



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

CONTENTS

- A. General description of programme of activities (PoA)
- B. Duration of the programme of activities
- C. Environmental Analysis
- D. Stakeholder comments
- E. Application of a baseline and monitoring methodology to a typical CDM Programme Activity (CPA)

Annexes

- Annex 1: Contact information on Coordinating/managing entity and participants of PoA
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring plan

NOTE:

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

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



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

A.1 Title of the programme of activities:

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Dubai Solar Farm Programme of Activities

Version 01

14/11/2011

A.2. Description of the programme of activities:

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1. General operating and implementing framework of PoA

The Dubai Electricity and Water Authority (DEWA) is a Dubai Government authority. DEWA is 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.

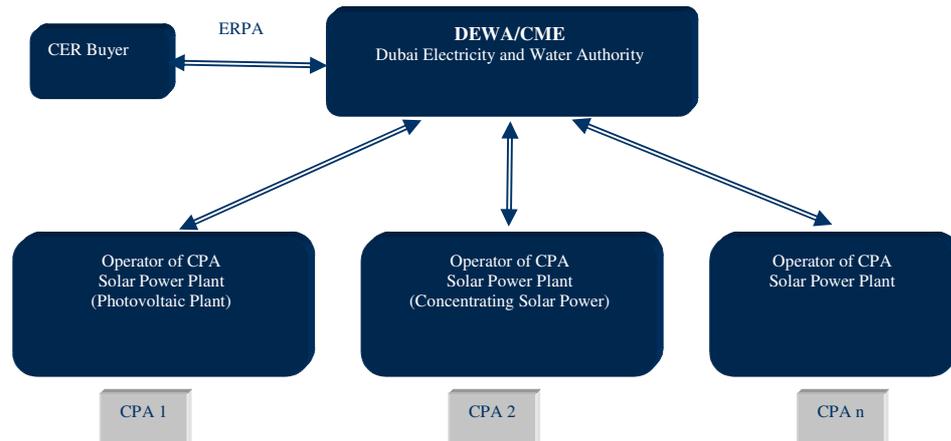
Based on the *Dubai Integrated Energy Strategy 2030* that foresees a 5% solar energy share of total electricity generation by 2030, DEWA is planning the implementation of 400 MW solar power in the Emirate of Dubai. Some of this generation capacity may be directly owned by DEWA, and some of it may be implemented by Independent Power Producers (IPPs) that feed the solar electricity into the DEWA grid.

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)

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. Policy/measure or stated goal of the PoA

The purpose of the proposed PoA is the generation of electricity through the utilization of the solar power potential in Dubai. The electricity generated through individual project activities will be supplied to the Dubai Emirate grid operated by DEWA under power purchase agreements between the owners of the solar power plants and DEWA (in cases where DEWA does not directly own the solar power plants). The implementation of the PoA will result in an increased share of solar energy for the Emirate of Dubai, as envisaged in the *Dubai Integrated Energy Strategy 2030*¹.

Energy and water demands in Dubai have been growing in excess of 9% per annum² in recent years and this demand growth has been fueled by competitive long-term piped gas supply contracted from Abu Dhabi and Qatar. This competitive gas price has translated into power and water prices that are relatively low but have resulted in Dubai becoming one of the most energy- and CO₂- intensive economies in the world.

If current trends were to continue unabated, energy supply will become a growing challenge for Dubai: power demand is forecast to reach 90-140 TWh by 2030 (49 TWh in 2010), which translates into 3-5% p.a. growth over the next 20 years. Similarly, water demand is forecast to grow from 94,000 Million Imperial Gallon in 2010 up to 150-220,000 Million Imperial Gallon in 2030, equivalent to a growth of 2.3-4.3% p.a. over the same period³.

In this scenario, the gas needed to fuel the demand will outstrip the amount currently contracted by as much as 2-2.5 times by 2030. The gap between currently contracted gas and demand will then reach 2-3.6 billion cubic feet per day by 2030. The additional gas will then likely come at a significantly higher price and Dubai's energy bill will increase by more than USD 8 billion in 2030, and it will escalate to around USD 9 billion as of 2030⁴.

¹ Dubai Integrated Energy Strategy 2030, Dubai Supreme Council of Energy and Government of Dubai, March 2011

² Ibid.

³ Ibid.

⁴ Ibid.



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 2030⁵. 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.

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:

- Abundance of low-cost hydrocarbons and low electricity prices for consumers have hindered investment in renewables, in particular costly solar power;
- Lack of access to cost-effective, competitive solar technologies;
- Lack of infrastructure for construction, installation and operation;
- Lack of local capacity to design and develop solar power schemes. The United Arab Emirates lack specialisation to undertake feasibility studies that would include detailed design and costing of the schemes to make a meaningful impact on utilisation of solar power sites.

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.

Through the provision of sustainable energy in a country with one of the highest energy- and CO₂-intensive economies in the world, it is expected that the Dubai Solar Power 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 the *Dubai Energy Strategy 2030* to increase the share of solar power by 5% in 2030.

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 Emirate of Dubai and increase the share of green jobs in the region;

Increased investment capital

⁵ Dubai Integrated Energy Strategy 2030, Dubai Supreme Council of Energy and Government of Dubai, March 2011



- The CPA will promote sustainable development in the Emirate of Dubai 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;

3. 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 the Emirate of Dubai. 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.

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

>> Here the following information shall be included

1. Coordinating or managing entity of PoA as the entity which communicates with the Board

The coordinating or managing entity of the proposed PoA will be Dubai Electricity and Water Authority (DEWA)

2. Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.

