Programme design document form for CDM programmes of activities (Version 03.0)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

UAE Solar Programme of Activities
Version: 04
Date of completion: 02/07/2013

A.2. Purpose and general description of the PoA

1(a) Policy/measure or stated goal that the PoA seeks to promote

The purpose of the proposed PoA is the generation of electricity through the utilization of the solar power potential in the UAE. The electricity generated through individual project activities will be supplied to the electricity grids under power purchase agreements between the owners of the solar power plants and the grid operating companies (in cases where the grid operator does not directly own the solar power plants).

As part of the United Arab Emirates (UAE) effort to diversify its economy, reduce its dependence on oil and natural gas, as well as to reduce their carbon emissions and support sustainable development, the Dubai Electricity & Water Authority (DEWA) has initiated the development of the UAE Solar Programme of Activities to promote the development of solar power and diversify the energy mix of the country.

1(b) Framework for the implementation of the proposed PoA

The UAE is a federation of seven emirates – Abu Dhabi, Dubai, Sharjah, Ajman, Fujairah, Ras al-Khaimah, and Umm al-Quwain. Political power is concentrated in Abu Dhabi, which controls the vast majority of the UAE's economic and resource wealth. The two largest emirates – Abu Dhabi and Dubai – provide over 80 percent of the UAE's income and account for most of the population of the country. They are also the largest electricity consumers and are both experiencing fast growth in the energy sector.

There are four sovereign entities operating four separate electricity grids in the UAE:

- DEWA (Dubai Electricity & Water Authority) operates the electricity grid of the Dubai Emirate – DEWA will be the Coordinating and Managing Entity for the UAE solar Programme of Activities.
- ADWEA (Abu Dhabi Electricity and Water Authority) operates the electricity grid of the Abu Dhabi Emirate.
- SEWA (Sharjah Electricity and Water Authority) operates the electricity grid of the Sharjah Emirate.
- FEWA (Federal Electricity and Water Authority) operates the electricity grid of the four Northern Emirates: Ras Al Khaimah, Ajman, Umm al Quwain and Fujairah.

Energy and water demands in Dubai have been growing in excess of 9% per annum[1] in recent years what have resulted in Dubai becoming one of the most energy- and CO_2-intensive economies in the world.

To best meet its future energy requirements, Dubai will have to simultaneously tackle energy efficiency and energy supply. Energy efficiency efforts will ensure that Dubai may avoid up to 4 GW of electricity consumption by 2030[2]. In addition to improving overall efficiency, Dubai also has to pursue a diversification strategy in its sources of energy. This approach will allow the Emirate of Dubai to better manage fossil fuel energy costs and meet its energy security and environmental objectives. Renewable energies, and solar in particular, still come at higher cost but must be considered in the longer run as they will become cost-competitive. Dubai's approach – outlined in Dubai's *Energy Strategy 2030* – will allow Dubai to diversify its energy mix and have enough fuel capacity to meet demand in the highest scenarios.
With regard to solar power, Dubai's strategy is to scale-up solar to reach a share of 5% by 2030. To successfully implement the *Dubai Integrated Energy Strategy 2030*, Dubai will strengthen the energy sector set-up, manage demand and secure supply.
In Dubai, DEWA is voluntarily planning the implementation of about 1,000 of MW solar power in the Emirate of Dubai, based on the *Dubai Integrated Energy Strategy 2030* that foresees a 5% solar energy share of total electricity generation by 2030.

Similarly, the Emirate of Abu Dhabi plans to be generating 7% of its electricity from renewable sources by 2020 as part of the plan to diversify its energy mix. This would translate into around 1,500 MW of renewable power, most of which will be solar.
Abu Dhabi is facing identical problems with a projected growth of energy demand of 11% to 14% per year, resulting in an energy demand in 2020 more than double that of today. In order to reduce its dependence on fossil fuels, Abu Dhabi plans on providing 25% of this energy through nuclear power and renewables.

However, solar power schemes are plagued by a number of barriers which have hindered their development. Some of the factors that have limited large-scale implementation of solar power projects in the country are:

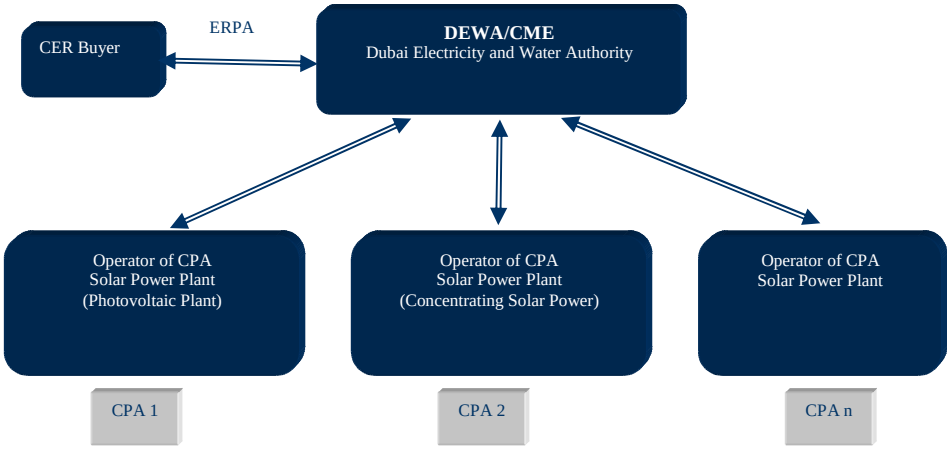
- There is abundance of low-cost hydrocarbons in UAE and the electricity prices are low, due to heavy subsidies which makes solar (as well as other renewable energy) projects artificially expensive
- The RE targets are set in Abu Dhabi and Dubai but there is no existing legally binding regulatory framework neither support schemes or mechanisms (such as feed-in-tariff) to achieve them
- It is difficult to obtain financing of the solar projects due to low attractiveness, lack of track record, and perceived higher risk of the solar power project amongst the banks and investment institutions
- Common financing models that allow customers to pay for solar developments through electricity bills are not achievable in the current pricing network in UAE
- Currently, the solar projects are subject to case-by-case regulation and electricity price negotiation which is both lengthy and cumbersome
- Extreme growth of the power and water consumption imposes a pressure on all new plants to produce both the electricity and the desalinated water – which the solar power plants don't do therefore the conventional fossil fuel based plants are preferred
- Technical issues of the solar power plants in desert areas (sanding resulting in output decrease, need for cleaning where there is no water, overheating, facing the wind during storms) are another disadvantages
- All this results in limited infrastructure for construction, installation and operation, human resources and missing research

DEWA is the Dubai Government authority responsible for power generation, water production, transmission and distribution of power and water in the Emirate of Dubai. DEWA operates 8 power plants with a total installed capacity of 7,361 MW and 7 desalination plants with an installed

capacity of 1.5 million cubic meters of water per day.

DEWA will be the Coordinating / Managing Entity (CME) and will have the following responsibilities with respect to the implementation of the proposed PoA:
− Creating PoA documentation (the CDM-POA-DD and CDM-CPA-DD)
− Obtaining a Letter of Authorization from the host country
− Obtaining a Letter of Approval from the host country and the Annex I Party involved
− Coordinating and communicating with the validator, verifier and the CDM Executive Board
− Drafting monitoring reports for all CPAs in accordance with the methodology outlined in the PoA-DD
− Requesting the UNFCCC to issue CERs into a registry account of the CER buyer(s)
Some of implemented solar generation capacity may be directly owned by the grid operators themselves, and some may be implemented by Independent Power Producers (IPPs) that feed the solar electricity into one of the UAE´s grids.
DEWA will enter into agreements with the individual owners of the solar power plants, stipulating that the latter cede all rights over the CERs to DEWA. The overall structure of the proposed scheme is given in Figure 1 below:

Figure 1: Structure of the proposed Programme of Activities



2. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity
The implementation of solar power projects is not mandatory in the United Arab Emirates or any of the emirates. The proposed PoA is a voluntary initiative conceived by DEWA (with no direct or indirect mandate by law) with the intent to support the objective of solar power development in the country.

3. Description of how the proposed PoA contributes to sustainable development

- Economical impacts:

The PoA, through its successful implementation, will serve as a model for investors and result in perception changes that are critical to expanding the use of solar power in Dubai. The availability of CER revenue will further provide impetus towards utilisation of solar power potential of the Emirate by attracting foreign investment. Further, the establishment of a market for investing in solar power projects will significantly impact building of capacity to manufacture system components domestically and lead to value creation and availability of green job opportunities in the region.

- Technology and know-how transfer:

By installing solar power plants, state-of-the-art environmentally sustainable technology is being applied by the project in the host country. Know-how transfer will be provided to local personnel to operate and maintain the plants.

- Environmental impacts:

Through the provision of sustainable energy in a country with one of the highest energy- and CO_2-intensive economies in the world, it is expected that the UAE Solar Programme of Activities will have a positive contribution to the achievement of MDG Goal 7: Ensuring environmental sustainability. The project is also consistent with the objectives of Dubai and Abu Dhabi to increase their share of solar power by respectively 5% in 2030 and 7% in 2020.

Since all four electricity grids in the United Arab Emirates are dominated by thermal power generation based on fossil fuel, the proposed project activity will achieve greenhouse gas emission reductions by displacing fossil fuel electricity from the grid.

A typical CPA in the PoA is expected to contribute to sustainable development in the following manner:

Job Creation

- The CPA will increase employment opportunities in the United Arab Emirates and increase the share of green jobs in the region;

Increased investment capital

- The CPA will promote sustainable development in the United Arab Emirates by promoting investment, and thereby improving the local economy;
- The CPA will reduce lead times and transaction costs associated with the CDM for potential investors in future CPAs, thereby making the proposed renewable power generation activity more attractive to sources of capital or equity;
- CERs revenue generated by the first few CPAs can be a potential capital source for future CPAs at early initial stages;
- The CPA will generate demand for local products when spare parts are needed, leading to promotion of business activities;

Enhanced diffusion of environmentally cleaner technologies

- The PoA will support the transfer of technology and technical know-how from other countries;

A.3. CMEs and participants of PoA

CME of the PoA: Dubai Electricity & Water Authority (DEWA)

Participants of the PoA:
- CME: Dubai Electricity & Water Authority (DEWA)
- Dubai Carbon Centre of Excellence (DCCE)

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
United Arab Emirates (Host)	Managing Entity: Dubai Electricity & Water Authority (DEWA) (public entity) Dubai Carbon Centre of Excellence (private entity)	No

A.5. Physical/ Geographical boundary of the PoA

The geographical boundary of the PoA extends up to the physical boundary of the United Arab Emirates.

A.6. Technologies/measures

The proposed PoA will promote renewable energy utilization by employment of solar power generation technologies.

The technologies proposed to be employed under the CPAs will be either

(i) Photovoltaic (PV) solar power plants, or
(ii) Concentrating Solar Power (CSP) plants.

The CPAs employing the PV technology may use, for example polycrystalline, monocrystalline or thin-film photovoltaic panels.

The CPAs employing the CSP technology may use, for example parabolic through system, power tower system or parabolic dish system. The CSP plants may use the natural gas, diesel or other liquid fossil fuel to supplement the solar output during periods of low solar radiation.

Per CPA, only one plant will be included into the PoA (i.e. a CPA shall include one plant only). The electricity generated by the project will be supplied to one of the four electricity grids in UAE. The technical details, including major civil works and equipment installed, will be detailed in the individual CPA-DD.

A.7 Public funding of PoA

There is no public funding from an Annex I country involved in the proposed PoA.

The required funds will be raised through various financial institutions and in-house funding. CME will ensure that there is no diversion of Official Development Assistance (ODA) in any of the CPAs under the PoA. This will be confirmed through an undertaking / declaration from the CPA owner submitted to CME.

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

The additionality of the PoA as whole is demonstrating that in the absence of CDM, none of the implemented CPAs would occur; due to:

(i) The proposed PoA is a voluntary coordinated action

The implementation of solar power projects is not mandatory in the United Arab Emirates or any of the Emirates. There is no regulation at federal level or Emirate level that restricts or empowers any authority to impose a fuel choice on electricity providers.

No obligation exists for DEWA or any other grid operator or any other private or public entity to utilize or develop solar power projects.

The proposed PoA is a voluntary initiative conceived by DEWA to stimulate sustainable development in the country.

(ii) The PoA would not be implemented in the absence of the PoA;

In order to better appreciate the extent of the challenges that the renewable energy sources, and the solar power in particular, face in United Arab Emirates and to demonstrate that such

activities *wouldn't be implemented in business-as-usual scenario*, a brief overview of the energy sector in UAEs and the share of solar power is provided below:

Power Sector in the United Arab Emirates

Although the region has one of the world's best solar resources, with several GW power generation potential, the government has historically valued oil and gas at cost and has provided the population with subsidized electricity, which has impeded the development of renewable energy.
Total installed grid-connected power generation capacity in UAEs is 26,132 MW, almost exclusively constituting from fossil fuel-based power plants (natural gas and heating oil).

Solar power projects in UAE:
There are only two grid-connected solar power plants in operation in UAE:

- Large scale 100 MW CSP plant called "Shams-1" in Abu Dhabi. This project foresees the CDM benefits and is registered as a CDM project activity "Abu Dhabi Solar Thermal Power Project", Ref. Number 2534.
- Small scale 10 MW photovoltaic power plant in Abu Dhabi. This project has been developed as a CDM project, and it is a registered as "ADFEC 10 MW Solar Power Plant", Ref. Number 2444. It is implemented in Madinat-Zayed, Emirate of Abu Dhabi and is part of the Masdar project, a unique, path-breaking low-carbon city with substantial government support, highly experimental and explicitly risk-taking and pioneering in the renewable energy sector of United Arab Emirates.

There is one small scale PV power plant in preparation in Dubai. It is a project of DEWA, with total installed capacity 13 MW. The project foresees the CDM benefits, too, registered under Ref. Number 6964 as "10 MW Photovoltaic Plant in Dubai, UAE".

Table 1–Latest Overview of the Installed Electricity Capacity in UAE

Based on fossil fuels	**Based on solar power**
26,022 MW	110 MW
99.58%	0.42%

Sources: www.emiratessolar.com,
http://www.irena.org/News/Description.aspx?NType=A&PriMenuID=16&catid=17&mnu=cat&News_ID=304 (solar power),
and http://www.uaestatistics.gov.ae/ReportPDF/310313_AES_ES_ENERGY%202011.xlsx (total capacity)

Fossil fuel-based thermal energy generation contributes to 99.58% of total installed power generation capacity. Solar power thus contributes only to 0.42% of total installed capacity for electricity generation of the country at the time of validation of this PoA.
Solar power is not a prevailing practice in UAEs.

Due to very low energy prices in UAE and high investment costs[3] for installation of solar power plants the incentive and interest for this type of energy generation is very low. As can be seen from the above overview, the only existing and all of the solar projects in preparation have been prepared as CDM projects. The generation of extra income from the carbon credits would significantly improve cash flow and debt service ratio of the projects.
Moreover, there is an important non-financial impact for solar power plants developers who will benefit from high positive credit of CDM and the "green image".

In this respect, the PoA is expected to provide a strong incentive to potential investors,

[3] *Installation costs for 1 kWp of photovoltaic power plant are estimated to 3,000 USD. Source: Bloomberg New Energy Finance, New York, April 2011.*

encouraging the implementation of solar power development in the region which would not happen without the CDM benefits the PoA provides.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced

The implementation of solar power technologies is not mandatory in the United Arab Emirates and there is no legal requirement on the choice of a particular technology.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

The implementation of solar power projects is not mandatory in the United Arab Emirates and there is no restriction or empowerment of any authority to restrict the fuel choice.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

The eligibility criteria for inclusion of a CPA in the PoA have been developed according to the *Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (further on referred to as "PoA Standard"), Version 02.1, EB 65[4].
Based on this eligibility criteria it is assumed that each CPA which is included in the registered PoA is additional.

A CPA is eligible for inclusion in the PoA, provided the CPA fulfils the following criteria, demonstrated through any of the listed evidences for each criterion below:

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

No.	Criteria	Yes/No	Conclusion	Documentary Evidence
(a)	Geographical boundary: Is the project activity located in the United Arab Emirates?	Yes	Eligible in the PoA	Land Documents, GPS Coordinates, maps
(b)	Double counting: Is the proposed CPA uniquely identified and defined in an ambiguous manner?	Yes	Eligible in the PoA	CPA title, GPS coordinates
	Is there any other registered CDM project activity with the same identification data?	No	Eligible in the PoA	Analysis of projects in the CDM pipeline
(c)	Specifications of technology/measure: Does the CPA implement a renewable power plant – solar PV or CSP power plant?	Yes	Eligible in the PoA	Technical project documentation
(d)	Start date: Is the CPA starting date on the day or later of the start of validation of the PoA (uploading for global stakeholders comments on the UNFCCC web site)	Yes	Eligible in the PoA	Project implementation plan, business plan
(e)	Applicability of the methodology: Does the CPA comply with criteria of ACM 0002, Version 13.0.0?	Yes	Eligible in the PoA	Described in the CPA-DD, using the Table 3 below
(f)	Additionality: is it demonstrated that the project activity which forms the CPA would not have occurred anyway due to technological barriers according to the latest version of the Tool for the demonstration and assessment of additionality?	Yes	Eligible in the PoA	CME check and confirmation in the CPA-DD

[4] *http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf*

(g)	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis:			
(g-1)	Does the proposed CPA consist of a new solar power plant located at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant)?	Yes	Eligible in the PoA	E.g. Technical project documentation, Project Report, Land Documents, Clearances, Purchase Orders, CME site visit
(g-2)	Environmental impact analysis: If the EIA is required by the national/Emirate laws/regulation has it been performed accordingly?	Yes	Eligible in the PoA	EIA documentation, if applicable
(g-3)	Stakeholders´ involvement: Has the stakeholder consultation been conducted and have all concerns raised been taken into due account?	Yes	Eligible in the PoA	E.g. event invitation, minutes of the meeting, example questionnaire, summary of concerns raised and clarification provided thereof, attendance sheet, photographs and/or video
(h)	Funding from Annex I parties: Has/will the CPA receive/d any public funding from Annex I country? If so, is it a diversion from the Official Development Aid (ODA)?	No	Eligible in the PoA	Confirmation in the CPA-DD.
(i)	Target group and distribution mechanism	Not applicable, no specific target group and no specific distribution mechanisms are applied		
(j)	Conditions related to sampling requirements	Not applicable, sampling procedures are not applied		
(k)	Small-scale or micro-scale threshold	Not applicable, the PoA involves large-scale CPAs[5]		
(l)	Debundling	Not applicable, the PoA involves large-scale CPAs		

Table 3 - Applicability criteria of the methodology

Applicability Criteria	Project eligibility
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)	All CPAs under the PoA are new solar power plants supplying electricity to the grid.
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	All CPAs install new solar power plants.

