



POA VALIDATION REPORT

STANDARD BANK PLC

VALIDATION OF THE CLIMATE ACTION RESPONSE ENTERPRISE (CARE) FOR ENERGY EFFICIENCY IN CHILLER PLANTS

REPORT No. SINGAPORE-VAL/0003/2012
REVISION No. 03

BUREAU VERITAS CERTIFICATION

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VALIDATION REPORT

Date of first issue: 14/02/2012	Organizational unit: Bureau Veritas Certification Holding SAS
Client: Standard Bank Plc	Client ref.: Mr. Geoff Sinclair

Summary:
Bureau Veritas Certification has made the validation of the Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants project of Standard Bank Plc located in Singapore on the basis of UNFCCC criteria for the small scale CDM PoA, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM rules and modalities and the subsequent decisions by the CDM Executive Board, as well as the host country criteria.

The validation scope is defined as an independent and objective review of the project design document, the project's baseline study, monitoring plan and other relevant documents, and consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final validation report and opinion. The overall validation, from Contract Review to Validation Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

The first output of the validation process is a list of Clarification and Corrective Actions Requests (CL and CAR), presented in Appendix A. Taking into account this output, the project proponent revised its project design document.

In summary, it is Bureau Veritas Certification's opinion that the project correctly applies the baseline and monitoring methodology AMS II.C Version 13 and meets the relevant UNFCCC requirements for the CDM and the relevant host country criteria.

Report No.: Singapore-val/0003/2012	Subject Group: CDM
Project title: Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants	
Work carried out by: Kuseru Wibowo (Lead Verifier) So Shuk Ling (Verifier) HB Muralidhar (Technical Specialist)	
Internal Technical Review carried out by: S. Thyagaraj (Internal Reviewers)	
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Work approved by:

Flavio Gomes

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1 INTRODUCTION

Standard Bank Plc has commissioned Bureau Veritas Certification to validate its small scale CDM PoA project "Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants" (hereafter called "the project") in Republic of Singapore.

This report summarizes the findings of the validation of the project, performed on the basis of UNFCCC criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

1.1 Objective

The validation serves as project design verification and is a requirement of all projects. The validation is an independent third party assessment of the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant UNFCCC and host country criteria are validated in order to confirm that the project design, as documented, is sound and reasonable, and meets the stated requirements and identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM rules and modalities and the subsequent decisions by the CDM Executive Board, as well as the host country criteria.

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations.

The validation is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Validation team

The validation team consists of the following personnel:

FUNCTION	NAME	CODE HOLDER*	TASK PERFORMED
Lead Verifier	Kusheru Wibowo	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> DR <input checked="" type="checkbox"/> SV <input type="checkbox"/> RI
Verifier	So Shuk Ling	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> DR <input checked="" type="checkbox"/> SV <input type="checkbox"/> RI
Technical Specialist	HB Muralidhar	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> DR <input checked="" type="checkbox"/> SV <input type="checkbox"/> RI
Financial Specialist	N.A.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> DR <input type="checkbox"/> SV <input type="checkbox"/> RI
Internal	S. Thyagaraj	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> DR <input type="checkbox"/> SV <input checked="" type="checkbox"/> RI



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Technical Reviewer (ITR)			
Specialist supporting ITR	N.A.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> DR <input type="checkbox"/> SV <input type="checkbox"/> RI

*DR = Document Review; SV = Site Visit; RI = Report issuance

2 METHODOLOGY

The overall validation, from Contract Review to Validation Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

In order to ensure transparency, a validation protocol was customized for the project, according to the version 01.2 of the Clean Development Mechanism Validation and Verification Manual, issued by the Executive Board at its 55th meeting on 30/07/2010. The protocol shows, in a transparent manner, criteria (requirements), means of validation and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organizes, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The completed validation protocol is enclosed in Appendix A to this report.

2.1 Review of Documents

The Project Design Document (PoA-DD), typical CPA-DD and a real case CPA-DD (Capricorn CPA) were submitted by Standard Bank Plc and additional background documents related to the project design and baseline, i.e. country Law, Guidelines for Completing the Project Design Document (PoA-DD), Approved methodology, Kyoto Protocol, Clarifications on Validation Requirements to be Checked by a Designated Operational Entity were reviewed.

To address Bureau Veritas Certification corrective action and clarification requests, Standard Bank Plc revised the PoA-DD and resubmitted it on 15/12/2011 for re-webhosting.

The validation findings presented in this report relate to the project as described in the PoA-DD version 3 dated on 25 Nov 2011, typical CPA-DD and real case CPA-DD ie (Capricorn CPA- version 3 dated on 25 Nov 2011).

Based on the completeness check point No. 6, Dated 24/08/2012 CME has revised the PoA-DD in accordance with latest PoA standard EB 65 Annex 3 and submitted to DOE as Version 05. Validation Team has verified the changes and found in accordance with the

2.2 Follow-up Interviews

On 11and12/10/2011 Bureau Veritas Certification performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of Ascendas Services Pte Ltd, Trane Air-conditioning Pte Ltd, Climate Resources Exchange Pte Ltd and



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British High Commission Singapore were interviewed (see References). The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
Ascendas Services Pte Ltd	<ul style="list-style-type: none"> ➤ Project Background, PoA and CPA consideration ➤ Agreement sign with Climate Resources Exchange Pte Ltd ➤ Management Board Meeting on consideration benefits of CDM for retrofit chiller plant project ➤ Cost barrier ➤ Environmental legal law and Environmental analysis for CPA ➤ Scrap equipment monitoring ➤ Sources and gases included in the CPA boundary ➤ Additionality demonstration ➤ Environmental legal law and environmental analysis ➤ Site visit chiller plant
Trane Air conditioning Pte. Ltd	<ul style="list-style-type: none"> ➤ Contract of replacing chiller plant ➤ Project Technology ➤ Prevailing practice form technology implementation point of view. ➤ Installation and commissioning of chiller plant ➤ Energy coefficient and energy saving data before and after retrofit ➤ Baseline study ➤ Energy coefficient performance guarantee ➤ Emission reduction calculation ➤ Project handover to Ascendas Services ➤ Maintenance plan for chiller plant ➤ Equipment monitoring and EMS data monitoring emission reduction ➤ Training of technicians ➤ Scrap equipment monitoring ➤ Site visit chiller plant
LOCAL Stakeholder-British High Commission Singapore	<ul style="list-style-type: none"> ➤ Feedback of the information of survey participant done during the stakeholders consultation Meeting on 03 Feb 2010
Climate Resources Exchange Pte Ltd-	<ul style="list-style-type: none"> ➤ Agreement with Standard Bank on the PoA for Energy Efficiency in Chiller Plants in Industrial / Commercial Buildings across Singapore ➤ Project background and PoA consideration ➤ Agreement with Ascendas of CPA ➤ CPAs inclusion in PoA ➤ Meeting with DNA Singapore (NEA) on letter of approval ➤ Communication with Standard Bank letter of approval from UK ➤ Environmental legal law and environmental analysis ➤ Stake holder consultation processes ➤ Additionality demonstration

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to raise the requests for corrective actions and clarification and any other outstanding issues that needed to be clarified for Bureau Veritas Certification positive conclusion on the project design.

Corrective Action Requests (CAR) is issued, where:

- (a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- (b) The CDM requirements have not been met;



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(c) There is a risk that emission reductions cannot be monitored or calculated.

The validation team may also use the term Clarification Request (CL), if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in the verification protocol in Appendix A.

2.4 Internal Technical Review

The validation report underwent a Internal Technical Review (ITR) before requesting registration of the project activity.

The ITR is an independent process performed to examine thoroughly that the process of validation has been carried out in conformance with the requirements of the validation scheme as well as internal Bureau Veritas Certification procedures.

The Lead Verifier provides a copy of the validation report to the reviewer, including any necessary validation documentation. The reviewer reviews the submitted documentation for conformance with the validation scheme. This will be a comprehensive review of all documentation generated during the validation process.

When performing an Internal Technical Review, the reviewer ensures that:

The validation activity has been performed by the team by exercising utmost diligence and complete adherence to the CDM rules and requirements.

The review encompasses all aspects related to the project which includes project design, baseline, additionality, monitoring plans and emission reduction calculations, internal quality assurance systems of the project participant as well as the project activity, review of the stakeholder comments and responses, closure of CARs, CLs and FARs during the validation exercise, review of sample documents.

The reviewer compiles clarification questions for the Lead Verifier and Validation Team and discusses these matters with Lead Verifier.

After the agreement of the responses on the 'Clarification Request' from the Lead Verifier as well as the PP(s) the finalized validation report is accepted for further processing such as uploading on the UNFCCC webpage.

3 VALIDATION CONCLUSIONS

In the following sections, the conclusions of the validation are stated.

The findings from the desk review of the original project design documents and the findings from interviews during the follow up visit are described in the Validation Protocol in Appendix A.

The Clarification and Corrective Action Requests are stated, where applicable, in the following sections and are further documented in the Validation Protocol in Appendix A. The validation of the Project resulted in 00 Corrective Action Requests (CARs) and 03 Clarification Requests (CLs).

The CARs and CLs were closed based on adequate responses from the Project Participant(s) which meet the applicable requirements. They have been reassessed before their formal acceptance and closure.

The number between brackets at the end of each section correspond to the VVM paragraph

3.1 Approval (49-50)

A letter of approval has been received (Category 1 Ref 11 & 10) and the following support documentation was received from Singapore DNA and UK DNA respectively:

1. Singapore DNA is National Environmental Agency which has issued the Letter of approval for Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants in Singapore by Climate Resources Exchange dated 20 September 2010 (Category 1 Ref 11).

2. UK DNA is from Department of Energy & Climate change has issued the Letter of Approval for Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants (Reference number: SB/03/2010) dated on 14 Oct 2010 (Category 1 Ref 10).

It is clearly stated in both LOA's that CME is implementing this PoA voluntarily and this project will assist in achieving sustainable development in host country.

Bureau Veritas Certification received these letters from the project participants and does not doubt its authenticity.

The title and contents of the letter of approval refer to the precise proposed CDM project activity title in the PoA-DD being submitted for registration.

Bureau Veritas Certification considers the letters are in accordance with paragraphs 45 - 48 of the VVM.

3.2 Participation (54)

The participation for each project participant has been approved by a Party of the Kyoto Protocol.

The validation team concluded this by verified the web <http://maindb.unfccc.int/public/country.pl?country=SG> the host party is non Annex 1 party Republic of Singapore and verified the web <http://maindb.unfccc.int/public/country/pl?country=GB> that Annex 1 party including United Kingdom of Great Britain.



3.3 Project design document (57)

The validation team hereby confirms that the PoA-DD (Ver -05) , typical CPA-DD (Ver – 04) and a real case CPA-DD (Capricorn CPA) complies with the latest forms of the guidance documents for completion of PoA-DD, typical CPA-DD and real case CPA-DD i.e. EB65 Annex 3 using latest version of the template form CDM-CPA-DD, and thus complying with Para 57 of VVM, version 1.2.

3.3.1 Specific PoA Requirements (167)

(a) Eligibility Criteria for Enrolling CPA

According to the EB60 Annex 26 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 (version 01), a full additionality assessment is not required in the context of component project activities (CPA), rather the confirmation of additionality for CPAs should be concluded by means of the eligibility criteria.

Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plant PoA project clearly establishes eligibility criteria for inclusion of a project as a CPA under the PoA in section A.4.4.2 of PoA-DD. There are totally 13 eligibility criteria identified and established by CME. The validation team has validated these criteria and found that selected criteria are found in accordance with the CDM PoA requirement generally and specifically with EB 65 Annex 3 and the approved methodology used by the CME to develop this PoA. List of criteria validated by the validation team is as given below.

Eligibility Criteria As per EB 65 Annex 3	Specific Eligibility Conditions Established by CME for inclusion of CPA in the PoA	Validation Opinion
(a) The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA.	<ul style="list-style-type: none"> The CPA must be within the geographical location of The Republic of Singapore as stated in section A.4.1.2 of the PoA-DD 	CME has clearly established the Physical / Geographical Boundary of the PoA in PoA-DD section A.4.1.2, hence this eligibility criteria is relevant.
(b) Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. Programme logo);	<ul style="list-style-type: none"> As per the conditions set out in in the operation and management plan of the PoA – as defined under section A.4.4.1 (Operational and management plan of the PoA-DD). Each CPA shall have a unique identification number (UIN) based on its precise geo-coordinates (GPS) and assigned under the building owner's name. The CME will have this recorded in the database of the operating and management software/hardware system. In addition, a CARE PoA Logo printed sticker with the UIN number shall be issued and must be displayed on the control infrastructure of the chiller plant system of each CPA. 	The Eligibility Criteria found valid and is verifiable through the Operational and Management Plan as presented in the PoA – DD.



(c) The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;	<ul style="list-style-type: none"> • Each CPA must implement water-cooled chiller technology and shall comply with ASHRAE 14 guidelines and AHRI 550 calibration standards and shall implement a building automation software technology that is able to measure and monitor the performance of the chiller plant system in order to achieve a minimum energy efficiency coefficient of 0.65kW/TR at 1-minute intervals and be able to store such data that the DOE can verify on an annual basis during the crediting period of the CPA. 	<p>Technology Specification found correctly applied, PoA allows only Water cooled chiller plant systems which are following ASHRAE 14 Guidelines and AHRI 550 Calibration standard while retrofitting the Existing Chiller plant to mandatorily achieve 0.65 KW/TR energy efficiency.</p> <p>Specification for Monitoring system at 1 Minute interval is also found a relevant criteria which is a must requirement for including CPA to the PoA.</p>
	<ul style="list-style-type: none"> • Any building whether industrial, commercial or residential must be operating a chiller plant to cool the building with an installed cooling load capacity of more than 100TR and have a total chiller plant system efficiency of not better than 0.65kW/TR (i.e.0.66kW/TR and higher). 	<p>This eligibility criteria is found objective and there will be objective evidences in the form of energy audit results to conclude the energy efficiency at what baseline chiller plant systems are operating / running. Hence the eligibility criteria is acceptable for inclusion of CPA.</p>
	<ul style="list-style-type: none"> • Each CPA must have completed an energy audit on the chiller plant system and conducted by a registered Energy Service Company (ESCO) accredited by the National Environment Agency (NEA) and prove through a comprehensive report that the measurements and computation that the chiller plant system efficiency was not better than 0.65kW/TR in the baseline scenario. 	<p>This eligibility criteria is found relevant and this helps to provide unbiased opinion for inclusion of CPA in the PoA.</p> <p>This will make the CPA inclusion more systematic and authentic, hence the acceptable.</p>
(d) Conditions to check the start date of the CPA through documentary evidence;	<ul style="list-style-type: none"> • Each CPA to be considered for inclusion under the PoA must prove that the start date is after the start date of the PoA, i.e. the date that the PoA was first published for Global Stakeholder Consultation – April 6 2010. The documentary evidence must show and prove that any Purchase or Works Order made out to the technology provider or main contractor must be after this date. 	<p>The eligibility criterion found in accordance with the PoA requirement and is found one of the important criteria. During Validation of PoA Validation team confirmed from the UNFCCC web site for the start date of the PoA and found that the eligibility criteria is in accordance with it. The criterion is verifiable during inclusion of the CPA in PoA in Future and hence acceptable.</p>
(e) Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by	<ul style="list-style-type: none"> • Each CPA must prove that it adheres to the baseline and monitoring methodology of AMSIIC Version 13. 	<p>CME has decided to use AMS IIC, Version 13 as the approved small scale methodology. This criteria also can be verified during inclusion of CPA to PoA</p>