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

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

A.4.1. Location of the programme of activities:

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United Arab Emirates

A.4.1.1. Host Party(ies):

>>

United Arab Emirates

A.4.1.2. Physical/ Geographical boundary:

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The geographical boundary of the PoA extends up to the physical boundary of the Emirate of Dubai.

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

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A typical CPA under this PoA takes place in the boundary of Emirate of Dubai and generates electricity through the utilization of the solar power potential in Dubai and will result in an increased share of solar energy for the Emirate of Dubai.

The first CPA involves the construction of 3 MW solar power plant using thin-film panels in a modular fashion in 1 MW sub-plant blocks. Each 1 MW sub-plant will be connected to a 1 MW inverter and in turn to a 0.4/33 kV transformer and supply electricity to the DEWA grid. The first CPA is expected to be commissioned in 2013. Further CPAs are expected to be included into the PoA every 2-3 years. Each CPA will consist of one solar power plant.

DEWA and also private sector CPA implementers will operate CPAs under the PoA. Ownership of each CPA will be defined at the CPA level and contractual agreements of CPA implementers with DEWA will be in place before inclusion of the respective CPA.

Capacity development:

For all CPA implementers and personnel involved an on-site training in each of the plants 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 CME Project Manager will be conducted by external CDM experts. This will ensure that the CME Project Manager is prepared for the responsibilities of DEWA with respect to the implementation of the proposed PoA.



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

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The proposed large-scale project activity falls under Sectoral Scope I: “Energy industries (renewable - / non-renewable sources)”.

Reference: ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources --- Version 12.1.0⁶

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; 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 the DEWA grid. The technical details, including major civil works and equipment installed, will be detailed in the individual CPA DD.

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 is provided by training local personnel to operate and maintain the plants.

Since the DEWA grid is 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.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

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Based on this eligibility criteria section and E.5.2, it is assumed that each CPA that is included in the registered PoA is additional.

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

No.	Criteria	Applicability (Yes/No)	Conclusion	Documentary Evidence
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	Detailed Project Report, Land Documents, Clearances, Purchase Orders
3	Is the project activity located in the Emirate of Dubai?	Yes	Eligible in the PoA	Land Documents, GPS Coordinates
4	Does the CPA supply electricity to the DEWA grid?	Yes	Eligible in the PoA	Preliminary grid feed-in approval of DEWA

⁶

<http://cdm.unfccc.int/filestorage/V/A/1/VA17EM2PNDJWBTFY34KGRLZO68S9UQ/Consolidated%20baseline%20methodology%20for%20grid-connected%20electricity%20generation%20from%20renewable%20sources.pdf?t=ak58bHVocGswfDBeN83yj7XvImfVXHfCRvXk>



5	Has the CPA owner entered into a contractual agreement with the CME?	Yes	Eligible in the PoA	Contract with the CME (this is only relevant for CPAs not owned by DEWA)
6	Is the proposed CPA a voluntary initiative, not mandated by any policy and/or regulation in the host country?	Yes	Eligible in the PoA	Check of legislation by the CME at the date of preliminary grid feed-in approval by DEWA
7	Is the proposed CPA registered as a part of any other PoA or as an individual CDM project?	No	Eligible in the PoA	GPS coordinates, undertaking from the CPA owner, analysis of projects in the CDM pipeline
8	Can the electricity generated from the individual CPA be accurately measured and recorded to calculate actual emission reductions according to the applied baseline and monitoring methodology?	Yes	Eligible in the PoA	Monitoring plan
9	Is the CPA in line with -Dubai’s environmental protection regulations -Environmental Protection and Safety Section Technical Guidelines -Dubai’s Environmental impact assessment procedures?	Yes	Eligible in the PoA	Check of regulation by CME at the time of inclusion of the CPA into the PoA
10	Has the CPA applied the latest approved version of the “Tool for the demonstration and assessment of additionality” and was additionality clearly proved?	Yes	Eligible in the PoA	Additionality analysis and demonstration of additionality as per the latest approved version of the “Tool for the demonstration and assessment of additionality” by CME
11	Has the stakeholder meeting been conducted as described in Section D.2. of the PoA DD and have all concerns raised been taken into due account?	Yes	Eligible in the PoA	Minutes of the meeting, summary of concerns raised and clarification provided thereof, attendance sheet, photographs and or video

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

>> The information presented here shall constitute the demonstration of additionality on the PoA level. The following is demonstrated in this section:



- (i) The proposed PoA is a voluntary coordinated action;
- (ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;
- (iii) If the PoA implemented is a mandatory policy/regulation, this would/is not enforced
- (iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation

(i) *The proposed PoA is a voluntary coordinated action*

The implementation of solar power projects is not mandatory in the United Arab Emirates and the Emirate of Dubai. There is no regulation at federal level or Emirate level that restricts or empowers any authority to impose a fuel choice on electricity providers. The proposed PoA is a voluntary initiative conceived by DEWA to stimulate sustainable development in the country. No obligation exists for DEWA to utilize or develop solar power projects. The PoA has been conceived as an enabler to support the objective of solar power development in the country. The proposed PoA can therefore be regarded as a voluntary coordinated action.