[5] *Even if the CPA is below the large-scale threshold, it is handled as a large-scale project activity.*

In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	CPAs are Greenfield projects and therefore this criterion is not applicable.
In case of hydro power plants: One of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2.	CPAs are solar power plants and therefore this criterion is not applicable.
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	CPAs are solar power plants and therefore this criterion is not applicable.
The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that results in the creation of a new single reservoirs or in the increase in an existing single reservoirs where the power density of the reservoir is less than 4 W/m^2.	CPAs are solar power plants and therefore this criterion is not applicable.
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	CPAs are Greenfield plants and therefore this criterion is not applicable.
In addition, the applicability conditions included in the tools referred to above apply.	These criteria are fulfilled as described in the respective

This methodology refers to the latest approved versions of the following tools: 1. Tool to calculate the emission factor for an electricity system; 2. Tool for the demonstration and assessment of additionality; 3. Combined tool to identify the baseline scenario and demonstrate additionality; 4. Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.	sections of the PoA-DD and individual CPA-DDs.

There are no additional eligibility criteria for any of the distinct type of CPA considering technical and economic parameters, as described in the methodology, since

- they are not relevant (the solar irradiation in all UAE is sufficiently high), or
- they are reflected in the initial CPA implementer´s decision to undertake the project (investment climate, size of installation, efficiency of the technology, operating and maintenance costs, etc.), or
- they are reflected in the CPA´s additionality assessment (subsidies), or
- they are included in the general eligibility criteria (ODA)

Updating of the eligibility criteria will be performed as per the "PoA Standard", Section 3.2.2.

B.3. Application of methodologies

Technology/measure: The CPAs included in the proposed PoA will generate electricity from the renewable solar energy, using either photovoltaic (PV) or concentrated solar power (CSP) technology. The installed capacity of the power plants will be usually of a large scale (above 5 MW).

Therefore the chosen approved baseline and monitoring methodology for CPAs using both the PV and the CSP technology:
Title: ACM0002 - Consolidated baseline methodology for grid connected electricity generation from renewable sources, Version 13.0.0, EB 67
Sectoral Scope I: "Energy industries (renewable - / non-renewable sources)"
Scale: Large-scale

Reference: It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC/CDM:
http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

This methodology also refers to the latest approved versions of the following **tools:**

- "Combined tool to identify the baseline scenario and demonstrate additionality", Version 5.0.0, EB 70
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v5.0.0.pdf
- "Tool to calculate the emission factor for an electricity system for definition of an electricity system", Version 2.2.1", EB 63
- http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdfAdditionality of CPAs is demonstrated as per the "Tool for the demonstration and assessment of additionality", Version 07.0.0, EB 70
- http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", currently Version 02, EB 41
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

The Programme of Activities follows the latest versions of these general regulatory/standards:

- "Clean development mechanism project standard", Version 03.0, EB 65
  http://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-

20130412165420186/pp_stan01.pdf

- Standard "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", Version 02.1 , EB 65 http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf
- Guideline "Completing the programme design document form for CDM programmes of activities", Version 03.1, EB 70 http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid10.pdf
- Guideline "Completing the component project activity design document form", Version 01.0, EB 66 http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid14.pdf

SECTION C. Management system

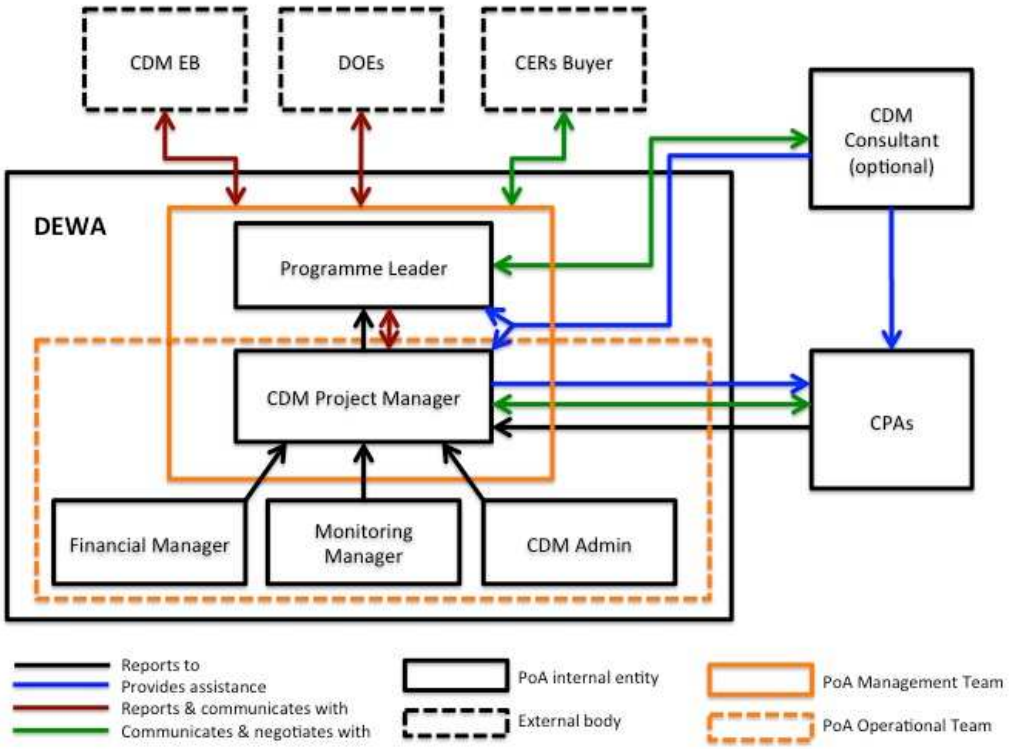
The operational and management arrangements to be established at the CME level are elaborated according to the PoA Standard.

a) Clear definition of roles and responsibilities of personnel involved in the process of CPA inclusion

The role of the CME is to assess and review potential CPAs, to perform eligibility assessment, complete the CPA-DD, and submit a CPA inclusion request to the DOE.

The CME responsibilities are split across two teams within the organization: the PoA Management Team and PoA Operational Team. Some tasks may be performed by external consultants, however, always checked and approved by CME.

Figure 1 - Organisational structure of the CME



The **PoA Management Team** consists of the Programme Leader, (representative of the management) and the CDM Project Manager. The CDM Project Manager and other persons within DEWA executing operational tasks form the **PoA Operational Team**.

The responsibilities and competencies of all the personnel on individual positions are flexible – they can be merged or dispersed according to the actual needs and capacities.

The CME may ensure **external consultants** for advisory and assistance both for CME itself as well as for CPA implementers.
General competency and qualification requirements for all involved personnel:

- clear understanding of CDM modalities and protocol
- clear understanding of the monitoring and verification requirements of the PoA
- clear understanding of the CPA eligibility criteria of the PoA
- fluency in English

Detailed overview of the team members and their tasks and competencies are described in the CME Manual which has been made available to the DOE at the time of PoA validation.

b) Records and arrangements for training and capacity development for personnel

Introductory CDM/PoA/CME training will be provided for all involved personnel. Specific training will be provided to individual positions as required. Training will be provided whenever a new member is inducted to any of the above mentioned team. Update trainings will be provided after any substantial change in the CDM/PoA/CME rules by UNFCCC.
Records of the trainings (training documents and attendance sheets) will be kept and made available to the DOE upon request.

c) Procedures for technical review of inclusion of a CPA in the PoA

In order to be included in the PoA, the CME will assess the eligibility of each CPA to see if fulfils the requirements, the criteria as described in section B.2.
A CPA is eligible for inclusion under the PoA, provided that the CPA fulfils the eligibility criteria, demonstrated through the listed evidences for each eligibility criterion.
The CPA will be tested for eligibility in 2 steps:

1. At identification of a new CPA the general characteristics of the CPA are checked
2. If the CPA passes the entry testing, the CPA-DD shall be drafted for the CPA and documentation and evidence shall be collected. Thus more in-depth characteristics are confronted with eligibility criteria and accordance with all criteria is confirmed by providing the necessary documents and evidences.

Eligible CPA will obtain a serial number, the CPA implementer shall sign a contract with CME (if the CPA implementer is different from the CME itself), CPA implementation plan will be prepared and CME will apply to DOE to confirm inclusion of the CPA into the PoA.
The step-by-step procedure is described in the CME Manual.

d) <u>Procedure to avoid double counting</u>

DEWA, as CME, will confirm that the project activity included in the CPA is not registered in any other CPA of the PoA or any other registered CDM Project activity through the following procedure to avoid double counting of CPAs under any other CDM or PoA activity:

- External double counting check: At the time of CPA eligibility check, DEWA will check any double counting using public information sources such as UNFCCC website data, UNEP Risoe CD4CDM data, the VCS website, etc.
- Internal double counting check: The PoA database as will not enable duplicate entries of the GPS coordinates which are unique for each CPA. Thus it will be ensured that one CPA is not included in the PoA more than once. Each CPA will be given a unique serial number. The format of the number will be as following: LNNN, with L being the first letter of the name of the grid the CPA is connected to (D for DEWA, F for FEWA, S for SEWA, A for ADWEA) and NNN being an order number associated with the CPA. E.g. the first CPA connected to DEWA grid will have the following serial number: D001.
- Internal double counting declaration: At the time of inclusion, DEWA shall obtain a declaration from the CPA implementer that "there is no double counting of CERs from this CPA under any CDM Project or CPA in another PoA", along with the following undertakings:
  - The CPA has not been and will not be registered as a single CDM project activity or as a CPA under another PoA.

- The CPA implementer is aware that the CPA will be subscribed to the present PoA.
- The CPA implementer cedes its rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC to DEWA.

e) Record keeping system and documentation control for each CPA

In order to ensure transparency and high quality of the information and documentation managed by CME the record keeping system for every CPA and the overall PoA database is specially designed by CME.

It will consist of the following details for enabling unique identification for each CPA:

1. Unique serial number of the CPA,
2. Name of the CPA implementer,
3. Shareholding pattern of the CPA implementer describing the ownership information of the respective solar power plant,
4. Exact Location: City/State/Province/Emirate,
5. GPS coordinates (latitude and longitude),
6. Grid which the CPA is connected to,
7. Commissioning details of each unit,
8. Start date of crediting period and date of renewal of permits,
9. The record of technical specification of each solar power plant participating in the PoA,
10. Roles and responsibilities for audit and verification of monitored parameters.

A record-keeping system will be established by each CPA implementer, too. The data monitoring will primarily include the measurement of electricity exported to and imported from the grid by each CPA. The CPA implementer will prepare a report with the monthly records of electricity exported to and imported from the grid, gross electricity generation, transmission/transformation losses and auxiliary consumption. In case of any anomalies, the CPA implementer will take appropriate corrective actions. The reports will be submitted to CME. CME will maintain a record of this data which will subsequently be provided to the DOE during the verification process. Detailed description of the procedures to be followed by each CPA for monitoring and record keeping of data is provided in Part II, Section B.7.2.

f) Measures for continual improvement of the PoA management

Management system of the PoA shall be continuously reviewed by all involved personnel in order to identify any potential weaknesses, risks/threats, and ways of their elimination, as well as opportunities for improvement.

In order to do so, internal audits will be scheduled for at least once per year and technical reviews will be performed for certain documents (new CPAs, monitoring reports, new version of CME Manual).

g) The CPA implementers are aware and have agreed that their activity is being subscribed to the PoA

The CPA implementer involved in any of the CPAs under this programme shall provide the mandate to DEWA to subscribe the project under the PoA. This will be ensured through a contractual agreement of the CPA implementers with DEWA before inclusion of the respective CPA.

h) Updating eligibility criteria

Updating of the eligibility criteria will be performed as per the “PoA Standard”, Section 3.2.2.

Moreover, in accordance with ACM0002 version 13.0.0, the eligibility criteria related to costs, revenues and investment climate will be updated every two years in order to correctly reflect the technical and market circumstances of a CPA implementation, if necessary..

SECTION D. Duration of PoA

D.1. Start date of PoA

Starting date of the PoA is 01.03.2012 – the date of publication of the PoA-DD for global stakeholder consultation.

D.2. Duration of the PoA

28 years 0 months

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

The environmental impact assessment/analysis will be done at the CPA level.
Environmental Impact Assessment needs to be carried out in accordance with respective Emirate´s rules and federal UAEs´ rules and guidelines at the time of inclusion of the CPA.

The current rules foresee that, for each project, a notice of intent will be submitted to the relevant authority in the respective emirate, which will then decide on the need for an Environmental Impact Assessment (EIA) and will state the form and scope of the assessment.
The CPA implementer will then perform the EIA as requested.

E.2. Analysis of the environmental impacts

N/A. The environmental impact assessment/analysis will be done at the CPA level.

E.3. Environmental impact assessment

N/A. The environmental impact assessment/analysis will be done at the CPA level.

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

The Local Stakeholder Consultations will be held at the CPA level, taking into consideration variations in the scale, locations, and technologies of the CPAs.

In general, for each CPA to be included into the PoA the CPA implementer with assistance of the CME shall:

- invite local stakeholders to provide comments on the proposed CPA in an open and transparent manner, in a way that facilitates comments to be received from local stakeholders and allows for a reasonable time for comments to be submitted,
- describe the proposed CPA in a manner that allows the local stakeholders to understand it,
- demonstrate how due steps/actions were taken to appropriately engage stakeholders and solicit comments,
- prepare a summary of the comments received from local stakeholders, demonstrate that all comments received for the proposed CPA have been considered

F.2. Summary of comments received

N/A. The Local Stakeholder Consultations will be held at the CPA level.

F.3. Report on consideration of comments received

N/A. The Local Stakeholder Consultations will be held at the CPA level.

SECTION G. Approval and authorization

The CME has submitted to DOE a letter from the Environment Agency in Abu Dhabi which is a DNA of the Host Party (United Arab Emirates) representing both:

a) Letter of Approval of the Host Party b) Letter of authorization of coordination of the PoA for DEWA as the CME

PART II. Generic component project activity (CPA)

PART II.1.- Generic PV-CPA

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

The PV-CPAs included in the proposed PoA will generate electricity from the renewable solar energy, using photovoltaic (PV) technology – monocrystalline, polycrystalline or thin-film panels. Installed capacity of one PV power plant will be usually more than 5 MW and the power plant will be connected and supplying to the grid.

The PV power plants will provide sustainable energy in a country with one of the highest energy- and CO_2-intensive economies in the world, will have a positive contribution to the achievement of MDG Goal 7: Ensuring environmental sustainability, as well as to the objectives of Dubai and Abu Dhabi emirates to increase their share of solar power by respectively 5% in 2030 and 7% in 2020.

A typical CPA in the PoA is expected to contribute to sustainable development in the following manner:

Job Creation

- The CPA will increase employment opportunities in the United Arab Emirates and increase the share of green jobs in the region;

Increased investment capital

- The CPA will promote sustainable development in the United Arab Emirates by promoting investment, and thereby improving the local economy;
- The CPA will reduce lead times and transaction costs associated with the CDM for potential investors in future CPAs, thereby making the proposed renewable power generation activity more attractive to sources of capital or equity;
- CERs revenue generated by the first few CPAs can be a potential capital source for future CPAs at early initial stages;
- The CPA will generate demand for local products when spare parts are needed, leading to promotion of business activities;

Enhanced diffusion of environmentally cleaner technologies

- The PoA will support the transfer of technology and technical know-how from other countries;

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

Technology/measure: The PV-CPAs included in the proposed PoA will generate electricity from the renewable solar energy, using photovoltaic (PV) technology.

The chosen approved baseline and monitoring methodology for the PV-CPAs:
Title: ACM0002 - Consolidated baseline methodology for grid connected electricity generation from renewable sources, Version 13.0.0, EB 67

Reference: It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC/CDM:
http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

This PoA also follows of the following **tools:**

- "Combined tool to identify the baseline scenario and demonstrate additionality", Version 5.0.0, EB 70
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v5.0.0.pdf
- "Tool to calculate the emission factor for an electricity system", Version 2.2.1", EB 63
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
- "Tool for the demonstration and assessment of additionality", Version 07.0.0, EB 70
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", Version 02, EB 41
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

The CPA follows the latest versions of these general regulatory/standards:

- "Clean development mechanism project standard", Version 03.0, EB 65
  http://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20130412165420186/pp_stan01.pdf
- "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", Version 02.1 , EB 65
  http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf
- Guideline "Completing the programme design document form for CDM programmes of activities", Version 03.1, EB 70
  http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid10.pdf
- Guideline "Completing the component project activity design document form", Version 01.0, EB 66
  http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid14.pdf

B.2. Application of methodology(ies)

The methodology ACM0002 has been applied since it relates to large scale grid-connected electricity generation from renewable sources. The applicability criteria of the methodology, along with project eligibility, are provided in the table below:

Applicability Criteria	Project eligibility
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the	All PV-CPAs under the PoA are new solar power plants supplying electricity to the grid.

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)	
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	All PV-CPAs install new solar power plants.
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	PV-CPAs are Greenfield projects and therefore this criterion is not applicable.
In case of hydro power plants: One of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2.	PV-CPAs are solar power plants and therefore this criterion is not applicable.
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	PV-CPAs are solar power plants and therefore this criterion is not applicable.

The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that results in the creation of a new single reservoirs or in the increase in an existing single reservoirs where the power density of the reservoir is less than 4 W/m^2.	PV-CPAs are solar power plants and therefore this criterion is not applicable.
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	PV-CPAs are Greenfield plants and therefore this criterion is not applicable.
In addition, the applicability conditions included in the tools referred to above apply. This methodology refers to the latest approved versions of the following tools: 5. Tool to calculate the emission factor for an electricity system; 6. Tool for the demonstration and assessment of additionality; 7. Combined tool to identify the baseline scenario and demonstrate additionality; 8. Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.	These criteria are fulfilled as described in the respective sections of the PoA-DD and individual PV-CPA-DDs.

Documentation that has been used as a basis of justification of the use of methodology: project documentation and/or PV power plant design. It will be prepared for each individual PV-CPA.