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<p>CPAs;</p>		<p>in future and hence acceptable.</p>
<p>(f) Conditions that ensure that CPAs meets the requirements pertaining to the demonstration of additionality as per Attachment A of Appendix B of Simplified modalities and procedures for small-scale CDM project activities. The additionality is demonstrated at the PoA level using Attachment A of Appendix B of simplified modalities and procedure for small-scale CDM project Activities. The most appropriate barrier selected is the Prevailing practice barrier and detailed justification of additionality due to prevailing practice in the host country Singapore is provided in the PoA-DD section A.4.3 and it is extended to all CPA's. Based on the description of the Prevailing practice barrier, the following key criteria are identified to demonstrate CPA additionality:</p>	<ul style="list-style-type: none"> ▪ Each CPA must demonstrate that in the absence of the guidance of the PoA it would not have been able to achieve a chiller plant system efficiency of 0.65kW/TR measured at 1-minuteIntervals based on the integrated design-approach for the retrofit of the old Chiller plant systems. ▪ Each CPA implements the proposed voluntary measure of the PoA and is not a result of any other policy or measure applied within the boundary of the PoA hence, it would not exist in the absence of the PoA ▪ Each CPA increases enforcement of the mandatory policy/regulation that would systematically not be enforced, or increases compliance with those requirements for which non compliance is widespread in the country/region, hence, it results in an increased level of enforcement or compliance that would not be reached in the absence of the PoA; ▪ Each CPA increases enforcement of the existing mandatory policy/regulation to a level that would not be reached in the absence of the PoA. 	<ul style="list-style-type: none"> - Specific host country policies or regulations should not mandate the CPA implementation. - By implementing CPA a bench mark of consistent achievement of energy efficiency shall be achieved.
<p>(g) The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;</p>	<ul style="list-style-type: none"> • Each CPA must meet the EIA requirements as stated in the EIA Section C – below. Each CPA must also demonstrate and present records that equipment replaced have been scrapped and independently verified. The local stakeholder consultation has already been done at the PoA level and so each CPA does not need to undergo such a separate stakeholder consultation. 	<p>The Eligibility criteria is found verifiable against the Local Regulatory requirements from the approval point of view and waste disposal point of view.</p> <p>Scrap disposal records can be verified against each CPA to be included in future and hence the eligibility criteria found acceptable.</p>
<p>(h) Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance;</p>	<ul style="list-style-type: none"> • Each CPA shall provide documentary evidence for their source of funding for developing their respective retrofit project. 	<p>This criteria is also found verifiable and hence accepted.</p>



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<p>(i) Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or micro-scale project categories.</p>	<ul style="list-style-type: none"> • Each CPA shall undergo a debundling check as prescribed under section A.4.4.1 (Operational and management plan of the PoA-DD) and verified by the DOE prior to inclusion. 	<p>CME has established debundling check mechanism as described in the PoA-DD section A.4.4.1, where a tool is established to verify that the CPA is not a debundled component of any large scale, small scale or a micro scale project activity. Hence the eligibility criteria is acceptable.</p>
<p>(j) Condition in determining the difference in the loading capacity of the chiller plant system in the baseline scenario as compared to the project activity.</p>	<ul style="list-style-type: none"> • CPAs where cooling load capacity changes significantly between the baseline and the project activity, i.e. less than 10% or more than 50% as compared to the baseline shall be excluded from this PoA in accordance with the applied methodology AMS IIC Version 13. 	<p>This eligibility criteria is also found verifiable and hence is acceptable.</p>
<p>(k) Condition to determine if the CPA falls within the requirement of an SSC-CPA.</p>	<ul style="list-style-type: none"> • Each CPA shall not generate an electrical energy savings of more than 60GWh per annum post retrofit. 	<p>This eligibility criteria is also found verifiable and hence it is acceptable.</p>
<p>(l) Condition to determine if the CPA is eligible to be included in the PoA if parts of the system are shut down and/or if there is no actual retrofit but only optimization or calibration works performed to improve chiller plant system efficiency.</p>	<ul style="list-style-type: none"> • Such CPAs will not be included. 	<p>As per the PoA-DD description it is validated that CPA which involves retrofit of old Chiller plant systems with new efficient Chiller plant systems to achieve energy efficient coefficient of 0.65 KW/TR or better will only be eligible to participate in this PoA. This eligibility criteria is also found verifiable and hence it is acceptable</p>
<p>(m) Conditions to determine if a CPA is eligible to be included in the PoA based on Refrigerant Usage</p>	<ul style="list-style-type: none"> • CPAs switching from use of older refrigerants R11/R12/R22 to a non-CFC refrigerant such as R134a or R123 are allowed. • CPAs switching from any of R134a or R123 refrigerants to a new refrigerant that is commercially available that is CFC-free and which refrigerant has a lower GWP than any of R134a or R123 refrigerants in the future is allowed. 	<p>This eligibility criteria is also found verifiable from the baseline chiller plant design specifications and new chiller plant system technical specification and hence acceptable.</p> <p>This eligibility criteria is also found verifiable from the baseline chiller plant design specifications and new chiller plant system technical specification and hence acceptable.</p>

CME has opted to perform additionality assessment at PoA level using Attachment A to Appendix B of the “Simplified Modalities & Procedures for small-scale CDM Project Activities. As per the criteria for the additionality CME shall provide an explanation to show that the project activity would not have occurred anyway due to at least one barrier.

As per section E.5.1 barrier due to prevailing practice is considered as the important barrier for implementing the proposed PoA project activity in host country Singapore.



As per the justification provided by CME in this particular PoA project activity, prevailing practice or existing regulatory or policy requirement would have led to implementation of a technology with higher emissions. i.e Chiller plant systems installation with lesser energy efficiency ratings than that of 0.65 kW/TR.

Prior to incorporation of any CPA into the PoA, an assessment on eligibility criteria and additionality will be done to determine whether the project activity is eligible to be included into the PoA or not. CME will complete the check against the eligibility criteria established by the PoA.

While doing so it will be ensured that each individual building has its own unique identity and CME has established a mechanism in Operational and Management, wherein CME will provide a sticker with geo co-ordinates.

CME has checked all the information required during the assessment for the inclusion of the first CPA in the PoA and the validation team has verified that the real case CPA (Capricorn CPA) inclusion check has been completed by CRX.

Based on these criteria, the validation team concluded that it was sufficient to ensure that all CPAs would comply with the CDM requirements applicable to the PoA.

(b) Operational and Management Arrangements for the PoA (166)

As described in section A4.4, CRX is the coordinating and managing entity for the management of PoA and monitoring plan for each individual CPA. To ensure CRX has controlled all records and information related to the implementation of individual CPA and also in the position to ensure each CPA is operated in accordance with the specific requirements of the monitoring programme, contractual arrangement will be signed with each participating building owners. For the first real case CPA, contract agreement has been signed between CRX and The CPA implementer HSBC Institutional Trust Services (Singapore) Limited as Trustee of Ascendas Real Estate Investment Trust for Capricorn Building.

A record keeping for each CPA under the PoA

Each CPA will maintain its monitoring data and submit to CRX as managing entity to archive the data in secure database as stated in section PoA-DD section A.4.4.1.

A procedure to avoid double accounting

To avoid double accounting, each CPA will be given a unique identification name as reference. In addition to that, prior to include new CPA into the proposed PoA, CRX will check UNFCCC website and consult DNA of Singapore to ensure that the CPA is not another CDM project activity or CPA of another PoA. For the first real case CPA-DD (Capricorn CPA), a contract agreement between Ascendas and CRX has been signed to show that there is an agreement for inclusion of the replacement activity in the PoA and that this project has not been registered either as a CDM project activity or CPA of another PoA.

The SSC-CPA included is not a de-bundled component of another CDM project activity

Guidance for determining the occurrence of de-bundling under a PoA will be followed by CRX to ensure that the proposed CPA is not a de-bundled component of another project activity. In Accordance with the guidance a proposed small scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below:



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

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

For the first specific CPA-DD (Capricorn CPA), it was confirmed that it is not a de-bundled component of another CDM project activity by cross check the UNFCCC website and also reviewing the contract agreement between the CPA implementer HSBC Institutional Trust Services (Singapore) Limited as Trustee of Ascendas Real Estate Investment Trust for Capricorn Building and CRX dated on 31 Dec 2009.

(c) Validation of the First Specific CPA-DD (Capricorn CPA) (168)

The Capricorn CPA comply with all the eligibility criteria and therefore is eligible to be included under the PoA. The justifications are as follows:

- (i) The new project fulfil all three conditions of AMS II.C methodology, version 13;
- (ii) There is no enforced regulation in Singapore that requires to install higher energy efficient chiller plant for air conditioning purpose in commercial or industrial buildings;
- (iii) The CPA is in compliance with all laws and regulations in Singapore,
- (iv) The CPA is approved by CRX as the managing entity;
- (v) The CPA has aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies.: Total estimated annual saving potential of real case CPA is 1.62 GWh which is much lesser than the cap established by the small scale methodology AMS II.C Version 13 Type II.

This has been further confirmed via the site visit and interview with the project participants. Complete Validation details of Real Case CPA is provided in the CPA Validation Report separately.

3.4 Changes in the Project Activity

The validation team has observed during site visit that the project activity has been implemented in accordance with the description provided in the web hosted PoA -DD. Thus, no changes were observed during site visit with comparison to the webhosted PDD as compared to details mentioned in web hosted PDD /Ref: 02/.

However, the final PDD Ver-04, dated 05/03/2012 has following changes as compared to PDD Ver. 01 that was web hosted.

There are few specific changes were made to the PoA-DD, based on the outcome of Validation process

1. The most significant change is the change of Approved methodology to develop this proposed PoA. Initially CME has utilized AMS II.E Version 10, which is now replaced by AMS IIC Version 13.
2. Algorithms in PoA-DD section E.6.2 now aligned with the approved methodology algorithm for calculating Baseline and project emissions.

3. PoA-DD section E.6.3 and E.7.1 are revised to incorporate monitoring parameters prescribed by the algorithm of approved methodology to determine Baseline and project emissions.
4. PoA-DD section A.4.2.2, and E.5.1 are revised in accordance with the latest PoA standard EB 65 Annex 3.
5. PoA-DD section E.6 is revised to include applicability conditions as prescribed in Approved methodology used by PP and its compliance.

These changes were validated by the validation team and found appropriately addressed in PoA –DD version 04 Dated 05/03/2012.

During Completeness check it was notified that PoA-DD and CPA-DD documents to be made aligned with the latest EB 65 Annex 3, hence CME has updated the PoA-DD to Version 5.

3.5 Project description (64)

The process undertaken to validate the accuracy and completeness of the project description include the document review, interview of CME, CPA implementer, contractors and on-site assessment dated on 10-11 Oct 2011.

The proposed Small Scale Programme of Activity in Singapore is intended to achieve energy efficiency by reducing the consumption of electricity used in various buildings for air conditioning purpose by replacing existing large sized energy intensive CFC / non CFC Chillers by new generation energy efficient Chillers.

In Singapore Chiller plants installed during year 1980 – 2000 or still being installed as Greenfield Chiller plants are showing trend of specific energy consumption of 1.2 – 1.8 kW/TR on an average. This trend is observed despite there is an availability of the new generation chillers which can achieve energy consumption rating of 0.65 kW/TR.

The proposed Small Scale PoA activity promotes implementation of new generation energy efficient chillers in Singapore for the purpose air conditioning; this will help in achieving 51-78% reduction in electricity consumption and thereby reducing corresponding CO2 emissions.

For each replaced Chiller System the level of service of the Chiller system is not significantly smaller (10%) or significantly larger (50%) than the baseline.

The boundary of the PoA is the Republic of Singapore. The geographical boundary of each CPA will be determined by the location of the buildings where chiller systems are installed.

The PoA – DD and CPA – DD were first web hosted on UNFCCC Website on 06th April 2010 for Global Stakeholder consultation process. It is validated that the start date of the changed CPA is after the date on which PoA – DD was first published for global stakeholder consultation, which is in line with EB requirement that the start date of any CPA is not, or will not be prior to the commencement of validation of the programme of activities. The length of the PoA does not exceed 28 years.

During the course of validation of this PoA project, there is a significant change to the project (eg; criteria for entry of CPAs into the PoA - as prescribed in the eligibility requirements of the PoA- is changed to accommodate more CPAs, a new specific CPA and new typical CPA reflecting the new eligibility criteria is included with the intention of replacing the originally web-hosted CPA to



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maintain clarity and transparency & originally web-hosted CPA to be removed as it does not meet the eligibility criteria)

To accommodate the change in PoA and originally web hosted CPA validation team seek a clarification from EB and the EB responded affirmatively allowing the re webhosting of PoA DD, changed CPA-DD and Typical CPA-DD. Event log of the email communication is presented transparently in the below mentioned table.

Date	Communication summary	Result
10/06/2011	1 st Communication from DOE on behalf of CME for clarifying change of CPA and re webhosting of PoA for GSC	-
27/06/2011	EB Response to 1 st Communication	Affirmative response which indicates that re webhosting of PoA along with changed conditions, new CPA and revised Typical CPA is possible.
07/07/2011	2 nd Communication from DOE on behalf of CME for further clarification whether start date of re webhosted PoA will change or remain same	-
22/07/2011	EB response to 2 nd Communication	Affirmative response which indicates that the start date of PoA should not be changed during the re-webhosting. It should be maintained as it was for the first GSC. It is outlined in the procedures for registration of a Programme of activities.

Based on the responses provided by EB, PoA-DD, New specific CPA-DD and Typical CPA –DD were re webhosted for global stake holder's consultation process on 15/12/2011.

The PoA is operated and implemented by Climate Resources Exchange Pte Ltd (CRX). CRX will manage the PoA on behalf of Standard Bank, the PoA sponsor.

CRX will co-ordinate each small scale CPA by ensuring replacement of chiller plants and implemented with proper and measurable monitoring and verification system to provide reliable and authentic operational data on real time basis including Heat Balance which is clearly described in PoA-DD (page 51) using a step-by-step description of a typical monitoring plan using the ASHRAE Guideline and ARI 550 standard.

There are no mandatory policies or regulations for adoption of the program to use energy efficient chiller with 0.65kW/TR or better in Singapore buildings, however Singapore government promotes energy efficient designs in building by providing incentive/grants. The proposed PoA is a voluntary action by coordinating / managing entity – CRX.

The validation team hereby confirms that the project description in PoA-DD (version 3) is accurate and complete in all respects and that there are no changes to the project activity/design or boundary as compared to the webhosted PoA-DD.

3.6 Baseline and monitoring methodology

3.6.1 General requirement (76-77)

According to the PoA-DD, the CPA under the PoA will apply the small scale methodology AMS II.C Version 13 "Demand-side energy efficiency activities for specific technologies". As this PoA



only includes individual CPAs, that results in aggregate energy savings of 60 GWh per year for electrical end use energy efficiency technologies Type II components this condition is considered as one of the important methodological condition to assess the inclusion of CPA's to the PoA.

For each replaced appliance/equipment/system the rated capacity or output or level of service (e.g., light output, water output, room temperature and comfort, the rated output capacity of air-conditioners etc.) is not significantly smaller (maximum - 10%) than the baseline or significantly larger (maximum + 50%) than the baseline. CME has ensured that the methodology condition will be fulfilled by each CPA, by providing guideline on page 51 of PoA-DD for Step-by-step description of a typical monitoring plan using the ASHRAE Guideline and ARI 550 standard.

The steps taken to assess the relevant information contained in the PoA-DD against each applicability condition of the approved methodology utilized by the CME to develop the proposed POA and the criteria for inclusion of small scale CDM Project Activities (CPA's) are described below.

Applicability condition (1): This methodology comprises activities that encourage the adoption of energy-efficient equipment / appliance e.g., lamps, ballasts, refrigerators, motors, fans, air conditioners, pumping systems) at many sites. These technologies may replace existing equipment or be installed at new sites. In the case of new facilities, the determination of baseline scenario shall be as per the procedures described in the general guidance to SSC methodologies under the section "Type II and III Greenfield projects (new facilities)". The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies. For fossil fuel end use energy efficient technologies, the limit is 180 GWh thermal per year in fuel input.