Although the “Clarifications Regarding the Procedures for Registration of a Programme of Activities as a Single CDM Project Activity And Issuance of Certified Emission Reductions for a Programme Of Activities”, EB 60 Annex 26⁷, clarifies that a full additionality assessment is not required in the context of component project activities, rather the confirmation of additionality for CPAs should be conducted by means of the eligibility criteria, the CME has in this case decided to demonstrate the additionality at the CPA level. The decision has been made because of the scale and technical complexity of the individual CPAs as well as the application of two different solar technologies.

So far, only one large-scale solar power project activity is under implementation in the United Arab Emirates: the registered CDM project activity, “Abu Dhabi Solar Thermal Power Project”, Ref. Number 2534, registered in 2009 but not yet commissioned. It is implemented in Madinat-Zayed, Emirate of Abu Dhabi and is part of the Masdar project, Abu Dhabi, 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. This grid connected power plant is not a solar-only technology but uses solar technology (624 parabolic through solar collector assemblies) in combination with a fossil-fuel based boiler, producing power from the steam turbine run by solar energy and natural gas.

The only already operational solar power plant in United Arab Emirates is a small-scale 10 MW power plant. This project has also been developed by Masdar and is a registered CDM project, “ADFEC 10 MW Solar Power Plant”, Ref. Number 2444.

So far, solar power development has not further advanced, and commercial capacity addition has not yet started in the United Arab Emirates.

7

http://cdm.unfccc.int/filestorage/1/Q/R/1QRAJGC0P2MWD48Z369INYOK7F5SET/eb60_repan26.pdf?t=emp8bHVocG9mfDDtjIau-XOfgZS1ggYUT0WY



In this respect, the PoA is expected to provide a strong incentive to potential investors, leading to systematic implementation of the *Integrated Energy Strategy 2030* and encouraging the implementation of solar power development in the region.

- (ii) *If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;*

In order to facilitate better understanding of the situation of solar power projects in Dubai and the reason for low penetration of solar power, an overview of the barriers faced by these kinds of projects 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.

In the United Arab Emirates, only 10 MW solar power has been exploited so far. Solar power contributes only to 0.05% of total electricity generation of the country. Fossil fuel-based thermal energy generation contributes to 99.95% of total power generation.

Table 1 below gives an overview of installed fossil fuel based capacity and installed solar power capacity:

Table 1: Installed Electricity Capacity in UAE

Currently Installed	
Based on fossil fuels	Based on solar power
18,474 MW	10 MW
99.95%	0.05%

Sources: www.emiratessolar.com (solar power) and <http://www.eia.gov/cabs/uae/Full.html> (fossil fuel capacity)

High installation costs for solar power technologies of more than US\$ 3,000⁸ per kW (PV plant) have impeded exploitation of solar power electricity.

The United Arab Emirates has no hydro power, biomass or geothermal potential. Only wind energy and solar power have an economically feasible potential to be explored and, among those two renewables, solar has more potential but comes at high cost.

Table 2 below gives a comparison of generation cost for wind and solar energy:

Table 2: Generation Costs of Wind and Solar Energy

⁸ Bloomberg New Energy Finance, New York, April 2011



Type	Unit Cost (US\$ /kW)
Wind	3,000
Solar	>3,000

Sources: Bloomberg, New Energy finance, New York, April 2011 / <http://www.windustry.org/how-much-do-wind-turbines-cost>

If the PoA is registered and approved by the Executive Board, an Emission Reduction Purchase Agreement will significantly improve cash flow and debt service cover ratio of the project (which is high for capital-intensive projects) and help overcome the high development costs of solar power plants.

Under the *Dubai Integrated Energy Strategy 2030*, the electricity demand of Dubai is forecast to grow by 3-5% per annum over the next 20 years, increasing from a capacity of 49 TWh (2010) to 90-140 TWh by 2030⁹. In order to meet the growing demand, Dubai will pursue a diversification strategy in its sources of energy. The main fuel choices in addition to gas are coal and nuclear energies. Short-term demand can only be met by additional liquefied natural gas (LNG) or piped gas. There is already additional gas-fired power capacity in the pipeline and developing alternative sources such as coal or nuclear will take longer.

Between 2015 and 2020, Dubai will start to diversify its fuel mix by adding 1.5 GW of new capacity in “clean coal” and between 2020 and 2030, Dubai will diversify into nuclear as a long-term, base-load option. Dubai will need to consider contracting 1.4 GW to 5.6 GW nuclear capacities¹⁰.

In addition, Dubai will also start scaling-up solar power, which is expected to account for a share of 5% in 2030. Thus, there is substantially greater thrust on fossil fuel and nuclear based generation sources in the future energy mix. The proposed solar power programme will provide the necessary incentive to potential investors, leading to systematic implementation of the *Integrated Energy Strategy 2030* and encouraging the implementation of solar power development in the region.

- (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.

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

A.4.4.1. Operational and management plan:

⁹ Dubai Integrated Energy Strategy 2030, Dubai Supreme Council of Energy and Government of Dubai, March 2011

¹⁰ Ibid.



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The PoA will be monitored at two different levels: at individual CPA level and at the CME level. DEWA will build in-house CDM capacity for PoA management and CPA inclusion. CDM training workshops will be conducted by international CDM experts.

The operational and management arrangements to be established at the CME level are described in this section, and the arrangements/structure to be established at the CPA and site level are described in Section E.7.2.

(i) Record keeping system for each CPA

A record keeping system will be established by DEWA which will consist of the following details for enabling unique identification for each CPA:

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

A record-keeping system will be established by each CPA implementer. 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 DEWA. DEWA 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 Section E.7.2.