B.3. Sources and GHGs

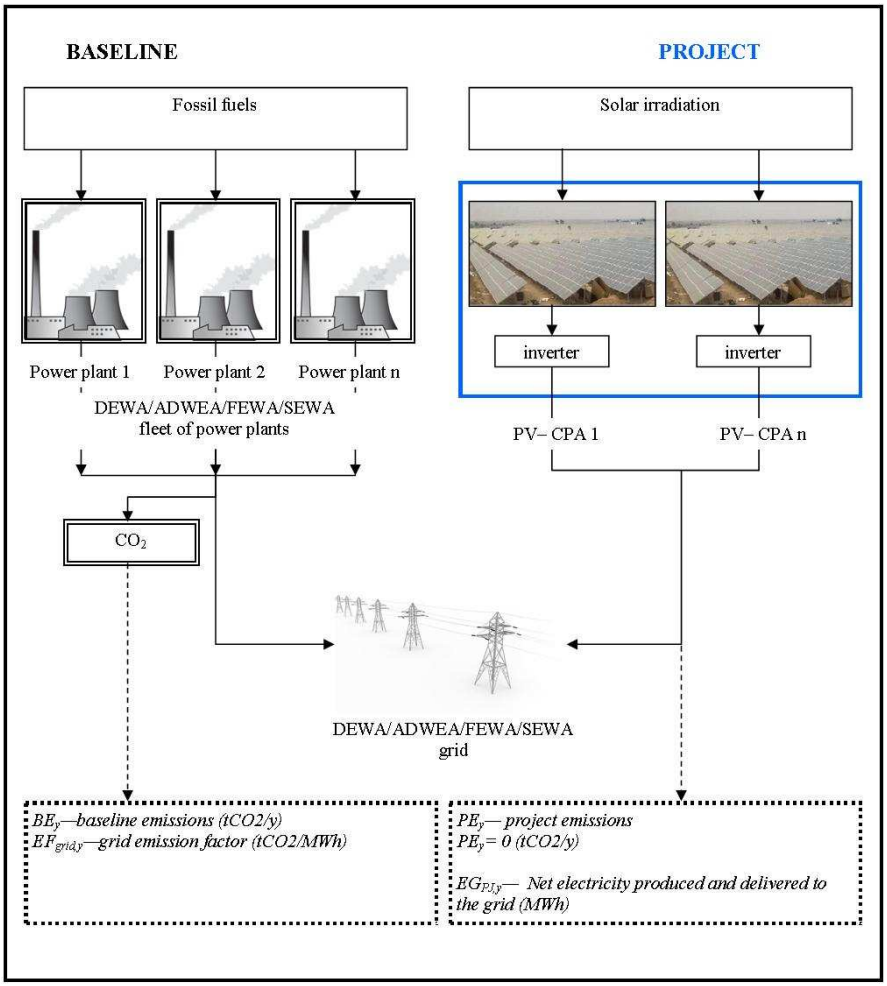
As per methodology ACM0002, *the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.*

The baseline includes the emissions related to the electricity produced by the facilities and power plants to be displaced by the CPA. This involves emissions from displaced fossil fuel use at power plants connected to one of the four separate electricity grids in UAE operated by sovereign entities:

- DEWA (Dubai Electricity & Water Authority) operates the electricity grid of the Dubai Emirate – DEWA will be the Coordinating and Managing Entity for the UAE solar Programme of Activities.
- ADWEA (Abu Dhabi Electricity and Water Authority) operates the electricity grid of the Abu Dhabi Emirate.
- SEWA (Sharjah Electricity and Water Authority) operates the electricity grid of the Sharjah Emirate.
- FEWA (Federal Electricity and Water Authority) operates the electricity grid of the four Northern Emirates: Ras Al Khaimah, Ajman, Umm al Quwain and Fujairah.

Source		Gas	Included	Justification/Explanation
Baseline	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	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	No significant emissions of CO2 are associated with construction or operation of the PV-CPA, no fossil fuel will be used for electricity generation. No geothermal plant
		CH_4	No	Not applicable to solar power plants
		N_2O	No	Not applicable to solar power plants
	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	No geothermal plant
		CH_4	No	No geothermal plant
		N_2O	No	No geothermal plant
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	No hydro power plant
		CH_4	No	No hydro power plant
		N_2O	No	No hydro power plant

Figure 2 - PV CPA project diagram



Equipment/technology to be installed by the project activity

Emission source/ GHGs included

Data/parameters monitored

Project boundary

B.4. Description of baseline scenario

The baseline scenario is defined in the chosen methodology ACM 0002, as follows: *" If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

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

B.5. Demonstration of eligibility for a generic CPA

No.	Criteria	Yes/ No	Conclusion	Demonstration and justification of how the CPA complies with the criteria	Documentary Evidence
(a)	Geographical boundary: Is the project activity located in the United Arab	Yes	Eligible in the PoA	The CPA is/will be located within the geographical boundary of one of the	Land Documents, GPS

	Emirates?			emirates in UAE.	Coordinates, maps
(b)	Double counting: Is the proposed CPA uniquely identified and defined in an ambiguous manner?	Yes	Eligible in the PoA	The CPA is uniquely identified and defined in an ambiguous manner.	CPA title, GPS coordinates
	Is there any other registered CDM project activity with the same identification data?	No	Eligible in the PoA	There is no other registered CDM project activity with the same identification data.	Analysis of projects in the CDM pipeline
(c)	Specifications of technology/measure: Does the CPA implement a renewable power plant – solar PV or CSP power plant?	Yes	Eligible in the PoA	The CPA implements a PV plant, renewable power generation from solar energy.	Technical project documentation
(d)	Start date: Is the CPA starting date on the day or later of the start of validation of the PoA (uploading for global stakeholders comments on the UNFCCC web site)	Yes	Eligible in the PoA	The start date of the CPA is later than the start date of the PoA.	Project implementation plan, business plan
(e)	Applicability of the methodology: Does the CPA comply with criteria of ACM 0002, Version 13.0.0?	Yes	Eligible in the PoA	Applicability of the chosen methodology for the CPA is justified above in the section B.2. of the Part II. of this PoA-DD	Described in the CPA-DD
(f)	Additionality: is it demonstrated that the project activity which forms the CPA would not have occurred anyway due to technological barriers according to the latest version of the Tool for the demonstration and assessment of additionality?	Yes	Eligible in the PoA	The proposed CPA would not occur anyway, as demonstrated below.	CME check and confirmation in the CPA-DD
(g)	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis:				
(g-1)	Does the proposed CPA consist of a new solar power plant located at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant)?	Yes	Eligible in the PoA	The CPA is/will be constructed on the empty site; it is a greenfield project. CME has checked and confirms that there is no solar power plant on the site.	E.g. Technical project documentation, Project Report, Land Documents, Clearances, Purchase Orders, CME site visit
(g-2)	Environmental impact analysis: If the EIA is required by the national/Emirate laws/regulation has it been performed accordingly?	Yes	Eligible in the PoA	The EIA has been performed or the EIA is not required	EIA documentation if applicable or confirmation from the respective authority that EIA is not required
(g-3)	Stakeholders´ involvement: Has the stakeholder	Yes	Eligible in the PoA	CPA has invited and taken account of the local	E.g. event invitation,

	consultation been conducted and have all concerns raised been taken into due account?			stakeholders' comments.	minutes of the meeting, example questionnaire, summary of concerns raised and clarification provided thereof, attendance sheet, photographs and/or video
(h)	Funding from Annex I parties: Has/will the CPA receive/d any public funding from Annex I country? If so, is it a diversion from the Official Development Aid (ODA)?	No	Eligible in the PoA	The CPA has not received any public funding from Annex I country Or If so, is it not diversion from the Official Development Aid (ODA)	Confirmation in the CPA-DD.
(i)	Target group and distribution mechanism	Not applicable, no specific target group and no specific distribution mechanisms are applied			
(j)	Conditions related to sampling requirements	Not applicable, sampling procedures are not applied			
(k)	Small-scale or micro-scale threshold	Not applicable, the PoA involves large-scale CPAs[6]			
(l)	Debundling	Not applicable, the PoA involves large-scale CPAs			

Confirmation of additionality of the generic PV-CPA:

As per the PoA Standard, Section 3.Requirements, point 10., the **additionality of each PV-CPA** is reflected in the eligibility criteria derived from the relevant requirements contained in the additionality section of the large scale methodology ACM0002.

As per the methodology ACM0002, *"The additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Board, which is available on the UNFCCC CDM website."*

Additionality of each PV-CPA shall be demonstrated according steps of the **"**Tool for the demonstration and assessment of additionality, Version 7.0.0., EB 70 as follows:

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

This step is optional.

If it is not applied; it shall be considered that the proposed project activity is not the first-of-its-kind.

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

Credible and realistic alternatives to the CPA should be defined through the following sub-steps:

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

These alternatives include, at minimum:

The proposed project activity undertaken without being registered as a CDM project activity

b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g. cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant,

[6] *Even if the CPA is below the large-scale threshold, it is handled as a large-scale project activity.*

examples of scenarios identified in the underlying methodology;

c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

For the purpose of identifying relevant alternative scenarios, the CPA implementer will include the technologies or practices that provide outputs or services (e.g. electricity, heat) with comparable quality, properties and application areas as the proposed CPA and that have been implemented previously or are currently being introduced in the relevant country/region.

Outcome of sub-step 1a: Identified realistic and credible alternative scenario(s) to the project activity

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

Outcome of sub-step 1b: Identified realistic and credible alternative scenarios to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations. At least one of the identified alternatives is in line with current laws and regulations in the UAEs at the time of the submission of the CPA to DOE for validation.

The proposed project activity is not the only realistic and credible scenario that is in compliance with mandatory regulations.

Project participants chose to further demonstrate the additionality by the means of *Step 3 – Barrier Analysis*.

Step 3: Barrier analysis:

Barriers to the proposed project activity are identified and it is assessed which of the alternatives are prevented by these barriers.

The latest approved version of the "Guidelines for objective demonstration and assessment of barriers" shall be taken into account.

CPA determines whether the proposed project activity faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and

(b) Do not prevent the implementation of at least one of the alternatives.

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

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

b) Technological barriers

c) Other barriers

From the listed barriers, the project participants chose to use the Technological barriers for further demonstration of additionality.

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, the CPA implementer should explain how they are affected less strongly than they affect the proposed CPA.

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 the CDM does not alleviate the identified barriers that prevent the implementation of the proposed CPA, the project cannot be considered additional.

Outcome of Step 3: 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:
The above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and region. This test is a **credibility check** to complement the barrier analysis (Step 3).
If the outcome of the common practice analysis is that the project is not the common practice in the region, and the CPA has successfully demonstrated its additionality by the barrier analysis, it will be concluded that the CPA is additional.
Identify and discuss the existing common practice through the following sub-steps. Since the proposed CDM project activity applies measure that is listed in the definitions section of the Additionality Tool, proceed to Sub-step 4a.

Sub-step 4a: The proposed CDM project activity(ies) applies measure(s) that are listed in the definitions section of the tool
As per the tool, the latest version of the "Guidelines on common practice" available on the UNFCCC website shall be applied.
The latest version at the time of submission of the PoA for validation is Version 02.0 (EB 69) (http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid44.pdf).

Outcome of sub-step 4: [By following the above step-wise approach it will be demonstrated that the PoA eligibility/additionality condition is still applicable after implementation of the proposed CPA, and the CPA is eligible and additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

According to the approved methodology ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following: *Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".*

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Equation (6) of the methodology ACM0002, Version 13.0.0 (EB 67)

Where:

BE_y	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system (tCO_2/MWh)

Calculation of the $EF_{grid,CM,y}$:

The emission factor (tCO_2/MWh) for the displacement of electricity generated by power plants in an electricity system is calculated in a transparent and conservative manner as combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the UNFCCC methodological 'Tool to calculate the Emission Factor for an electricity system' (further on referred to as "GEF Tool").

The GEF Tool calculates the combined margin emission factor (CM) which is the weighted average of the operating margin (OM) and build margin (BM) emission factors of the electricity system; the effect of a specific project upon the electricity grid can be illustrated in terms of its effect upon operations, or the "operating margin" (OM), and its effect upon capacity additions, or the "build margin" (BM). The OM is primarily a near-term effect and the BM a long-term effect. In principle, a project's effect upon system capacity mix could be to defer new capacity additions and/or to accelerate existing capacity retirements.

Due to the national grids structure and independence of the 4 individual grids operating in UAEs the grid emission factor is calculated separately for each grid.

Application of the grid emission factors by individual CPAs:

Each new CPA included under the proposed PoA shall apply the grid emission factor from the latest version of the PoA-DD.

Due to lack of information, only the DEWA and FEWA grid emission factors are calculated and available in the PoA-DD for the first 7 years of the crediting period of the UAE Solar Programme of Activities, as follows:

1. The **DEWA** grid emission factor is calculated ex-ante at the time of submission of the PoA-DD for validation and it is fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the DEWA grid and included into the PoA during the first 7 years of the PoA crediting period, and fixed for the first 7 years of the respective crediting period of these CPAs.

The DEWA grid emission factor will be revised after 7 years of the PoA crediting period, and fixed and used accordingly.

The **DEWA** grid emission factor for the first 7 years of the PoA crediting period has been calculated according to the GEF Tool, Version 2.2.1, EB 63. Details of the calculation are in Appendix 4

Vale to be used for the first 7 years of the PoA: 0.5152 tCO_2/MWh

2. The **FEWA** grid emission factor is calculated ex-ante at the time of submission of the PoA-DD for validation and it is fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the FEWA grid and included into the PoA during the first 7 years of the PoA crediting period, and fixed for the first 7 years of the respective crediting period of these CPAs.

The FEWA grid emission factor will be revised after 7 years of the PoA crediting period, and fixed and used accordingly.

The **DEWA** grid emission factor for the first 7 years of the PoA crediting period has been calculated according to the GEF Tool, Version 2.2.1, EB 63. Details of the calculation are in Appendix 4

Vale to be used for the first 7 years of the PoA: 0.8022 tCO_2/MWh

For ADWEA and SEWA grid emission factors where data is not available at the time of PoA validation, the following approach shall be applied:

3. The **ADWEA** grid emission factor shall be calculated at CPA level, at the time of inclusion of each CPA connected to the ADWEA grid and fixed for the first CPA crediting period. The ADWEA grid emission factor may be calculated on the PoA level after 7 years of the PoA crediting period and fixed on the PoA level for the second 7 years of the PoA crediting period and used accordingly.

4. The **SEWA** grid emission factor shall be calculated at CPA level, at the time of inclusion of each CPA connected to the SEWA grid and fixed for the first CPA crediting period. The SEWA grid emission factor may be calculated on the PoA level after 7 years of the PoA crediting period and

fixed on the PoA level for the second 7 years of the PoA crediting period and used accordingly.

Explanation of the methodological choices of the calculation of the DEWA and FEWA grid emission factor fixed in the PoA-DD for the first 7 years of the PoA crediting period:
According to the GEF Tool, Version 2.2.1, EB 63 there are 6 main steps in the process of calculating the grid emission factor[7]:

STEP 1. Identify the relevant electricity systems

Although operating independently the 4 grids operating in UAEs are mutually interconnected.
The DEWA, ADWEA, FEWA and SEWA grids are wholly located in UAEs which is the non-Annex I country.
There are no connected grids from Annex I countries.
Therefore the GEF Tool is applicable to the proposed project activity.

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

For both the DEWA and FEWA grid emission factors, Option I has been used: Only grid power plants are included in the calculation.

STEP 3. Select a method to determine the operating margin (OM)

For both the DEWA and FEWA grid emission factors calculation, the Average OM method has been chosen. The average OM emission factor ($EF_{grid,OM\text{-}ave,y}$) is calculated as the average emission rate of all power plants serving the grid.

According to the GEF Tool, for the average OM the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante option.*
- *Ex post option.*

The ex ante data vintage option has been chosen. The emission factor is determined once at the PoA validation stage (for DEWA and FEWA grids), thus no monitoring and recalculation of the emissions factor for future CPAs is required during the first 7 years. For grid power plants, a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PoA-DD to the DOE for validation, has been used.

STEP 4. Calculate the operating margin emission factor according to the selected method
The average OM emission factor is calculated as ($EF_{grid,OM\text{-}ave,y}$) is calculated as the average emission rate of all power plants using the methodological guidance as described for the simple OM, but also including the low-cost/must-run power plants in all equations.

The Average OM may be calculated:
Option A: Based on the electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B should only be used if the necessary data for Option A is not available.

[7] *Details of GEF calculations are in Appendix 4*

For both the DEWA and FEWA grid emission factors calculation, Option A has been chosen for the calculation of the Average OM. *Under this option, the Average OM emission factor is calculated based on the net electricity of each power unit and an emission factor for each power unit, as follows:*

$$EF_{grid,OM-avee,y} = \frac{\Sigma_m EG_{m,y} * EF_{EL,my}}{\Sigma_m EG_{m,y}}$$

Equation (1) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,OM-ave,y}$	Average 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)
$EF_{EL,my}$	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 $EF_{EL,m,y}$:
According to the GEF Tool, there are 2 options for determination of the CO_2 emission factor of power unit *m*.
Option A1 has been chosen because the data on fuel consumption and electricity generation is available.
$EF_{EL,m,y}$ is calculated as follows:

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

Equation (2) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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* (tCO_2/GJ)
$EG_{m,y}$	Net 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

STEP 5 – Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: *ex ante*
Option 2: *ex post*

Option 1: ex ante has been chosen.

As per the GEF Tool, STEP 5, Option 1, *for the first crediting period, the build margin emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of PoA-DD submission to the DOE for validation.*
For the second crediting period, the build margin emission factor should 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.
For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option 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 is determined according to the GEF Tool, as per the following procedure, consistent with the chosen ex-ante data vintage:

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

SET-5-units of the DEWA grid:

Nr.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)
1	M 12 GT	25.05.2010	109,254
2	M 11 GT	22.02.2010	31,570
3	H 54 GT	17.11.2008	133,797
4	H 53 GT	10.09.2008	252,914
5	H 52 GT	23.06.2008	112,655
		Total	**640,190**

SET-5-units of the FEWA grid:

Nr.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)
1	Al-Zawra GT.1	10/12/2008	411,152
2	Al-Zawra GT.2	27/11/2008	306,625
3	Nakheel GT.6	02/2006	699,815
4	Nakheel GT.4	01/2003	118,655
5	Nakheel GT.5	07/2000	82,974
		Total	**1,619,221**

(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 ($AEG_{SET} \geq 20\%$, in MWh);

SET≥20% of the DEWA grid:					
No.	**Unit No.**	**Start of electricity supply to the grid**	**System generation 2010 (MWh)**	**Cumulated generation (MWh)**	**Share of the system generation (%)**
1	M 12 GT	25.05.2010	109,254	109,254	0.33%
2	M 11 GT	22.02.2010	31,570	140,824	0.42%
3	H 54 GT	17.11.2008	133,797	274,620	0.83%
4	H 53 GT	10.09.2008	252,914	527,535	1.59%
5	H 52 GT	23.06.2008	112,655	640,190	1.93%
6	H 51 GT	27.05.2008	153,326	793,516	2.39%
7	L 26 CEST	26.07.2009	1,062,607	1,856,122	5.59%
8	L 25 CEST	24.11.2008	1,138,642	2,994,764	9.02%
9	L 24 GT	15.05.2008	1,363,440	4,358,204	13.12%
10	L 23 GT	29.11.2007	1,086,588	5,444,792	16.40%
11	L 22 GT	17.07.2007	1,566,309	7,011,101	21.11%
12	L 21 GT	01.07.2007	1,373,926	8,385,027	25.25%
		Total	**8,385,027**		**25.25%**

Note: The 20% of AEG_{total} falls on part of the generation of the unit L 22 GT therefore the unit is fully included.
Moreover, the unit L 21 GT is included in the sample group although it is already higher than the 20% threshold. It is because that the steam turbine units L 25 CEST and L 26 CEST included in the sample group are not independent units; they are interconnected with all the gas turbine units L 21 GT, L 22 GT, L 23 GT, and L 24 GT. Therefore all these units have to be reckoned together, and the plant L Ph-2 must be considered as whole.