This PoA involves retrofit / installation of energy-efficient chiller to existing energy inefficient chiller in single site or many sites and also each CPA will not exceed energy saving of 60 GWh per year for electrical end use energy efficiency technologies.

Applicability condition (2): For each replaced appliance / equipment / system the rated capacity or output or level of service (e.g light output, water output, room temperature and comfort, the rated output capacity of air-conditioners etc.) is not significantly smaller (maximum – 10%) than the baseline or significantly larger (maximum + 50%) than the baseline.

Cooling requirement of each participating building in baseline and in project scenario shall be assessed by the CME prior to the inclusion in the PoA in terms of Cooling Load (TR), Baseline Equipment Capacities (KW), Energy Consumption (KWH/Year) and configuration of system to ensure the CPA meets applicability condition. This has identified as one of the important criteria by CME for inclusion.

Detailed Energy audit by independent accredited ESSCO will be conducted before retrofitting the Chiller plant system. Baseline monitoring results will be compared with the design specification of new/ proposed chiller plant system to ensure that the out put conditions before and after retrofitting are meeting the applicability condition. Hence the Condition is found met.

Applicability condition (3): If the energy efficient equipment contains refrigerants, then the refrigerant used in the project case shall be CFC free. Project emissions from the



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baseline refrigerant and / or project refrigerants shall be considered in accordance with the guidance of the Board (EB 34, paragraph 17). This methodology credits emission reductions only due to the reduction in electricity consumption from use of more efficient equipment / appliance.

While implementing the proposed CPA, CME has established a mechanism to verify the refrigerant gas characteristics, which will be also a part of energy audit and technical verification process. By Means of technical verification CME will ensure that the proposed CPA to be included in the PoA has a provision of correct refrigerant gases., hence, the methodology condition number 3 is satisfied.

The validation team hereby confirms that the selected baseline and monitoring methodology AMS II.C (Version 13) , is previously approved by the CDM Executive Board, and is applicable to the project activity, which, complies with all the applicability conditions therein.

The validation team hereby confirms that, as a result of the implementation of the proposed CDM project activity, there are no greenhouse gas emissions occurring within the proposed CDM project activity boundary, which are expected to contribute more than 1% of the overall expected average annual emissions reductions, which are not addressed by the applied methodology

3.6.2 Project boundary (80)

The boundary of the PoA is the Republic of Singapore. The geographical boundary of each CPA will be determined by the location of the buildings where Chiller systems are installed. Each CPA will limit participation by buildings belonging to a certain geographical region.

PoA Document has defined the project boundary as installed high energy efficiency chiller system within Singapore.

During Site visit on 11-12 Oct 2011 it was observed that CME has selected Capricorn Building as the first CPA to be implemented, which located at 1 Science Park Road, Science park II in Singapore, CME has decided to replace air cooled chiller by water cooled chiller. During site visit project boundary was physically verified and found that it complying with the PoA-DD project boundary description.

The project boundary includes following important equipment's

- Water cooled energy efficient chillers
- Cooling Towers,
- Pumps & motor drives,
- Electrical control system,
- Piping System
- Energy Monitoring and Control System

Based on the above assessment, the validation team hereby confirms that the identified boundary and the selected sources and gases are justified for the project activity.

3.6.3 Baseline identification (87-88)

The steps taken to assess the requirement given in paragraph 81 and 82 of the VVM are described below:

The PoA correctly applies the approved simplified baseline methodology for small-scale

CDM project activities - AMS-II.C, version 13, "Demand-side energy efficiency activities for specific technologies".

CPAs will be defined to ensure that the aggregate energy savings by a single CPA may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency. Therefore, AMS-II.C is applicable to the project.

Three alternatives to the proposed PoA have been identified:

- The activity could occur without being registered as a PoA through government or private sector support.
- Individual or collaborative efforts by Singapore ESCO's as well as Building owners to promote rapid uptake of energy efficient Chiller technology in Singapore :
- Continuation of the current situation: The baseline alternatives include continue use of energy intensive chiller system for existing or new buildings

It is demonstrated that alternatives I and II face barriers (refer to section 3.7).

The baseline scenario is thus the continuation of the current situation, which is in accordance with approved methodology AMS II C as the emission baseline is the baseline energy consumption of equipment displaced.

The CME has defined the baseline in accordance with Approved methodology AMS II.C condition as per the para 6 which states that if the energy displaced is electricity, the emission baseline is determined using option 1 as given below:

Option 1- the product of the baseline energy consumption of equipment / appliances and the emission factor for the electricity displaced:

$$BE_y = E_{BL,y} * EF_{CO_2,ELEC,y} + Q_{ref, BL} * GWP_{ref,BL}$$

$$E_{BL,y} = \sum_i (n_i \times \rho_i \times o_i / (1 - l_y))$$

Parameters	Symbol	Unit	Validation Opinion
Baseline Emission Calculation:			
Number of devices of the group of "i" devices replaced, for which the project energy efficient equipment is operating during the year	n_i	Number	Chiller System is considered as one complete set of devices replaced - Project Description. This approach is found correct as all replaced chillers will be running in series.
Power of the devices of the group of "i" baseline devices . In the case of a retrofit activity, "power" is the weighted average of the devices replaced. In the case of new installations, "power" is the weighted average of devices on the market	ρ_i	kW/Hr	This information shall be obtained from the Baseline Monitoring Data at one minute interval, which is made mandatory by CME for inclusion of CPA as per eligibility criteria (c).
Average annual operating hours of the devices of the group of "i" baseline devices	o_i	Hours/Annun	Calculated value considering 365 Days of operation for 24 Hours a day.
Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction.	l_y		SMART Grid Technology Primer – A summary, Evidence of Grid losses in Singapore (http://app.nccs.gov.sg/data/resources/docs/TechPrimers/Smart%20Grid%20Primer.pdf)



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Average annual quantity of refrigerant used in the baseline to replace the refrigerant that has leaked (tonnes/year). Values from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used	$Q_{ref,BL}$	tonnes/year	As per guidance from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories. As per table 7.9 this refrigerant charge range may be from between 10kg to 2,000kg per chiller and a maximum leakage of 15% per annum is determined for developing countries. Further - The refrigerant charge used for these calculations is a composite kg/kW value for screw and centrifugal compressors integrated over the size range of interest. Individual sources for these values were 1) those published in the original TEWI report, 2) those estimated by an Ad-Hoc subcommittee formed by ARI member companies, and 3) those published in the 1995 UNEP Report (Fischer 1991, Hourahan 1996a, UNEP 1995).
Global Warming Potential of the baseline refrigerant (tCO ₂ e/t refrigerant)	$GWP_{ref,BL}$	tCO ₂ e/t refrigerant	Global warming potential of the project activity refrigerant as per IPCC Values
Grid emission factor for Singapore	$EF_{CO_2,ELEC,y}$	kgCO ₂ /kWh	Derived from National Environment Agency of Singapore
Energy consumption in the baseline in year y	$E_{BL,y}$	kWh/Annum	Calculated Value using Equation $E_{BL,y} = \sum_i (n_i \times \rho_i \times o_i / (1 - l_y))$
Baseline emission	BE	tCO _{2e}	Calculated value using equation $BE_y = E_{BL,y} * EF_{CO_2,ELEC,y} + Q_{ref, BL} * GWP_{ref,BL}$

Since the baseline is energy displaced electricity, CME has made a provision at PoA level to demonstrate the calculation of baseline cooling load and electricity consumption and made it mandatory to carry out baseline campaign for One month period to gather the relevant data from baseline chiller plants prior to the replacement of chiller plant system at each CPA. CME has also used the theoretical approach to crosscheck the baseline calculation which is common in HVAC industry i.e. using Cooling load and Chiller plant system energy efficiency. Detailed calculation of baseline emission is provided in CPA-DD. Hence Validation Team confirms that Baseline identification and calculation of Baseline Emission is in accordance with the Option 1 of Approved Methodology AMS II.C, Version 13.

CME has demonstrated the method of calculating grid emission factor in PoA-DD section E.6. CME has utilized "Tool to calculate the emission factor for an electricity system" version 02 (EB 50 Annex 14) ; CME has opted to use Ex- ante approach to fix the grid emission factor.

In accordance with this CME has utilized Grid Emission Factor, published by National Environmental Agency (NEA) dated on 25 Feb 2011. NEA is Singapore DNA.

$Q_{ref, BL}$ and $GWP_{ref,BL}$ have been considered for the baseline emission and project emission calculations appropriately. CME has utilized IPCC default values for GWP of refrigerant gases used.

Based on the above assessment, the validation team hereby confirms that:



- (a) All the assumptions and data used by the project participants are listed in the PoA-DD, including their references and sources;
- (b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PoA-DD;
- (c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- (d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PoA-DD;
- (e) The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

3.6.4 Algorithms and/or formulae used to determine emission reductions (92-93)

The steps taken to assess the requirement outlined in paragraph 89 the VVM are described below:

CME has used the algorithm and formulae in line with the AMS II.C Version 13 and corresponding tools to calculate emission factor stated AMS ID (EB63 Annex 19 Methodological Tool "Tool to calculate the emission factor for an electricity system" version 02.2.1).

The CME has described detailed algorithms and calculations under Section E.4 and E.6 of PoA-DD respectively, which covers formulae used for each individual parameter as explained below.

Baseline emission calculated by:

$$BE_y = E_{BL,y} * EF_{CO_2,ELEC,y} + Q_{ref, BL} * GWP_{ref,BL}$$

Where BE_y = baseline emissions in year y (tCO₂e)

$E_{BL,y}$ = energy consumption in baseline in year y (kWh)

$EF_{CO_2,ELEC,y}$ = emission factor in year y calculated in accordance with the provision in AMS-I.D (tCO₂/MWh)

The baseline emission will be calculated using Equation 1 of AMS II.C, Version 13 and the details for validation of monitoring parameter are provided in the table in Section 3.6.3 of this validation report. The baseline energy consumption (kWh) shall be monitored during ex ante monitoring campaign (as mentioned in the Eligibility criteria (c) and (j) in PoA DD Section A.4.2.2).

As per the theoretical approach, (which will be used for cross checking purpose) the energy consumption (kWh) and cooling load (TRH) will be based on 1 month measurement campaign. This one month baseline period was determined by following the ASHRAE guideline 14 section 5.2.2 where stated that selecting the baseline period generally is the period immediately before retrofit.

This guideline also prescribes that baseline monitoring period selection should take drastic seasonal variation in account. In Singapore context, there are no significant seasonal variations observed, hence selected one month baseline monitoring period selected by CME found appropriate and conservative.

$Q_{ref, BL}$: CME has established 2 ways to arrive at the quantity of refrigerant charge in baseline chillers

- By checking the Technical specifications of baseline chillers

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- In case this information is not available then using default value as per guidance from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories. As per table 7.9 this refrigerant charge range may be from between 10kg to 2,000kg per chiller and a maximum leakage of 15% per annum is determined for developing countries. Further - The refrigerant charge used for these calculations is a composite kg/kW value for screw and centrifugal compressors integrated over the size range of interest. Individual sources for these values were 1) those published in the original TEWI report, 2) those estimated by an Ad-Hoc subcommittee formed by ARI member companies, and 3) those published in the 1995 UNEP Report (Fischer 1991, Hourahan 1996a, UNEP 1995).

For $GWP_{ref,BL}$ of refrigerant IPCC default value is applied .

As per Theoretical approach CME Crosschecks baseline calculations using standard HVAC calculations. CME follows Methodological approach to calculate Baseline emissions, Project Emissions and Emission reductions.

Equations used for crosschecking as per Theoretical approach are given as below.

Baseline efficiency: $\text{Input (kWh)}_{\text{baseline}} / \text{output (TR-H)}_{\text{baseline}}$

Baseline cooling loading = $\text{TR-H}_{\text{baseline}}$

Baseline consumption = baseline efficiency x baseline cooling load

Project emissions are calculated as stated in the methodology AMS II.C para 8

$$PE_y = EP_{J,y} * EF_{CO_2,y}$$

PE_y : Project emissions in year y (tCO₂e)

$EP_{J,y}$: energy consumption in project activity in year y. This shall be determined ex post based on monitored value.

Parameter	Unit	Value	Validation Opinion
Energy consumption in project activity	$EP_{J,y}$	kWh / year	Project electricity consumption is calculated using post retrofit monitoring of the project activity using 1 Minute interval monitoring system. The project activity energy consumption is calculated using formula KW Load x Operating hours / (1 – Ly). CME has considered 8760 hrs per year of operations and Ly = 0.03. This approach is found conservative and hence accepted.
Average annual quantity of refrigerant used in the baseline	$Q_{ref PJ,y}$	Ton	As per guidance from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories. As per table 7.9 – This refrigerant charge range may be from 10kg to 2,000kg per chiller and a maximum leakage of 15% per annum is determined for developing countries.
Global Warming Potential of the baseline refrigerant	$GWP_{ref PJ,y}$	tCO ₂ e/t refrigerant	IPCC default value obtained from (http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html)



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Emission factor for electricity or thermal baseline energy. The emissions associated with grid electricity consumption	$EF_{CO_2, y}$	Kg CO ₂ /kWh	Emission factor is the calculated value using published Simple operating margin and build margin values published by Singapore DNA, National Environmental Agency.
Project Emission	PE _y	tCO ₂ e / year	Calculated value using prescribed formulae from Approved Methodology. $PE_y = EP_{J,y} * EF_{CO_2,y}$

Emission reductions are calculated as per equation given under para 11 of AMS II.C:

$$ER_y = (BE_y - PE_y) - LE_y$$

LE_y (Leakage): there is no leakage included since the equipment is scrapped independently.

Emission reductions are calculated by deducting Project Emissions from Baseline Emissions.

Grid Emission Factor Calculation:

Grid emission factor is published by Singapore DNA which is National Environmental Agency on 25 Feb 2011 based on 3 years data 2007, 2008 and 2009.

CME decided to use the Ex ante option which complies with the EB 50 Annex 14 rules. A 3-year generation weighted average has been derived for the years, 2007, 2008 and 2009. The build and operating margins of the grid are considered as a product of the weighted average for each margin and summed to give the final value of the emission factor ($EF_{grid,CM,y}$) and expressed in kilograms CO₂ per kWh as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (kgCO₂/kWh)

$EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (kgCO₂/kWh)

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

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

Then the emission reduction will be calculated by energy saved per month x $EF_{grid,CM,y}$

where $EF_{grid,CM,y} = 0.4512$ kgCO₂/kWh

Hence the annual kWh energy saving x 0.4512kgCO₂/kWh / 1000 = tonCO₂e per annum.

Validation Team has validated the emission factor published by NEA on 25 Feb 2011, it is calculated as per the tool to calculate the emission factor for an electricity system EB63 Annex 19. The validation is done on site together with NEA to validate the data calculation by EMA (Energy Market Authority).

The Energy Market Authority (EMA) is a statutory board under the Ministry of Trade and Industry. EMA regulates the electricity and piped gas industries and district cooling services in



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designated areas, and is also responsible for ensuring the security, reliability and adequacy of electricity supply.

Each month Power generating companies will provide data to EMA and EMA will compute the data based on the tool to calculate the emission factor for an electricity system EB63 Annex 19. EMA has calculated the operating margin using simple operating margin stated in the Tool. EMA has calculated the simple OM emission factor according to the equation (1) stated in the Tool:

$$EF_{\text{grid, OM simple,y}} = \sum_m EG_{m,y} \times EF_{EL,m,y} / \sum_m EG_{m,y}$$

$EF_{\text{grid, OM simple,y}}$ = 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)

Validation team has validated the $EF_{EL,m,y}$ calculated based on the equation 1 with the data seen the quantity of fuel used, Net Calorific Value and IPCC value on emission factor of the fuel.