(ii) A system/procedure to avoid double counting:

DEWA will confirm, as per EB 55 Annex 38 Paragraph 6(i), 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:

- 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.
- 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.

- (iii) 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.

A.4.4.2. Monitoring plan:

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Monitoring and verification shall be carried out for each CPA. The parameters included in Section E.7.1 will be monitored by the CPA implementer according to the procedures and monitoring framework established in Section E.7.2. The monitored data will be submitted to CME Project Manager at DEWA and the CPA implementer will keep a record of the same. DEWA shall also develop and maintain a database that will contain the verification status of each CPA included in the PoA separately.

Verification of the monitored data will be conducted by a DOE for each individual plant.

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

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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. DEWA 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 DEWA.

SECTION B. Duration of the programme of activities

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

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15/11/2011

Date when the CDM-PoA-DD is uploaded to UNFCCC for global comments.

B.2. Length of the programme of activities:

>>

28 years 0 months

As per the “Procedures for registration of a programme of activities as a single CDM project activity and issuance of certified emission reductions for a programme of activities” (Version 04.1) EB 55, Annex 38¹¹ the length of the PoA shall not exceed 28 years.

¹¹

http://cdm.unfccc.int/filestorage/X/T/1/XT12DHPN79U4FISGMYA00JW5KZLQVR.1/eb55_repan38.pdf?t=aXR8bHVocTNvfDD4bftQ4X81fyvUkfr1XEij



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

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

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

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

Environmental Impact Assessment will be carried out in accordance with Dubai Municipality and federal rules and guidelines at the time of inclusion of the CPA.

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

>>

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

Environmental Impact Assessment will be carried out in accordance with Dubai Municipality and federal 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 Dubai Municipality (DM), which will then decide on the need for an Environmental Impact Assessment (EIA). In the case that an EIA is required, DM will state the form of it. It can be either an internally performed assessment, resulting in an Environmental Impact Statement (EIS) or an assessment performed by an external expert entity approved by the government. An Environmental Impact Report (EIR) is the output of this process. The EIS or EIR shall be submitted to Dubai Municipality (DM). The EIS or EIR is a pre-condition for obtaining the Environmental Protection and Safety Permit from DM – Environmental Protection and Safety Section (DM EPSS).

SECTION D. Stakeholders' comments

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

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

The Local Stakeholder Consultations will be held at the CPA level, taking into consideration the scale and different technologies of the CPAs. It is essential to capture the stakeholders' views on the impact of each of the different technologies implemented in the CPAs.

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

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The requirement of stakeholder consultation under the internationally-agreed rules on CDM does not prescribe how comments by local stakeholders are to be invited, and does not exclude the possibility that such comments are simply received in writing.



Each CPA implementer will apply the following approach as considered appropriate for stakeholder consultation and document the same in the respective CPA-DD:

- a. Identification of Stakeholders. The list can include among others:
 1. Local inhabitants
 2. Technology providers/suppliers
 3. Participants from government agencies providing approval for the project
 4. Participants from local NGO's (not mandatory)
- b. Invitation – to be sent at least 10 days in advance
 1. Notification in local newspapers
- c. Fixing time and venue for the meeting
 1. The time and venue chosen should be such that it allows maximum participation from various sections/groups
- d. Conducting the meeting at the site/chosen venue keeping in mind the following:
 1. Appropriateness of location for maximum representation
 2. Availability of space to accommodate anticipated gathering
- e. Address by the CPA representative of the project (in the form of a presentation), which should include:
 1. Description of the project activity
 2. Associated benefits e.g. greenhouse gas emissions mitigation, control of air pollution, employment benefits, efficient utilization of resources etc.
 3. Associated impacts on environment/people
 4. Contribution to social/economic empowerment
- f. Seeking comments from the stakeholders
 1. Open round for seeking comments/suggestions
 2. Each query/comment to be noted along with the details of the stakeholder asking the question (e.g. name of the stakeholder, representative of which section/village)
- g. Providing clarifications/response to the comments raised by the stakeholders
- h. Preparing minutes of the proceedings providing a summary of concerns raised and clarifications provided thereof.
- i. Proof of attendance should include the following:
 1. Attendance sheets to be prepared seeking the following details of individual stakeholders:
 - i. Name
 - ii. Organization/entity
 - iii. Village/Town
 - iv. Signature

Photographs or video recording of the proceedings

D.3. Summary of the comments received:

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The comments received during the stakeholder consultation will be properly documented in the minutes of the meeting and a summary of the same will be provided under relevant sections in the CPA DD.

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

>>

A summary of responses to stakeholder comments provided during the meeting will also be presented in the individual CPA DD.



SECTION E. Application of a baseline and monitoring methodology

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

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The following approved baseline and monitoring methodology to all CPAs that will be included in the PoA:

Title: Consolidated baseline methodology for grid connected electricity generation from renewable sources
Reference: ACM0002, currently: version 12.1.0, EB 58

It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC/CDM¹²

In case the applied approved methodology is put on hold or withdrawn, no new CPAs will be added to the PoA in accordance with the timelines indicated in latest version of the “Procedures for the revision of an approved baseline and monitoring methodology by the EB (EB55, Annex 38, paragraph 18)¹³.

If the methodology is subsequently revised, the CDM-PoA-DD must be revised accordingly and validated by a DOE and approved by the EB that will define the new version of the PoA and the PoA specific CDM-CPA-DD (EB55, Annex 38, paragraph 19)¹⁴. Such revisions are not required in cases where a methodology is revised without being placed on hold or withdrawn.