SET≥20% of the FEWA grid:					
No.	**Unit No.**	**Start of electricity supply to the grid**	**System generation 2010 (MWh)**	**Cumulated generation (MWh)**	**Share of the system generation (%)**
1	Al-Zawra GT.1	10/12/2008	411,152	411,152	12.09%
2	Al-Zawra GT.2	27/11/2008	306,625	717,777	21.10%
		Total	**717,777**		**21.10%**

(c) *From $SET_{5\text{-}unit}$s 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. Ignore steps (d), (e) and (f).

SETsample of the DEWA grid:		
$AEG_{SET\text{-}5\text{-}units}$	<	$AEG_{\geq 20\%}$
$SET_{\geq 20\%}$	=	SET_{sample}

None of the power units of the SET_{sample} started to supply electricity to the grid more than 10 years ago.
In this case ignore steps (d), (e) and (f). Hence, the group of power units included in SET≥20% is the sample to calculate the build margin for DEWA grid. Hence, the sample of units used to calculate the DEWA grid build margin is SET≥20%.

SETsample of the FEWA grid:		
$AEG_{SET\text{-}5\text{-}units}$	>	$AEG_{\geq 20\%}$
$SET_{\text{-}5\text{-}units}$	=	SET_{sample}

One of the power units of the SET_{sample} started to supply electricity to the grid more than 10 years ago.

In this case:

(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).

One of the power units (Nakheel GT.5) in SET_{sample} started to supply electricity to the grid more than 10 years ago therefore this power unit was excluded from SET_{sample}. There are no power units registered as CDM project activities in the FEWA grid.

Also with exclusion of this power unit the set comprises 20% of the electricity generation of the project electricity system.

SETsample of the FEWA grid:

Nr.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)
1	Al-Zawra GT.1	10/12/2008	411,152
2	Al-Zawra GT.2	27/11/2008	306,625
3	Nakheel GT.6	02/2006	699,815
4	Nakheel GT.4	01/2003	118,655
		Total	**1,536,247**

In this case ignore steps (e) and (f). Hence, the group of power units included in $SET_{5\text{-}units}$ except of the Nakheel GT. 5 is the sample to calculate the build margin for FEWA grid.

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 power generation data is available, calculated as follows:

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

Equation (12) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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 in year (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 power 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.

Option A1 has been chosen for determination of $EF_{EL,m,y}$ in both the DEWA and FEWA case.
The most recent historical year for which the electricity generation data is available is year 2010 in both the DEWA and FEWA case.

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 emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

Option (a) – weighted average CM method has been used in both the DEWA and FEWA case, as follows:

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

Equation (13) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,CM,y}$	Combined margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,BM,y}$	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 (%)

According the GEF Tool, *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_{OB} = 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.*

For the proposed project activity, the following default values have been used for w_{OM} and w_{BM}, in line with the guidance of the GEF Tool: w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

Project emissions

As per approved methodology ACM0002, for most renewable power generation project activities, including the photovoltaic solar power, PE_y = 0.

Leakage

As prescribed in ACM0002, no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electricity sector projects are emissions arising due to

activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Equation (11) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

ER_y = Emission reductions in year y (t CO_2e/yr)
BE_y = Baseline emissions in year y (t CO_2/yr)
PE_y = Project emissions in year y (t CO_2e/yr)

B.6.2. Data and parameters that are to be reported ex-ante

The general data that shall be reported by each CPA in the CPA-DD:

Data/Parameter	Unit/Format	Rationale/ Evidence
Serial number of the CPA	LNNN	Unambiguous identification of the CPA Identification of the grid connected to
CPA title	-	Unambiguous identification of the CPA Identification of the grid connected to
Name of the CPA implementer, address, contacts	-	-
Exact CPA Location: City/Emirate, GPS coordinate/s	Latitude, Longitude	Definition of the boundary Eligibility
Starting date of the CPA	DD/MM/YYYY	Eligibility
Starting date of the crediting period (expected start date for production of electricity)	DD/MM/YYYY	Estimation of ERs
Technical specification of each solar power plant (type, make, model of the solar panels, etc.)	-	Eligibility
Installed capacity	MW	Eligibility
Annual output	MWh/year	Estimation of ERs

Data and parameters that do not require monitoring:

Data / Parameter:	$EF_{grid,CM,y}$ ($EF_{DEWA,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for DEWA grid
Source of data:	Calculated based on data provided by the grid operator – DEWA The information used was the most updated available at the start of the validation process.
Value(s) applied:	0.5152 tCO_2/MWh (for wind and solar project activities)

Choice of data or Measurement methods and procedures:	As per the "Tool to calculate the emission factor for an electricity system", Version 2.2.1, EB 63
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the DEWA grid. The value is determined once at the PoA validation stage and fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the DEWA grid during the first 7 years of the PoA, and fixed for the first 7 years of the respective crediting period of these CPAs. The DEWA GEF will be revised after 7 years of the PoA crediting period, and fixed thereon accordingly.

Data / Parameter:	$EF_{grid,CM,y}$ $(EF_{FEWA,CM,y})$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for FEWA grid
Source of data:	Calculated based on data provided by the electricity grid operator – FEWA The information used was the most updated available at the start of the validation process.
Value(s) applied:	0.8022 tCO_2/MWh (for wind and solar project activities)
Choice of data or Measurement methods and procedures:	As per the "Tool to calculate the emission factor for an electricity system", Version 2.2.1, EB 63
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the FEWA grid. The value is determined once at the PoA validation stage and fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the FEWA grid during the first 7 years of the PoA, and fixed for the first 7 years of the respective crediting period of these CPAs. The FEWA GEF will be revised after 7 years of the PoA crediting period, and fixed thereon accordingly.

Data / Parameter:	$EF_{grid,CM,y}$ $(EF_{ADWEA,CM,y})$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for ADWEA grid in year *y*
Source of data:	Calculated according to the "Tool to calculate the emission factor for an electricity system"
Value(s) applied:	To be specified in each CPA connected to the ADWEA grid at the time of inclusion

Choice of data or Measurement methods and procedures:	Background data will be provided by the electricity grid operator – ADWEA or other official source
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the ADWEA grid. The calculation of the grid emission factor shall be based on official data available at the time of the CPA inclusion and the value of the grid emission factor shall be fixed ex-ante for the entire crediting period of the CPA.

Data / Parameter:	$EF_{grid,CM,y}$ ($EF_{SEWA,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for SEWA grid in year *y*
Source of data:	Calculated according to the "Tool to calculate the emission factor for an electricity system"
Value(s) applied:	To be specified in each CPA connected to the SEWA grid at the time of inclusion.
Choice of data or Measurement methods and procedures:	Background data will be provided by the electricity grid operator – SEWA or other official source
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the SEWA grid. The calculation of the grid emission factor shall be based on official data available at the time of the CPA inclusion and the value of the grid emission factor shall be fixed ex-ante for the entire crediting period of the CPA.

B.6.3. Ex-ante calculations of emission reductions

Baseline Emissions:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Equation (6) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

BE_y = Baseline emissions in year *y* (tCO_2/yr)

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

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

Fixed parametric values for the first 7 years of the PoA crediting period:

$EF_{grid,CM,y}$ of DEWA grid = 0.5152 tCO2/MWh

$EF_{grid,CM,y}$ of FEWA grid = 0.8022 tCO2/MWh

Calculation of $EG_{PJ,y}$ for greenfield renewable energy power plants:

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y}$$

Equation (7) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

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

Project emissions

As per approved methodology ACM0002, for PV-CPAs that apply photovoltaic technologies, project emissions (PE_y) are estimated to be zero:

$PE_y = 0$.

Emission reductions:

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Equation (11) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

ER_y	Emission reductions in year *y* (t CO_2e/yr)
BE_y	Baseline emissions in year *y* (t CO_2/yr)
PE_y	Project emissions in year *y* (t CO_2e/yr)

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter).

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/y
Description:	Quantity of the net electricity supplied by the project activity to the grid in the year *y*
Source of data:	On-site measurements in the substation by electricity meter(s). (For ex-ante calculation of estimated emission reductions the value shall be sourced from the technical specifications of the project activity)
Value(s) applied	To be specified for each CPA

Measurement methods and procedures:	The net electricity will be measured by bi-directional electricity meters installed on site, with accuracy class at least 0.2. Metering equipment will be detailed for each CPA individually. The data will be recorded and stored on site and archived electronically for 2 years following the end of the last crediting period.
Monitoring frequency:	The monitoring will be continuous, with at least hourly measurement and monthly recording
QA/QC procedures:	Main and control meter shall be installed for each power plant. The metering equipment will be properly inspected and calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and according to the relevant national calibration standard or standard set by individual grid operator periodically, at minimum bi-annually. Net electricity supplied to the grid will be cross-checked by measurements of the grid operator at the point of feeding to the grid or with records for sold electricity
Purpose of data	Calculation of baseline emissions
Additional comment:	-

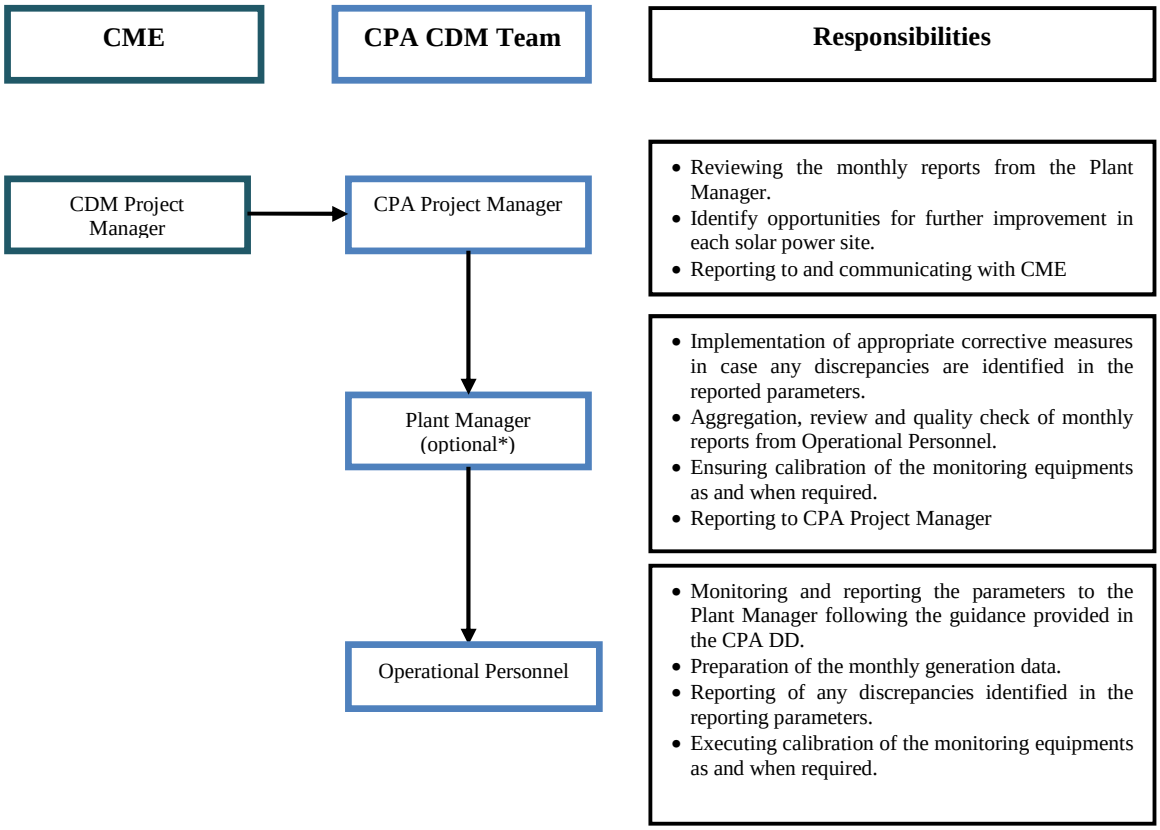
B.7.2. Description of the monitoring plan for a generic CPA

DEWA as the coordinating/ managing entity will set the procedures verifying the CERs generated by the CPA annually and will coordinate individual CPA implementers. The authority and responsibility of project management at CPA level, as well as monitoring, measurement, and reporting will rest with the CPA implementer.

Monitoring plan of a CPA:
The monitoring plan has been developed based on the PoA-DD and the approved methodology **ACM 0002, Version 13.0.0, EB 67**.
Monitoring will take place from start date of the crediting period as determined for each CPA.

Monitoring Plan Objective
The purpose of the monitoring plan is to measure the net electricity delivered to the electricity grid by the CPA.

Monitoring organization –CPA CDM team management structure and responsibilities
The CPA implementer will undertake the overall responsibility for daily operating and reporting.
Staff to carry out the monitoring work and report the data to CME is/will be identified within the company according to the following structure:



*This position is optional and can be excluded if not appropriate for particular CPA conditions. Then the responsibilities shall be divided between Operational Personnel and CPA Project Manager

- **Operational Personnel**

Operational Personnel is responsible for the power plant operation on site, controlling the plant function and the monitoring equipment function.
Monitoring data obtained from the monitoring/measuring equipment shall be compiled and reported to the Plant Manager monthly, including report on any discrepancies, break-downs, etc.

- **Plant Manager**

The monthly data and documents reported by the Operational Personnel will be compiled by the Plant Manager to the monthly reports to the CPA Project Manger in a format called the CDM format report that will contain
- data collected from the plant, aggregated
- quality check confirmation
- discrepancy & correction actions report
- calculation of the net electricity supplied to the grid by the project activity

The Plant Manager is responsible for storing and archiving of all CDM related information relevant to the CPA in electronic form and in paper print-outs if relevant.
[This position is optional and can be excluded if not appropriate for particular CPA conditions. Then the responsibilities shall be divided between Operational Personnel and CPA Project Manager.]

- **CPA Project Manager**

CPA Project Manager is responsible for
- the final review of the aggregated monthly reports,
- ensuring the compliance with requirements of the monitoring plan, CDM modalities and procedures including calibration frequency
- order of the corrective measures in case any discrepancy is observed
- calculating the result emission reductions

- signing the final monthly report
- compiling an annual CPA report for the CME

Monitoring and Archiving of Data

- **Monitoring equipment and installation**

Quantity of the net electricity produced and supplied to the grid by the proposed project activity, as well as electricity consumption of the auxiliary equipment at the plant site will be monitored by main bi-directional electricity meters. Type, accuracy class and exact location of the meters will be specified in the CPA-DD. The minimum accuracy class will be 0.2 and the minimum calibration frequency will be every 2 years.

All used equipment will be in compliance with national technical standards.

- **Data monitoring and management**

All monitoring data and records will be archived in electronic form and as paper prints if relevant. Electronic documents will be backed up on compact disc or hard disc and stored for minimum 2 years after the end of each crediting period of the project activity.

Quality Assurance and Quality Control

To ensure that the data is reliable and transparent, the CPA implementer, in cooperation with the CME Project Manager, will establish Quality Assurance and Quality Control (QA&QC) measures to effectively control and manage data reading, recording, auditing as well as archiving data and all relevant documents.

The installation location of the meters will be detailed in each CPA. Control meter will be installed for each main meter. The project entity will implement QA&QC measures to calibrate and guarantee the accuracy of metering and safety of the project operation.

The monitoring equipment will be calibrated and inspected properly and periodically as per standard industry norms and requirements of respective grid operator and will be properly calibrated in accordance with relevant industry standards and the instructions (schedules, procedures) for quality assurance from the equipment manufacturer/ provider.

The CDM team will meet periodically to review project parameters, check data collected, emissions reduced, etc. The following will be the procedure for taking corrective action and addressing any non-conformances discovered:

- All the mismatching data, along with the name of the respective Plant Manager and the person in charge of the logbooks, will be recorded in either a note book or an electronic file.
- The respective site Plant Manager in the CDM team will send a FAR (Forward Action Request) or CAR (Corrective Action Request) to the concerned Operational Personnel.
- After receipt of the communication, the concerned site individual in charge will correct the data and will reply to the CPA Project Manager in the CDM team.
- The corrected data will then be compiled by the respective CPA Project Manager.

Capacity development

An on-site training for the CPA implementer´s involved personnel will be conducted. The training will be on the following aspects of equipments involved in the Project activity – start up techniques, operation, maintenance, monitoring of parameters, precautions, safety instructions and emergency preparedness etc. The following procedure will be followed for training:

- A copy of Operation and Maintenance manual, Safety instructions related to the equipment involved in the Project activity will be made available to all employees involved in the Project.
- During commissioning of the new equipments (of the Project activity), training on all above aspects to all employees involved in the Project activity will be provided.
- Whenever an employee handles the equipments involved in the Project activity first time, training will be provided to him on start up techniques, operation, maintenance, monitoring of parameters, precautions, safety instructions and emergency preparedness etc.
- The training will be provided by respective equipment supplier and expert O & M personnel of the company.

CDM capacity development for the CPA Project Manager will be conducted by CDM experts (by CME or external expert approved by CME). This will ensure that the CPA Project Manager is prepared for the responsibilities with respect to the implementation of the proposed CPA.

PART II. Generic component project activity (CPA)

PART II.2.- Generic CSP-CPA

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

The CSP-CPAs included in the proposed PoA will generate electricity from the renewable solar energy, using concentrated solar power (CSP) technology - using parabolic through system, power tower system or parabolic dish system. The CSP plants may use the natural gas, diesel or other liquid fossil fuel to supplement the solar output during periods of low solar radiation, and may use various kinds of thermal energy storage systems (e.g. molten salt) or no storage.

Installed capacity of one CSP power plant will be usually more than 5 MW and the power plant will be connected and supplying to the grid.

The CSP power plants will provide sustainable energy in a country with one of the highest energy- and CO_2-intensive economies in the world, will have a positive contribution to the achievement of MDG Goal 7: Ensuring environmental sustainability, as well as to the objectives of Dubai and Abu Dhabi emirates to increase their share of solar power by respectively 5% in 2030 and 7% in 2020.

A typical CPA in the PoA is expected to contribute to sustainable development in the following manner:

Job Creation

- The CPA will increase employment opportunities in the United Arab Emirates and increase the share of green jobs in the region;

Increased investment capital

- The CPA will promote sustainable development in the United Arab Emirates by promoting investment, and thereby improving the local economy;
- The CPA will reduce lead times and transaction costs associated with the CDM for potential investors in future CPAs, thereby making the proposed renewable power generation activity more attractive to sources of capital or equity;
- CERs revenue generated by the first few CPAs can be a potential capital source for future CPAs at early initial stages;
- The CPA will generate demand for local products when spare parts are needed, leading to promotion of business activities;

Enhanced diffusion of environmentally cleaner technologies

- The PoA will support the transfer of technology and technical know-how from other countries

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

Technology/measure: The CSP-CPAs included in the proposed PoA will generate electricity from the renewable solar energy, using concentrated solar power (CSP) technology.