Also confirmed the build margin is calculated based on 2 condition stated by EMA:

- 1) 5 most recent new power plant addition to the grid since 2004 and
- 2) 20% of system generation in MWh.

Combined margin is calculated as the average of the sum of build margin and simple operating margin. Hence validation team confirms that emission factor calculated and published by the NEA and EMA is in line with the requirement of Tool to calculate emission factor of electrical system.

Also validation team has validated the baseline data collection (Category 1 reference 17 & 19) from 18 Dec 2010 to 21 Jan 2011 for energy kWh and cooling load TR-H and their efficiency kWh/TR-H.

Based on the above assessment, the validation team hereby confirms that:

- (a) All assumptions and data used by the project participants are listed in the PoA-DD, including their references and sources;
- (b) All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PoA-DD;
- (b) All values used in the PoA-DD are considered reasonable in the context of the proposed CDM project activity;
- (c) The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;
- (d) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PoA-DD.



3.7 Additionality of a project activity (97)

The steps taken and sources of information used, to cross-check the information contained in the PDD on this matter are described below:

CME has demonstrated the additionality of PoA by using Attachment A to Appendix B of the “Simplified Modalities & Procedures for small scale CDM Project Activities, where the selection of various barriers is recommended. Out of 4 barriers recommended by the Attachment A to Appendix B, CME has selected barrier due to prevailing practice in the host country as an appropriate barrier which is described in PoA-DD section E.5. Also CME has taken a decision to prove additionality at PoA level only.

This decision of proving additionality at PoA level was validated based on arguments and relevant evidences by CME during validation. Detail of validation opinion on additionality is as given below

In accordance with EB Guideline on “Demonstration of additionality of small scale project activity”, (version 09.0, EB 68 Annex 27). To explain further, how achieving chiller plant efficiency of 0.60 – 0.65 KW/RT faces prevailing practice barrier, CME has referred to the developmental background on energy efficiency measures in Singapore, specifically for Chiller plants systems exists and getting implemented.

Host country has ratified the Kyoto Protocol in Year 2006 and since then there is a movement observed towards achieving energy efficiency in Singapore. As per the historical data made available by the countries regulatory body National Environmental Agency, it was observed that there were only 6 projects implemented prior to this PoA, with an intention to achieve specific energy efficiency coefficient in the range of 0.60 - 0.65 KW/TR for chiller plant system.

Out of all these implemented projects only SingPost is known to match with the technology and integrated design approach implemented in the proposed PoA project i.e. replacement of old energy in efficient chillers and ancillary equipment with energy efficient water cooled chiller and equipment's, pipelines and installation of 1 minute interval monitoring system. Validation team has verified list of projects provided in the PoA DD by CME and found that 4 Projects have achieved energy efficiency by means of either optimization of chillers or ancillary equipment's or by reducing the operational hours (i.e. Shutting down Chiller plants in night) and there is no consistency in achieving energy efficiency of 0.65 KW/TR.

Sector	Company	Measures implemented
Industry	Systems on Silicon Manufacturing Co. Pte Ltd (SSMC)	Optimization of chillers: The optimal level of refrigerant charging was determined for best chiller efficiency and controller was implemented to maintain optimal performance under all operating/loading conditions. <i>Validation Conclusion: The Company received EASe Grant for reducing energy bill, however there is no evidence to suggest that Chiller plant system is able to achieve specific Energy efficiency Coefficient of 0.65 and better.</i>
	Singapore Oxygen Air Liquide Pte Ltd (SOXAL)	Shutting down of chiller plant at night: Before the implementation of this measure, the chiller plant was operated 24 hours daily although the facility only operates from 8am to 7pm on a 5.5-day week. The main reason for this was to prevent condensation from taking place. The shutdown sequence was modified such that the AHUs are switched off only after a period of time where the supply, exhaust and scrubber fans have stopped operation. This minimized condensation problems.



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		<p>Retrofit of chiller plant: The existing chillers and associated pumps were replaced with more efficient ones. System efficiency improved by 38%.</p> <p>Optimization of chilled water pumps: Variable speed drives were installed on the new chilled water pumps, allowing them to run relative to the cooling load demand.</p> <p>Optimization of chilled water primary pumps: The pumps were optimized by converting direct-on-line to variable speed drive that supplies power to the pumps at reduced speed depending on pressure.</p> <p>Validation Conclusion: The Company received EASe Grant for reducing energy bill, however there is no evidence to suggest that Chiller plant system is able to achieve specific Energy efficiency Coefficient of 0.65 and better.</p>
Building	Singapore Post Center	<p>The chiller plant system efficiency is improved from 1.1 kW/RT to 0.6kW/RT via the following measures Chiller replacement: Three (3) numbers of the existing chillers were replaced with more efficient ones. Optimization of pumps and cooling towers. Variable speed drives were installed to the pumps and cooling towers including 1 Minute interval monitoring system.</p> <p>Validation Conclusion: It is observed that the Building is able to demonstrate that specific energy efficiency of 0.65 kW/TR is achieved consistently by the Chiller plant system.</p>
	Singapore Airline House	<p>Optimization of pumps and cooling towers: A 20% improvement in chiller plant system efficiency was achieved by installing new condenser pumps and installing variable speed drives to chilled water pumps and cooling towers.</p> <p>Validation Conclusion: The Company received EASe Grant for reducing energy bill, however there is no evidence to suggest that Chiller plant system is able to achieve specific Energy efficiency Coefficient of 0.65 and better.</p>

In case of SingPost project, a complete retrofit of Chiller Plant System took place and hence it was considered as similar type of energy efficiency project. However it was observed that there is a clear distinction between the SingPost project and the proposed PoA project i.e. SingPost project was conceived before Singapore acceded Kyoto Protocol as well it is availing EASE grant.

Also it was further observed that after the implementation of SingPost project in year 2007, there is no known precedence of implementing same technology and integrated design approach for achieving the Energy efficiency coefficient of 0.65 KW/TR in Singapore by any other building till the CME came up with the PoA project. Initially CME developed Galen project as 1st CPA to be included in the PoA project, however due to the start date problem i.e. CPA start date was earlier than PoA GSC date, Galen Project was not qualified to be the 1st CPA. Capricorn also belongs to the same CPA owner and it was implemented later with start date of 16/11/2010. This change in the 1st real case CPA was approved by UNFCCC through mail communication Dtd. 27/06/2011& 22/07/2011, which is explained in the PoA Validation Report adequately.

From the known sources and publically available information it is validated that the general trend of energy efficiency in chillier plant system in Singapore is 1.36 KW/TR on an average. This was also confirmed by the Singapore DNA, National Environmental Agency, through a letter Reference NEA/EP/RCD/10-00068-1 dated on 13 July 2010 From this it was observed that installation of Chiller plant Systems using an integrated Design approach to achieve better

Energy Efficiency coefficient in the range of 0.60 – 0.65 KW/TR is not a prevailing practice in host country Singapore.

1. Prevailing practice or existing regulatory policy requirements would have led to implementation of technology which higher emission.

Further it is validated that there is no regulatory requirement in Singapore that the building owners have to use energy efficient Chiller Plant Systems with Energy Efficiency coefficient of 0.65 kW/TR or better. Although there are certain initiatives by the Singapore government to promote energy efficiency by means of publishing code of practice and energy efficiency standards such as SS530, there is no specific requirement/mandates for actually achieving an energy efficiency coefficient of 0.65 kW/TR. From the statistical data provided by National Environmental Agency of Singapore, it can be concluded that most of the energy efficient chiller plant systems operating in existing commercial and industrial buildings have a specific energy efficiency coefficient of about 1.36 kW/TR, which is shown in the above graph:

It was also evident that the implementation of energy efficient chiller plant in Singapore is encouraged by the Singapore government through various schemes e.g.

- Energy Efficiency Improvement Assistance Scheme (EASe) – Started in 2005 and provides 50% of consultancy fees, there is no specific energy efficiency norm established.
- GREET (Grant For Energy Efficient Technology) – Launched on 24th May 2011, there is no specific energy efficiency norm established and requires that project should not commence operation before approval of grant. In this specific PoA the decision on implementation was taken much before the launch of the GREET Scheme, and hence it is confirmed that the project is not implemented due to the implementation of GREET scheme.
- Green Mark Scheme – Awards 7 point for 0.9 KW/TR energy efficiency and 13points (Max) if 0.60 KW/TR energy Efficiency for Chiller plant systems.
- Code of Practice – General Guidelines only.

However the response to such schemes is found very poor, i.e. hardly 10 buildings are found registered under GREET scheme, which is insignificant in highly urbanized Singapore, also there is no credible data/ information available to show that energy efficiency achieved by these projects is consistently monitored and reported. Whereas the proposed PoA is designed to monitor and report chiller plant efficiency in consistent

Under the initiative of energy efficiency improvement in Singapore, the government has an objective to convert 80% of existing buildings as energy efficient buildings by 2030. In line with this objective different government agencies such as Building Construction Authority (BCA). BCA's Green Mark is the popular scheme, under which, established the basic criteria is specific consumption level 0.9 KW/TR for achieving 7 points and a maximum of 13 points shall be awarded when 0.6 KW/TR or better energy efficiency is achieved by a chiller plant /Ref 21/. None of these schemes are binding or a legal obligation upon the project owners or developers.

Hence, the validation team has concluded that installing chillers with specific energy consumption rating of 0.65 kW/TR is a not a prevailing practice in Singapore which can however become a



benchmark for future development. It is confirmed that the existing or present trend of installation of chillers have an average specific energy consumption of 0.74 - 1.36kW/TR (this value cannot be fixed) that have led to 'implementation of a technology' with higher emissions.

2. Best practice examples include but are not limited to, the demonstration that project is among the first of its kind in terms of technology, geography

In context of host country Singapore, Chiller plant system with an integrated design approach to achieve specific energy consumption of 0.65 KW/Tr or better is one of benchmark example in line with ASHRAE guideline and ARI 550 to arrive at cooling efficiency and establishing the monitoring and measurement requirements in line with ASHRAE 14 for all key operating parameters at 1-minute intervals.

CME has utilized latest technology i.e. EMS Software to achieve this 1-minute interval monitoring requirement, and it is made mandatory for all CPAs to be incorporated in this PoA.

This 1 minute interval monitoring system will be able to track and store monitoring data for the analysis of energy efficiency of the system on continual basis. The monitoring system comprises of highly technical hardware and software tools with adequate accuracy levels, which are listed as below:

- Temperature sensors,
- Data acquisition System
- Data logging system
- Magnetic flow meter
- KW power meter

From sectoral knowledge of validation team and discussion with different ESCOs it is understood that achieving chiller energy efficiency of 0.65 kWh/TR or better with accurate measurement and data tracking under the guidance of ASHRAE 14 at 1-minute intervals is highly difficult task. Hence, ESCOs are reluctant to provide performance guarantee for extended duration.

From the description of technology provided in the PoA & CPA DD's, Validation team observed that the technology adopted to achieve the energy efficiency coefficient of 0.65 KW/TR involves an integrated Design approach of retrofitting the chiller plant with energy efficient equipment's (i.e. Chillers, pumps, Cooling towers etc.) and monitoring at a 1 minute interval using EMS (Electronic Monitoring System) in accordance with ASHRAE 14 Guideline, is not a baseline trend and PoA ensures that only such technology implementation through retrofits of existing chiller plants are eligible to include as CPA in the future.

Based on the arguments presented in the PoA DD and supporting evidences, Validation team confirms that the proposed Programme of Activities faces barrier due to prevailing practice, and it is proven that achieving energy efficiency coefficient in the range of 0.60 – 0.65 KW/TR becomes a real and prohibitive barrier that can hardly be overcome by additional financial means of grant, subsidies etc. made available by the Singapore Government to promote energy efficiency.

3.7.1 Prior consideration of the clean development mechanism (104)

The validation team validated the project activity start date provided in the PoA-DD by verified the webhosted dated for the 1st PoA-DD version 1 on 06/04/2010.



As per the present EB rules, Prior Consideration of PoA is not an requirement. CME only has to ensure the CPA start date under the PoA shall not before the start date of the PoA where in this case the real CPA submitted together with this PoA was on 16/11/2010.

3.7.1.1 Historical information on project timeline

The PoA start date is on 06/04/2010 as the webhosted date for global stakeholder consultation and as per EB49 Annex 22, it falls under the category of new project activities. Hence, Historical information on project timeline with respect to any real action prior to start ate of project activity is not applicable.

Based on the initial validation process outcome the project documentation has undergone a significant change, which calls for re webhosting of the project documentation for global stake holders comments. The changes in the Project documentation are listed section 3.4 of this report.

Re web hosting of the changed project documentation was done on 15/12/2011 for global stake holder consultation process.

3.7.2 Identification of alternatives (107)

The approved methodology AMS II.C version 13 does not require identification of alternatives. Hence it is not applicable to this PoA.

3.7.3 Investment analysis (114)

CME did not select the investment analysis to claim for additionality, hence, it is not applicable to this PoA.

3.7.4 Barrier analysis (118)

The steps taken to assess the relevant information contained in the PDD against each barrier are described below.

CME has demonstrated the additionality on barrier due to prevailing practice which has described above in section 3.7.

The validation team hereby confirms that the barrier analysis performed is credible.

3.7.5 Common practice analysis (121)

CME did not select the common practice analysis to claim for additionality, hence, it is not applicable to this PoA.

3.8 Monitoring plan (124)

The validation team hereby confirms that the monitoring plan complies with the requirements of the methodology.

The steps taken to assess whether the monitoring arrangements described in the monitoring plan are feasible within the project design are described below.

CME has described the monitored plan will monitor the follow data:

1. Temperature for chilled water supply and return
2. Rate of flow of chilled water
3. Electrical energy demand for each and every equipment within the chiller plant.



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4. *pi* - Power consumption of one chiller system baseline, which is the weighted Average of baseline chiller system. This is monitored using Baseline monitoring records for one month, which is a ex ante value.
5. *oi* - Average annual operating hours of the Chiller plant in Baseline as well as project scenario which is fixed value using $365 \times 24 = 8760$ calculation, which is Ex ante value
6. *ly* - Average annual technical grid losses – Technical grid loss in Singapore is derived by using publically available data published by Government of Singapore through EMA (Energy Market Authority), which shows that the Technical Grid loss for Singapore is defined as 3%, which is a ex ante value./Ref 22/

The measurement of data will be at 1 minute interval and data will be stored in Energy Management Software (EMS).

These data will be computed to account for

1. Chiller plant loading (TR-tons of refrigeration) over a times series to obtain TR-H and
2. Electrical Energy Consumption in kW over a time series to obtain kW-H.

These two values (TR-H and kW-H) are computed independently to determine the energy efficiency coefficient in kW/TR.

CME has identified following monitoring equipment's to fulfil the monitoring plan established in PoA DD :

1. Power transducer to monitor the total power demand including all chiller plant equipment to determine the electrical power demand-baseline and power demand during project activity in kW.
2. Magnetic or ultrasonic flow meter to monitor the chilled water flow produced by the chiller plant in litres / second use in baseline and project activity
3. Thermistor probe to monitor the chilled water supply and return temperature in baseline in degree C.
4. Scrapped record from independent agency for old chillers and its equipment. The serial number of the scrapped chiller indicated in the scrap record.

Accuracy requirements and calibration needs are clearly identified against each individual monitoring equipment's, which is found in line with manufacturing specifications.

EMS software installed by the CME for monitoring operating performance of the Chiller system has proven track record which provides CME with the ability to centrally monitor, analyze, and control chiller system to achieve desired energy-efficiency in the chiller operations. Fundamentally, an EMS is an information and control system used to optimize operations of end-use equipment using a computer with application software, a custom-programmed database, a communications network, and a series of control devices and data sensors.