The approved methodology uses the “Combined tool to identify the baseline scenario and demonstrate additionality, currently version 03.0.1”, EB 60¹⁵

The approved methodology also draws upon the “Tool to calculate the emission factor for an electricity system” for definition of an electricity system, currently, version 2.2.1”, EB 63¹⁶

Additionality is demonstrated as per the “Tool for the demonstration and assessment of additionality”., Currently, version 5.2.1, EB 39¹⁷

¹² (<http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L>)

¹³

http://cdm.unfccc.int/filestorage/X/T/1/XT12DHPN79U4FISGMYA00JW5KZLQVR.1/eb55_repan38.pdf?t=ZkJ8bHVocTlufDAoYvtKENkArQoSXMLw-3jn

¹⁴

http://cdm.unfccc.int/filestorage/X/T/1/XT12DHPN79U4FISGMYA00JW5KZLQVR.1/eb55_repan38.pdf?t=ZkJ8bHVocTlufDAoYvtKENkArQoSXMLw-3jn

¹⁵ <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-02-v3.0.1.pdf>

¹⁶ <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v2.2.1.pdf>

¹⁷ <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v5.2.1.pdf>



Project emissions from fossil fuel combustion (only relevant for CSP technologies) shall be calculated as per the latest version of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”¹⁸.

The Programme of Activities follows the latest version of the “Procedures for Registration of a Programme of Activities as a Single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme of Activities”, Version 4.1, EB 55, Annex 38¹⁹.

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

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

¹⁸ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>

¹⁹

http://cdm.unfccc.int/filestorage/X/T/1/XT12DHPN79U4FISGMYA00JW5KZLQVR.1/eb55_repan38.pdf?t=ZkJ8bHVocTlufDAoYvtKENkArQoSXMLw-3jn



Applicability Criteria	Project eligibility
<p>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</p>	<p>All CPAs under the PoA are new solar power plants supplying electricity to the national / regional grid.</p>
<p>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</p>	<p>All CPAs install new solar power plants.</p>
<p>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”.</p>	<p>Power generated by the solar power plant would have otherwise been delivered by the existing and new energy mix of the DEWA grid.</p>
<p>Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity are not applicable, since in this case the baseline may be the continued use of fossil fuels at the site;</p>	<p>CPAs are Greenfield projects and therefore this criterion is not applicable.</p>
<p>In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Error! Reference source not found. on page Error! Bookmark not defined. 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</p>	<p>CPAs are Greenfield projects and therefore this criterion is not applicable.</p>



Applicability Criteria	Project eligibility
historical reference period and the implementation of the project activity;	
<p>In case of hydro power plants, one of the following conditions must apply:</p> <ul style="list-style-type: none">○ The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or○ The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m²; or○ The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m².	CPAs are solar power plants and therefore this criterion is not applicable.



Applicability Criteria	Project eligibility
<p>The methodology is not applicable to the following:</p> <ul style="list-style-type: none"> • 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 plants²⁰ that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m². 	<p>CPAs are solar power plants and therefore this criterion is not applicable.</p>
<p>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”.</p>	<p>CPAs are Greenfield plants and therefore this criterion is not applicable.</p>

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

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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 the DEWA power grid.

Table 3 illustrates the emission sources and gases included in the project boundary for the purpose of calculating project emissions and baseline emissions.

²⁰ Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.



Table 3: Emission Sources and Gases Included in the Project Boundary

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 ₂ O	No	Minor emission source
Project activity	For geothermal power plants, fugitive emissions of CH ₄ and CO ₂ from non-condensable gases contained in geothermal steam	CO ₂	No	No geothermal plant
		CH ₄	No	No geothermal plant
		N ₂ O	No	No geothermal plant
	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 (only for CSP plants)
		CH ₄	No	No geothermal plant
		N ₂ O	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 ₂ O	No	No hydro power plant

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

>>

As per the approved methodology ACM0002, "the baseline scenario for all activities that involve the installation of a new grid-connected renewable power plant/unit is 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'".

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

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

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As per Decision 17/cp.7, paragraph 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Since additionality is being demonstrated at CPA level, assessment and demonstration of additionality for a typical CPA will be described in the CPA DD.

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

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Since additionality is being demonstrated at CPA level, data for assessing additionality of a CPA will be described in the CPA DD. Key criteria for the assessment of additionality will be identified as per the “Tool for the demonstration and assessment of additionality”. The CME is requested to apply the latest version of the Tool agreed by the Executive Board and available on the UNFCCC website in order to prove additionality of the CPA.

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

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

>>

According to the approved methodology ACM0002, Version 12.1.0, 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”. The DEWA grid emission factor is fixed for all CPAs included in the first 7 years of the PoA crediting period and for the respective first 7 years crediting period of these CPAs.

The grid emission factor will be calculated ex-ante for each CPA during the inclusion year and the same will be used throughout the crediting period and will be revised at the point of renewal of the crediting period of the PoA.

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

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

Where:

- BE_y = Baseline emissions in year y (tCO₂/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 CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO₂/MWh)

The emission factor (tCO₂/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’ (Version 02.2.1).²¹

²¹ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>



The 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.

According to the Tool, there are 6 main steps in the process of calculating the grid emission factor:

STEP 1. Identify the relevant electricity systems

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

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

The connected power grids are:

- 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

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)

For the proposed project activity, the simple OM method has been chosen because the low-cost/must-run resources constitute less than 50% of the total generation of DEWA grid in the average of the 5 most recent years (as seen in Table 1 below).

