



**Project design document form for
small-scale CDM project activities**

(Version 07.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for small-scale CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	DEWA Chiller Station L
Version number of the PDD	4
Completion date of the PDD	02/02/2016
Project participant(s)	Dubai Carbon Centre of Excellence Dubai Electricity and Water Authority (DEWA)
Host Party	United Arab Emirates
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	AMS-II.B. ver. 9 - Supply side energy efficiency improvements – generation
Sectoral scope(s) linked to the applied methodology(es)	1 : Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	26,800 metric tonnes CO2 equivalent

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The purpose of the project activity is to improve the efficiency of the three gas turbines (GTs) L 71 – L 73 installed at Station L Phase 1 of Dubai Electricity and Water Authority (DEWA) (DEWA being the project proponent) by implementing an inlet air chilling system called Thermal Energy Storage and Turbine Inlet Air Cooling (TESTIAC). It is estimated that this measure will result in an increase of average historic (2008-2010) efficiencies of the gas turbines by approximately 2%.

The project activity will cool the inlet air of 3 gas turbines, each a model GE PG9351 (FA+e) installed at Station L Phase 1, down to approximately 25 degrees Celsius. The TESTIAC system will cool in continuous mode for 8 hours per day, 7 days per week; the thermal energy storage system will re-charge during the 16 hours/day when it is not cooling. The TESTIAC system will be operated during 7 months of the year, between April – October, when ambient temperatures in Dubai are at their highest.

The effect of cooling the ambient air is to increase the efficiency of the gas turbine by increasing the density of inlet air, thereby increasing the air mass flow rate into the (constant volumetric flow) gas turbine.

The project activity reduces greenhouse gas emissions because less fossil fuel input is required to generate the same output of electricity during operation of the TESTIAC system. The expected emission reductions will be approximately 26,800 tCO₂e per year

In the view of the project participants, the project activity contributes to sustainable development by:

- Generating electrical energy with less fossil fuel consumption, thereby reducing greenhouse gas emissions.
- Transferring new technology to the host country, as this will be the first project activity installing a Thermal Energy Storage and Turbine Inlet Air Cooling system in a power plant located in the host country.

A.2. Location of project activity

A.2.1. Host Party

United Arab Emirates

A.2.2. Region/State/Province etc.

Emirate of Dubai

A.2.3. City/Town/Community etc.