The chosen approved baseline and monitoring methodology for the CSP-CPAs:
Title: ACM0002 - Consolidated baseline methodology for grid connected electricity generation

from renewable sources, Version 13.0.0, EB 67

Reference: It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC/CDM:
http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

This methodology also refers to the latest approved versions of the following **tools:**

- "Combined tool to identify the baseline scenario and demonstrate additionality", Version 5.0.0, EB 70
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v5.0.0.pdf
- "Tool to calculate the emission factor for an electricity system for definition of an electricity system", Version 2.2.1, EB 63
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
- "Tool for the demonstration and assessment of additionality", Version 07.0.0, EB 70
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", Version 02, EB 41
  http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

The CPA follows the latest versions of these general regulatory/standards:

- "Clean development mechanism project standard", Version 03.0, EB 65
  http://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20130412165420186/pp_stan01.pdf
- "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", Version 02.1 , EB 65
  http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf
- Guideline "Completing the programme design document form for CDM programmes of activities ", Version 03.1, EB 70)
  http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid10.pdf
- Guideline "Completing the component project activity design document form", Version 01.0, EB 66
  http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid14.pdf

B.2. Application of methodology(ies)

The methodology ACM0002 has been applied since it relates to large scale grid-connected electricity generation from renewable sources. The applicability criteria of the methodology, along with project eligibility, are provided in the table below:

Applicability Criteria	Project eligibility
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)	All PV-CPAs under the PoA are new solar power plants supplying electricity to the grid.
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	All CSP-CPAs install new solar power plants.

In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	CSP-CPAs are Greenfield projects and therefore this criterion is not applicable.
In case of hydro power plants: One of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2.	CSP-CPAs are solar power plants and therefore this criterion is not applicable.
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	CSP-CPAs are solar power plants and therefore this criterion is not applicable.
The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that results in the creation of a new single reservoirs or in the increase in an existing single reservoirs where the power density of the reservoir is less than 4 W/m^2.	CSP-CPAs are solar power plants and therefore this criterion is not applicable.

In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	CSP-CPAs are Greenfield plants and therefore this criterion is not applicable.
In addition, the applicability conditions included in the tools referred to above apply. This methodology refers to the latest approved versions of the following tools: 9. Tool to calculate the emission factor for an electricity system; 10. Tool for the demonstration and assessment of additionality; 11. Combined tool to identify the baseline scenario and demonstrate additionality; 12. Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.	These criteria are fulfilled as described in the respective sections of the PoA-DD and individual CSP-CPA-DDs.

Documentation that has been used as a basis of justification of the use of methodology: project documentation and/or CSP power plant design. Will be prepared for each individual CSP-CPA.

B.3. Sources and GHGs

As per methodology ACM0002, *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.*

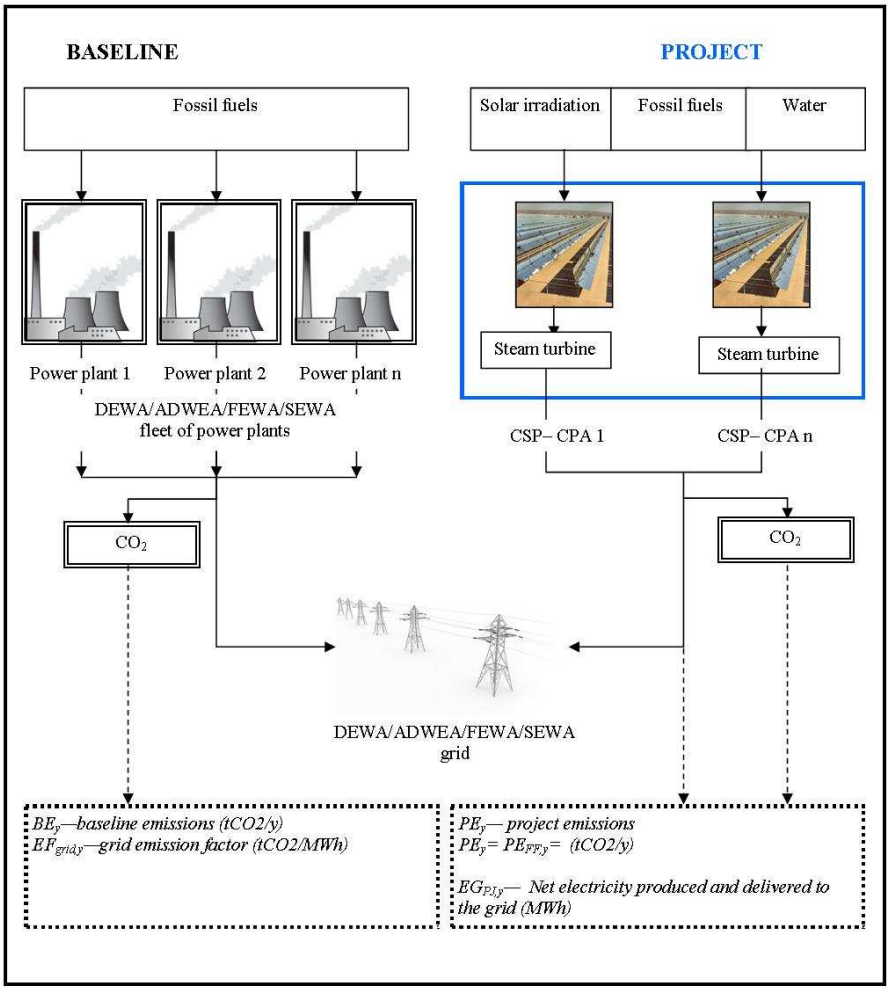
The baseline includes the emissions related to the electricity produced by the facilities and power plants to be displaced by the CPA. This involves emissions from displaced fossil fuel use at power plants connected to one of the four separate electricity grids in UAE operated by sovereign entities:

- DEWA (Dubai Electricity & Water Authority) operates the electricity grid of the Dubai Emirate – DEWA will be the Coordinating and Managing Entity for the UAE solar Programme of Activities.
- ADWEA (Abu Dhabi Electricity and Water Authority) operates the electricity grid of the Abu Dhabi Emirate.
- SEWA (Sharjah Electricity and Water Authority) operates the electricity grid of the Sharjah Emirate.
- FEWA (Federal Electricity and Water Authority) operates the electricity grid of the four Northern Emirates: Ras Al Khaimah, Ajman, Umm al Quwain and Fujairah.

Source		Gas	Included	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source

	fossil fuel fired power plants that are displaced due to the project activity	N_2O	No	Minor emission source
Project activity	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	Yes	Main emission source
		CH_4	No	Not applicable to solar power plants
		N_2O	No	Not applicable to solar power plants
	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	No geothermal plant
		CH_4	No	No geothermal plant
		N_2O	No	No geothermal plant
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	No hydro power plant
		CH_4	No	No hydro power plant
		N_2O	No	No hydro power plant

Figure 3 - Project diagram of a CSP-CPA



B.4. Description of baseline scenario

The baseline scenario is defined in the chosen methodology ACM 0002, as follows: *" If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

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

B.5. Demonstration of eligibility for a generic CPA

No.	Criteria	Yes/ No	Conclusion	Demonstration and justification of how the CPA complies with the criteria	Documentary Evidence
(a)	Geographical boundary: Is the project activity located in the United Arab	Yes	Eligible in the PoA	The CPA is/will be located within the geographical boundary of one of the	Land Documents, GPS

	Emirates?			emirates in UAE.	Coordinates, maps
(b)	Double counting: Is the proposed CPA uniquely identified and defined in an ambiguous manner?	Yes	Eligible in the PoA	The CPA is uniquely identified and defined in an ambiguous manner.	CPA title, GPS coordinates
	Is there any other registered CDM project activity with the same identification data?	No	Eligible in the PoA	There is no other registered CDM project activity with the same identification data.	Analysis of projects in the CDM pipeline
(c)	Specifications of technology/measure: Does the CPA implement a renewable power plant – solar PV or CSP power plant?	Yes	Eligible in the PoA	The CPA implements a PV plant, renewable power generation from solar energy.	Technical project documentation
(d)	Start date: Is the CPA starting date on the day or later of the start of validation of the PoA (uploading for global stakeholders comments on the UNFCCC web site)	Yes	Eligible in the PoA	The start date of the CPA is later than the start date of the PoA.	Project implementation plan, business plan
(e)	Applicability of the methodology: Does the CPA comply with criteria of ACM 0002, Version 13.0.0?	Yes	Eligible in the PoA	Applicability of the chosen methodology for the CPA is justified above in the section B.2. of the Part II. of this PoA-DD	Described in the CPA-DD
(f)	Additionality: is it demonstrated that the project activity which forms the CPA would not have occurred anyway due to technological barriers according to the latest version of the Tool for the demonstration and assessment of additionality?	Yes	Eligible in the PoA	The proposed CPA would not occur anyway due to technological barriers, as demonstrated below.	CME check and confirmation in the CPA-DD
(g)	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis:				
(g-1)	Does the proposed CPA consist of a new solar power plant located at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant)?	Yes	Eligible in the PoA	The CPA is/will be constructed on the empty site; it is a greenfield project. CME has checked and confirms that there is no solar power plant on the site.	E.g. Technical project documentation, Project Report, Land Documents, Clearances, Purchase Orders, CME site visit
(g-2)	Environmental impact analysis: If the EIA is required by the national/Emirate laws/regulation has it been performed accordingly?	Yes	Eligible in the PoA	The EIA has been performed or the EIA is not required	EIA documentation if applicable or confirmation from the respective authority that EIA is not required
(g-3)	Stakeholders´ involvement: Has the stakeholder	Yes	Eligible in the PoA	CPA has invited and taken account of the local	E.g. event invitation,

	consultation been conducted and have all concerns raised been taken into due account?			stakeholders' comments.	minutes of the meeting, example questionnaire, summary of concerns raised and clarification provided thereof, attendance sheet, photographs and/or video
(h)	Funding from Annex I parties: Has/will the CPA receive/d any public funding from Annex I country? If so, is it a diversion from the Official Development Aid (ODA)?	No	Eligible in the PoA	The CPA has not received any public funding from Annex I country Or If so, is it not diversion from the Official Development Aid (ODA)	Confirmation in the CPA-DD.
(i)	Target group and distribution mechanism	Not applicable, no specific target group and no specific distribution mechanisms are applied			
(j)	Conditions related to sampling requirements	Not applicable, sampling procedures are not applied			
(k)	Small-scale or micro-scale threshold	Not applicable, the PoA involves large-scale CPAs[8]			
(l)	Debundling	Not applicable, the PoA involves large-scale CPAs			

Confirmation of additionality of the generic CSP-CPA:

As per the PoA Standard, Section 3.Requirements, point 10., the **additionality of each CSP-CPA** is reflected in the eligibility criteria derived from the relevant requirements contained in the additionality section of the large scale methodology ACM0002.

As per the methodology ACM0002, *"The additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Board, which is available on the UNFCCC CDM website."*

Additionality of each CSP-CPA shall be demonstrated according steps of the **"**Tool for the demonstration and assessment of additionality, Version 7.0.0., EB 70 as follows:

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

This step is optional.

If it is not applied; it shall be considered that the proposed project activity is not the first-of-its-kind.

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

Credible and realistic alternatives to the CPA should be defined through the following sub-steps:

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

These alternatives include, at minimum:

a) The proposed project activity undertaken without being registered as a CDM project activity

[8] *Even if the CPA is below the large-scale threshold, it is handled as a large-scale project activity.*

b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g. cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;
c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

For the purpose of identifying relevant alternative scenarios, the CPA implementer will include the technologies or practices that provide outputs or services (e.g. electricity, heat) with comparable quality, properties and application areas as the proposed CPA and that have been implemented previously or are currently being introduced in the relevant country/region.

Outcome of sub-step 1a: Identified realistic and credible alternative scenario(s) to the project activity

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

Outcome of sub-step 1b: Identified realistic and credible alternative scenarios to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations. At least one of the identified alternatives is in line with current laws and regulations in the UAEs at the time of the submission of the CPA to DOE for validation.

The proposed project activity is not the only realistic and credible scenario that is in compliance with mandatory regulations.

Project participants choose to further demonstrate the additionality by the means of *Step 3 – Barrier Analysis*.

Step 3: Barrier analysis:

Barriers to the proposed project activity are identified and it is assessed which of the alternatives are prevented by these barriers.

The latest approved version of the "Guidelines for objective demonstration and assessment of barriers" has been taken into account.

CPA determines whether the proposed project activity faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

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

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
b) Technological barriers
c) Other barriers

From the listed barriers, the project participants chose to use the Technological barriers for further demonstration of additionality.

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, the CPA implementer should explain how they are affected less strongly than they affect the proposed CPA.

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 the CDM does not alleviate the identified barriers that prevent the implementation of the

proposed CPA, the project cannot be considered additional.

Outcome of Step 3: 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:
The above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and region. This test is a **credibility check** to complement the barrier analysis (Step 3).
If the outcome of the common practice analysis is that the project is not the common practice in the region, and the CPA has successfully demonstrated its additionality by the barrier analysis, it will be concluded that the CPA is additional.

Identify and discuss the existing common practice through the following sub-steps. Since the proposed CDM project activity applies measure that is listed in the definitions section of the Additionality Tool, proceed to Sub-step 4a.

Sub-step 4a: The proposed CDM project activity(ies) applies measure(s) that are listed in the definitions section above
As per the tool, the latest version of the "Guidelines on common practice" available on the UNFCCC website shall be applied. The latest version at the time of submission of the PoA for validation is Version 02.0 (EB 69)
(http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid44.pdf).

Outcome of sub-step 4: By following the above step-wise approach it will be demonstrated that the PoA eligibility/additionality condition is still applicable after implementation of the proposed CPA, and the CPA is eligible and additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

According to the approved methodology ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following: *Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".*

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Equation (6) of the methodology ACM0002, Version 13.0.0 (EB 67)

Where:

BE_y	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system (tCO_2/MWh)

Calculation of the $EF_{grid,CM,y}$:
The emission factor (tCO_2/MWh) for the displacement of electricity generated by power plants in an electricity system is calculated in a transparent and conservative manner as combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the UNFCCC methodological 'Tool to calculate the Emission Factor for an electricity system' (further on referred to as "GEF Tool").
The GEF Tool calculates the combined margin emission factor (CM) which is the weighted average of the operating margin (OM) and build margin (BM) emission factors of the electricity system; the effect of a specific project upon the electricity grid can be illustrated in terms of its effect upon operations, or the "operating margin" (OM), and its effect upon capacity additions, or the "build margin" (BM). The OM is primarily a near-term effect and the BM a long-term effect. In principle, a project's effect upon system capacity mix could be to defer new capacity additions and/or to accelerate existing capacity retirements.

Due to the national grids structure and independence of the 4 individual grids operating in UAEs the grid emission factor is calculated separately for each grid.

Application of the grid emission factors by individual CPAs:
Each new CPA included under the proposed PoA shall apply the grid emission factor from the latest version of the PoA-DD.

Due to lack of information, only the DEWA and FEWA grid emission factors are calculated and available in the PoA-DD for the first 7 years of the crediting period of the UAE Solar Programme of Activities, as follows:
1. The **DEWA** grid emission factor is calculated ex-ante at the time of submission of the PoA-DD for validation and it is fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the DEWA grid and included into the PoA during the first 7 years of the PoA crediting period, and fixed for the first 7 years of the respective crediting period of these CPAs.
The DEWA grid emission factor will be revised after 7 years of the PoA crediting period, and fixed and used accordingly.
The **DEWA** grid emission factor for the first 7 years of the PoA crediting period has been calculated according to the GEF Tool, Version 2.2.1, EB 63. Details of the calculation are in Appendix 4
Vale to be used for the first 7 years of the PoA: 0.5152 tCO_2/MWh

2. The **FEWA** grid emission factor is calculated ex-ante at the time of submission of the PoA-DD for validation and it is fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the FEWA grid and included into the PoA during the first 7 years of the PoA crediting period, and fixed for the first 7 years of the respective crediting period of these CPAs.
The FEWA grid emission factor will be revised after 7 years of the PoA crediting period, and fixed and used accordingly.
The **DEWA** grid emission factor for the first 7 years of the PoA crediting period has been calculated according to the GEF Tool, Version 2.2.1, EB 63. Details of the calculation are in Appendix 4
Vale to be used for the first 7 years of the PoA: 0.8022 tCO_2/MWh

For ADWEA and SEWA grid emission factors where data is not available at the time of PoA validation, the following approach shall be applied:

3. The **ADWEA** grid emission factor shall be calculated at CPA level, at the time of inclusion of each CPA connected to the ADWEA grid and fixed for the first CPA crediting period. The ADWEA grid emission factor may be calculated on the PoA level after 7 years of the PoA crediting period and fixed on the PoA level for the second 7 years of the PoA crediting period and used accordingly.

4. The **SEWA** grid emission factor shall be calculated at CPA level, at the time of inclusion of each CPA connected to the SEWA grid and fixed for the first CPA crediting period. The SEWA grid emission factor may be calculated on the PoA level after 7 years of the PoA crediting period and fixed on the PoA level for the second 7 years of the PoA crediting period and used accordingly.

Explanation of the methodological choices of the calculation of the DEWA and FEWA grid emission factor fixed in the PoA-DD for the first 7 years of the PoA crediting period:
According to the GEF Tool, Version 2.2.1, EB 63 there are 6 main steps in the process of calculating the grid emission factor[9]:

STEP 1. Identify the relevant electricity systems

Although operating independently the 4 grids operating in UAEs are mutually interconnected.
The DEWA, ADWEA, FEWA and SEWA grids are wholly located in UAEs which is the non-Annex I country.
There are no connected grids from Annex I countries.
Therefore the GEF Tool is applicable to the proposed project activity.

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

For both the DEWA and FEWA grid emission factors, Option I has been used: Only grid power plants are included in the calculation.

STEP 3. Select a method to determine the operating margin (OM)

For both the DEWA and FEWA grid emission factors calculation, the Average OM method has been chosen. The average OM emission factor ($EF_{grid,OM\text{-}ave,y}$) is calculated as the average emission rate of all power plants serving the grid.

According to the GEF Tool, for the average OM the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante option.*
- *Ex post option.*

The ex ante data vintage option has been chosen. The emission factor is determined once at the PoA validation stage (for DEWA and FEWA grids), thus no monitoring and recalculation of the emissions factor for future CPAs is required during the first 7 years. For grid power plants, a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PoA-DD to the DOE for validation, has been used.

STEP 4. Calculate the operating margin emission factor according to the selected method
The average OM emission factor is calculated as ($EF_{grid,OM\text{-}ave,y}$) is calculated as the average emission rate of all power plants using the methodological guidance as described for the simple OM, but also including the low-cost/must-run power plants in all equations.

The Average OM may be calculated:
Option A: Based on the electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

[9] *Details of GEF calculations are in Appendix 4*

Option B should only be used if the necessary data for Option A is not available.

For both the DEWA and FEWA grid emission factors calculation, Option A has been chosen for the calculation of the Average OM. *Under this option, the Average OM emission factor is calculated based on the net electricity of each power unit and an emission factor for each power unit, as follows:*

$$EF_{grid,OM-avee,y} = \frac{\Sigma_m EG_{m,y} * EF_{EL,my}}{\Sigma_m EG_{m,y}}$$

Equation (1) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,OM-ave,y}$	Average 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)
$EF_{EL,my}$	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 $EF_{EL,m,y}$:
According to the GEF Tool, there are 2 options for determination of the CO_2 emission factor of power unit *m*.
Option A1 has been chosen because the data on fuel consumption and electricity generation is available.
$EF_{EL,m,y}$ is calculated as follows:

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

Equation (2) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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* (tCO_2/GJ)
$EG_{m,y}$	Net 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

STEP 5 – Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: *ex ante*
Option 2: *ex post*

Option 1: ex ante has been chosen.