An EMS operates chiller system equipments through a control loop, which is comprised of controllers, sensors, switches, relays, and end devices. Monitoring parameters included for monitoring are supply and return air temperature, chilled water temperature, ambient temperature and humidity levels, energy consumption etc. EMS is designed to function effectively to keep track of following operations with high reliability at 1 minute interval

- Facility environmental conditioning



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- Environmental system monitoring and control
- Supervisory monitoring and control
- Supervisory control strategies
- Optimum start/stop
- Duty cycling
- Load shedding
- Load shifting
- Data analysis tools for energy accounting

EMS also permits the evaluation of system performance, historic data trends, and chiller system operation to make effective decisions on methods that further optimize the system.

CME has decided to use the Ex ante option to determine Grid emission factor which complies with the EB50 Annex 14.regarding

Validation team has verified the calibration report (Category 1 reference 18) for the main equipment and scrap records (Category 1 reference 16) from third party Sun 88 Engineer to dispose off the old chiller units for the 1st real CPA project. Also during site visit at Carpracorn building verified the EMS system of capture the data of power and operating hours in order to calculate the energy consumption.

The validation team hereby confirms that the project participants are able to implement the monitoring plan.

3.9 Sustainable development (127)

The host Party's DNA confirmed the contribution of the project to the sustainable development of the host Party. Refer to item 3.1 of this report.

3.10 Local stakeholder consultation (130)

The steps taken to assess the adequacy of the local stakeholder consultation are described below.

The date of publication of the PoA-DD for stakeholder comments on 6th April 2010 for 30 days comments in UNFCC website with no comment received from public.

The local stakeholders consultation meeting was conducted on 2nd Feb 2010 (Category 1 reference 15). Different industrial sectors were invited for the stakeholders consultation session which include private sectors, government agency and investment companies. List of attended was signed by the attendant and meeting questionnaires were completed by attendant. Summary of the comments were listed in the PoA.

Validation team has sampled few local stakeholders through phone and also meeting with British High Commission Singapore. From the feedback gathered through all these sampled participants it was observed that there was no adverse comment received.

The validation team hereby confirms that the process of local stakeholder consultation is observed to be adequate.



3.11 Environmental impacts (133)

There is no regulatory requirement from host party Singapore government to do an environmental impact assessment for this replacement of high efficiency chiller plant.

CME however did carry out the environment assessment for internal control on waste can be generated from the replacement activities and defined all waste will be disposed off according to NEA waste disposal regulation.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PoA-DD has undergone several changes and hence it was web hosted tree times for Global Stakeholder Consultation Process. Following table gives detailed information on all three webhosting along with reasons for changes.

Webhosting Date	Reason for webhosting	Approved Methodology	Period of comment	Comments received
06/04/2010	Initial Webhosting of PoA Documents	AMS II-E / Ver 10	06/04/2010 to 05/05/2010	No Comment Received
20/08/2011	2 nd Webhosting due CPA Start Date is prior to the PoA start Date	AMS II-E/ Ver 10	20/08/2011 to 18/09/2011	No Comment Received
23/12/2011	3 rd Webhosting due to change in methodology	AMS II-C / Ver 10	23/12/2011 to 21/01/2012	No Comment Received

5 VALIDATION OPINION

Bureau Veritas Certification has performed a validation of the PoA- Climate Action Response Enterprise (CARE) for energy Efficiency in Chiller Plants Project in Singapore. The validation was performed on the basis of UNFCCC criteria and host country criteria and also on the criteria given to provide for consistent project operations, monitoring and reporting.

The validation consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

Project participant/s used the latest tool for demonstration of the additionality. In line with this tool, the PoA-DD provides analysis of barriers due to prevailing practice to determine that the project activity itself is not the baseline scenario.

By synthetic description of the project, the project is likely to result in reductions of GHG emissions partially. An analysis of the barriers due to prevailing practice demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of



the project activity. Given that the project is implemented and maintained as designed, the project is likely to achieve the estimated amount of emission reductions.

The review of the project design documentation (version 3) and the subsequent follow-up interviews have provided Bureau Veritas Certification with sufficient evidence to determine the fulfilment of stated criteria. In our opinion, the project correctly applies and meets the relevant UNFCCC requirements for the CDM and the relevant host country criteria. Bureau Veritas Certification thus requests registration of 'Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants' as CDM project activity.

6 REFERENCES

Category 1 Documents:

Documents provided by Type the name of the company that relate directly to the GHG components of the project.

- /1/ PoA-DD (Version 1) dated on 21 March 2010 Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plant
- /2/ PoA-DD (Version 2) dated on 18 July 2011– Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plant
- /3/ PoA-DD (Version 3)- 25 Nov 2011 Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plant
- /4/ Typical CDM-SSC-CPA-DD
- /5/ CPA-DD (Version 1) on 21 March 2010 Energy Efficiency in Chiller Plant at the Galen Building in Singapore Science Park II (The Galen CPA)
- /6/ CPA-DD (Version 2) on 18 July 2011– Energy efficiency in chiller plant at the Capricorn Building located at 1 Science Park Road, the Capricorn, Singapore 117528 ((Capricorn CPA)
- /7/ CPA-DD (Version 3) on 25 Nov 2011- Energy efficiency in chiller plant at the Capricorn Building located at 1 Science Park Road, the Capricorn, Singapore 117528 ((Capricorn CPA)
- /8/ Mandate and Request for inclusion into POA-Care for Energy Efficiency in Chiller Plants dated from 31 Dec 2009 from Climate Resource Exchange Pte Ltd with Singapore Science Park Limited
- /9/ Letter from Climate Resources Exchange and Standard Bank dated on April 20, 2010 to The Designated national Authority of Singapore National Environmental Agency for the subject on Request for Host Country Approval on the CARE (Climate Action Response Enterprise) CDM Program of Activities (PoA) for Energy Efficiency in Chiller Plants.
- /10/ Letter of Approval from UK DNA Department of Energy & Climate Change DNA ref: SB/03/2010 dated on 14 Oct 2010 to Standard Bank Plc for project title: Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants
- /11/ Letter of Approval from Singapore DNA- National Environmental Agency dated 20 September 2010 to Climate Resource Exchange Pte Ltd for project title: Climate



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- Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants
- /12/ Contract from Ascendas Services Pte Ltd on behalf of Singapore Science Park Ltd awarded to Trane Singapore (ref: AS/36/10-11/090) for the upgrading of existing air cooled chiller plant in Capricorn Building dated on 16 Nov 2010.
 - /13/ Certificate of completion and hand over of project for upgrading of existing air-cooled chiller system to water cooled chiller system at Science park road, The Capricorn from Trane Singapore to Ascendas in July 2011.
 - /14/ Contract for upgrading of existing air cooled chiller plant in Capricorn Building- Letter of undertaking for performance guarantee from Trane Singapore to Singapore Science Park Ltd.
 - /15/ Stakeholders Meeting Questionnaire completed by attendants on 02 Feb 2010
 - /16/ Scrap records of old chiller units together with the pumps no. 2 & no. 5 dated on 30/04/2011, no. 4 & no. 6 on 21/05/2011, no. 3 and no. 1 on 04/06/2011 from Sun 88 Engineering.
 - /17/ Trane baseline data tracking from 17/12/2010 to 21/01/2011 of Capricorn Building
 - /18/ Calibration reports of Power meters, flow meters, transducers and thermostats.
 - /19/ Capricorn Building M&V plan dated on 15/12/2011.
 - /20/ NEA letter (reference NEA/EP/RCD/10-00068-1) dated on 13 July 2010 to CRX to support using 0.65kWh energy efficiency or better and 1 minute interval data monitoring and measurement is not a prevailing practice in Singapore
 - /21/ Green Mark Assessment criteria for non residential existing Building (Version 2.1) http://bca.gov.sg/GreenMark/others/GM_NREB_V2.1.pdf
 - /22/ Emission reduction calculation spread sheet
 - /23/ Capricorn Building Baseline Summary 18 Dec 2010- 21 Jan 2011- PowerPoint presentation.
 - /24/ Refrigerant Handling for gas recovery from dismantled chiller at Capricorn Building – Service report of Trane (Report no. 09152/2011 dated 26/07/2011)
 - /25/ Capricorn Baseline Chiller Plant data- An excel sheet for monitoring baseline parameters during 18 Dec 2010- 21 Jan 2011
 - /26/ EMS software technical data sheet and configuration documents
 - /27/
 - /28/
 - /29/
 - /30/

Category 2 Documents:

Background documents related to the design and/or methodologies employed in the design or other reference documents.

- /1/ EB 55 Annex 1 (Version 01.2) Clean Development Mechanism Validation and Verification Manual
- /2/ AMS II.E (Version 10): Energy efficiency and fuel switching measures for



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- buildings.
- /3/ AMS II. C (Version 13): Demand-side energy efficiency activities for specific technologies
 - /4/ EB 63 Annex 19 AMSI.D Methodology Tool “ Tool to calculate the emission factor for an electricity system’ Version 02.2.1
 - /5/ EB49 Annex 22 (Version 03)- Guidelines on the demonstration and assessment of prior consideration of the CDM
 - /6/ EB 35 Annex 34- Non-binding best practice examples to demonstrate additionality for SSC project activities
 - /7/ EB 41 Annex 45 - “Guidance on the Assessment of investment Analysis.
 - /8/ ARI 550- Implication for Chilled – Water Plant Design
 - /9/ Ashrae Guidelines 14- 2002 Measurement of Energy and Demand Savings
 - /10/ Ashrae Guideline 22-2008 Instrumentation for Monitoring Central Chilled-Water Plant Efficiency
 - /11/ How to buy an energy Efficient Water-Cooled Electric chiller. Source from Energy Efficiency and renewable Energy Federal Energy Management Program
 - /12/ Singapore National Environment Agency website :
<http://app2.nea.gov.sg/legislation.aspx>
 - /13/ Singapore National Environment Agency website:
<http://app2.nea.gov.sg/topics.climatechange.aspx>
 - /14/ Energy Sustainability Unit website: www.esu.com.sg
 - /15/ Singapore National Environment Agency Website:
<http://app2.nea.gov.sg/index.aspx>
 - /16/ Singapore National Environment Agency Websites:
<http://app.mewr.gov.sg/web/Contents/contents.aspx?contId=683>
 - /17/ Singapore National Environment Agency Websites:
http://app2.nea.gov.sg/funds_home.aspx
 - /18/ Building Construction Authority website: <http://www.bac.gov.sg>
 - /19/ Building Construction Authority website:
<http://www.bac.gov.sg/Publications/publications.html>
 - /20/ Building Construction Authority website:
<http://www.bac.gov.sg/Professionals/GovAsst/govasst.html>
 - /21/ SS 530: 2006 Code Of Practice For Energy efficiency standard for building services and equipment
 - /22/ e-mail dated 20 Feb 2012 from MR. Bhaskar RAM of NEA for explanation on timeline for the baseline chiller efficiency selection
 - /23/ Energy Efficiency Improvement Assistance Scheme (EASe)- APEC Workshop on Sustainable Energy Development in the Built Environment dated on 14 April 2009 by NEA- Powerpoint presentation (publicly available document at http://www.egeec.apec.org/www/UploadFile/2.iii_EE_%20improvement_asstnce_scheme_EASe_Singapore.pdf)

**Persons interviewed:**

List persons interviewed during the validation or persons that contributed with other information that are not included in the documents listed above.

- /1/ Mr. Vinod Kesava- MD / CEO of Climate Resources Exchange- CME Representative
- /2/ Mr. Kes Shotam- Senior Managing Director of Climate Resources Exchange- CME Representative
- /3/ Mr. Jason Lim Kin Siong- M&E Section Property Management Manger of Ascendas Services Pte Ltd- Implementer of CPA
- /4/ Mr. Leo Teo Siak Hian- Senior Project Manager- Asia Energy Solutions of Trane Air-conditioning Pte Ltd- Service Provider for installation of Chiller Systems.
- /5/ Mr. Steven Kang-Sales & Business Development Director- Asia Energy Services of Trane Air-conditioning Pte Ltd- Service Provider for installation of Chiller Systems.
- /6/ Ms.Shobana Kesara from British High Commission Singapore- Stakeholder
- /7/ Mr. Ng Pei Chen- Senior Executive Climate Change programme Department of National Environmental Agency- DNA Representative
- /8/ Personnel from Energy Market Authority
- /9/ Mr. Lee E. Lock – Senior Consultant from Trane Air-Conditioning Pte Ltd- Service Provider for installation of Chiller Systems.
- /10/ Ms. Ma Zhan- Standard Bank- CME
- /11/ Mr. William Pazos- Standard Bank-CME



7 CURRICULA VITAE OF THE DOE'S VALIDATION TEAM MEMBERS

Include CV of Team Leader, Team Members, Experts, Internal technical Reviewer

Kusheru Wibowo (Team Leader) : A Chemical Engineer with over all 18 years of experience. He has worked with Standards in Bureau Verification Certification as Lead auditor for Quality Management system ISO 9001, Environmental Management System ISO 14001 for nine years. He has undergone intensive training on Clean Development Mechanism and has been involved in 8 CDM project validation/verification activities

So Shuk Ling (Team Member) : She is Bachelor degree in Chemistry and statistic and Master degree in Manufacturing and Polymer Science. He has been working in auditing for quality and Environmental management system more than 9 years and in Electronics Manufacturing company more than 8 years. She has undergone intensive training on Clean Development Mechanism.

HB Muralidhar: (Technical specialist): Lead auditor in Bureau Veritas Certification for Environmental Management System, Quality Management System and Occupation Health and Safety Management System. Graduate in Electrical Engineering with 25 years of experience power generation and distribution related fields as well as in management system auditing. He has undergone intensive training on Clean Development Mechanism. He is the technical expert & conducted validation and verification for more than 50 CDM projects.

S. Thyagaraj (Internal Technical Reviewer): He has a Bachelors of Technology degree in Chemical Engineering and over 7 years of experience in Technical services covering various functions like Production management, Energy conservation and Environment protection measures in the manufacturing industry including ISO 14001 based quality management systems. He is a certified Energy Manager from Bureau of Energy Efficiency. Working for the last 2.5 years in Bureau Veritas Certification (India) Pvt. Ltd. as Verifier-Climate change. Has undergone training related to Clean Development Mechanism and is currently involved in validation and verification of CDM project activities.

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APPENDIX A: POA VALIDATION PROTOCOL

Project- Title: Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants.