Jebel Ali area in Jumeirah, south west of Dubai

A.2.4. Physical/Geographical location

Longitude 55.11129545
 Latitude 25.05208411

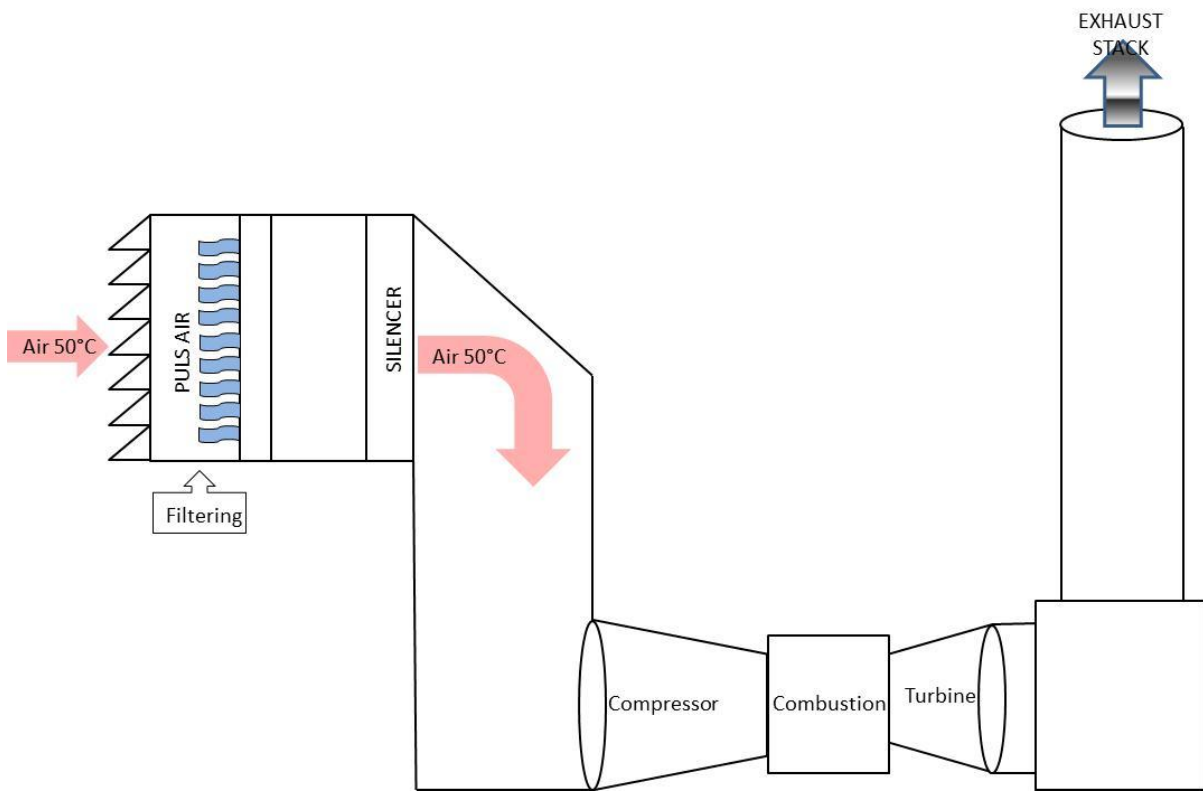


A.3. Technologies and/or measures

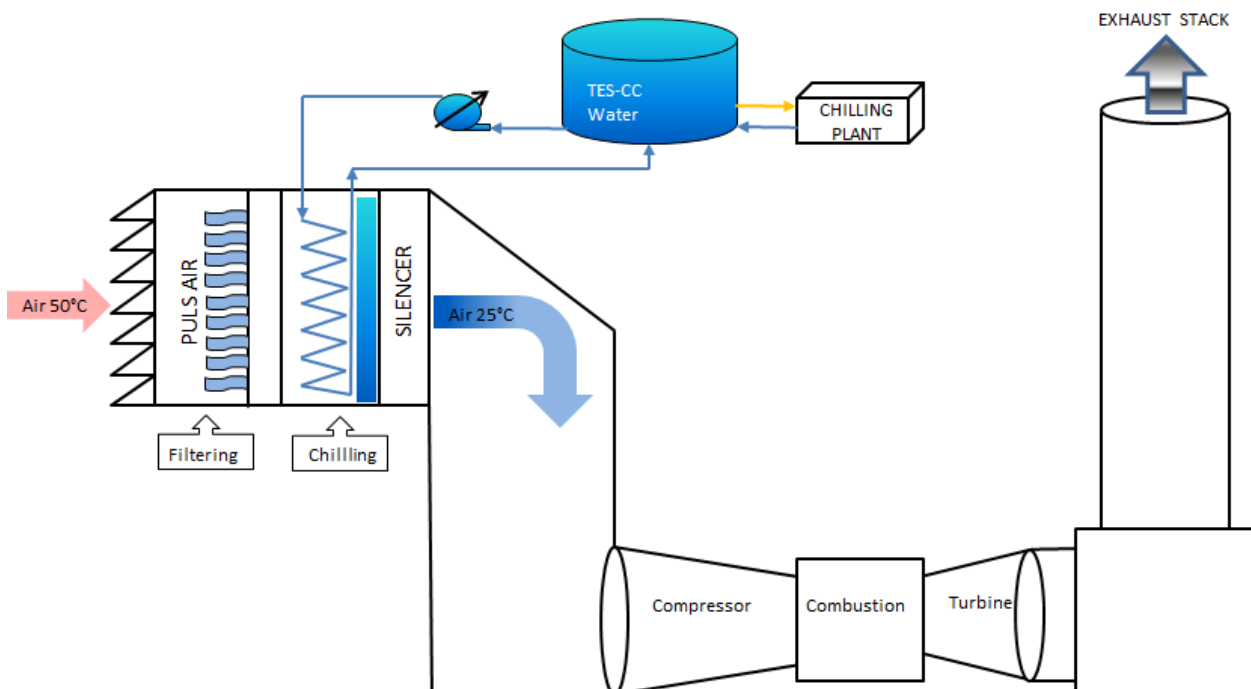
By implementing the state-of-the-art TESTIAC system for the first time in the host country, environmentally safe and sound technology and know-how are being applied in this CDM project activity in the host country.

The project proponent has even been contacted by renowned gas turbine manufacturers, expressing their interest in learning about the experiences from the project proponent with the new technology.

The following sketches illustrate first (1) the current GT system at Station L without and second (2) with chilling:



Without the chilling system, the ambient air passes through the filter section to the gas turbine and then to the exhaust stack. In this case, the temperature of the ambient air is equal to the temperature of the inlet air.



With chilling, the ambient air will be cooled after the filter section by cooling coils. The purpose of the air cooling coils is to produce indirect cooling of the air going to the turbine compressor, by means of cold water. These coils will use cooling water coming from the Thermal Storage Tank. The water is cooled in an ammonia-based refrigeration plant.

It is estimated that this measure will result in an increase of average historic (2008-2010) efficiencies of the gas turbines by approximately 2%.

Summarized description of the equipment and facilities of the project's system:

System guarantee:

Ambient air temperature:	50.0° C
Relative humidity:	25.0%
Cooled air temperature:	25.0° C
Number of cooling hours per day:	8 hours
Number of cooling days per week:	7 days

Thermal Storage:

Type of storage:	Water / Stratified
Temperature difference:	14.0° C / 36.5° C
Method of stratification:	Natural/Concentric Diff.
Tank usable volume:	24,871 m ³

Refrigeration plant:

Total refrigeration capacity:	42,000 kW
Water inlet temperature:	36.5° C
Water outlet temperature:	14.0° C
2 x Compressors screw type (HP):	+19.7° C / +51° C
Refrigeration capacity per compressor:	11,950 kW
2 x Compressor screw type (LP):	+10.5° C / +51° C
Refrigeration capacity per compressor:	9,126 kW

Pumping groups:

Chilled water consumption pumping group (5+1):

Low speed condition (normal operation):

Total flow rate:	3,257 m ³ /h
Number of running pumps:	5
Pumps speed:	1,220 rpm
Flow rate per pump:	651 m³/h

Normal speed condition (emergency operation):

Total flow rate:	5,428 m ³ /h
Number of running pumps:	5
Pumps speed:	1,790 rpm
Flow rate per pump:	1,086 m³/h

Chilled water production pumping group (2+1):

Total flow rate:	1,775 m ³ /h
Number of running pumps:	2
Pump speed:	1,490 rpm
Flow rate per pump:	888 m³/h

A.4. Parties and project participants

Party involved (host) indicates 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)
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Party A (host)	Dubai Carbon Centre of Excellence Dubai Electricity and Water Authority (DEWA)	No
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A.5. Public funding of project activity

There is no public funding from Annex I Parties for the proposed project activity.

A.6. Debundling for project activity

In reference to Appendix C to the simplified modalities and procedures for the SSC CDM project activities¹ the project proponent confirms that they have not registered any small scale CDM activity or applied to register another small scale CDM project activity within 1km of the project boundary, in the same project category and technology/measure in the previous two years. The project activity is not a debundled component of another larger project activity.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

Version 09 of AMS-II.B Supply side energy efficiency improvements – generation

Furthermore, the following methodological tool has been applied:

“Tool to determine the remaining lifetime of equipment” (Version 01)²

B.2. Project activity eligibility

Applicability conditions in Version 09 of AMS.II.B	Characteristics of the project activity	Applicability criterion met?
<i>This category comprises technologies or measures to improve efficiency of fossil fuel generating units that supply an electricity or thermal system by reducing energy or fuel consumption by up to the equivalent of 60 GWhe per year. Examples include efficiency improvements at power stations and district heating plants and co-generation. The technologies or measures may be applied to existing stations or be part of a new facility. A total saving of 60 GWhe is equivalent to maximal saving of 180 GW_{hth} in the fuel input to the generation unit.</i>	The proposed project activity involves the implementation of a Thermal Energy Storage and Turbine Inlet Air Cooling system to improve the efficiency of three gas turbines (GTs) installed at Station L Phase 1 of Dubai Electricity and Water Authority (DEWA). The proposed project activity will result in reductions of fuel consumption of approximately 136 GW _{hth} . This estimation is based on an average historic plant load factor of the three	Yes