As per the GEF Tool, STEP 5, Option 1, *for the first crediting period, the build margin emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of PoA-DD submission to the DOE for validation.*
For the second crediting period, the build margin emission factor should 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.
For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option 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 is determined according to the GEF Tool, as per the following procedure, consistent with the chosen ex-ante data vintage:

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

SET-5-units of the DEWA grid:

Nr.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)
1	M 12 GT	25.05.2010	109,254
2	M 11 GT	22.02.2010	31,570
3	H 54 GT	17.11.2008	133,797
4	H 53 GT	10.09.2008	252,914
5	H 52 GT	23.06.2008	112,655
		Total	**640,190**

SET-5-units of the FEWA grid:

Nr.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)
1	Al-Zawra GT.1	10/12/2008	411,152
2	Al-Zawra GT.2	27/11/2008	306,625
3	Nakheel GT.6	02/2006	699,815
4	Nakheel GT.4	01/2003	118,655
5	Nakheel GT.5	07/2000	82,974
		Total	**1,619,221**

(f) 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≥20%) and determine their annual electricity generation (AEG_{SET}≥20%, in MWh);

SET≥20% of the DEWA grid:					
No.	**Unit No.**	**Start of**	**System**	**Cumulated**	**Share of the**

		electricity supply to the grid	generation 2010 (MWh)	generation (MWh)	system generation (%)
1	M 12 GT	25.05.2010	109,254	109,254	0.33%
2	M 11 GT	22.02.2010	31,570	140,824	0.42%
3	H 54 GT	17.11.2008	133,797	274,620	0.83%
4	H 53 GT	10.09.2008	252,914	527,535	1.59%
5	H 52 GT	23.06.2008	112,655	640,190	1.93%
6	H 51 GT	27.05.2008	153,326	793,516	2.39%
7	L 26 CEST	26.07.2009	1,062,607	1,856,122	5.59%
8	L 25 CEST	24.11.2008	1,138,642	2,994,764	9.02%
9	L 24 GT	15.05.2008	1,363,440	4,358,204	13.12%
10	L 23 GT	29.11.2007	1,086,588	5,444,792	16.40%
11	L 22 GT	17.07.2007	1,566,309	7,011,101	21.11%
12	L 21 GT	01.07.2007	1,373,926	8,385,027	25.25%
		Total	**8,385,027**		**25.25%**

Note: The 20% of AEG_{total} falls on part of the generation of the unit L 22 GT therefore the unit is fully included.
Moreover, the unit L 21 GT is included in the sample group although it is already higher than the 20% threshold. It is because that the steam turbine units L 25 CEST and L 26 CEST included in the sample group are not independent units; they are interconnected with all the gas turbine units L 21 GT, L 22 GT, L 23 GT, and L 24 GT. Therefore all these units have to be reckoned together, and the plant L Ph-2 must be considered as whole.

SET≥20% of the FEWA grid:

No.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)	Cumulated generation (MWh)	Share of the system generation (%)
1	Al-Zawra GT.1	10/12/2008	411,152	411,152	12.09%
2	Al-Zawra GT.2	27/11/2008	306,625	717,777	21.10%
		Total	**717,777**		**21.10%**

(g) From $SET_{5\text{-}unit}$s 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. Ignore steps (d), (e) and (f).

SETsample of the DEWA grid:

$AEG_{SET\text{-}5\text{-}units}$	<	$AEG_{\geq 20\%}$
$SET_{\geq 20\%}$	=	SET_{sample}

None of the power units of the SET_{sample} started to supply electricity to the grid more than 10 years ago.
In this case ignore steps (d), (e) and (f). Hence, the group of power units included in SET≥20% is the sample to calculate the build margin for DEWA grid. Hence, the sample of units used to calculate the DEWA grid build margin is SET≥20%.

SETsample of the FEWA grid:

$AEG_{SET\text{-}5\text{-}units}$	>	$AEG_{\geq 20\%}$

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

One of the power units of the SET_{sample} started to supply electricity to the grid more than 10 years ago.

In this case:

(h) 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 ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, 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. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

One of the power units (Nakheel GT.5) in SET_{sample} started to supply electricity to the grid more than 10 years ago therefore this power unit was excluded from SET_{sample}. There are no power units registered as CDM project activities in the FEWA grid.

Also with exclusion of this power unit the set comprises 20% of the electricity generation of the project electricity system.

SETsample of the FEWA grid:

Nr.	Unit No.	Start of electricity supply to the grid	System generation 2010 (MWh)
1	Al-Zawra GT.1	10/12/2008	411,152
2	Al-Zawra GT.2	27/11/2008	306,625
3	Nakheel GT.6	02/2006	699,815
4	Nakheel GT.4	01/2003	118,655
		Total	**1,536,247**

In this case ignore steps (e) and (f). Hence, the group of power units included in $SET_{5\text{-units}}$ except of the Nakheel GT. 5 is the sample to calculate the build margin for FEWA grid.

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 power generation data is available, calculated as follows:

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

Equation (12) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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 in year (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 power 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.

Option A1 has been chosen for determination of $EF_{EL,m,y}$ in both the DEWA and FEWA case.
The most recent historical year for which the electricity generation data is available is year 2010 in both the DEWA and FEWA case.

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 emission factor
The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(c) Weighted average CM; or
(d) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

Option (a) – weighted average CM method has been used in both the DEWA and FEWA case, as follows:

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

Equation (13) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,CM,y}$	Combined margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,BM,y}$	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 (%)

According the GEF Tool, *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_{OB} = 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.*

For the proposed project activity, the following default values have been used for w_{OM} and w_{BM}, in line with the guidance of the GEF Tool: w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

Project emissions
As per approved methodology ACM0002, for most renewable power generation project activities, including the photovoltaic solar power, $\boldsymbol{PE_y} = 0$.
However, for geothermal, solar thermal and hydro power plants with reservoir, project activities may involve project emissions that can be significant. These project emissions are calculated as follows:

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

Equation (1) of the ACM 0002, Version 13.0.0, EB 67

Where:

PE_y	Project emissions in year *y* (tCO_2/yr)

$PE_{FF,y}$	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2/yr)
$PE_{HP,y}$	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2/yr)

The proposed PoA will not employ hydro power or geothermal power, therefore:
$\boldsymbol{PE_{GP,y} = 0}$
$\boldsymbol{PE_{HP,y} = 0}$

$\boldsymbol{PE_y = PE_{FF,y}}$

CPAs that implement CSP technologies are solar thermal projects, which can also use fossil fuels for electricity generation. CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

$PE_{FF,y}$ shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (at the time of submission of this PoA-DD to DOE for validation it is the Version 02, EB 41 (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf) (further on referred to as "Tool for emissions from fossil fuel".

Leakage

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

Emission reductions

Emission reductions are calculated as follows:

$\boldsymbol{ER_y = BE_y - PE_y}$

Equation (11) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
PE_y	=	Project emissions in year *y* (t CO_2e/yr)

B.6.2. Data and parameters that are to be reported ex-ante

The general data that shall be reported by each CPA in the CPA-DD:

Data/Parameter	Unit/Format	Rationale/ Evidence
Serial number of the CPA	LNNN	Unambiguous identification of the CPA Identification of the grid connected to
CPA title	-	Unambiguous identification of the CPA Identification of the grid connected to
Name of the CPA implementer, address, contacts	-	-

Exact CPA Location: City/Emirate, GPS coordinate/s	Latitude, Longitude	Definition of the boundary Eligibility
Starting date of the CPA	DD/MM/YYYY	Eligibility
Starting date of the crediting period (expected start date for production of electricity)	DD/MM/YYYY	Estimation of ERs
Technical specification of each solar power plant (type, make, model of the solar panels, etc.)	-	Eligibility
Installed capacity	MW	Eligibility
Annual output	MWh/year	Estimation of ERs

Data and parameters that do not require monitoring:

Data / Parameter:	$EF_{grid,CM,y}$ ($EF_{DEWA,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for DEWA grid
Source of data:	Calculated based on data provided by the grid operator – DEWA The information used was the most updated available at the start of the validation process.
Value(s) applied:	0.5152 tCO_2/MWh (for wind and solar project activities)
Choice of data or Measurement methods and procedures:	As per the "Tool to calculate the emission factor for an electricity system", Version 2.2.1, EB 63
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the DEWA grid. The value is determined once at the PoA validation stage and fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the DEWA grid during the first 7 years of the PoA, and fixed for the first 7 years of the respective crediting period of these CPAs. The DEWA GEF will be revised after 7 years of the PoA crediting period, and fixed thereon accordingly.

Data / Parameter:	$EF_{grid,CM,y}$ ($EF_{FEWA,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for FEWA grid
Source of data:	Calculated based on data provided by the electricity grid operator – FEWA The information used was the most updated available at the start of the validation process.
Value(s) applied:	0.8022 tCO_2/MWh (for wind and solar project activities)

Choice of data or Measurement methods and procedures:	As per the "Tool to calculate the emission factor for an electricity system", Version 2.2.1, EB 63
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the FEWA grid. The value is determined once at the PoA validation stage and fixed for the first 7 years of the PoA crediting period. Thus no monitoring and recalculation of the GEF is required for these first 7 years of the PoA. It will be used by all CPAs connected to the FEWA grid during the first 7 years of the PoA, and fixed for the first 7 years of the respective crediting period of these CPAs. The FEWA GEF will be revised after 7 years of the PoA crediting period, and fixed thereon accordingly.

Data / Parameter:	$EF_{grid,CM,y}$ ($EF_{ADWEA,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for ADWEA grid in year *y*
Source of data:	Calculated according to the "Tool to calculate the emission factor for an electricity system"
Value(s) applied:	To be specified in each CPA connected to the ADWEA grid at the time of inclusion.
Choice of data or Measurement methods and procedures:	Background data will be provided by the electricity grid operator – ADWEA or other official source
Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the ADWEA grid. The calculation of the grid emission factor shall be based on official data available at the time of the CPA inclusion and the value of the grid emission factor shall be fixed ex-ante for the entire crediting period of the CPA. .

Data / Parameter:	$EF_{grid,CM,y}$ ($EF_{SEWA,CM,y}$)
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for SEWA grid in year *y*
Source of data:	Calculated according to the "Tool to calculate the emission factor for an electricity system"
Value(s) applied:	To be specified in each CPA connected to the SEWA grid at the time of inclusion.
Choice of data or Measurement methods and procedures:	Background data will be provided by the electricity grid operator – SEWA or other official source

Purpose of data	Calculation of the baseline emissions
Additional comment:	Applicable to CPAs connected to the SEWA grid. The calculation of the grid emission factor shall be based on official data available at the time of the CPA inclusion and the value of the grid emission factor shall be fixed ex-ante for the entire crediting period of the CPA.

B.6.3. Ex-ante calculations of emission reductions

Baseline Emissions:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Equation (6) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Fixed parametric values for the first 7 years of the PoA crediting period:

$EF_{grid,CM,y}$ of DEWA grid = 0.5152 tCO2/MWh

$EF_{grid,CM,y}$ of FEWA grid = 0.8022 tCO2/MWh

Calculation of $EG_{PJ,y}$ for greenfield renewable energy power plants:

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y}$$

Equation (7) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

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

Project emissions

As per approved methodology ACM0002, CPAs that implement CSP technologies are solar thermal projects, which can also use fossil fuels for electricity generation. CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$). These project emissions are calculated as follows:

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

Where:

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

$PE_{FF,y}$ shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (at the time of submission of this PoA-DD to DOE for validation it is the Version 02, EB 41 (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf) (further on referred to as "Tool for emissions from fossil fuel".

Emission reductions:

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Equation (11) of the methodology ACM0002, Version 13.0.0, EB 67

Where:

ER_y	Emission reductions in year *y* (t CO_2e/yr)
BE_y	Baseline emissions in year *y* (t CO_2/yr)
PE_y	Project emissions in year *y* (t CO_2e/yr)

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter).

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/y
Description:	Quantity of the net electricity supplied by the project activity to the grid in the year *y*
Source of data:	On-site measurements in the substation by electricity meter(s). (For ex-ante calculation of estimated emission reductions the value shall be sourced from the technical specifications of the project activity)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	The net electricity will be measured by bi-directional electricity meters installed on site, with accuracy class at least 0.2. Metering equipment will be detailed for each CPA individually. The data will be recorded and stored on site and archived electronically for 2 years following the end of the last crediting period.
Monitoring frequency:	The monitoring will be continuous, with at least hourly measurement and monthly recording
QA/QC procedures:	Main and control meter shall be installed for each power plant. The metering equipment will be properly inspected and calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and according to the relevant national calibration standard or standard set by individual grid operator periodically, at minimum bi-annually. Net electricity supplied to the grid will be cross-checked by measurements of the grid operator at the point of feeding to the grid or with records for sold electricity
Purpose of data	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	$PE_{FF,y}$

Data unit:	tCO_2/yr
Description:	Project emissions from fossil fuel consumption in year *y*
Source of data:	Calculated according to the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (For ex-ante calculation of estimated emission reductions the value shall be sourced from the technical specifications of the project activity)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	Calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels.
Monitoring frequency:	Annually
QA/QC procedures:	-
Purpose of data	Calculation of project emissions
Additional comment:	-

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:	On-site measurements(For ex-ante calculation of estimated emission reductions the value shall be sourced from the technical specifications of the project activity)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	The fuel consumption will be monitored continuously and recorded monthly by metering equipment installed on site. Metering equipment will be detailed for each CPA individually. Continuous measurements: • 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 metering equipment will be properly inspected and calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and according to the relevant national calibration standard periodically, at minimum bi-annually. The consistency of metered fuel consumption quantities shall 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.
Purpose of data	Calculation of project emissions
Additional 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 (preferred source) b) Measurement by the project participant (if a) is not available)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	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.
Purpose of data	Calculation of project emissions
Additional comment:	Applicable only to CPAs implementing the CSP technology where the CO_2 emission coefficient $COEF_{i,y}$ is calculated according to the Option A (based on the chemical composition of the fossil fuel type).

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: a) Values provided by the fuel supplier in invoices (preferred source) b) Measurements by the project participants (if a) is not available) c) Regional or national default values (if a) is not available and can only be used for liquid fuels)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	If b) is applied by the CPA, density meters shall be used and the measurements shall 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:	N/A
Purpose of data	Calculation of project emissions
Additional comment:	Applicable only to CPAs implementing the CSP technology and where the CO_2 emission coefficient $COEF_{i,y}$ is calculated according to the Option A (based on the chemical composition of the fossil fuel type) 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 ρi,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: (a) Values provided by the fuel supplier in invoices (preferred source) (b) Measurements by the project participants (if (a) is not available) (c) Regional or national default values (if (a) is not available and can only be used for liquid fuels) (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)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	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.
Purpose of data	Calculation of project emissions
Additional comment:	Applicable only to CPAs implementing the CSP technology and where the CO_2 emission coefficient $COEF_{i,y}$ is calculated according to the Option B (based on net calorific value and CO_2 emission factor of the fuel type).

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: a) Values provided by the fuel supplier in invoices (preferred source) b) Measurements by the project participants (if a) is not available) c) Regional or national default values (if a) is not available and can only be used for liquid fuels) 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 (a) is not available)
Value(s) applied	To be specified for each CPA
Measurement methods and procedures:	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
QA/QC procedures:	N/A
Purpose of data	Calculation of project emissions

Additional comment:	Applicable only to CPAs implementing the CSP technology and where the CO_2 emission coefficient $COEF_{i,y}$ is calculated according to the Option B(based on net calorific value and CO_2 emission factor of the fuel type).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.

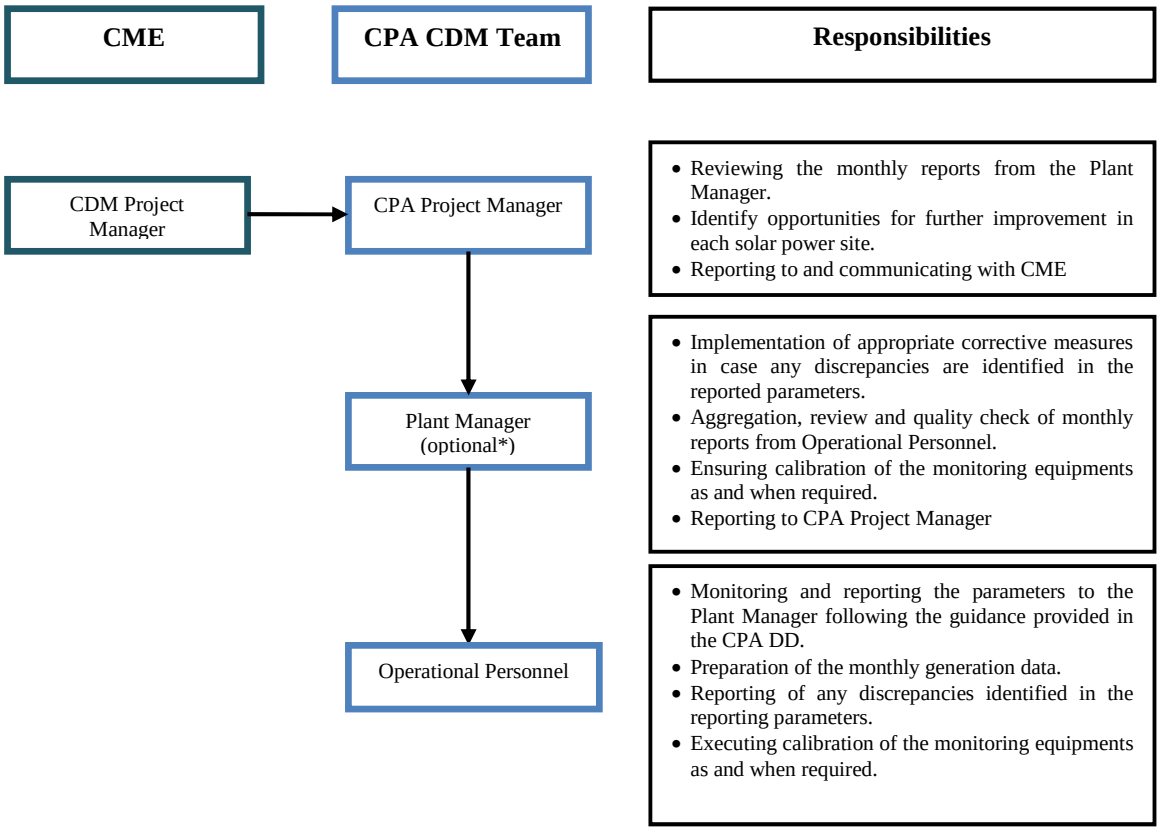
B.7.2. Description of the monitoring plan for a generic CPA

DEWA as the coordinating/ managing entity will set the procedures verifying the CERs generated by the CPA annually and will coordinate individual CPA implementers. The authority and responsibility of project management at CPA level, as well as monitoring, measurement, and reporting will rest with the CPA implementer.