All the power plants on the DEWA grid are fossil fuel-based, generating energy from natural gas and fuel oils. None of the power plants is considered as a low-cost/must-run resource. Since there are no renewable energy sources supplying the DEWA grid either, there are therefore no low-cost/must-run resources on the DEWA grid.

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

For the simple 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 PoA validation stage, thus no monitoring and recalculation of the emissions factor for future CPAs 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 PoA DD to the DOE for validation, has been used.

Table 4 - Overview of the Low-Cost/Must-Run Electricity Generation Sources in the DEWA Grid for the 5 Most Recent Years (2006-2010)

Year	Total Grid Generation	Fossil Fuel - Based Generation		Non-Fossil Fuel-Based Generation (low-cost/must-run)	
	MWh	MWh	share	MWh	share
	A	B	C = B/A	D	E = D/A
2006	19,939,047	19,939,047	100%	0	0%
2007	21,002,559	21,002,559	100%	0	0%
2008	28,613,194	28,613,194	100%	0	0%
2009	30,499,181	30,499,181	100%	0	0%
2010	33,207,614	33,207,614	100%	0	0%
Total	133,261,595	133,261,595	100%	0	0%

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

The simple OM may be calculated:

Option A: Based on the electricity generation and a CO₂ 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.

For the DEWA grid emission factor calculation, Option A has been chosen for the calculation of the simple OM.

Under this option, the simple OM emission factor is calculated based on the net electricity of each power unit and an emission factor for each power unit, as follows:

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

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

Where:

- $EF_{grid,OMsimple,y}$ Simple operating margin CO₂ emission factor in year y (tCO₂/MWh)
- $EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit *m* in year y (MWh)
- $EF_{EL,m,y}$ CO₂ emission factor of power unit *m* in year y (tCO₂/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 $EF_{EL,m,y}$:

For the DEWA grid emission factor calculation, 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 have been provided by DEWA.

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

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} * NCV_{i,y} * EF_{CO_2,i,y}}{EG_{m,y}}$$

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)
$EF_{CO_2,i,y}$	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*

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

As per the **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 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);*

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

For the DEWA grid emission factor: $AEG_{\geq 20\%} = 8,385,027$ MWh²²

- (c) *From $SET_{5-units}$ and $SET_{\geq 20\%}$, select the set of power units that comprises the larger annual electricity generation (SET_{sample}). Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).*

For the DEWA grid emission factor:

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

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

$$SET_{sample} \approx AEG_{\geq 20\%} = 8,385,027 \text{ MWh}$$

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.

²² Note: $AEG_{\geq 20\%}$ comprises more than 20% of AEG_{total} because there are two steam gas turbine units in one of the power plants running dependently on the gas turbine units of the power plant. Therefore, all these units have to be reckoned together, and this power plant must be considered as a whole.



The build margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

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

Equation (13) 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 <i>y</i> (tCO ₂ /MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit <i>m</i> in year (MWh)
$EF_{EL,m,y}$	CO ₂ emission factor of power unit <i>m</i> in year <i>y</i> (tCO ₂ /MWh)
<i>m</i>	Power units included in the build margin
<i>y</i>	Most recent historical year for which power generation data is available

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.

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 (14) 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 <i>y</i> (tCO ₂ /MWh)
$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year <i>y</i> (tCO ₂ /MWh)
$EF_{grid,OM,y}$	Operating margin CO ₂ emission factor in year <i>y</i> (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 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, project emissions are to be considered $PE_y = 0$.

However, for geothermal, solar thermal and hydro power plants with reservoir, project activities may involve project emissions that can be significant.

Thus, for CPAs that apply photovoltaic technologies, project emissions (PE_y) are estimated to be zero.

CPAs that implement CSP technologies are solar thermal projects, which can also use fossil fuels for electricity generation. CO₂ emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PEFF_{y,y}$). $PEFF_{y,y}$ shall be calculated as per the latest version of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”²³.

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, transport). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (1)$$

Where:

- ER_y = Emission reductions in year y (t CO₂e/yr)
- BE_y = Baseline emissions in year y (t CO₂/yr)
- PE_y = Project emissions in year y (t CO₂e/yr)

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

>>

Baseline Emissions:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (2)$$

Where:

- BE_y = Baseline emissions in year y (tCO₂/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 CO₂ emission factor for grid connected power generation in year y

²³ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>



calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (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:

$$EG_{PJ,y} = EG_{\text{facility},y} \quad (3)$$

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)

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

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (4)$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂/yr)

PE_y = Project emissions in year y (t CO₂e/yr)

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

Data / Parameter:	$FC_{i,m,y}, FC_{i,y}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by power plant/unit m (or in the project electricity system in case of $FC_{i,y}$) in year y
Source of data used:	Provided by DEWA
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	DEWA is the operator of the power plants.
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	Provided by DEWA
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	DEWA is the operator of the power plants and has the fuel parameters data from its fuel supplier(s).