¹ http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

² <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf>

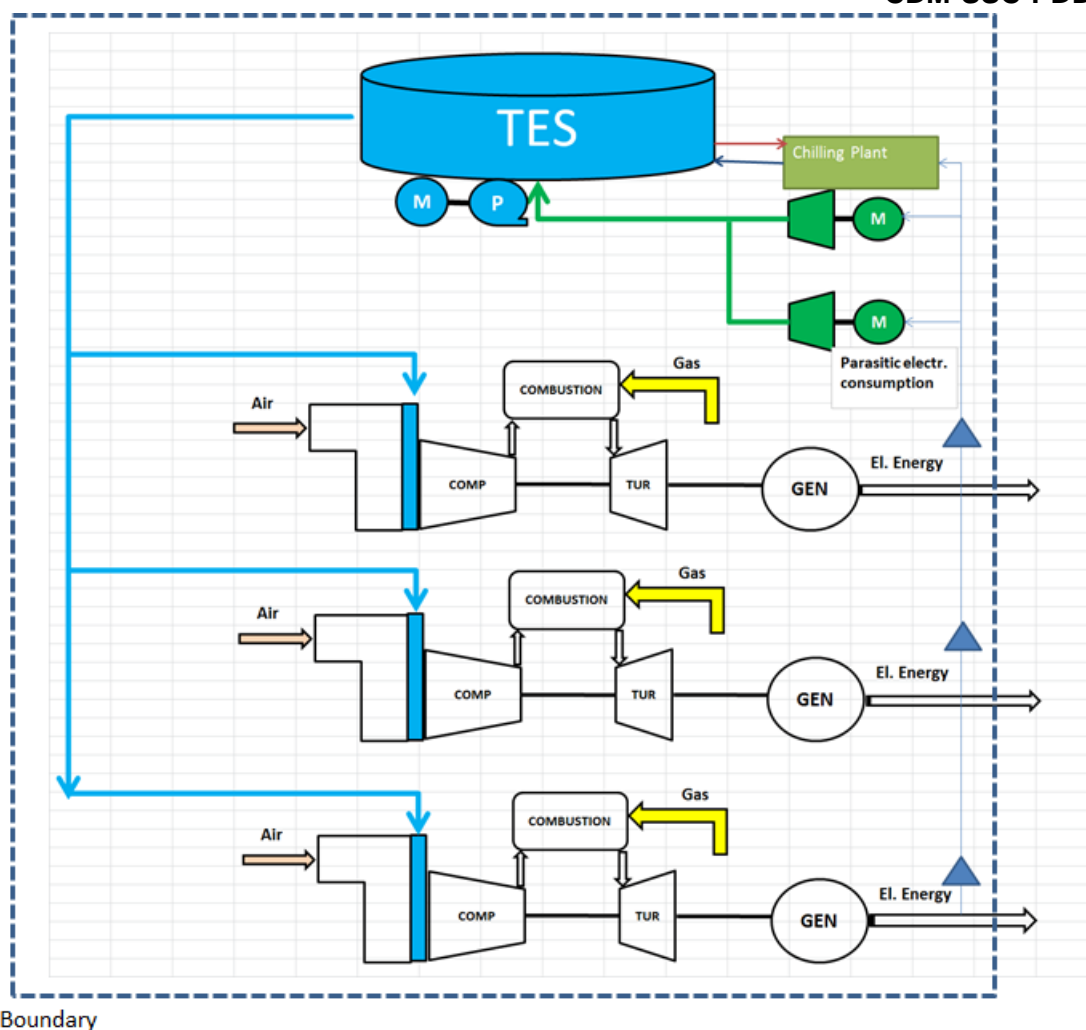
	<p>turbines of approximately 54% and a design capacity of 255.6 MW. The typical range of plant load factors of comparable gas turbines observed in the host country is between approximately 53-57%. However, the threshold of 180 GWh_{th} would only be met if the the project gas turbines would operate with a plant load factor of approximately 65% (see B. 6.1 and B. 6.3 and attached spread sheet for Emission Reduction calculations for further details)</p>	
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B.3. Project boundary

According to Version 09 of AMS.II.B³, the project boundary *is the physical, geographical site of the fuel fired power station unit affected by the efficiency measures.*

Therefore, the project boundary is the Station L Phase 1 plant including 3 gas turbines L71-L73 manufactured by GE Power Systems, model PG9351 (FA+e) with serial numbers GEK 110689 (298398 to 298400), located at Jebel Ali, Dubai, United Arab Emirates.

³ <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved>



B.4. Establishment and description of baseline scenario

According to Version 09 of AMS.II.B, the baseline is the technical losses of energy within the project boundary. In the case of retrofit measures the energy baseline is calculated as the monitored performance of the existing generating unit.

Since the proposed project activity is a retrofit measure, the baseline emissions are to be calculated as the monitored performance of the 3 existing gas turbines L71-L73 in Station L: model PG9351 (FA+e), serial numbers GEK 110689 (298398 to 298400).

In order to calculate (project and) baseline emissions, the following parameters are required:

- Total quantity of electricity generated in each of the three GTs L71-L73 in year y (MWh)
- Quantity of natural gas (NG) combusted in each of the three GTs L71-L73 in year y (Nm³)
- Net calorific value of NG in year y (GJ/Nm³)
- Quantity of distillate fuel oil (DFO) combusted for auxiliary purposes in each of the three GTs in year y (imperial gallon = IG)
- Net calorific value of DFO in year y (GJ/IG)
- Electricity consumption of the TESTIAC system in year y (MWh).
- Total electricity generation in each of the three GTs L71-L73 in any of the three historic years 2008-2010 h (MWh)

- Quantity of NG combusted in each of the three GTs L71-L73 in any of the three historic years 2008-2010 h (Nm³)
- Net calorific value of NG in any of the three historic years 2008-2010 h (GJ/Nm³)
- Quantity of DFO combusted in each of the three GTs L71-L73 in any of the three historic years 2008-2010 h (IG)
- Net calorific value of DFO in any of the three historic years 2008-2010 h (GJ/IG)
- CO₂ emission factor of natural gas (tCO₂/GJ)

For the explanation and justification of key assumptions and rationale, as well as for illustration of data used to determine the baseline emissions (variables, parameters, data sources etc.), please see Sections B 6.1-6.3.

B.5. Demonstration of additionality

Since the starting date of the project activity was before the date of validation, evidence is provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

29/04/2010	Letter of Acceptance of order for project activity equipment (start date of the proposed project activity)
27/05/2010	Receipt of prior consideration form at UNFCCC
29/08/2010	Civil Works Starting Date
03/10/2010	Receipt of prior consideration form at DNA of the host country

As such notifications were made within six months of the project activity start date, it can be concluded that CDM benefits were considered necessary in the decision to undertake the project as a CDM project activity.

Further implementation of the project activity:

12/11/2011	Upload of PDD for Validation
29/11/2011	Take over of TESTIAC system from manufacturer by the project proponent

According to *Guidelines on the Demonstration of Additionality of Small Scale Project Activities*⁴, project participants have the following options to demonstrate additionality:

- (a) *Investment barrier*
- (b) *Technological barrier*
- (c) *Barrier due to prevailing practice*
- (d) *Other barriers*

According to *EB 35, Annex 34: Non-binding best practice examples to demonstrate additionality for SSC project activities*⁵, best practice examples for demonstration of additionality of small scale activities inter alia are:

(d) **Barrier due to prevailing practice:** ...; Best practice examples include but are not limited to, the demonstration that the project is among the first of its kind in terms of technology, geography, sector, type of investment and investor, market etc.