Monitoring plan of a CPA:
The monitoring plan has been developed based on the PoA-DD and the approved methodology **ACM 0002, Version 13.0.0, (EB 67)**.
Monitoring will take place from start date of the crediting period as determined for each CPA.

Monitoring Plan Objective
The purpose of the monitoring plan is to measure the net electricity delivered to the electricity grid by the CPA.

Monitoring organization –CPA CDM team management structure and responsibilities
The CPA implementer will undertake the overall responsibility for daily operating and reporting.
Staff to carry out the monitoring work and report the data to CME is/will be identified within the company according to the following structure:



*This position is optional and can be excluded if not appropriate for particular CPA conditions. Then the responsibilities shall be divided between Operational Personnel and CPA Project Manager

- **Operational Personnel**

Operational Personnel is responsible for the power plant operation on site, controlling the plant function and the monitoring equipment function.
Monitoring data obtained from the monitoring/measuring equipment shall be compiled and reported to the Plant Manager monthly, including report on any discrepancies, break-downs, etc.

- **Plant Manager**

The monthly data and documents reported by the Operational Personnel will be compiled by the Plant Manager to the monthly reports to the CPA Project Manger in a format called the CDM format report that will contain
- data collected from the plant, aggregated
- quality check confirmation
- discrepancy & correction actions report
- calculation of the net electricity supplied to the grid by the project activity

The Plant Manager is responsible for storing and archiving of all CDM related information relevant to the CPA in electronic form and in paper print-outs if relevant.
[This position is optional and can be excluded if not appropriate for particular CPA conditions. Then the responsibilities shall be divided between Operational Personnel and CPA Project Manager.]

- **CPA Project Manager**

CPA Project Manager is responsible for
- the final review of the aggregated monthly reports,
- ensuring the compliance with requirements of the monitoring plan, CDM modalities and procedures including calibration frequency
- order of the corrective measures in case any discrepancy is observed
- calculating the result emission reductions
- signing the final monthly report
- compiling an annual CPA report for the CME

Monitoring and Archiving of Data

- **Monitoring equipment and installation**

Quantity of the net electricity produced and supplied to the grid by the proposed project activity, as well as electricity consumption of the auxiliary equipment at the plant site will be monitored by main bi-directional electricity meters. Type, accuracy class and exact location of the meters will be specified in the CPA-DD. The minimum accuracy class will be 0.2 and the minimum calibration frequency will be every 2 years.

For CPAs implementing the CSP technology the metering equipment/s related to the fossil fuel/s consumption and their technical parameters, including the type and location will be specified in the CPA-DD.
All used equipment will be in compliance with national technical standards.

- **Data monitoring and management**

All monitoring data and records will be archived in electronic form and as paper prints if relevant. Electronic documents will be backed up on compact disc or hard disc and stored for minimum 2 years after the end of each crediting period of the project activity.

Quality Assurance and Quality Control

To ensure that the data is reliable and transparent, the CPA implementer, in cooperation with the CME Project Manager, will establish Quality Assurance and Quality Control (QA&QC) measures to effectively control and manage data reading, recording, auditing as well as archiving data and all

relevant documents.
The installation location of the meters will be detailed in each CPA. Control meter will be installed for each main meter. The project entity will implement QA&QC measures to calibrate and guarantee the accuracy of metering and safety of the project operation.
The monitoring equipment will be calibrated and inspected properly and periodically as per standard industry norms and requirements of respective grid operator and will be properly calibrated in accordance with relevant industry standards and the instructions (schedules, procedures) for quality assurance from the equipment manufacturer/ provider.

The CDM team will meet periodically to review project parameters, check data collected, emissions reduced, etc. The following will be the procedure for taking corrective action and addressing any non-conformances discovered:

- All the mismatching data, along with the name of the respective Plant Manager and the person in charge of the logbooks, will be recorded in either a note book or an electronic file.
- The respective site Plant Manager in the CDM team will send a FAR (Forward Action Request) or CAR (Corrective Action Request) to the concerned Operational Personnel.
- After receipt of the communication, the concerned site individual in charge will correct the data and will reply to the CPA Project Manager in the CDM team.
- The corrected data will then be compiled by the respective CPA Project Manager.

Capacity development
An on-site training for the CPA implementer´s involved personnel will be conducted. The training will be on the following aspects of equipments involved in the Project activity – start up techniques, operation, maintenance, monitoring of parameters, precautions, safety instructions and emergency preparedness etc. The following procedure will be followed for training:

- A copy of Operation and Maintenance manual, Safety instructions related to the equipment involved in the Project activity will be made available to all employees involved in the Project.
- During commissioning of the new equipments (of the Project activity), training on all above aspects to all employees involved in the Project activity will be provided.
- Whenever an employee handles the equipments involved in the Project activity first time, training will be provided to him on start up techniques, operation, maintenance, monitoring of parameters, precautions, safety instructions and emergency preparedness etc.
- The training will be provided by respective equipment supplier and expert O & M personnel of the company.

CDM capacity development for the CPA Project Manager will be conducted by CDM experts (by CME or external expert approved by CME). This will ensure that the CPA Project Manager is prepared for the responsibilities with respect to the implementation of the proposed CPA.

Appendix 1. Contact information on entity/individual responsible for the PoA

Organization	Dubai Electricity & Water Authority (DEWA)
Street/P.O. Box	P.O. Box 564
Building	DEWA Head Office near Wafi Mall
City	Dubai
State/Region	Dubai
Postcode	
Country	United Arab Emirates
Telephone	+971 4 324 4444
Fax	+971 4 324 8111
E-mail	dewa@dewa.gov.ae
Website	www.dewa.gov.ae
Contact person	Fatima Mohammed Alfoora Alshamsi Sr. Manager – New Business Development
Title	Eng.
Salutation	Mrs.
Last name	Alshamsi
Middle name	
First name	Fatima
Department	Strategy & Business Development – New Business Development
Mobile	+971 050 6282235

Organization	Dubai Carbon Centre of Excellence
Street/P.O. Box	P.O. BOX 333992
Building	-
City	Dubai
State/Region	Dubai
Postcode	P.O. BOX 333992
Country	United Arab Emirates (UAE)
Telephone	+ 971 4 307 2600
Fax	+ 971 4 451 3399
E-mail	info@dcce.ae
Website	www.dcce.ae
Contact person	Ivano Iannelli Chief Executive Officer
Title	-
Salutation	Mr
Last name	Iannelli
Middle name	-
First name	Ivano
Department	-
Mobile	+971 50 558 7503

Appendix 2. Affirmation regarding public funding

As discussed under Section A.4.5, there is no recourse to any public funding for the proposed PoA which is declared by DEWA as the CME.

Appendix 3. Application of methodology(ies)

N/A

Appendix 4. Further background information on ex ante calculation of emission reductions

BASELINE INFORMATION

1. Calculation of the CO_2 emission factor of DEWA grid:

According to the **Tool to calculate the emission factor for an electricity system, (Version 02.2.1)**; further on referred as "GEF Tool"; there are 6 main steps in the process of calculating the grid emission factor:

STEP 1. Identify the relevant electricity systems

As per the GEF Tool, a grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

Similarly, connected electricity system is an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

The DNA of the UAE has not published any delineation of project electricity systems and connected electricity systems. If this information is not available, the project participants should define the project electricity system and any connected electricity systems using the following criteria to determine the existence of significant transmission constraints:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year;
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

Application of the first criterion does not result in a clear determination of the grid boundary. There are four different entities responsible for different regional grids within the UAE:

1. Abu Dhabi Water and Electricity Authority (ADWEA),
2. Dubai Water and Electricity Authority (DEWA),
3. Sharjah Water and Electricity Authority (SEWA), and
4. Federal Water and Electricity Authority (FEWA).

These regional grids are not operated with spot markets for electricity, and dispatch decisions are being made centrally within each regional grid[10]. The regional grids have been connected through high voltage transmission lines but prices still defer between regions and are affected by political considerations. As end-user prices are kept relatively constant, one can conclude that price differences of more than 5% exist for more than 60% of the year. As can be seen from the table below the prices of all 4 electricity systems are constant throughout the year and the difference is more than 5%

[10] *http://www.adwec.ae/documents/ppt/prospects_for_electricity_trade_between_gcc_countries.pdf*

Customer Category	ADWEA[11]	DEWA[12]	SEWA	FEWA[13]
Residential	3-15 fils/kWh	23-38 fils/kWh	30 fils/kWh	20-33 fils/kWh
Commercial	15 fils/kWh	23-38 fils/kWh	30 fils/kWh	20-33 fils/kWh
Industrial	15 fils/kWh	23-38 fils/kWh	40 fils/kWh	20-33 fils/kWh

The second criterion does not provide a clear boundary either. Regional transmission lines are available and have spare capacity but the current utilization level cannot be explained by differences in real transmission costs alone. As there is no liberalized market for electricity between regional grids, utilization of transmission capacity is mainly a result of long term commercial negotiations between the four authorities.
As the two criteria above do not result in a clear identification of a grid boundary, the project electricity system is defined as the Dubai Emirate regional grid operated by DEWA, defined by following power plants/units which are all connected through transmission and distribution lines to the project activity and can be dispatched without significant transmission losses:

Name of power plant/unit	Installed capacity in 2010[14] (MW)
Jebel Ali Power and Desalination Station "D"	1,027
Jebel Ali Power and Desalination Station "E"	605
Jebel Ali Power and Desalination Station "G"	798
Aweer Power Station "H" - Ph I	607
Aweer Power Station "H" - Ph II	421
Aweer Power Station "H" - Ph III	818
Jebel Ali Power and Desalination Station "K"	831
Jebel Ali Power and Desalination Station "L" - Ph I	861
Jebel Ali Power and Desalination Station "L" - Ph II	1,393

The relevant electricity system is the electricity grid system supplying Dubai Emirate, operated by Dubai Electricity & Water Authority (DEWA).

The relevant electricity system is located in United Arab Emirates only, which is not an Annex-I country.
Therefore the GEF Tool is applicable to the proposed project activity.

Connected electricity system, e.g. national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.
The connected power grids are:

[11] *http://www.rsb.gov.ae/en/PrimaryMenu/index.aspx?LeftType=1&SubCatLeftMenu_Name=Customer%20Tariffs%20&%20Charges&SubCatLeftMenu_ID=152&SubCatMenu_Name=Tariffs%20&%20Charges&SubCatMenu_ID=151&CatMenu_ID=67&PriMenu_ID=177&CatMenu_Name=Tariffs&PriMenu_Name=*
[12] *http://www.dewa.gov.ae/tariff/tariffdetails.aspx*
[13] *http://fewa.gov.ae/_arabic/Slab.html*
[14] *http://www.dewa.gov.ae/aboutus/electStats2010.aspx*

- In Non-Annex I countries:
    - Abu Dhabi Water and Electricity Authority (ADWEA), in UAE;
    - Sharjah Electricity and Water Authority (SEWA), in UAE; and
    - Federal Electricity and Water Authority (FEWA), in UAE.
- In Annex I countries: none

There is no electricity import from the connected grids.

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

For the DEWA grid emission factor calculation, Option I has been used: only grid power plants are included in the calculation.

STEP 3. Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

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

For the DEWA grid emission factor calculation, the Average OM method has been chosen.
The average OM emission factor ($EF_{grid,OM\text{-}ave,y}$) is calculated as the average emission rate of all power plants serving the grid.

The data on annual net electricity production for the 5 most recent years have been provided by DEWA.

For the average OM the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante option.*
- *Ex post option.*

For the DEWA grid emission factor calculation, the ex ante data vintage option has been chosen. The emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PoADD to the DOE for validation has been used.

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

The average OM emission factor is calculated as (*EFgrid,OM-ave,y*) *is calculated as the average emission rate of all power using the methodological guidance as described for the simple OM, but also including the low-cost/must-run power plants in all equations.*

The Average OM may be calculated:
Option A: Based on the electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B should only be used if the necessary data for Option A is not available.

For the DEWA grid emission factor calculation, Option A has been chosen for the calculation of the Average OM. *Under this option, the Average OM emission factor is calculated based on the net electricity of each power unit and an emission factor for each power unit, as follows:*

$$EF_{grid,OM-ave,y} = \frac{\Sigma_m EG_{m,y} * EF_{EL,my}}{\Sigma_m EG_{m,y}}$$

Equation (1) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,OM-ave,y}$	Average 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)
$EF_{EL,my}$	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

Sources of the data:

$EF_{grid,OM-ave,y}$	Calculation is provided in the Excel file "GEF DEWA Calculation- V2"
$EG_{m,y}$	The data on net electricity generated and delivered to the grid by the power units have been provided by DEWA.
$EF_{EL,y}$	Calculated according to the Tool to calculate the emission factor for an electricity system, (Version 02.2.1); see the details on the determination method below
m	For the proposed project activity, m = power plants operated by DEWA, as listed in Excel file "GEF DEWA calculation-V2"
y	y = 2008, 2009, 2010

Determination of $EG_{m,y}$:
According to the GEF Tool, the $EG_{m,y}$ for grid power plants is determined as per the provisions in the monitoring tables – the source of the data should be the utility or government records or official publications. For average OM, the monitoring frequency of the data should be either 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); or annually during the crediting period for the relevant years, following the guidance in Step 3.
For the DEWA grid emission factor calculation, the data has been provided by the utility (DEWA) and the data from the most recent three historical years for which data is available (years 2008, 2009, 2010) has been used.

Determination of $EF_{EL,m,y}$:
The emission factor of each power unit m should be determined as follows:

- ***Option A1****. If for a power unit m data on fuel consumption and electricity generation is available;*
- ***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;*
- ***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.*

For the DEWA grid emission factor calculation, Option A1 has been chosen for the calculation of $EF_{EL,m,y}$ because data on fuel consumption and electricity generation is available.

Justification of the chosen option: this option should be used if, for a power unit *m*, the data on fuel consumption and electricity generation is available. The data on fuel consumption and electricity generation over the 3 most recent years have been provided by DEWA.

$EF_{EL,m,y}$ is calculated as follows:

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

Equation (2) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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* (tCO_2/GJ)
$EG_{m,y}$	Net 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

Sources of data:

$EF_{EL,m,y}$	Calculation is provided in the Excel file "GEF DEWA calculation-V2"
$FC_{i,y}$	The data on amounts of the fossil fuel types combusted in the power units have been provided by DEWA.
$NCV_{i,y}$	The net calorific values of the fossil fuel types combusted in the power units have been provided by DEWA.
$EF_{CO2,i,y}$	Source: 1. For the natural gas and distillate fuel oil (DFO), $EF_{CO2,i,y}$ is based on the laboratory analysis of the fuel. 2. For the medium fuel oil, the IPCC default value at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories[15] has been used.
$EG_{m,y}$	The data on net electricity generated and delivered to the grid by the power units have been provided by DEWA.
m	m = power plants operated by DEWA, as listed in the Excel file "GEF DEWA calculation-V2"
i	Natural gas (NG) medium fuel oil (MFO) diesel fuel oil (DFO)
y	y = 2008, 2009, 2010

[15] *http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html*

Calculation of the generation-weighted average CO_2 emissions per unit net electricity generation – the average OM:

	NET ELECTRICITY GENERATION		OPERATING MARGIN EMISSIONS FACTOR
	MWh	Weight	tCO_2/MWh
2008	28,613,451	0.31	0.5579
2009	30,499,280	0.33	0.5417
2010	33,207,824	0.36	0.5064
TOTAL	**92,320,555**	**1**	
$EF_{DEWA, OM-ave,2008-2010}$ =		**($EF_{OM,2008}$*$weight_{2008}$) + ($EF_{OM,2009}$*$weight_{2009}$) + ($EF_{OM,2010}$*$weight_{2010}$)**	
		0.5340 tCO_2/MWh	

STEP 5 – Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: *ex ante*
Option 2: *ex post*

For the DEWA grid emission factor calculation, Option 1: ex ante has been chosen.

As per the GEF Tool, STEP 5, Option 1, *for the first crediting period, the build margin emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of POA DD submission to the DOE for validation.*
For the second crediting period, the build margin emission factor should 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.
For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option 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 is determined according to the GEF Tool, as per the following procedure, consistent with the chosen ex-ante data vintage:

(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 ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);*

Nr.	Unit No.	Start of electricity supply to the grid	Generation 2010 (MWh)	Cumulated generation (MWh)
1	M 12 GT	25.05.2010	109,254	109,254
2	M 11 GT	22.02.2010	31,570	140,824
3	H 54 GT	17.11.2008	133,797	274,620
4	H 53 GT	10.09.2008	252,914	527,535
5	H 52 GT	23.06.2008	112,655	640,190

For the DEWA grid emission factor: $AEG_{SET\text{-}5\text{-}units}$ = 640,190 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≥20%) and determine their annual electricity generation (AEG_{SET}≥20%, in MWh);*

Nr.	Unit No.	Start of electricity supply to the grid	Generation 2010 (MWh)	Cumulated generation (MWh)	Share of the system generation (%)
1	M 12 GT	25.05.2010	109,254	109,254	0.33%
2	M 11 GT	22.02.2010	31,570	140,824	0.42%
3	H 54 GT	17.11.2008	133,797	274,620	0.83%
4	H 53 GT	10.09.2008	252,914	527,535	1.59%
5	H 52 GT	23.06.2008	112,655	640,190	1.93%
6	H 51 GT	27.05.2008	153,326	793,516	2.39%
7	L 26 CEST	26.07.2009	1,062,607	1,856,122	5.59%
8	L 25 CEST	24.11.2008	1,138,642	2,994,764	9.02%
9	L 24 GT	15.05.2008	1,363,440	4,358,204	13.12%
10	L 23 GT	29.11.2007	1,086,588	5,444,792	16.40%
11	L 22 GT	17.07.2007	1,566,309	7,011,101	21.11%
12	L 21 GT	01.07.2007	1,373,926	8,385,027	25.25%
				Total generation of the system in 2010	33,207,614 MWh

For the DEWA grid emission factor: $AEG_{\geq 20\%}$ =8,385,027 MWh

Note: The 20% of AEG_{total} falls on part of the generation of the unit L 22 GT therefore the unit is fully included.
Moreover, the unit L 21 GT is included in the sample group although it is already higher than the 20% threshold. It is because that the steam turbine units L 25 CEST and L 26 CEST included in the sample group are not independent units; they are interconnected with all the gas turbine units L 21 GT, L 22 GT, L 23 GT and L 24 GT. Therefore all these units have to be reckoned together, and the plant L Ph-2 must be considered as whole.

(c) *From $SET_{5\text{-}unit}$s and SET≥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. Ignore steps (d), (e) and (f).

For the DEWA grid emission factor:

$$AEG_{SET\text{-}5\text{-}units} < AEG_{\geq 20\%}$$
$$SET_{\geq 20\%} = SET_{sample}$$
$$SET_{sample} \approx AEG_{\geq 20\%} = 8{,}385{,}027 \text{ MWh}$$

None of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago. Therefore, the selected SET_{sample} can be used for calculation of the build margin. Steps (d), (e) and (f) of the procedure are ignored.