Any comment:	-
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Data / Parameter:	$EF_{CO_2,i,y}, EF_{CO_2,m,i,y}$
Data unit:	tCO ₂ /GJ
Description:	CO ₂ emission factor of fossil fuel type <i>i</i> used in power unit <i>m</i> in year <i>y</i>
Source of data used:	For natural gas and distillate fuel oil: as per composition and carbon content analysis, provided by DEWA. For medium fuel oil: IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Volume 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories ²⁴
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	DEWA is the operator of the power plants and has the fuel parameters data from its fuel supplier(s).
Any comment:	-

Data / Parameter:	$EG_{m,y}, EG_y$
Data unit:	tCO ₂ /GJ
Description:	Net electricity generated by power plant/unit <i>m</i> in year <i>y</i>
Source of data used:	Provided by DEWA.
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	DEWA is the operator of the power plants.
Any comment:	-

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

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

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh/y
Description:	Quantity of the net electricity supplied by the project activity to the grid in the year <i>y</i>
Source of data to be used:	Calculated from the on-site measurements in the substation by electricity meter(s). Calculated as the difference between the total (gross) electricity generation of the project activity in the year <i>y</i> ($EG_{gross,y}$) and the electricity consumption of the project activity in the year <i>y</i> (electricity consumption by the auxiliary equipment at the solar power plant: EC_y)
Value of data	
Description of measurement methods and procedures to be	In accordance with the approved methodology, the monitoring will be continuous, with at least hourly measurement and monthly recording. The data will be archived electronically and as paper prints for 2 years

²⁴ <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>



applied:	following the end of the last crediting period.
QA/QC procedures to be applied:	The metering equipment will be properly calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and according to the relevant national calibration standard. Net electricity supplied to the grid will be cross-checked by measurements of the grid operator at the point of feeding to the grid.
Any comment:	-

Data / Parameter:	$EG_{gross,y}$
Data unit:	MWh/y
Description:	Quantity of the total gross electricity generated and supplied by the project activity solar power plant to the grid in the year y
Source of data to be used:	On-site measurements in the sub-station by electricity meter(s)
Value of data	
Description of measurement methods and procedures to be applied:	In accordance with the approved methodology, the monitoring will be continuous, with at least hourly measurement and monthly recording. The data will be archived electronically and as paper prints for 2 years following the end of the last crediting period.
QA/QC procedures to be applied:	The metering equipment will be properly calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and according to the relevant national calibration standard.
Any comment:	-

Data / Parameter:	EC_y
Data unit:	MWh/y
Description:	Quantity of the electricity consumption by the project activity solar power plant in the year y
Source of data to be used:	On-site measurements by electricity meter(s)
Value of data	
Description of measurement methods and procedures to be applied:	In accordance with the approved methodology, the monitoring will be continuous, with at least hourly measurement and monthly recording. The data will be archived electronically and as paper prints for 2 years following the end of the last crediting period.
QA/QC procedures to be applied:	The metering equipment will be properly calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and according to the relevant national calibration standard. Electricity consumed by the project activity will be imported from the grid and therefore it will be cross-checked by the grid operator's measurements as per the invoices.
Any 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 to be	On-site measurements



used:	
Value of data	
Description of measurement methods and procedures to be applied:	<p>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);</p> <ul style="list-style-type: none"> • 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.
QA/QC procedures to be applied:	<p>The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes.</p> <p>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.</p>
Any comment:	Only relevant for CPA plants that can also use fossil fuels for electricity generation.

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 to be used:	<p>The following data sources may be used if the relevant conditions apply: Data Source:</p> <ol style="list-style-type: none"> a) Values provided by the fuel supplier in invoices (preferred source) b) Measurement by the project participant (if a) is not available)
Value of data	
Description of measurement methods and procedures to be applied:	<p>Measurements should be undertaken in line with national or international fuel standards</p> <p>The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated</p>
QA/QC procedures to be applied:	<p>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.</p>
Any comment:	Only relevant for CPA plants that can also use fossil fuels for electricity generation and where the CO ₂ emission coefficient COEF _{i,y} is calculated based on the chemical composition of the fossil fuel type.

Data / Parameter:	$P_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type i in year y



Source of data to be used:	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 of data	
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel standards The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures to be applied:	
Any comment:	Only relevant for CPA plants that can also use fossil fuels for electricity generation and where $FC_{i,j,y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (e.g. GJ/m ³ , GJ/ton)
Description:	Weighted average net calorific value of fuel type i in year y
Source of data to be used:	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 of data	
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards 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 to be applied:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Only relevant for CPA plants that can also use fossil fuels for electricity generation and where the CO ₂ emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO ₂ emission factor of the fuel type.