The TESTIAC system as applied in the proposed project activity is among the first of its kind in terms of technology/measure not only in the host country but worldwide (as confirmed by

⁴ http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

⁵ http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid15_v01.pdf

statements from various renowned turbine manufacturers). The use of the TESTIAC system is therefore below the 10% usage threshold in the host country as set out in EB 50 Annex 13 *Guidelines for Objective Demonstration and Assessment of Barriers*⁶. These facts demonstrate that the technology faces a barrier due to prevailing practice in the host country and can therefore be classified as additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

$$ER_y = BE_y - PE_y - LE_y \quad 1$$

where

ER_y	Emission reductions in year y [tCO ₂]
BE_y	Baseline emissions in year y [tCO ₂]
PE_y	Project emissions in year y [tCO ₂]
LE_y	Leakage emissions in year y [tCO ₂]

Baseline Emissions, BE_y

Baseline emissions are calculated by (i) first summing up the electricity generated in year y by each of the three gas turbines (GTs) L71-L73 $EG_{PJ,m,y}$ while subtracting **the parasitic load of the TESTIAC system**⁷ used for chilling each turbine $\frac{EC_{PJ,TESTIAC,y}}{m=3}$. The result is then (ii) second multiplied by the baseline emission factor ($EF_{BL,m,CO2}$).

$$BE_y = \sum_m (EG_{PJ,m,y} - \frac{EC_{PJ,TESTIAC,y}}{m=3}) \times EF_{BL,m,CO2} \quad 2$$

Where:

$EG_{PJ,m,y}$	Quantity of electricity generated in each of the three GTs m L71-L73 in year y (MWh)
$EF_{BL,m,CO2}$	Baseline Emission Factor for each of the three GTs m L71-L73 (tCO ₂ /MWh)
$EC_{PJ,TESTIAC,y}$	Quantity of electricity consumed by the TESTIAC system in year y MWh
m	Gas turbines GTs L71-L73

$$EF_{BL,m,CO2} = \frac{\sum_i \sum_h \frac{FC_{m,i,h} \times NCV_{i,h}}{EG_{m,h}} \times EF_{NG,CO2,y}}{h=3} \quad 3$$

Where:

$FC_{m,i,h}$	Quantity of fuels i (NG and DFO) combusted in each of the three GTs m L71-L73 in any of the three historic years 2008-2010 h (Nm ³ and IG)
$NCV_{i,h}$	Net calorific value of fuels i (NG and DFO) in any of the three historic years 2008-2010 h (GJ/Nm ³ and GJ/IG)
$EF_{NG,CO2,y}$	CO ₂ emission factor of natural gas (tCO ₂ /GJ)

⁶ http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid38.pdf

⁷ Since the parameter $EG_{PJ,m,y}$ refers to total (or “gross”) electricity generated by the turbines it also still includes the amount or electricity which is supplied to the TESTIAC system. That means that project and baseline emissions as monitored in the proposed project activity would both “automatically” include emissions associated to the TESTIAC system. Therefore instead of adding TESTIAC related emissions again to project emissions (which would basically mean that they are counted twice), they have to be subtracted from baseline emissions (in the baseline there would be no TESTIAC system and hence no related emissions)

$EG_{m,h}$	Electricity generation in each of the three GTs m L71-L73 in any of the three historic years 2008-2010 (MWh)
h	Three most recent historic years before implementation of the TESTIAC system 2008-2010

Explanation of parameters and key assumptions:

$EG_{PJ,m,y}$:

- For ex post baseline emissions determination, this parameter is monitored.
- For ex ante determination, the average of the three most recent historic years 2008-2010 before implementation of the TESTIAC system is applied

$EC_{PJ,TESTIAC,y}$

- For ex post baseline emissions determination, this parameter is monitored.
- For ex ante determination this parameter is based on the assumptions that the proposed project activity will operate during 214 days (7 months) of the year for 24 hours (of which 8 hours are cooling and 16 hours are for recharging) with a parasitic load of 5.3MW. The estimate based on manufacturer's specifications results in 27,221 MWh per year.

$EF_{NG,CO_2,y}$:

- The IPCC default value for natural gas 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, has been selected: 0.0543 tCO₂/GJ

EF_{BL,m,CO_2} :

- This parameter is based on the average of (the reciprocal value of) efficiencies (which is expressing the *technical losses of energy in the baseline* as requested by methodology AMSII.B-Ver.9) of the three gas turbines L71-L73 of the three most recent historic years 2008-2010 before implementation of the TESTIAC system (explained by the expression $\frac{\sum_i \sum_h \frac{FC_{m,i,h} \times NCV_{i,h}}{EG_{m,h}}}{h=3}$) multiplied with the CO₂ emission factor of natural gas $EF_{NG,CO_2,y}$ which is the lower emission factor of the two fuels, natural gas and distillate fuel oil, used in the gas turbines and is therefore conservative.⁸

$FC_{m,i,h}$

- Historic measurements by the project proponent as described in more detail under 6.2

$NCV_{i,h}$

- Information provided by the fuel supplier as described in more detail under 6.2

$EG_{m,h}$

- Historic measurements by the project proponent as described in more detail under 6.2

Project Emissions, PE_y

Project emissions are calculated by summing up the electricity generated in each of the three gas turbines (GTs) L71-L73 $EG_{PJ,m,y}$ multiplied by a **project emission factor** (EF_{PJ,m,CO_2}) as follows:

$$PE_y = \sum_m EG_{PJ,m,y} \times EF_{PJ,m,CO_2} \quad 4$$

$$EF_{PJ,m,CO_2} = \left(\sum_i \frac{FC_{m,i,y} \times NCV_{i,y}}{EG_{PJ,m,y}} \right) \times EF_{NG,CO_2,y} \quad 5$$

PE_y	Project Emissions in year y (tCO ₂)
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⁸ This is also in line with response from the Executive Board to request for clarification AM_CLA_0173

$EG_{PJ,m,y}$	Quantity of electricity generated in each the three GTs m L71-L73 in year y (MWh)
EF_{PJ,m,CO_2}	Project Emission Factor for each of the three GTs m L71-L73 (tCO ₂ /MWh)
$FC_{m,i,y}$	Quantity of fuels i (natural gas and distillate fuel oil [DFO]) combusted in each of the three GTs L71-L73 in year y (Nm ³ and imperial gallon = IG)
$NCV_{i,y}$	Net calorific value of fuels i (natural gas and distillate fuel oil [DFO]) in year y (GJ/Nm ³ and GJ/IG)
$EF_{NG,CO_2,y}$	CO ₂ emission factor of natural gas (tCO ₂ /GJ)
m	Gas Turbine GTs L71-L73

Explanation of parameters and key assumptions:

$EG_{PJ,m,y}$:

- For ex post project emissions determination, this parameter is monitored.
- For ex ante determination, the average of the three most recent historic years 2008-2010 before implementation of the TESTIAC system is applied

EF_{PJ,m,CO_2} :

- For ex post project emissions this parameter is monitored based on the monitored efficiency (which is expressing the *technical losses of energy in the project scenario*) of the three gas turbines L71-L73 (explained by the expression) $(\sum_i \frac{FC_{m,i,y} \times NCV_{i,y}}{EG_{PJ,m,y}})$ multiplied by the CO₂ emission coefficient of natural gas $EF_{NG,CO_2,y}$. The same emission coefficient is used for baseline emission determination and project emission determination because emission reductions of the project activity are then limited to the extent of the incremental efficiency increase through the project activity and no emission reductions can be claimed due to differences in fossil fuel emissions and change of fuel consumption patterns.⁹ AMS-II.B does not specify any approaches for cases where more than one fossil fuel may be used. Therefore, this approach from latest version of ACM0013 has been selected. Even though ACM0013 only relates to new facilities while AMS-II.B refers to new and existing facilities both methodologies apply to technologies or measures which improve the efficiency of fossil fuel generating units.
- For ex ante project emissions this parameter is based on the manufacturer's estimation of an increase of average historic (2008-2010) efficiencies of gas turbines of 2%. (E.g. having calculated an annual average historic efficiency of 33.5% for GT L71, this would mean an estimated increase to an efficiency level of 34.2%). The expected efficiency increase is used to calculate the expected ex-ante fuel consumption of NG and DFO.