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 power generation data is available, calculated as follows:

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

Equation (12) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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 (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 power generation data is available

Sources of data:

$EF_{grid,BM,y}$	**Calculation is provided in the Excel file "GEF DEWA calculation-V2"**
$EG_{m,y}$	**The data on net electricity generated and delivered to the grid by the power units have been provided by DEWA.**
$EF_{EL,m,y}$	**The CO_2 emission factor of each power unit m has been determined according to the "Tool": as per the guidance in Step 4 (a) for the simple OM, using year 2010 for the most recent historical year *y* for which power generation data is available, and using for *m* the power units included in the build margin.**
m	**Power units as listed in the Excel file "GEF DEWA calculation-V2"**
y	**y = 2010**

As result of the calculation:

$EF_{DEWA,BM,2010}$=	**0.4588 tCO_2/MWh**

STEP 6 - Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(e) Weighted average CM; or
(f) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

For the DEWA grid emission factor calculation, the CM has been calculated according to Option (a) – weighted average CM method, as follows:

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

Equation (13) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,CM,y}$	Combined margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,BM,y}$	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_{OB} = 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.*

For the proposed project activity, the following default values have been used for w_{OM} and w_{BM}, in line with the guidance of the GEF Tool: w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

Result of the calculation of the combined margin emission factor for the DEWA electricity system:

	Wind and solar power generation project activities
w_{OM}	0.75
w_{BM}	0.25
$EF_{DEWA,CM,2010}$ =	$EF_{grid,OM\text{-}ave,2008\text{-}2010} * 0.75 + EF_{grid,BM,2010} * 0.25$
$EF_{DEWA,CM,2010}$ =	0.5340 * 0.75 + 0.4588 * 0.25
$EF_{DEWA,CM,2010}$ =	**0.5152 tCO_2/MWh**

2. Calculation of the CO_2 emission factor of FEWA grid:

According to the **Tool to calculate the emission factor for an electricity system, (Version 02.2.1)**; further on referred to as the "GEF Tool"; the calculation was performed in **6 steps** as follows:

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

STEP 1. Identify the relevant electricity systems

Project electricity system defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

As per the GEF Tool, a grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

Similarly, connected electricity system is an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be

dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

The DNA of the UAE has not published any delineation of project electricity systems and connected electricity systems. If this information is not available, the project participants should define the project electricity system and any connected electricity systems using the following criteria to determine the existence of significant transmission constraints:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year;
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

Application of the first criterion does not result in a clear determination of the grid boundary. There are four different entities responsible for different regional grids within the UAE:

5. Abu Dhabi Water and Electricity Authority (ADWEA),
6. Dubai Water and Electricity Authority (DEWA),
7. Sharjah Water and Electricity Authority (SEWA), and
8. Federal Water and Electricity Authority (FEWA).

These regional grids are not operated with spot markets for electricity, and dispatch decisions are being made centrally within each regional grid[16]. The regional grids have been connected through high voltage transmission lines but prices still defer between regions and are affected by political considerations. As end-user prices are kept relatively constant, one can conclude that price differences of more than 5% exist for more than 60% of the year. As can be seen from the table below the prices of all 4 electricity systems are constant throughout the year and the difference is more than 5%

Customer Category	ADWEA[17]	DEWA[18]	SEWA	FEWA[19]
Residential	3-15 fils/kWh	23-38 fils/kWh	30 fils/kWh	20-33 fils/kWh
Commercial	15 fils/kWh	23-38 fils/kWh	30 fils/kWh	20-33 fils/kWh
Industrial	15 fils/kWh	23-38 fils/kWh	40 fils/kWh	20-33 fils/kWh

The second criterion does not provide a clear boundary either. Regional transmission lines are available and have spare capacity but the current utilization level cannot be explained by differences in real transmission costs alone. As there is no liberalized market for electricity between regional grids, utilization of transmission capacity is mainly a result of long term commercial negotiations between the four authorities.

As the two criteria above do not result in a clear identification of a grid boundary, the project electricity system is defined as the federal grid operated by FEWA, defined by power plants/units which are all connected through transmission and distribution lines to the project activity and can be dispatched without significant transmission losses.

Name of power plant

[16] *http://www.adwec.ae/documents/ppt/prospects_for_electricity_trade_between_gcc_countries.pdf*

[17] *http://www.rsb.gov.ae/en/PrimaryMenu/index.aspx?LeftType=1&SubCatLeftMenu_Name=Customer%20Tariffs%20&%20Charges&SubCatLeftMenu_ID=152&SubCatMenu_Name=Tariffs%20&%20Charges&SubCatMenu_ID=151&CatMenu_ID=67&PriMenu_ID=177&CatMenu_Name=Tariffs&PriMenu_Name=*

[18] *http://www.dewa.gov.ae/tariff/tariffdetails.aspx*

[19] *http://fewa.gov.ae/_arabic/Slab.html*

Ajman
Al Zawra
UAQ
Dhaid
Galeelah
Nakheel

The relevant electricity system is located in United Arab Emirates only, which is not an Annex-I country.
Therefore the Tool is applicable.

Connected electricity system, e.g. national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

The connected power grids are:
- In non-Annex I countries:
    - Abu Dhabi Water and Electricity Authority (ADWEA), in UAE;
    - Dubai Water and Electricity Authority (DEWA), in UAE; and
    - Sharjah Water and Electricity Authority (SEWA), in UAE.
- In Annex I countries: none

Therefore the GEF Tool is applicable to the proposed project activity.
The FEWA grid received only power from the Abu Dhabi Water and Electricity Authority (ADWEA) connected grid.
For the purpose of determining the operating margin emission factor of the FEWA grid, the emission factor of the ADWEA grid is calculated in accordance with the "Tool to calculate the emission factor for an electricity system" – Version 02.2.1 . For the calculation of the ADWEA emission factor, the weighted average operating margin (OM) emission factor has been chosen according to the tool. The ADWEA average OM emission factor is calculated using option A, based on the electricity generation and a CO_2 emission factor for each power unit while the determination of the emission factor of each power unit is determined using Option A1 as the data on fuel consumption and electricity generation is available. Therefore, the ADWEA average OM emission factor follows the same steps 2-4 below, which is applied for the FEWA average OM emission factor. Detailed description is in the Annex 3.3 below.
The ADWEA average OM factor is used in the calculation of the operating margin emission factor of the FEWA and considered as a single power plant.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system (FEWA grid).

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)
Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

For the FEWA grid emission factor, Option I has been used: Only grid power plants are included in the calculation.

STEP 3. Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

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

For the FEWA grid emission factor, the average OM method has been chosen.

For the average OM the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante option.*
- *Ex post option.*

For the FEWA grid emission factor, the ex ante data vintage option has been chosen. The emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation has been used.

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

The average OM emission factor is calculated as the average emission rate of all power plants serving the grid.
The average OM may be calculated:
Option A: Based on the electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.
Option B should only be used if the necessary data for Option A is not available.

For the FEWA grid emission factor, Option A has been chosen for the calculation of the average OM because the necessary data are available. *Under this option, the average OM emission factor is calculated based on the net electricity of each power unit and an emission factor for each power unit, as follows:*

$$EF_{grid,OM-ave,y} = \frac{\Sigma_m EG_{m,y} * EF_{EL,my}}{\Sigma_m EG_{m,y}}$$

Equation (1) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{grid,OMs-ave,y}$	Average 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)
$EF_{EL,y}$	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 - the ex ante option.

Source of the data:

$EF_{grid,OM-ave,y}$	Calculation is provided in the Excel file "GEF FEWA RasAlKhajmah Calculation- V2"
$EG_{,m,y}$	Provided by FEWA.
$EF_{EL,m,y}$	Calculated according to the Tool to calculate the emission factor for an

	electricity system, (Version 02.2.1); see the details on the determination method below
m	m = all power plants operated by FEWA + import from ADWEC (considered as one power unit)
y	y = 2008, 2009, 2010

Determination of $EF_{EL,m,y}$:
The emission factor of each power unit m should be determined as follows:

- ***Option A1****. If for a power unit m data on fuel consumption and electricity generation is available;*
- ***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 CO1 emission factor of the fuel type used and the efficiency of the power unit;*
- ***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.*

For the FEWA grid emission factor, Option A1 has been chosen for the calculation of $EF_{EL,m,y}$.

Justification of the chosen option: this option should be used if for a power unit *m* the data on fuel consumption and electricity generation is available. The data on fuel consumption and electricity generation over the 3 most recent years are available, have been provided by FEWA.
$EF_{EL,m,y}$ is calculated as follows:

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

Equation (2) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{EL,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,y}$	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 (tCO_2/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	Most recent historical year for which power generation data is available

Sources of data:

$EF_{EL,m,y}$	Calculation is provided in the Excel file “GEF FEWA RasAlKhajmah Calculation- V2”
$FC_{i,y}$	Provided by FEWA
$NCV_{i,y}$	Provided by FEWA, as per fuels suppliers information
$EG_{m,y}$	Provided by FEWA.
m	m = power plants operated by FEWA + import from ADWEC (considered as one power unit)
i	Natural gas (NG) medium fuel oil (MFO)

diesel fuel oil (DFO)

y y = 2008, 2009, 2010

Calculation of the generation-weighted average CO_2 emissions per unit net electricity generation – the average OM:

	NET ELECTRICITY GENERATION		OPERATING MARGIN EMISSIONS FACTOR
	MWh	**Weight**	**tCO_2/MWh**
2008	9,059,198	0.33	0.8362
2009	9,131,538	0.33	0.7992
2010	9,219,618	0.34	0.8055
TOTAL	**27,410,353**	**1**	
$EF_{FEWA, OM-ave,2008-2010}$ =		**($EF_{OM,2008}$*$weight_{2008}$) + ($EF_{OM,2009}$*$weight_{2009}$) + ($EF_{OM,2010}$*$weight_{2010}$)**	
		0.8136 tCO_2/MWh	

STEP 5 – Calculate the build margin (BM) emission factor
In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: *ex ante*
Option 2: *ex post*

For the FEWA grid emission factor, Option 1: ex ante has been chosen.

As per the GEF Tool, STEP 5, Option 1, *for the first crediting period, the build margin emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation.*

For the second crediting period, the build margin emission factor should 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.

For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option 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 is determined according to the GEF Tool, as per the following procedure, consistent with the chosen ex-ante data vintage:

(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);

For the FEWA grid emission factor: $AEG_{SET\text{-}5\text{-}units}$ = 1,619,221.00 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≥20%) and determine their annual electricity generation (AEG_{SET}≥20%, in MWh);

For the FEWA grid emission factor: $AEG_{\geq 20\%}$ = 717,777.00 MWh

(c) From $SET_{5\text{-}unit}$s 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. Ignore steps (d), (e) and (f).

For the FEWA grid emission factor: $AEG_{SET\text{-}5\text{-}units} > AEG_{\geq 20\%}$

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

One of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago.

(d) Exlude from SETsample 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 activity, 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)

One of the power units (Nakheel GT.5) in SETsample started to supply electricity to the grid more than 10 years ago. Also with exclusion of this power unit the set comprises 20% of the electricity generation of the project electricity system. Therefore, SET_{sample} encompasses the power units

- Al-Zawra GT.1
- Al-Zawra GT.2
- Nakheel GT.6
- Nakheel GT.4

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).
The power unit Nakheel GT.5 started to supply electricity to the grid more than 10 years ago, thus this power unit were excluded from $SET_{sample.}$ The SET_{sample} compromises at least 20% of generation.
$AEG_{SET\text{-}Sample}$ =1,536,247 MWh

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 power generation data is available, calculated as follows:

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

Equation (12) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

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 power generation data is available

Sources of data:

$EF_{grid,BM,y}$	Calculation is provided in the Excel file "GEF FEWA RasAlKhajmah Calculation- V2"
$EG_{,m,y}$	Provided by FEWA.
$EF_{EL,m,y}$	The CO_2 emission factor of each power unit m has been determined according to the "Tool": as per the guidance in Step 4 (a) for the simple OM.
m	m = power plants operated by FEWA
y	y = 2010

As result of the calculation:

$EF_{FEWA,BM,2010}$=	**0.7680 tCO_2/MWh**

STEP 6 - Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(e) Weighted average CM; or

(f) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

For the FEWA grid emission factor, the CM has been calculated according to option A – weighted average CM method, as follows:

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

Equation (13) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

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

Source of data:

$EF_{grid,CM,y}$	Calculation is provided in the Excel file "GEF FEWA RasAlKhajmah Calculation- 23"
$EF_{grid,OM,y}$	Calculation is provided in the Excel file "GEF FEWA RasAlKhajmah

Calculation- V2"

$EF_{grid,BM,y}$	Calculation is provided in the Excel file "GEF FEWA RasAlKhajmah Calculation- V2"
w_{OM}	As per the Tool, Step 6, method (a): *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_{OB} = 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.* For the proposed project activity, the following default values have been used for wOM and wBM, in line with the guidance of the GEF Tool: w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

Result of the calculation of the combined margin emission factor for the FEWA electricity system:

	Wind and solar power generation project activities
w_{OM}	0.75
w_{BM}	0.25
$EF_{FEWA,CM,2010}$ =	$EF_{grid,OM\text{-}ave,2008\text{-}2010}$ * 0.75 + $EF_{grid,BM,2010}$*0.25
$EF_{FEWA,CM,2010}$ =	0.8136 * 0.75 + 0.7680 * 0.25
$EF_{FEWA,CM,2010}$ =	**0.8022 tCO_2/MWh**

Annex 3.3. Calculation of the average OM CO_2 emission factor of ADWEA grid:

For the FEWA grid emission factor:

- Attachment – "GEF FEWA RasAlKhaimah Calculation-V2" (separate MS Excel file)
- Attachment 2: "OM EF of the ADWEA grid-V1" (separate MS Excel file)

The following steps shows the calculation of the average operating margin for the Abu Dhabi Water and Electricity Authority (ADWEA) electricity system according to the steps of the UNFCCC "Tool to calculate the emission factor for an electricity system, Version 02.2.1 (EB 63)" for the year 2008, 2009 and 2010.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

Option II: Both grid power plants and off-grid power plants are included in the calculation.

For the ADWEA grid emission factor, Option I has been used: Only grid power plants are included in the calculation.
The same selection was applied for the FEWA grid emission factor calculation.

STEP 3. Select a method to determine the operating margin (OM)
The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(e) Simple OM; or
(f) Simple adjusted OM; or
(g) Dispatch data analysis OM; or
(h) Average OM.

The simple OM method (option A) can only be used if low-cost/must-run resources[20] constitute less than 50% of total grid generation in:

1) Average of the five most recent years, or
2) Based on long-term averages for hydroelectricity production.

For the ADWEA grid emission factor, the average OM method has been chosen
The same selection is applied for the FEWA grid emission factor.
For the average OM the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante option.*
- *Ex post option.*

For the ADWEA grid emission factor, the ex ante data vintage option has been chosen. The emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. The same selection was applied for the FEWA grid emission factor.

STEP 4. Calculate the operating margin emission factor according to the selected method
The operating margin emission factor is calculated according to the method average OM. The average OM emission factor ($EF_{grid,OM-ave,y}$) is calculated as the average emission rate of all power plants serving the grid.

The average OM may be calculated:
Option A: Based on the electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B should only be used if the necessary data for Option A is not available.

For the ADWEA operating margin emission factor, Option A has been chosen for the calculation of the average OM. *Under this option, the average OM emission factor is calculated based on the net electricity of each power unit and an emission factor for each power unit, as follows:*

$$\mathbf{EF_{grid,OM-ave,y}} = \frac{\mathbf{\Sigma_m EG_{m,y} * EF_{EL,m,y}}}{\mathbf{\Sigma_m EG_{m,y}}}$$

Equation (1) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

[20] *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 be included in this list, i.e. excluded from the set of plants.*

$EF_{grid,OM-ave,y}$	Average 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
y	The relevant year as per the data vintage chosen in Step 3 - the ex ante option.

Source of the data:

$EF_{grid,OM-ave,y}$	Calculation is provided in the Excel file "OM EF of the ADWEA grid-V2"
$EG_{,m,y}$	Provided by ADWEA.
$EF_{EL,m,y}$	Calculated according to the Tool to calculate the emission factor for an electricity system, (Version 02.2.1); see the details on the determination method below
m	m = all power plants operated by ADWEA
y	y = 2008, 2009, 2010

The same selection is applied for the FEWA grid emission factor.

Determination of $EF_{EL,m,y}$:
The emission factor of each power unit m should be determined as follows:

- ***Option A1****. If for a power unit m data on fuel consumption and electricity generation is available;*
- ***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 CO1 emission factor of the fuel type used and the efficiency of the power unit;*
- ***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.*

For the ADWEA grid emission factor, Option A1 has been chosen for the calculation of $EF_{EL,m,y}$.
The same selection is applied for the FEWA grid emission factor.
Justification of the chosen option: this option should be used if for a power unit *m* the data on fuel consumption and electricity generation is available. The data on fuel consumption and electricity generation over the 3 most recent years are available, have been provided by ADWEC[21].
$EF_{EL,m,y}$ is calculated as follows:

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

Equation (2) of the Tool to calculate the emission factor for an electricity system, (Version 02.2.1)

Where:

$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,y}$	Amount of fossil fuel type i consumed by power unit m in year y (mass or volume unit)

[21] *The Abu Dhabi Water and Electricity Company (ADWEC), the statistics provider, is a wholly owned subsidiary of the Abu Dhabi Water and Electricity Authority (ADWEA) and is the Single Buyer and Seller of Water & Electricity" in the Emirate of Abu Dhabi.*

$NCV_{i,y}$	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 (tCO_2/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
i	All fossil fuel types combusted in power unit m in year y
y	Most recent historical year for which power generation data is available

Sources of data:

$EF_{EL,m,y}$	Calculation is provided in the Excel file "OM EF of the ADWEA grid-V2"
$FC_{i,y}$	Provided by ADWEC
$NCV_{i,y}$	Provided by ADWEC
$EG_{m,y}$	Provided by ADWEC.
m	m = power plants operated by ADWEA
i	Gas Gas oil Crude oil Residual fuel oil
y	y = 2008, 2009, 2010

Result of the average OM emissions factor (2008-2010)

year	AVERAGE OPERATING MARGIN EMISSIONS FACTOR
	tCO_2/MWh
2008	$EF_{grid, OM\text{-}ave, 2008}$=0.8431
2009	$EF_{grid, OM\text{-}ave, 2009}$ =0.8077
2010	$EF_{grid, OM\text{-}ave,2010}$ =0.7926

The calculation is traceable via the Excel file "OM EF of the ADWEA grid-V2".

Appendix 5. Further background information on the monitoring plan

N/A

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Document information

Version	*Date*	*Description*
03.0	3 December 2012	Revision to clarify the determination of the start date for a PoA and the documentation requirement for generic CPA-DDs. (EB 70, Annex 6).
02.0	11 May 2012	EB 66, Annex 12 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities".
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