Data / Parameter:	$EF_{CO_2,i,y}$
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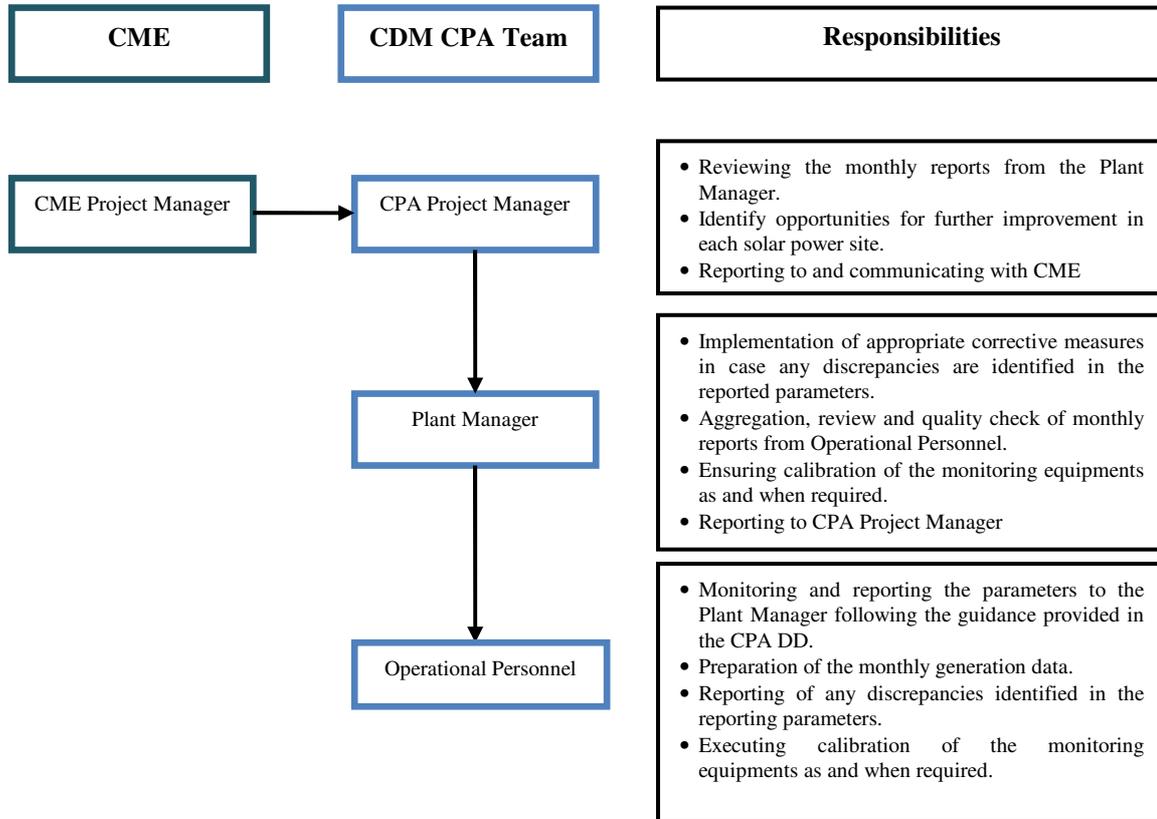


Data unit:	tCO ₂ /GJ
Description:	Weighted average CO ₂ emission factor of fuel type i in year y
Source of data to be used:	The following data sources may be used if the relevant conditions apply: a) Values provided by the fuel supplier in invoices (preferred source) b) Measurements by the project participants (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 of data	
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards 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 to be applied:	
Any comment:	Only relevant for CPA plants that can also use fossil fuels for electricity generation and where the CO ₂ emission coefficient COEF _{i,y} is calculated 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.

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

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The authority and responsibility of project management at CPA level, as well as monitoring, measurement, and reporting will rest with the CPA implementer (DEWA or an independent power producer). At the CPA level, a Project Team will be formed to ensure proper and continuous monitoring of the performance and generation of power. The operation and management structure that will be implemented by the CPA owners for the purpose of monitoring the CPA is illustrated below:



Monitoring Plan Objective and Organization

The purpose of the monitoring plan is to measure the net electricity delivered to the DEWA electricity grid by the CPA. Within the CDM team, Operational Personnel will be designated for each solar power site, which will be responsible for compiling, monitoring and reporting of data of their allotted solar power site.

The data collected from the solar power site will be aggregated by the Plant Manager. The data and documents received from Operational Personnel will be compiled in a format called the CDM format report. Quality checks will also be undertaken at this level to ensure all discrepancies are addressed. The net electricity attributable to the CPA will be calculated by subtracting the total electricity imported from the total electricity exported to the grid. The onus of reviewing, storing and archiving of all CDM-related information relevant to the CPA in a suitable manner will rest with the Plant Manager. A review will be conducted to ensure compliance to the requirements of the monitoring plan and other CDM modalities and procedures, including calibration frequency. Corrective measures will be applied in case any discrepancy is observed. The Plant Manager will further submit a consolidated report to the CPA Project Manager, who will finally review and sign the monthly performance of each CPA.

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.



Monitoring and Archiving of Data

The net electricity delivered to the DEWA grid by the project shall be monitored. The monitoring data is derived from periodic electricity meter records kept by the project owners and/or DEWA.

The CDM team within the implementer of the solar power plant will be responsible for collecting the monitoring data and will provide the coordinating entity with meter readings for electricity delivered and, if available, calibration certificates.

Details of the CPA monitoring plan will be described for each CPA. The data will be archived electronically and will be stored for 2 years after the end of the crediting period of each CPA by the coordinating entity.

Quality Assurance and Quality Control

The installation location of the meters will be detailed in each CPA. The project entity will implement QA&QC measures to calibrate and guarantee the accuracy of metering and safety of the project operation. The metering devices will be calibrated and inspected properly and periodically as per standard industry norms and requirements of DEWA. The grid operator (DEWA) and the project owners are responsible for operation and maintenance of their respective electricity meters.

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 a Note Book.
- 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, within one week 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.

E.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)
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Date of completion: 14/11/2011

Name of the entity: Dubai Electricity and Water Authority with its consultants.



Annex 1

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

Organization:	Dubai Electricity & Water Authority (DEWA)
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PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) - Version 01



CDM – Executive Board

page 38

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Represented by:	Ivano Iannelli
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

As discussed under Section A.4.5, there is no recourse to any public funding for the proposed PoA



Annex 3

BASELINE INFORMATION

The baseline information has already been provided under Section E.6. Further, the baseline data will be provided in each CPA at the time of its submission.



Annex 4

MONITORING INFORMATION

Detailed monitoring information with respect to metering equipment used, calibration method, etc. will be provided under each CPA.