$EF_{NG,CO_2,y}$:

- The IPCC default value for natural gas 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, has been selected: 0.0543 tCO₂/GJ.

$FC_{m,i,y}$

⁹ This is being actually the response from the Executive Board to request for clarification AM_CLA_0173. Based on that response the latest version 5 of ACM0013 now defines one emission factor EF_{FF,CO_2} which is the CO₂ emission factor of the fossil fuel type **used in the project and the baseline** (tCO₂/GJ) and which is determined as follows: *IPCC default values of the fuel type used in the project plant at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. In the case that several fuel types may be used in the project plant according to the technology provider's designs, use the fuel type with the lowest IPCC default value at the lower limit of the uncertainty.* The same approach has been taken in the proposed project activity.

- For ex post project emissions this parameter is monitored by the project proponent as described in more detail under B.7.1
- For ex ante project emissions this parameter is calculated based on the expected efficiency increase as determined by the manufacturer.

 $NCV_{i,y}$

- For ex post project emissions this parameter is monitored by the project proponent as described in more detail under B.7.1
- For ex ante project emissions this parameter is based on average of historic values (see section B.6.2)

Leakage emissions, LE_y

Since the energy efficiency technology is not equipment transferred from another activity, no leakage emissions are to be considered

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EG_{m,h}$
Unit	MWh
Description	Electricity generation in each of the three GTs L71-L73 in any of the three historic years h 2008-2010
Source of data	Records of the project proponent
Value(s) applied	<p>For m = GT L71</p> <p>h = 2008: 1,144,412</p> <p>h = 2009: 1,228,708</p> <p>h = 2010: 1,172,679</p> <p>For m = GT L72</p> <p>h = 2008: 1,407,091</p> <p>h = 2009: 1,186,193</p> <p>h = 2010: 1,247,474</p> <p>For m = GT L73</p> <p>h = 2008: 1,179,853</p> <p>h = 2009: 1,256,233</p> <p>h = 2010: 1,123,850</p>
Choice of data or Measurement methods and procedures	Measurements by electricity meter(s) of the project proponent. The data was recorded daily.
Purpose of data	For baseline emission calculation
Additional comment	

Data / Parameter	$FC_{m,NG,h}$
Unit	Nm ³
Description	Quantity of fuel i = natural gas combusted in each of the three GTs L71-L73 in any of the three historic years 2008-2010 h
Source of data	Records of the project proponent

Value(s) applied	<p>For m = GT L71</p> <p>h = 2008: 360,977,142</p> <p>h = 2009: 381,155,447</p> <p>h = 2010: 375,712,369</p> <p>For m = GT L72</p> <p>h = 2008: 456,092,770</p> <p>h = 2009: 390,438,691</p> <p>h = 2010: 411,700,586</p> <p>For m = GT L73</p> <p>h = 2008: 384,346,421</p> <p>h = 2009: 413,380,953</p> <p>h = 2010: 375,597,289</p>
Choice of data or Measurement methods and procedures	On-site measurements by flow meters of the project proponent. The data was recorded daily.
Purpose of data	For baseline emission calculation
Additional comment	

Data / Parameter	$FC_{m,DFO,h}$
Unit	IG
Description	Quantity of fuel i = distillate fuel oil (DFO) combusted in each of the three GTs L71-L73 in any of the three historic years 2008-2010 h
Source of data	Records of the project proponent
Value(s) applied	<p>For m = GT L71</p> <p>h = 2008: 63,246</p> <p>h = 2009: 39,405</p> <p>h = 2010: 78,942</p> <p>For m = GT L72</p> <p>h = 2008: 313,169</p> <p>h = 2009: 52,349</p> <p>h = 2010: 18,287</p> <p>For m = GT L73</p> <p>h = 2008: 426,196</p> <p>h = 2009: 171,400</p> <p>h = 2010: 2,253</p>
Choice of data or Measurement methods and procedures	On-site measurements by flow meters of the project proponent. The data was recorded daily.
Purpose of data	$FC_{m,DFO,h}$
Additional comment	

Data / Parameter	$NCV_{NG,h}$
Unit	GJ/Nm ³
Description	Net calorific value of fuel i = natural gas in any of the three historic years 2008-2010 h
Source of data	Provided by the fuel supplier

Value(s) applied	h = 2008 0.034 h = 2009 0.034 h = 2010 0.033
Choice of data or Measurement methods and procedures	Information provided by the fuel supplier
Purpose of data	For baseline emission calculation
Additional comment	

Data / Parameter	$NCV_{DFO,h}$
Unit	GJ/IG
Description	Net calorific value of fuel i = distillate fuel oil (DFO) in any of the three historic years 2008-2010 h
Source of data	Provided by the fuel supplier
Value(s) applied	h = 2008 0.164 h = 2009 0.163 h = 2010 0.163
Choice of data or Measurement methods and procedures	Information provided by the fuel supplier
Purpose of data	For baseline emission calculation
Additional comment	

B.6.3. Ex ante calculation of emission reductions

Baseline emissions:

Applying formula 2 using values as outlined under B.6.1 gives the following ex ante baseline emissions:

$$BE_y =$$

$$\text{for } m = L71 (1,181,933MWh - 9,074MWh) \times \frac{0.583tCO_2}{MWh} +$$

$$\text{for } m = L72 (1,280,253MWh - 9,074MWh) \times \frac{0.606tCO_2}{MWh} +$$

$$\text{for } m = L73 (1,186,645MWh - 9,074MWh) \times \frac{0.611tCO_2}{MWh}$$

$$BE_y = 2,172,702 \text{ tCO}_2$$

Project emissions:

Applying formula 4 using assumptions and values as outlined under B.6.1 gives the following ex ante project emissions:

$$PE_y =$$

$$\text{for } m = L71 \left(1,181,933MWh \times \left(\frac{1}{0.342} \right) \times \frac{0.0543tCO_2}{GJ} \times \frac{3.6GJ}{MWh} \right) +$$

$$\text{for } m = L72 \left(1,280,253 \text{ MWh} \times \left(\frac{1}{0.329} \right) \times \frac{0.0543 \text{ tCO}_2}{\text{GJ}} \times \frac{3.6 \text{ GJ}}{\text{MWh}} \right) +$$

$$\text{for } m = L73 \left(1,186,645 \text{ MWh} \times \left(\frac{1}{0.327} \right) \times \frac{0.0543 \text{ tCO}_2}{\text{GJ}} \times \frac{3.6 \text{ GJ}}{\text{MWh}} \right)$$

$$PE_y = 2,145,902 \text{ tCO}_2$$

Leakage emissions:

$$LE_y = 0 \text{ tCO}_2$$

Emission reductions:

Applying formula 1 using values as outlined under B.6.1 gives the following ex ante emission reductions:

$$ER_y = 2,172,702 - 2,145,902 = 26,800 \text{ tCO}_2$$

The detailed baseline calculations according to the methodology *AMS-II.B Supply side energy efficiency improvements – generation Version 09* and section 6.1 of this PDD are provided in a separate excel sheet *PDD_DEWACHillerStL-ERCalculationV2-EXANTE*

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO ₂ e)	Project emissions (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions (t CO ₂ e)
Year 1	2,172,702	2,145,902	0	26,800
Year 2	2,172,702	2,145,902	0	26,800
Year 3	2,172,702	2,145,902	0	26,800
Year 4	2,172,702	2,145,902	0	26,800
Year 5	2,172,702	2,145,902	0	26,800
Year 6	2,172,702	2,145,902	0	26,800
Year 7	2,172,702	2,145,902	0	26,800
Year 8	2,172,702	2,145,902	0	26,800
Year 9	2,172,702	2,145,902	0	26,800
Year 10	2,172,702	2,145,902	0	26,800
Total	21,727,020	21,459,020	0	268,000
Total number of crediting years	10			
Annual average over the crediting period	2,172,702	2,145,902	0	26,800

B.7. Monitoring plan**B.7.1. Data and parameters to be monitored**

Data / Parameter	$EG_{PJ,m,y}$
Unit	MWh
Description	Quantity of electricity generated in each of the three GTs L71-L73 in year y
Source of data	Measurements by electricity meter(s) of the project proponent

Value(s) applied	<p>Ex ante the average of the three most recent historic years 2008-2010 before implementation of the TESTIAC system is applied (see above under 6.2)</p> <p>For m = GT L71 Average 1,181,933</p> <p>For m = GT L72 Average 1,280,253</p> <p>For m = GT L73 Average 1,186,645</p>
Measurement methods and procedures	The monitoring will be continuous, with hourly recording. The data will be archived electronically and as paper print-outs for 2 years following the end of the crediting period.
Monitoring frequency	Continuous, with hourly recording
QA/QC procedures	The metering equipment will be calibrated according to the instructions (schedules, procedures) for quality assurance from the technology provider and in line with General Guidelines to SSC methodologies specifying calibration at least once in three years. The accuracy level is at minimum 0.5s. For QA/QC an external CDM consultant will double check the records for plausibility.
Purpose of data	For the calculation of project emission
Additional comment	

Data / Parameter	$FC_{DFO,m,y}$
Unit	IG
Description	Quantity of fuel type distillate fuel oil combusted by GT <i>m</i> (L71-L73) in year <i>y</i> .
Source of data	On-site measurements by flow meters of the project proponent
Value(s) applied	<p>Ex ante estimated based on assumption of increase of efficiency by the manufacturer;</p> <p>For m = GT L71 59,936</p> <p>For m = GT L72 126,717</p> <p>For m = GT L73 197,989</p>
Measurement methods and procedures	The monitoring will be continuous, with hourly recording. The data will be archived electronically and as paper print-outs for 2 years following the end of the last crediting period
Monitoring frequency	Continuous, with hourly recording
QA/QC procedures	<p>The metering equipment will be calibrated according to the instructions (schedules, procedures) for quality assurance from the technology provider. The accuracy level is not exceeding +/-1%.</p> <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>
Purpose of data	For the calculation of project emission

Additional comment	<p>The DOE should verify that DFO as start-up or auxiliary fuel is only used during: the start-up periods of the power plant, or short periods of interruption in the supply of natural gas due to technical or operational problems.</p> <p>This is to ensure that it is not a common practice, during the normal operation of the power plant, to fire or co-fire DFO as a multi-fuel power plant. In the case DFO input comprises more than 1% of the total fuel input annually on an energy basis no emission reductions can be claimed for that period.¹⁰</p>
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Data / Parameter	$NCV_{NG,y}$								
Unit	GJ/m ³								
Description	Net calorific of fuel type natural gas in year y								
Source of data	<p>One of the following data sources will be used, depending on their availability:</p> <table border="1"> <thead> <tr> <th>Data source</th><th>Conditions for using the data source</th></tr> </thead> <tbody> <tr> <td>(a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr> <tr> <td>(b) Measurements by the project participant</td><td>If (a) is not available</td></tr> <tr> <td>(c) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available</td></tr> </tbody> </table>	Data source	Conditions for using the data source	(a) Values provided by the fuel supplier in invoices	This is the preferred source	(b) Measurements by the project participant	If (a) is not available	(c) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If (a) is not available
Data source	Conditions for using the data source								
(a) Values provided by the fuel supplier in invoices	This is the preferred source								
(b) Measurements by the project participant	If (a) is not available								
(c) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If (a) is not available								
Value(s) applied	Ex ante 0.034 (assumed to be the [rounded] average of historic values, see section 6.2 which was provided by fuel supplier)								
Measurement methods and procedures	For a) and b) measurements will 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): Any future revision of the IPCC Guidelines should be taken into account								
QA/QC procedures	Values will be verified if they 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, additional information from the testing laboratory shall be collected to justify the outcome or additional measurements shall be conducted. The testing laboratory will have ISO17025 accreditation or will be able to justify that it can comply with similar quality standards.								
Purpose of data	For the calculation of project emission								
Additional comment	The data shall be archived for 2 years following the end of the crediting period.								

Data / Parameter	$NCV_{DFO,y}$
Unit	GJ/G
Description	Net calorific of fuel type distillate fuel oil in year y

¹⁰ This approach is more conservative than prescribed in similar large scale methodologies ACM0013 or AM0029.

Source of data	One of the following data sources will be used, depending on their availability:	
	Data source	Conditions for using the data source
	a) Values provided by the fuel supplier in invoices	This is the preferred source
	b) Measurements by the project participant	If (a) is not available
	c) Regional or national default values	If (a) is not available
	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	Ex ante 0.163 (assumed to be the [rounded] average of historic values, see section 6.2 which was provided by fuel supplier)	
Measurement methods and procedures	For a) and b) measurements will 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	Values will be verified if they 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, additional information from the testing laboratory shall be collected to justify the outcome or additional measurements shall be conducted. The testing laboratory will have ISO17025 accreditation or will be able to justify that it can comply with similar quality standards.	
Purpose of data	For the calculation of project emission	
Additional comment	The data shall be archived for 2 years following the end of the crediting period.	