Table 1 Validation requirements based on the Clean Development Mechanism Validation and Verification Manual (Version 01.2) and methodology AMS-II.C (Version 13) – “Demand-side energy efficiency activities for specific technologies ”

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
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CHECKLIST QUESTION	Ref.	§	COMMENTS		Draft Concl	Final Concl
1. Approval			COUNTRY A (Singapore-Climate Resources Exchange Pte Ltd)	COUNTRY B (UK- Standard Bank Plc)		
a. Have all Parties involved approved the project activity?	VVM	44	Yes Climate Resources Exchange Pte Ltd	Yes Standard Bank Plc	OK	OK
b. Has the DNA of each Party indicated as being involved in the proposed CDM project activity in section A.3 of the PoA-DD provided a written letter of approval? (If yes, provide the reference of the letter of approval, any supporting documentation, and specify if the letter was received from the project participant or directly from the DNA)	VVM	45	LOA from National Environmental Agency Singapore on 20 Sept 2010	LOA from Department of Energy & Climate Change, London UK DNA ref: SB/03/2010 dated on 14 Oct 2010	OK	OK
c. Does the letter of approval from DNA of each Party involved:	VVM	45				
i. confirm that the Party is a Party of the Kyoto Protocol?	VVM	45.a	Singapore country has ratified Kyoto Protocol on 12 April 2006	The United Kingdom ratified the Kyoto Protocol on 31 st May 2002	OK	OK
ii. confirm that participation is voluntary?	VVM	45.b	Yes	Yes	OK	OK
iii. confirm that, in the case of the host Party, the proposed CDM project activity contributes to the sustainable development of the country?	VVM	45.c	Yes	Yes		
iv. Refers to the precise proposed CDM project activity title in the PoA-DD being submitted for registration?	VVM	45.d	Yes	Yes	OK	OK
d. Is(are) the letter(s) of approval unconditional with	VVM	46	Yes	Yes	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl	
respect to (i) to (iv) above?						
e. Has(ve) the letter(s) of approval been issued by the respective Party's designated national authority (DNA) and is valid for the CDM project activity under validation?	VVM	47	Yes National Environmental Agency, Singapore	Yes Energy & Climate Change Department, London	OK	OK
f. If there is doubt with respect to authenticity of the letter of approval?	VVM	48	No	No	OK	OK
g. If yes, was verified with the DNA that the letter of approval is authentic?	VVM	48	NA	NA	NA	NA
2. Participation			<i>PP1 (Climate Resources Exchange Pte Ltd)</i>	<i>PP2 (Standard Bank Plc)</i>		
a. Have all project participants been listed in a consistent manner in the project documentation?	VVM	51	Yes Climate Resources Exchange Pte Ltd (CRX)	Yes Standard Bank Plc (SBP)	OK	OK
b. Has the participation of the project participants in the project activity been approved by a Party to the Kyoto Protocol?	VVM	51	Yes Refer to http://maindb.unfccc.int/public/country.pl?country=SG	Yes Refer to http://maindb.unfccc.int/public/country.pl?country=GB	OK	OK
c. Are the project participants listed in tabular form in section A.3 of the PoA-DD?	VVM	52	Yes	Yes	OK	OK
d. Is the information in section A.3 consistent with the contact details provided in annex 1 of the PoA-DD?	VVM	52	Yes	Yes	OK	OK
e. Has the participation of each of the project participants been approved by at least one Party	VVM	52	Yes refer to 1b above	Yes Refer to 1b above	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
involved, either in a letter of approval or in a separate letter specifically to approve participation? (Provide reference of the approval document for each of the project participants)					
f. Are any entities other than those approved as project participants included in these sections of the PoA-DD?	VVM	52	NO	NO	OK OK
g. Has the approval of participation issued from the relevant DNA?	VVM	53	Yes Refer to 1b above	Yes Refer to 1b above	OK OK
h. Is there doubt with respect to (g) above?	VVM	53	NO	NO	OK OK
i. If yes, was verified with the DNA that the approval of participation is valid for the proposed project participant?	VVM	53	NA	NA	NA NA
3A - Project Design Document-PoA					
a. Is the PoA-DD used as a basis for validation prepared in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website?	VVM	55	Yes. It is according to CDM SSC-PoA-DD)- Version 01		OK OK
b. Is the PoA-DD in accordance with the applicable CDM requirements for completing the PoA-DD?	VVM	56	Yes, it is according to CDM-SSC-PoA-DD Version 01 requirements,		OK OK
c. In CDM-SSC-PoA-DD section A.1 are following provided?	EB 33	Ann 43			
i. Title of project	EB 33	Ann 43	Climate Action Response Enterprise (CARE) for Energy Efficiency in Chiller Plants		OK OK
ii. Current version number and date of document	EB 33	Ann 43	Version 3 dated Nov 25, 2011		OK OK
d. In CDM-SSC-PoA-DD section A.2 are following provided?	EB 33	Ann 43			



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
i. Description of the general operating and implementing framework of PoA?	EB 33	Ann 43	Yes The program is intended to promote energy efficiency in Singapore's building sector by replacing inefficient chiller plants with those of more efficient design and technology to achieve an efficiency of 0.65 kW/TR or better.	OK	OK
ii. Description of Policy / measure or stated goal of PoA?	EB 33	Ann 43	Yes The PoA aims to help achieve Energy Efficiency and reduce consumption of electricity in Singapore in turn leading to reduction in GHG emissions from burning of fossil fuels from power generation.	OK	OK
iii. Confirmation of that the proposed PoA is a voluntary action by the coordinating / managing entity?	EB 33	Ann 43	Yes There is no mandatory / regulatory requirements in Singapore to replace the existing chillers with more energy efficient ones. The proposed PoA is a voluntary action by the managing entity. Both LoA letters for CRX and SBP stated the PoA is a voluntary action by both Parties.	OK	OK
e. In CDM-SSC-PoA-DD section A.3 are following provided in the tabular format?	EB 33	Ann 43			
i. Coordinating or managing entity of the PoA as the entity which communicates with the Board?	EB 33	Ann 43	Yes CRX will manage the PoA on behalf of SBP (the PoA sponsor). CRX and SBP will be joint focal points with respect to communication with the Board	OK	OK
ii. Project participants being registered in relation to the PoA. PP may or may not be involved in one of the CPAs related to the PoA.	EB 33	Ann 43	Yes CRX and SBP will be the project participant in PoA.	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
f. In CDM-SSC-PoA-DD section A.4.1 are following provided?	EB 33	Ann 43			
i. Location of the programme of activities provided	EB 34	Ann 43	Yes The Republic of Singapore	OK	OK
ii. In CDM-SSC-PoA-DD section A4.1.1 host party(ies) name provided?	EB 33	Ann 43	Yes The Republic of Singapore	OK	OK
iii. In CDM-SSC-PoA-DD section A4.1.2 is Physical / Geographical boundary provided? Definition of boundary for the PoA in terms of a geographical area (e.g municipality, region within a country, country or several countries) within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented, taking into consideration the requirement that all applicable nation and / or sectoral policies and regulations of each country within that chosen boundary	EB 33	Ann 43	Yes The Republic of Singapore Between Latitudes 1 ⁰ 09' North, 1 ⁰ 29'North and longitudes 103 ⁰ 26' east, 104 ⁰ 25' east	OK	OK
g. In CDM-SSC-PoA-DD section A.4.2 are description of a typical small scale CDM programme activities (CPA) provided?	EB 33	Ann 43	Yes Typical CPA shall be a commercial building in Singapore that can achieve an energy efficiency coefficient of 0.65 kW/TR or better and it has to fall within the eligibility criteria defined in the PoA-DD.	OK	OK
i. In CDM-SSC-PoA-DD section A4.2.1 a description of technology or measures to be employed by the SSC-CPA provided?	EB 33	Ann 43	Yes a) A complete retrofit and / or replacement of components of the chiller plants with equipment of much higher efficiency. And / or b) complete revision of the design of the chiller plants.	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
			The above two activities will be based on a thorough energy audit / technical carried out by technicians of calibre towards achieving an overall system efficiency of 0.65 kW/TR or better.		



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
ii. In CDM-SSC-PoA-DD section A4.2.2 description of eligibility criteria for inclusion of a SSC-CPA in the PoA provided? This section of A4.2.2 only a description of criteria for enrolling the CPA shall be described, the criteria for demonstration additionality of CPA shall be described in Section E5.	EB 33	Ann 43	Yes 14 eligibility criteria have been defined including the applicability condition of AMS II.C version 13 requirements.	OK	OK
h. In CDM-SSC-PoA-DD section A.4.3 is the description of how the anthropogenic emission of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (Assessment and demonstration of additionality)	EB 33	Ann 43	Yes Demonstration of additionality of the PoA using Attachment A to Appendix B of the " Simplified Modalities & Procedures for small scale CDM Project Activities. The PP selected to use Barrier due to prevailing practice.	OK	OK
i. Is the proposed PoA a voluntary coordinated action?	EB 33	Ann 43	Yes There is no mandatory requirement in Singapore to replace existing chiller with more energy efficient components.	OK	OK
ii. Demonstrated if the PoA is implementing a voluntary coordinated action, it would not be implemented in that absence of the PoA?	EB 33	Ann 43	Most buildings in Singapore have higher energy efficiency than 1 kW/TR or more, individual building owners do not have enough incentive or any legal requirements for them to replace their existing chillers before the expiry of the technical lifetime. PoA allows them the opportunities to participate in an island-wide program and avail CDM benefits with reduced transaction costs.	OK	OK
iii. Demonstrated if the PoA is implementing a mandatory policy / regulation, this would / is not	EB 33	Ann 43	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
enforced?					
iv. Demonstrated if mandatory a policy / regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy / regulation?	EB 33	Ann 43	NA	NA	NA
i. In CDM-SSC-PoA-DD section A.4.4 is Operational, management and monitoring plan for the programme of activities information provided as following (PoA)?	EB 33	Ann 43			
a. In CDM-SSC-PoA-DD section A4.4.1 Operational and management plan that record keeping system for each CPA under the PoA?	EB 33	Ann 43	Yes Record keeping has been defined for each CPA under the PoA	OK	OK
b. A system / procedure to avoid double accounting e.g to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA.	EB 33	Ann 43	Yes, CME will check the CPA is not part of de-bundle project under a large scale activity prior inclusion the CPA into the PoA.	OK	OK
c. The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity?	EB 33	Ann 43	Yes The CME will require the project implementers to declare they do not have another CPA under a registered or work-in-progress PoA implemented.	OK	OK
d. The provision to ensure that those operating the CPA are aware of an have agreed that	EB 33	Ann 43	The building owners will sign relevant legal agreements with the coordinating entity consenting to their buildings being included in the PoA.	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
their activity begin subscribed to the PoA			Site visit on 12 Oct 2011 meeting with CPA implementer and they have shown fully aware of the PoA criteria.		
j. In CDM-SSC-PoA-DD section A4.4.2 is monitoring plan provided the following information?	EB 33	Ann 43			
1. description of the proposed statistically sound sampling method / procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emission by source or removals by sinks of greenhouse gases achieved by CPAs under PoA?	EB 33	Ann 43	Yes, For CPAs the data can be gathered will be 1. Temperature for chilled water supply and return 2. rate of flow of chilled water 3. electrical energy demand for each and every equipment within the chiller plant The measurement of data at one minute intervals. The data is gathered using Energy Management Software (EMS) Site visit on 12 Oct 2011 seen the Energy management software (EMS) trending for those mentioned data	OK	OK
2. in case the coordination / managing entity opts for verification method that does not use sampling but verified each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that	EB 33	Ann 43	Yes No sampling method use. Each and every CPA that is included in the PoA will be validated.	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA.					
k. In CDM-SSC-PoA-DD section A.4.5 is public funding of the programme of activities (PoA) provided?	EB 33	Ann 43	No public funding used for this PoA	OK	OK
l. In CDM-SSC-PoA-DD section B.1 is the duration of the programme of activities provided?	EB 33	Ann 43			
i. Starting date of the programme of activities (PoA)?	EB 33	Ann 43	The start date of the PoA on 06 April 2010 for the 1 st PoA webhosted at UNFCCC for period of comments from 06 April 2010 to 05 May 2010 Note: 2 nd PoA version 2 dated on 25 July 2011 webhosted at UNFCCC on 20 Aug 2011-18 Sept 2011 3 rd PoA version 3 dated 25 Nov 2011 webhosted on 15 Dec 2011	OK	OK
ii. Length of the programme of activities (PoA)?			Yes 28 years	OK	OK
m. In CDM-SSC-PoA-DD section C are the following provided?	EB 33	Ann 43			
i. In CDM-SSC-PoA-DD section C.1 is level of which environmental	EB 33	Ann 43	Yes Indicated the second choice as Environmental	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
analysis as per requirement of the CDM modalities and procedures is undertaken indicated in the section and justify of the choice provided?			Analysis is done at SSC-CPA level and justification has been provided. Environmental analysis: scrapping of metal parts, disposal of refrigeration gas and oils and grease industrial waste from dismantle of the chiller		
ii. In CDM-SSC-PoA-DD section C2 is documentation on the analysis of the environmental impact, including transboundary impacts provided?	EB 33	Ann 43	Yes No trans-boundary movement involved cause the replaced equipment will be disposed as per permissible procedures and guidelines applicable to Singapore and / or provided by the NEA	OK	OK
iii. In CDM-SSC-PoA-DD section C3 is a statement on 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).	EB 33	Ann 43	Yes In accordance with the environmental regulations in Singapore, there is no law or regulation required for environmental impact assessment for energy efficiency project in replacing chiller plant.	OK	OK
n. In CDM-SSC-PoA-DD section D are following Stakeholder's comments provided?	EB 33	Ann 43			
i. In CDM-SSC-PoA-DD section D.1 is the level at which local stakeholder comments are invited indicated and justify the choice provided?	EB 33	Ann 43	Local stakeholder consultation is done at PoA level and justification is provided.	OK	OK
ii. In CDM-SSC-PoA-DD section D.2 is brief description how comments	EB 33	Ann 43	Yes Stakeholder meeting is on 03 Feb 2010 at the	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
by local stakeholders have been invited and complied?			premises of Thomson Reuters Communities. Various governmental agencies, NGOs, private sector participants and academics were invited through Thomson Reuters Communities network.		
iii. In CDM-SSC-PoA-DD section D.3 a summary of comments received provided?	EB 33	Ann 43	Yes Recorded 7 comments	OK	OK
iv. In CDM-SSC-PoA-DD section D.4 a report on how due account was taken of any comments received provided?	EB 33	Ann 43	Using survey forms to the participant and entire even was caught on video camera and minutes were captured during the question and answer session.	OK	OK
o. In CDM-SSC-PoA-DD section E. Application of a baseline and monitoring methodology are following provided?	EB 33	Ann 43			
i. In CDM-SSC-PoA-DD section E.1 is the title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA provided?	EB 33	Ann 43	Yes AMS II.E / version 10 Energy Efficiency and Fuel Switching Measures for Buildings was stated at PoA version 2 dated on 25 July 2011 but after action done due to CL 1, it has changed to AMS IIC. Version 13- Demand-side energy efficiency activities for specific technologies in PoA-DD version 3 dated on 25 Nov 2011.	OK	OK
ii. In CDM-SSC-PoA-DD section E.2 is justification of the choice of the methodology and why it is applicable to a SSC-CPA provided? Notes: in case of CPAs which individually do not exceed the SSC threshold, SSC methodologies may be used once they	EB 33	Ann 43	CL 1 has been raised on AMS II.E is related to energy efficiency & fuel savings initiatives implemented together. In this project, there is only improvement in energy efficiency. Please clarify. Revised the methodology using AMS II.C version	CL 1	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
have first been reviewed and, as needed, revised to account for leakage in the context of a SSC-CPA.			<p>13. Hence CL 1 closed.</p> <p>3 applicability criteria from the AMS II.C version 13 Each applicability provide the justification of choice for each CPA.</p> <ol style="list-style-type: none"> 1. CPA is comprise retrofit / installation of an energy efficiency chiller plant with 0.65 kW/TR better energy efficiency in a building / group of similar buildings. Also each CPA will not exceed energy saving of 60GWh per annum. 2. There are metering solutions directly measure and record the energy use within the chiller plant to ensure the criteria on the rated capacity or output or level of service is not significantly smaller (max 10%) than the baseline or significant larger (max. 50%) than the baseline. 3. PoA will be used CFC free refrigerants. EB34, paragraph 17 is one of the consideration stated in the PoA eligibility criteria. 		
iii. In CDM-SSC-PoA-DD section E.3 is description of the sources and gases included in the SSC-CPA boundary provided?	EB 33	Ann 43	Yes Mainly CO2 gas.	OK	OK
iv. In CDM-SSC-PoA-DD section E.4 is description of how the baseline scenario is identified and description of the identified baseline scenario provided?	EB 33	Ann 43	The baseline scenario was decided using the trapezoidal integration of area under curve with respect to energy consumption (KWH) and building loading (TRH) and under a time series. Baseline period was defined to follow the principle	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
			<p>prescribed in ASHRAE Guideline 14 section 5.2.2.</p> <p>System parameters measured in the baseline are air conditioning kW and kWh using a kW transducer at the main switchboard, including chillers, pumps, cooling towers, and, air-conditioning load using flow meters and thermostats on chilled water header supply and return.</p>		