Data / Parameter	$EC_{PJ,TESTIAC,y}$
Unit	MWh
Description	Quantity of electricity consumed by the TESTIAC system in year y
Source of data	Electricity consumption meters at the TESTIAC system
Value(s) applied	Ex ante: 27,221 MWh
Measurement methods and procedures	The data will be archived electronically and as paper print-outs for 2 years following the end of the last crediting period
Monitoring frequency	Continuous, with hourly recording
QA/QC procedures	The metering equipment will be calibrated according to the instructions (schedules, procedures) for quality assurance from the technology provider and in line with General Guidelines to SSC methodologies specifying calibration at least once in three years. The accuracy level is +/-1%. For QA/QC an external CDM consultant will double check the records for plausibility.
Purpose of data	For the calculation of project emission
Additional comment	

Data / Parameter	$EF_{NG,CO_2,y}$
Unit	tCO ₂ /GJ

Description	Emission factor of fuel type natural gas
Source of data	IPCC default value of the fuel type used in the project plant 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 <i>2006 IPCC Guidelines on National GHG Inventories</i> . ¹¹
Value(s) applied	0.0543
Measurement methods and procedures	--
Monitoring frequency	--
QA/QC procedures	--
Purpose of data	For the calculation of project emission
Additional comment	Any future revision of the IPCC Guidelines should be taken into account

B.7.2. Sampling plan

The section is left blank intentionally.

B.7.3. Other elements of monitoring plan

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Management structure and responsibility

Overall responsibility for daily operating and reporting lies with the project proponent. A staff member will be specified within the company, and provided with training, to carry out the monitoring work (data recording and archiving, quality assurance and quality control of the data, equipment calibration, scheduled and unscheduled maintenance, and adoption of corrective actions if needed).

Management structure

The manager of the proposed project activity will assume overall responsibility for the monitoring process, including the follow-up of daily operations, definition of personnel involved with the monitoring work, review of the monitored results/data, and quality assurance of measurements and the process of training new staff.

Responsibility of the personnel directly involved

The personnel involved with monitoring will be given appropriate training. They will be responsible for carrying out the following tasks:

- Supervise and verify metering and recording: the staff will coordinate internally with other departments to ensure and verify adequate metering and recording of data, including hourly recording of TESTIAC system operation, hourly fuel consumption and electricity generation;
- Collection of additional data, sales/invoices: the staff will collect sales receipts and relevant data for monitoring of the proposed project activity;
- Calibration: the staff will coordinate with the responsible organizations to ensure that calibration of the metering instruments is carried out in accordance with instructions (schedules, procedures) for quality assurance from the technology provider;
- Data archives: the staff will be responsible for storing all monitoring data and making it available to the DOE for the verification of emission reductions.

Support and third party participation

The staff will receive support from CDM experts (internal and/or external) in their responsibilities through the following actions:

¹¹ <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>

- Provide the staff with a calculation template in electronic form for calculation of annual emission reductions;
- Provide specific CDM monitoring instructions to the personnel involved in the project activity's operation;
- Follow-up of the monitoring plan and continuous on-demand advice to the staff;
- Compilation of the monitored data and preparation of the monitoring report;
- Coordination with DOEs for the preparation of periodic verifications.

Monitoring equipment and installation:

All equipment will be in compliance with national standards.

The gas and distillate fuel oil consumption of the gas turbines will be monitored by flow meters. The generated electricity will be monitored by electricity meters. Readings will be taken every hour and recorded in a log book.

Data monitoring management and recording

All monitoring data and records will be archived in electronic form and as paper print-outs. Electronic documents will be backed up on compact disc or hard disc. The project proponent will also keep copies of additional relevant documents and prepare a periodic monitoring report, which includes the monitoring parameter data and data summary, the calibration records and the emission reductions calculation. The recorded data will be kept for at least two years after the end of the crediting period or issuance of CERs, whichever occurs later.

Quality control and Quality assurance

Relevant metering equipment will be properly calibrated in accordance with the instructions (schedules, procedures) for quality assurance from the technology provider and in line with General Guidelines to SSC methodologies specifying calibration at least once in three years

Emergency procedures

In case of emergencies (conditions under which the project proponent has not been able to monitor due to an unexpected accident), the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

1. The project proponent will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring staff and the manager of the project activity will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

Date of Completion 14/11/2012

Person/entity determining the baseline and monitoring methodology :

Clemens Plöchl, Wolfgang Wetzer;

Energy Changes Projektentwicklung GmbH

Zip code + city postal address: Obere Donaustraße 12/28, 1020 Vienna

Country: Austria

Telephone number:	Wolfgang Wetzer	Clemens Ploechl
	+43 (0) 19684529	+43 699 10403690

Fax number: +43 (0) 19684529

Email: clemens.ploechl@energy-changes.com
wolfgang.wetzer@energy-changes.com

Energy Changes Projektentwicklung GmbH is not a project participant.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

The CDM Glossary of Terms, Version 05¹² defines the start date as follows:

.....In light of the above definition, the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. This, for example, can be the date on which contracts have been signed for equipment or construction/operation services required for the project activity. Minor pre-project expenses, e.g. the contracting of services /payment of fees for feasibility studies or preliminary surveys, should not be considered in the determination of the start date as they do not necessarily indicate the commencement of implementation of the project.

29/04/2010 Letter of Acceptance of order for project activity equipment.

C.1.2. Expected operational lifetime of project activity

The operational lifetime of the TESTIAC system according to the manufacturer's design specifications is 30y-0m

Date of take over of the gas turbines GTs of Station L where the TESTIAC is being implemented:

GT L 71	04/06/2006
GT L 72	28/08/2006
GT L 73	11/08/2007

The operational lifetime of the gas turbines according to the manufacturer's design specifications is 30 years and 0 months (30y-0m). Therefore the remaining operational lifetime is above 10 years (proposed crediting period).

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Fixed.

C.2.2. Start date of crediting period

01/01/2013 or the date of registration of the project activity whichever is later.

C.2.3. Length of crediting period

10y-0m

¹² <http://cdm.unfccc.int/Reference/glossary.html>

This is determined according to EB 50 Annex 15 *Tool to determine the remaining lifetime of equipment* Version 1¹³

The following option to determine the remaining lifetime of the equipment is chosen:

Use manufacturer's information on the technical lifetime of equipment and compare to the date of first commissioning;

Date of take over of the gas turbines GTs of Station L where the TESTIAC is being implemented:

GT L 71	04/06/2006
GT L 72	28/08/2006
GT L 73	11/08/2007

The technical lifetime of the gas turbines according to the manufacturer's design specifications is 30 years and 0 months (30y-0m). Therefore, the remaining lifetime is above 10 years (proposed crediting period).

Date of take over of the TESTIAC system:

TESTIAC	29/11/2011
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The technical lifetime of the TESTIAC system (project activity) according to the manufacturer's design specifications is 30y-0m. Therefore, the remaining lifetime is above 10 years (proposed crediting period).

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

Documentation of environmental impacts is not required by the host Party for the proposed project activity, however a short summary is provided below:

The proposed project activity will create more favourable ambient conditions for the gas turbines while operating in summer. This operation mode will not create any adverse conditions for increase of current emissions levels.

Releases to the Atmosphere:

Emissions of CO₂ and NO_x are expected to be reduced. Noise emissions generated by chilling compressors and various other plant equipment, are limited to acceptable levels (less than 55dBA) by the contract specification and confirmed by design documents.

The project activity is using ammonia as the refrigeration medium. All vents of the ammonia system are conducted to specifically designed "ammonia dilution tank" where eventual gases are dispersed in water without any emissions to the ambient air.

Releases to the Sea:

The project activity is using treated distillate water in a closed cycle process without draining to the external sea. All project chemical drains are collected in the common drainage pit that has no release to the sea.

Noise Emissions:

¹³ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf>

Noise emissions generated by chilling compressors and various other plant equipment are limited to acceptable levels by contract specifications and confirmed by design documents.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

On May 17th 2011, a stakeholder event was organized in Amwaj Rotana Hotel, Jumeirah Beach Residence, Dubai, UAE.

The local stakeholders had been invited to the event through a public announcement in the newspaper *Gulf News* on May 3rd 2011.

The project proponent presented the proposed project activity and an introduction to the Clean Development Mechanism to local stakeholders.

Stakeholders had the opportunity to make oral comments during the event and additionally by sending an e-mail to the Dubai Carbon Centre of Excellence at cdm@dcce.com until 30th May 2011.

E.2. Summary of comments received

During the stakeholder event, some general questions of a technical nature were discussed.

After the presentation, different questions regarding the project were asked. Mr. Sami Bustami, DUBAL, asked how many hours DEWA needs to cool the water and how much it costs to cover 8 hours daily. Another question was raised regarding the anticipated reduction of inlet air temperature. Mr. Simic replied that the reductions are expected to be between 20 to 25 degrees.

Prof. Bassam Abdel Karim, of the British University in Dubai, asked how DEWA goes about identifying its peak period – whether it is based on the load or the temperature. He observed that it is noticeable that the load is also very high even outside the identified peak hours. This question was answered by an engineer from DEWA who stated that they use both load and temperature.

No concerns with regard to the project activity were raised during the event or through email.

E.3. Report on consideration of comments received

No concerns were raised, and technical questions were answered during the stakeholder event.

SECTION F. Approval and authorization

The letter of approval from Party for the project activity is available at the time of submitting the PDD to the validating DOE.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	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 4 451 3388
Fax	+ 971 4 451 3399
E-mail	info@dcce.ae
Website	www.dcce.ae
Contact person	Ivano Iannelli
Title	Chief Executive Officer
Salutation	Mr
Last name	Iannelli
Middle name	-
First name	Ivano
Department	-
Mobile	+971 50 558 7503
Direct fax	+971 4 451 3399
Direct tel.	+971 4 451 3388 x201
Personal e-mail	ivanoi@dcce.ae

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Dubai Electricity and Water Authority (DEWA)
Street/P.O. Box	P. O. Box 564
Building	
City	Dubai
State/Region	
Postcode	
Country	United Arab Emirates
Telephone	+971 4 324 4444
Fax	+971 4 324 8111
E-mail	
Website	www.dewa.gov.ae
Contact person	
Title	Deputy Senior Manager – Commissioning (G)
Salutation	
Last name	Simic
Middle name	
First name	Nebojsa
Department	Commissioning
Mobile	+971 50 455 2328
Direct fax	+971 4304 1471
Direct tel.	+971 4802 4752
Personal e-mail	Nebojsa.simic@dewa.gov.ae

Appendix 2. Affirmation regarding public funding

As indicated in section A.5, there is no public funding from Annex I Parties for the proposed project activity.

Appendix 3. Applicability of methodology and standardized baseline

All relevant information is provided in section B.2. The detailed baseline calculations according to the methodology *AMS-II.B Supply side energy efficiency improvements – generation Version 09* and section 6.1 of this PDD are provided in a separate excel sheet *PDD_DEWACHillerStL-ERCalculationV2-EXANTE*.

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

The section is left blank intentionally.

Appendix 5. Further background information on monitoring plan

The section is left blank intentionally.

Appendix 6. Summary of post registration changes

There are two post registration changes:

- a) Corrections in the revised PDD that do not affect the project, and do not require prior approval
- b) Permanent changes from the MP which require prior approval

a) Correction in the revised PDD:

Start Date: 01/01/2013

End Date: 31/12/2023

Description: In section B.7.2 under Quality control and Quality assurance the first word in first sentence is revised from “The metering equipment will be properly calibrated [...]” to “Relevant meter equipment will be properly calibrated [...]” as per technology provider and with general guidelines to SSC methodologies specifying at least once in three years.

Accuracy: The change has no influence on the emission reductions. As the DFO meters will only have to be factory calibrated as be technology provider and no subsequent calibration is required the change in wording is considered correct and accurate.

Conservativeness: Not applicable.

Appendix 1 PS: The correction falls under Point 1 of the Appendix 1 to PS as the correction does not affect the project design.

b) Permanent changes from registered monitoring plan:

Start Date: 01/01/2013

End Date: 31/12/2013

Description: Update of the calibration frequency and procedure for DFO meters, parameter $FC_{DFO,m,y}$ from calibration according to the instructions [...] from the technology provider and in line with General Guidelines to SSC methodologies calibration once in three years to only calibration according to the instructions [...] from the technology provider.

MM compliance: The methodology does not specify any calibration frequency regulation.

Later version of MM: The later version of the methodology does not specify any calibration frequency regulation.

The initial monitoring plan has been prepared and submitted for registration when the General Guidance of SSC CDM Methodologies version 17 under §17 (c) required to measuring equipment to be calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years. Current version 22.1 thereof does not request the same. The regulation has been incorporated into PS §65 (f) which requires “Specifications of the calibration frequency for the measuring equipment. In cases where neither the selected methodology and, where applicable, the selected standardized baseline, nor the Board’s guidance specify any requirements for calibration frequency for measuring equipment, project participants or the coordinating/managing entity shall ensure that the equipment are calibrated either

- in accordance with the local/national standards, or
- as per the manufacturer’s specifications.

If local/national standards or the manufacturer’s specifications are not available, international standards may be used.”

As there is no local/national standard for the calibration but a manufacturer specification is available. The manufacturer specification states that the equipment is “factory calibrated and does not normally need to be calibrated in the field”.

Based on that the regulation of PS §65 (f) is fulfilled.

Accuracy: The initial and revised monitoring plan requires monitoring equipment with accuracy of +/- 1% or better. DOE checked the related manufacturer manual/technical specification of the monitoring equipment actually installed, which has also been inspected during onsite visit, which refers to an accuracy of the flow meter of +/-0.15%. The installed flow meter is an coriolis flow meter which is generally due to its measurement principle very accurate and resistant against any drift or influence/MPC/.

The technical specification further details that the related meter is factory calibrated and does not need to be calibrated in the field as per manufacturer specification. Based on the confirmation by technology provider that the meter does not need subsequent calibrations during operation DOE considers the updated calibration frequency as per revised monitoring plan adequate and correct. The DFO consumption on energy basis for the years 2013 and 2014 compared to the NG consumption is only 0.06% and 0.1%. The accuracy of

the measurement and especially the final emission reductions is therefore considered to be not significantly reduced or affected.

Conservative-ness: Refer to above Accuracy section.

Appendix 1 PS: The issue could fall under Point 5. (f)

“Change of calibration frequency or practice for monitoring equipment as per the applied methodology or national standard;”

Considering that the General Guidance has been meanwhile revised and the related requirement of once in three years has been removed.

However prior approval is requested.