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
v. In CDM-SSC-PoA-DD section E.5 is the description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA) provided as following:	EB 33	Ann 43			
i. In CDM-SSC-PoA-DD section E5.1 has project participants demonstrated, using the procedure provided in the baseline and monitoring methodology applied, additionality of a typical CPA?	EB 33	Ann 43	<p>Refer to CL 2</p> <p>PP has reply with revised the PoA-DD to have more data to justified the addtionality. Hence CL 2 closed.</p> <p>It is according to Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities.</p> <p>Revised the PoA-DD to describe the addtionioanlity with more information on 1) current technology, provide data from NEA (National Environmental Agency) of existing plant efficiency at average 1.36KW/TR and data on how many industry building achieved less than 0.65 KW /RT. 2) Design Know How 3) Incentive grant from NEA 4. Letter from NEA to support energy efficiency less than 0.65KW/RT is not Prevailing practice.</p> <p>Using barrier due to prevailing practice</p>	CL 2	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
ii. In CDM-SSC-PoA-DD section E5.2 has the project participant provided the key criteria for assessing additionality of a CPA when proposed to be included in the registered PoA. The criteria shall be based on additionality assessment undertaken in the E5.1 above?	EB 33	Ann 43	Refer to CL 2 Closed. Key criteria for assessment additionality of the CPA a) base on no mandatory requirement b) barrier due to prevailing practice	CL 2	OK
p. In CDM-SSC-PoA-DD section E6 Estimation of emission reductions of a CPA information provided as following?	EB 33	Ann 43			
i. In CDM-SSC-PoA-DD section E6.1 explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA provided?	EB 33	Ann 43	PoA DD has defined clearly on the methodology choices and the base line will be calculated as the option 1 of the baseline $BE_y = E_{BL,y} * EF_{CO2,ELEC,y} + Q_{ref,BL} * GWP_{ref,BL}$ Where the Q and GWP are not applicable in their project as justified in the PoA-DD they will only consider using lower GWP in refrigerant in the CPA. $EF_{CO2,ELEC,y}$ is obtained from NEA published data. $E_{BL,y}$ baseline consumption is calculated as per the formula defined in the PoA-DD and excel sheet has been submitted by PP for the following data calculation. Baseline efficiency: $input (kW-H)_{baseline} / output (TR-H)_{baseline}$ Post retrofit efficiency: $Input(kW-H)_{post-retrofit} / output (TR-H)_{post-retrofit}$ Energy saved per month = $(TR-H)_{baseline/month} * [(kW/TR)_{baseline(1 month)} - (kW/TR)_{post-retrofit(per month)}$	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
ii. In CDM-SSC-PoA-DD section E6.2 Equation, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA provided?	EB 33	Ann 43	<p>Yes</p> <p>Energy saved per month= $(TR-H)_{baseline/month} \times [(kW/TR)_{baseline(1\ month)} - (kW/TR)_{post-retrofit(per\ month)}]$</p> <p>Savings in kWh x Grid Emission factor = tons of emission reductions in tCO2.</p> <p>Under EB50 report- Annex 14: Methodological tool to calculate the emission factor for an electricity system, it states that: If the DNA of the host country has published a delineation of the project electricity system that is connected electricity systems, these delineations should be used"</p> <p>The Singapore DNA has published these numbers on Feb 25, 2011 which applies to CDM projects or programs in Singapore.</p> <p>CRX has decided to use the Ex ante option which complies with the EB50 Annex 14</p> <p>In order to calculate the overall grid emission factor, the build and operating margins of the grid are considered as a product of the weighted average for each margin and summed to give the final value of the emission factor ($EF_{grid,CM,y}$) and expressed in kilograms CO2 per kWh as follow: $EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$ The grid emission factor for Singapore is calculated</p>	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
			<p>as where default values of 50% have been used for the W_{OM} & W_{BM}</p> $EF_{grid,CM,y} = (0.5000 \times 50\%) + (0.4023 \times 50\%)$ $= 0.25 + 0.2012 = 0.4512 \text{ kg CO/ kWh}$ <p>CERs eligible = Energy saved in kWh x 0.4512 kg/kWh</p> <p>Emission factor validated at the EMA (Energy Market Authority) on site on 31 Oct 2011 by DOE to validate the data as calculated as per the Tool to calculate the emission factor for an electricity system EB63 Annex 19.</p>		



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
iii. In CDM-SSC-PoA-DD section E6.3 data and parameters that are to be reported in CDM-SSC-CPA-DD form with the following data/parameter on data unit, description source of data used, value applied, justification of the choice of data or description of measurement methods and procedures actually applied, any comments?	EB 33	Ann 43	Yes. Total 18 parameters: 1.Electrical Power Demand-kW- baseline 2.Electrical energy consumption in baseline(kWh) 3.Chilled Water flow demand in baseline- Litre/sec 4.Chilled water supply temperature in baseline-degree C 5.Chilled water return temperature in baseline-degree C 6. Chilled water cooling load in baseline-TR 7. Chilled water cooling load energy in baseline-TR-H 8. Electrical power demand during project activity-kW 9. electrical energy consumption during project activity- kWh 10. chilled water flow demand in project activity-Litre / sec 11. Chilled water supply temperature during project activity-degree C 12. chilled water return temperature in project activity-degree C 13. Chilled water cooling load in project activity (TR) 14. Chilled water cooling load energy in project activity (TR-H) 15. Annual chiller plant system cooling efficiency in project activity- kWh/TRH 16. Calculated annual electrical energy consumption of new chiller plant with reference to baseline scenario in project activity- kWh/year	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
			17. Calculated annual electrical energy savings of new chiller plant (project activity) with reference to baseline scenario- kW-H 18. Calculated grid emission factor (combined margin)		



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
q. In CDM-SSC-PoA-DD section E7 description of the monitoring plan for SSC-CPA are provided as following?	EB 33	Ann 43			
i. In CDM-SSC-PoA-DD section E7.1 data and parameters to be monitored by each SSC-CPA with the following data / parameters on data unit, description source of data to be used, value of data applied for the purpose of calculating expected emission reductions in Section B5, description of measurement methods and procedures to be applied, QA/QC procedures to be applied, any comments	EB 33	Ann 43	Yes 18 parameters as described above row.	OK	OK
ii. In CDM-SSC-PoA-DD section 7.2 is description of the monitoring plan for a SSC-CPA provide?	EB 33	Ann 43	Yes Post-retrofit monitoring procedures have been defined.	OK	OK
r. In CDM-SSC-PoA-DD section B.8 date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s) / entity(ies) provided?	EB 33	Ann 43	Yes March 5, 2010 by Vinod Kesava- Climate Resources Exchange Pte Ltd	OK	OK
a. In CDM-SSC-PoA-DD Annex 1 is Contact information on coordinating / managing entity and participants in the programme of activities provided?	EB 33	Ann 43	Yes	OK	OK
3B. Programme of activities	VVM	165			
a. Operational and management arrangements for the PoA	VVM	166			



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
i. is the operational and management arrangements which have been established by the coordinating / managing entity are suitable for the PoA being validated?	VVM	166	Yes	OK	OK
ii. do the coordinating / managing entity have control of all records and information related to the implementation of individual CPAs?	VVM	166	Yes Serial number will be given to each CPA	OK	OK
iii. is the coordinating / managing entity in a position to ensure each CPA is being operated in accordance with the specific requirements of the programme?	VVM	166	Yes CPA will sign a agreement letter with CRX	OK	OK
4. Project description					
a. Does the PoA-DD contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation?	VVM	58	Yes The program is to replace inefficient chiller plant in Singapore with new chiller has the efficiency of at least 0.65kW/TR or better to reduce the energy savings from this PoA which lead to CO2 emission reduction.	OK	OK
b. Is the description of the proposed CDM project activity as contained in the PoA-DD:	VVM	59	Yes		
i. sufficiently covering all relevant elements?	VVM	59	Yes	OK	OK
ii. accurate?	VVM	59	Refer to CL 2 CL 2 closed.	CL 2	OK
iii. providing the reader with a clear understanding of the nature of the proposed CDM project activity?	VVM	59	Yes		
iv. Are there any changes / modification compared to the webhosted PoA-DD	VVM	59	Yes Refer CL 1	CL1	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
			CL 1 closed The change due to using different methodology. PoA-DD version 1 and version 2 using AMS IIE Version 10 and PoA-DD version 3 using AMS IIC Version 13.		



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
c. Is the proposed CDM project activity in existing facilities or utilizing existing equipments?	VVM	60	Yes In existing facilities to replace or retrofit the chiller system	OK	OK
d. Is the CDM project activity one of the following types:	VVM	60			
i. Large scale?	VVM	60	No It is a small scale project	NA	NA
ii. Non-bundled small scale projects with emission reductions exceeding 15,000 tonnes per year?	VVM	60	NA	NA	NA
iii. Bundled small scale projects, each with emission reductions not exceeding 15,000 tonnes?	VVM	60	NA	NA	NA
e. If yes to (c) and (d) above, was a physical site inspection conducted to confirm that the description in the PoA-DD reflects the proposed CDM project activity, unless other means are specified in the methodology?	VVM	60	Yes 1 st CPA site visit on 12 Oct 2011 at CPA project level at Capricorn@ 1 Science Park Road, Science park II, Singapore 117528	OK	OK
f. If yes to (d.iii) above, was the number of physical site visits base on sampling?	VVM	60	No sampling	OK	OK
g. If yes is the sampling size appropriately justified through statistical analysis?	VVM	60	NA	NA	NA
h. For other individual proposed small scale CDM project activities with emission reductions not exceeding 15,000 tonnes per year, was a physical site inspection conducted?	VVM	61	Refer to above section 4e	OK	OK
i. For all other proposed CDM project activities not referred to in paragraphs 59 – 61, and for other individual proposed small scale CDM project	VVM	62	NA	NA	NA



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
activities with emission reductions not exceeding 15,000 tonnes per year, was a physical site inspection conducted?					
j. If no, was it appropriately justified?	VVM	62	NA	NA	NA
k. Does the proposed CDM project activity involve the alteration of an existing installation or process?	VVM	63	Yes. It is a replacement of air cooled chiller to water cooled chiller	OK	OK
l. If yes, does the project description clearly state the differences resulting from the project activity compared to the pre-project situation?	VVM	63	Yes	OK	OK
5. Baseline and monitoring methodology					
a. General requirement					
a. Do the baseline and monitoring methodologies selected by the project participants comply with the methodologies previously approved by the CDM Executive Board?	VVM	65	Yes According to AMS II C Version 13	OK	OK
b. Is the selected methodology applicable to the project activity?	VVM	66	Refer to (5.b.a) below	-	-
c. Had the PP correctly applied the selected methodology?	VVM	66	Refer to (5.b.d) below	-	-
d. Had the selected methodology been correctly applied with respect to project boundary?	VVM	67	Refer to (5.c) below	-	-
e. Had the selected methodology been correctly applied with respect to baseline identification?	VVM	67	Refer to (5.d) below	-	-
f. Had the selected methodology been correctly applied with respect to Algorithms and/or formulae used to determine emission reductions?	VVM	67	Refer to (5.e) below	-	-
g. Had the selected methodology been correctly applied with respect to additionality?	VVM	67	Refer to (6) below	-	-



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
i. Specific questions per methodology regarding application of the methodology with respect to additionality			There is no specific additionality mentioned in the AMS II C / Version 13. They are following Appendix B of the simplified modalities and procedures for small-scale CDM project activities	OK	OK
h. Had the selected methodology been correctly applied with respect to monitoring methodology?	VVM	67	Refer to (7) below	-	-
i. Specific questions per methodology regarding application of the methodology with respect to monitoring methodology.			Refer to (7) below		
<i>b. Applicability of the selected methodology to the project activity</i>					
a. Is the selected baseline and monitoring methodology, previously approved by the CDM Executive Board, applicable to the project activity including that the used version is valid?	VVM	68	Yes According to AMS II.C Version 13	OK	OK
i. are all the technology / measure mentioned in the methodology regarding applicability have been followed?			Yes 3 applicability are mentioned in the AMS II.C version 13	OK	OK
b. Has the DOE applied specific guidance provided by the CDM Executive Board in respect to the applicable approved methodology?	VVM	69	As per the AMS II.C Version 13 and CDM rules	OK	OK
c. Is the methodology correctly quoted?	VVM	70	PoA using AMS II.E is related to energy efficiency & fuel savings initiatives implemented together. In this project, there is only improvement in energy efficiency, please clarify- CL1 CL 1 closed Revised the PoA using AMS II.C Version 13	CL 1	OK
d. Are the applicability conditions of the methodology met?	VVM	71			



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
i. Does the Project Activity encourage the adoption of energy-efficient equipment, lamps, ballasts, refrigerators, motor, fans, air conditioners, appliance, etc at many sites?	AMS	II.C	It is energy efficiency chiller improvement implemented at single building.	OK	OK
ii. Will the technology / technologies replace existing equipment or be installed at new sites	AMS	II.C	It is energy efficiency chiller (ie. 0.65kWh/TR) replacement on inefficient chiller (>1.2-1.8 kWh/TR) in Singapore	OK	OK
iii. In the case of new facilities, was the baseline scenario determined as per the procedures described in the general guidance to SSC methodologies under the section Type II and III Greenfield projects (new facilities)	AMS	II.C	Yes It is following Type II of AMS IIC option 1 of baseline.	OK	OK
iv. Does the project activity involve electrical end us energy efficiency technology?	AMS	II.C	Yes Using energy efficiency equipment (chillers, cooling towers, pumps, size of pipes, routing, monitoring system / bas, etc) and inter-linking these components optimally to deliver the required cooling load at lower electricity consumptions	OK	OK
v. If yes, is the aggregate energy savings by a single project exceed the equivalent of 60GWh per year? Note: the aggregate energy savings by a single project may not exceed the equivalent of 60GWh per year.	AMS	II.C	No It does not exceed to 60GWh per year.	OK	OK
vi. Does the project activity involve fossil fuel end use energy efficient technologies	AMS	II.C	No It used electrical end use technology- water cooled chiller	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
vii. If yes, is the aggregate energy savings by a single project exceed 180 GWh thermal per year in fuel input? Note: The aggregate energy savings by a single project may not exceed 180 GWh thermal per year in fuel input.	AMS	II.C	NA	NA	NA
viii. For each replaced appliance/equipment, is the capacity or output or level of service (e.g light output, room temperature and comfort, the rated output capacity of air-conditioners etc) not significantly smaller (maximum-10%) than the baseline or significantly larger (maximum+ 50%) than the baseline	AMS	IIC	There are metering solution to monitor each replaced appliance / equipment that their rated output is not significantly smaller 10% also not significantly larger than 50% than the baseline.	OK	OK
ix. If the energy efficient equipment contains refrigerants, then are the refrigerants used in the project case CFC free?	AMS	IIC	CFC free refrigerants such as R123 or R134a to be used in the PoA	OK	OK
x. Are project emissions from the baseline refrigerant and/or project refrigerants considered in accordance with the guidance of the Board (EB34, paragraph 17)?	AMS	IIC	Yes PoA will use the refrigerants in either the baseline or the project activity as the emission from refrigerants in the CPA must be equal or lower than the baseline refrigerant type. Hence, the refrigerant leakage emission can be neglected.	OK	OK
xi. Is the claim for credits of emission reductions only due to the reduction in electricity consumption from use of more efficient equipment / appliances?	AMS	IIC	Yes Using energy efficiency equipment (chillers, cooling towers, pumps, size of pipes, routing, monitoring system / bas, etc) and inter-linking these components optimally to deliver the required cooling load at lower electricity consumptions	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
xii. Does the project activity involves the replacement of equipment?	AMS	IIC	Yes Replace air cooled chiller to water cooler chiller.	OK	OK
xiii. Is the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped?	AMS	IIC	Yes Replaced equipment is scrapped independently , hence, the leakage effect is neglected in the PoA.	OK	OK
e. Is the project activity expected to result in emissions other than those allowed by the methodology?	VVM	71	No	OK	OK
f. Is the choice of the methodology justified?	VVM	71	Refer to CL 1 Closed Explained in CDM-SSC-PoA-DD section E6.1	CL 1	OK
g. Have the project participants shown that the project activity meets each of the applicability conditions or the approved methodology?	VVM	71	Refer to (5.b.d) above	CL 1	OK
h. Have the project participants shown that the project activity meets each of the applicability conditions of any tool or other methodology component referred to the methodology?	VVM	71	Yes Validated with EMA that the emission factor is calculated as per the Tool to calculate the emission factor for an electricity system version 02.2.1 (EB 63 Annex 19).	OK	OK
i. Did the project activity fall under category Type II and III Greenfield Projects (new facilities)?	AMS	II.C	Type II	OK	OK
ii. In such case did the project participant use a Type II and Type III small-scale methodology?	AMS	II.C	Yes Using type II small scale methodology	OK	OK
iii. If yes, is it demonstrated that the most plausible baseline scenario for this project activity is the baseline provided in the respective Type II and III small scale methodology?	AMS	II.C	Yes It follows the AMS II C that emission baseline is base on option 1 of baseline.	OK	OK
iv. Did the demonstration include the assessment of the alternatives of the project	AMS	II.C	NA Not a requirement from AMS II.C	NA	NA



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
activity?					
v. For the purpose of the demonstration, did the project participants apply the steps 1 to 3 of the latest version of "Combined tool to identify the baseline scenario and demonstrate additionality" to identify the baseline scenario?	AMS	II.C	NA Using Attachment A to Appendix B of the "Simplified Modalities & Procedures for small-scale CDM Project Activities" to demonstration of additionality to this small scale PoA.	NA	NA
vi. Is the identified baseline scenario the same as the baseline of the methodology?	AMS	II.C	Yes It is following the Option 1 of the baseline stated in the methodology as the product of the baseline energy consumption of equipment / appliances and the emission factor for the electricity displaced.	OK	OK
vii. If so, is it demonstrated that the implementation of the project as "the proposed project activity undertaken without begin registered as CDM" is not the common practice in the region?	AMS	II.C	Yes Demonstrated barrier due to prevailing practice	OK	OK
i. Is the DOE, based on local and sectoral knowledge, aware that comparable information is available from sources other than that used in the PoA-DD?	VVM	71	Yes, other similar CDM projects	OK	OK
j. If yes, was the PoA-DD cross checked against the other sources to confirm that the project activity meets the applicability conditions of the methodology? (provide the reference to these choices)	VVM	71	Compared to another data we have got during previous validation process	OK	OK
k. Can a determination regarding the applicability of the selected methodology to the proposed CDM project activity be made?	VVM	72	Refer to CL 1 Closed	CL 1	OK
l. If no, clarification of the methodology was	VVM	72	NA	NA	NA



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
requested, in accordance with the guidance provided by the CDM Executive Board?					
m. If answer to (5.b.d) above is “no”, revision or deviation from the methodology was requested, in accordance with the guidance provided by the CDM Executive Board?	VVM	73	NA	NA	NA
n. If yes to (5.b.l) and (5.b.m) above, a request for registration was submitted before the CDM Executive Board has approved the proposed deviation or revision?	VVM	74	NA	NA	NA
c. Project boundary					
a. Does the PoA-DD correctly describe the project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity?	VVM	78	Yes PoA project boundary: The republic of Singapore	OK	OK
i. Does the project boundary cover the physical, geographical location of each measure (each piece of equipment) installed?	AMS	II.C	Yes Within The Republic of Singapore Entire chiller system in single building	OK	OK
b. Is the delineation in the PoA-DD of the project boundary correct and include identification of all locations, processes and equipment including secondary equipment and associated processes such as logistics etc?	VVM	79	Yes Longitude and latitude provided for The Republic of Singapore Between latitude 1°09'North, 1°29' North and longitudes 103°36' East, 104°25' East. (reference from Singapore Facts & Figures 2006 published by Singapore Government)	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
c. Does the delineation in the PoA-DD of the project boundary meet the requirements of the selected baseline?	VVM	79	Yes Replaced chillers within The Republic of Singapore	OK	OK
d. Have changes been made to the project boundary in comparison to the webhosted PoA-DD. If yes, please comment on the reason for the changes.	VVM	79	There is no changes in the boundary in comparison to the webhosted PoA-DD.	OK	OK
e. Have all sources and GHGs required by the methodology been included within the project boundary?	VVM	79	Yes. Mainly CO2.	OK	OK
f. Does the methodology allow project participant to choose whether a source or gas is to be included within the project boundary?	VVM	79	NO	OK	OK
g. If yes, have the project participants justified that choice?	VVM	79	NA	NA	NA
h. If yes, is the justification provided reasonable? (provide reference to the supporting documented evidence provided by the project participants)	VVM	79	NA	NA	NA
d. Baseline identification					
a. Does the PoA-DD identify the baseline for the proposed CDM project activity, defined as the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed CDM project activity?	VVM	81	Yes	OK	OK
b. Has any procedure contained in the methodology to identify the most reasonable baseline scenario, been correctly applied?	VVM	82	Yes As according to AMS II.C Version 13	OK	OK
i. Is the energy displaced by the project	AMS	II.C	No	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
activity fossil fuel based?			Energy displaced by electricity used in the project activity		
ii If yes, is the energy baseline calculated at the existing level of fuel consumption or the amount of fuel that would be used by the technology that would have been implemented otherwise?	AMS	II.C	NA	NA	NA
iii. Is the emission baseline calculated as the energy baseline multiplied by an emission factor for the fossil fuel displaced?	AMS	II.C	NA	OK	OK
iv. Are there reliable local / national data available for emission factor?	AMS	II.C	Yes It is published by Singapore government National Environmental Agency (NEA). NEA is also the DNA of Singapore.	OK	OK
v. If yes, are these data used for the emission factor?	AMS	II.C	Yes	OK	OK
vi. Are country or project specific data not available or difficult to obtain?	AMS	II.C	NO	OK	OK
vii. If yes, are IPCC default values of emission factor used?	AMS	II.C	NA	OK	OK
viii. Is the energy displaced by the project activity electricity?	AMS	II.C	Yes It is energy displaced project activity.	OK	OK
ix. If yes, is the emission baseline determined as the product of the baseline energy consumption of equipment/ appliances and the emission factor for the electricity displaced?	AMS	II.C	Yes The emission baseline follow the option 1 of baseline stated in the AMS II.C.	OK	OK
x. Does this project activity seek to retrofit or modify an existing unit or equipment resulting in an increase in capacity?	AMS	II.C	Yes This is retrofit the inefficient Air cooled chiller to energy efficiency water cooled chiller.	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
xi. If yes, is the determination of the baseline scenario for the incremental capacity based on the procedures described in the general guidance to SSC methodologies under the sections "retrofit" and "capacity increase?"	AMS	II.C	Yes	NA	NA
c. Does the selected methodology require use of tools (such as the "Tool for the demonstration and assessment of additionality" and the "Combined tool to identify the baseline scenario and demonstrate additionality") to establish the baseline scenario?	VVM	82	No	NA	NA
d. If yes, was the methodology consulted on the application of these tools? (In such cases, the guidance in the methodology shall supersede the tool.)	VVM	82	NA	NA	NA
i. is the project activity the one that seek to retrofit or modify an existing unit or equipment?	AMS	II.C	Retrofit existing energy inefficient air cooled chiller.	OK	OK
ii. If yes, is there any increase capacity or output or level of service?	AMS	II.C	Yes	OK	OK
iii. If yes, is it within the range of -10% than the baseline and + 50% than the baseline? Note: For any increase of capacity or output or level of service beyond this range, which is due to the project activity, a different baseline shall apply.	AMS	II.C	Yes The increase capacity of cooling load will be within -10% of baseline and + 50% of baseline.	OK	OK
iv. If the project activities involved capacity increase, is it demonstrated that the most plausible baseline scenario for the additional (incremental) capacity is the baseline provided in the methodology AMS II.C?	AMS	II.C	Yes. It is following the option 1 of baseline stated in AMS II.C.	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
v. Did the demonstration include the assessment of the alternatives of the project activity by applying the Steps 1 to 3 of the latest version of “combined tool to identify the baseline scenario and demonstrate additionality” to identify the baseline scenario?	AMS	II.C	NA Using Attachment A to Appendix B of the “Simplified Modalities & Procedures for small-scale CDM project activities”	NA	NA
vi. Is the identified baseline scenario for the additional (incremental) capacity the same as the baseline of the methodology?	AMS	II.C	Yes	OK	OK
vii. If yes, is it demonstrated that the implementation of the project as the “the proposed project activity undertaken without being registered as CDM’, is not the common practice in the region?	AMS	II.C	Yes Demonstrated the PoA is due to barrier of prevailing practice.	OK	OK
viii. If the most plausible scenario for the additional capacity is the project activity, are the baseline emissions considered only to the extent of the capacity of the facility, which is being replaced?	AMS	II.C	Yes	OK	OK
ix. Are the calculations for emission factor for grid electricity done as per the procedures of AMS ID?	AMS	II.C	Yes. NEA has published the grid emission factor for past 3-year and declare that it is calculated as per AMS ID (using methodological tool- Tool to calculate the emission factor for an electricity system, version 02.2.1).	OK	OK
x. If yes, is the latest version of AMS ID referred?	AMS	II.C	Yes Tool to calculate the emission factor for an electricity system, version 02.2.1).	OK	OK
xi. Is the latest version of the “ Tool to calculate	AMS	II.C	NEA has published the grid emission factor for past	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
the emission factor fro an Electricity System” used in the project activity?			3-year and declare that it is calculated as per AMS ID. Project activity has used the NEA published emission factor for their calculation.		
xii. Is the baseline determined by using the 6 steps outlined in the tool?	AMS	II.C	NA	NA	NA
xiii. Are the calculations of the Operating Margin, Build Margin and the Combined margin transparently described in the PoA-DD and CPA-DD?	AMS	II.C	Yes Data is transparently presented in the PoA-DD and CPA-DD. Validation has done on site at EMA together with NEA on 31/01/2012. where National Environmental Agency is Singapore DNA. EMA is the Energy Market Authority which is the government body regulate the energy generation from the electricity generation company. Operating margin is calculated base on simple OM. Previous 3-year data available to calculate the simple OM. Generation companies responsible to submit data monthly basis to EMA. Simple OM is calculated as per the equation 1 specified in the Tool. FEEL,m,y is calculated base on quantity of fule use, NCV value and IPCC emission factor of the fuel.	OK	OK
xiv. Is the version of the CEA data used in the calculations relevant at the time of webhosting of PoA-DD and CPA-DD in the calculations?	AMS	II.C	Yes Latest data published by NEA on 25 Feb 2011 were used for the calculation for the webhosted PoA-DD and CPA-DD.	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
xv. Are the emission factor calculations using any other data apart from the CEA data? If yes, provide details thereof.	AMS	II.C	No	OK	OK
e. Does the methodology require several alternative scenarios to be considered in the identification of the most reasonable baseline scenario?	VVM	83	No	NA	NA
f. If yes, are all scenarios that are considered by the project participants and are supplementary to those required by the methodology reasonable in the context of the proposed CDM project activity?	VVM	83	NA	NA	NA
g. Has any reasonable alternative scenario been excluded?	VVM	83	NA	NA	NA
h. Is the baseline scenario identified reasonably supported by:	VVM	84			
a. Assumptions?	VVM	84	Base on the guideline ASHRAE 14 and 22. Follow according to option 1 of baseline sated in AMS II.C.	OK	OK
b. Calculations?	VVM	84	Yes	OK	OK
c. Rationales?	VVM	84	Yes	OK	OK
i. Are the documents and sources referred to in the PoA-DD correctly quoted and interpreted?	VVM	84	Follow the ASHRAE Guide 14 & 22	OK	OK
j. Was the information provided in the PoA-DD cross checked with other verifiable and credible sources, such as local expert opinion, if available? (identify the sources)	VVM	84	During site visit meeting with Engineering team from Trane.	OK	OK
k. Have all applicable CDM requirements been taken into account in the identification of the baseline scenario for the proposed CDM project activity?	VVM	85	Yes	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
l. Have all relevant policies and circumstances been identified and correctly considered in the PoA-DD, in accordance with the guidance by the CDM Executive Board?	VVM	85	Yes	OK	OK
m. Does the PoA-DD provide a verifiable description of the identified baseline scenario, including a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM project activity?	VVM	86	Yes The baseline is determined as according to option 1 of baseline indicated in the AMS II.C. Baseline calculation period base on the Ashrae guideline 14 & 22.	OK	OK
<i>e. Algorithms and/or formulae used to determine emission reductions</i>					
a. Do the steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions comply with the requirements of the selected baseline and monitoring?	VVM	89	According to the AMS II.C version 13	OK	OK
b. Have the equations and parameters in the PoA-DD been correctly applied with respect those in the select approved methodology?	VVM	90	There is no excel sheet on CER estimation has not been provided- CL 3 PP submitted on excel sheet for CER estimation calculation, hence CL 3 Closed.	CL 3	OK
i. are baseline emission calculated using the formula $BE_y = E_{BL,y} * EF_{CO2,ELEC,y} + Q_{ref,BL} * GWP_{ref,BL}$, where $E_{BL,y} = \sum_i (n_i * p_i * o_i) / (1-l_y)$?	AMS	II.C	$Q_{ref,BL} * GWP_{ref,BL}$ is not consider because refrigerant used in the PoA will be lower than baseline. l_y is not consider because Singapore grid is small where the grid loss is very small can consider insignificant. Baseline emission using (TR-H) baseline/month x (KW/TR) baseline efficiency	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
ii. In the case of retrofit activity is the “power” calculated as the weighted average of the devices replaced?	AMS	II.C	Monthly energy consumption data is available and average monthly energy consumption is considered for deriving the baseline emissions. Calculated the cooling load TR-H baseline and Baseline efficiency KW/TR	OK	OK
iii. In the case of new installations is the “ power” calculated as the weighted average of devices on the market?	AMS	II.C	NA	NA	NA
iv. Has the ly value included non-technical losses such as commercial losses (e.g theft / pilferage)? Note: This value shall not include non-technical losses such as commercial losses (e.g theft / pilferage).	AMS	II.C	NA CME consider ly is not consider because Singapore Grid is small the grid loss is insignificant.	NA	NA
v. Are the average annual technical grid losses determined using recent, accurate and reliable data available for the host country, ie from recent data published either by national utility or an governmental body?	AMS	II.C	NA CME consider ly is not consider because Singapore Grid is small the grid loss is insignificant. Verified with local government body EMA (Energy Market Authority) who regulate the electricity generation companies in Singapore confirm that the technical gird loss is considered in Singapore very small.	NA	NA
vi. Is the reliability of the data used (e.g appropriateness, accuracy / uncertainty, especially exclusion of non technical grid losses) established and documented by the project participant in the PoA-DD ?	AMS	II.C	Yes Validate the data calculation using by the EMA (Energy Market Authority) – government body who regulate the electricity generation companies in Singapore. Data is calculated as per the tool (EB63 Annex 19)	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
vii. if no recent data are available or the data cannot be regarded accurate and reliable, is the default value of 0.1 as specified by the methodology used for average annual technical grid losses?	AMS	II C	NA	OK	OK
viii. Is the value of $Q_{ref, BL}$ used as per values from Chapter 7: Emission of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories?	AMS	II.C	$Q_{ref, BL}$ is not consider in the calculation because the PoA dose not make provision for the computation of emission from refrigerants in either the baseline or the project activity as the emission from refrigerants in the CPA must be equal to or lower than that of the baseline refrigerant type.	OK	OK
ix. Are the project emissions consisting of electricity and / or fossil fuel used in the project equipment, determined as follows: $PE_y = EP_{PJ,y} * EF_{CO2,y}$	AMS	II.C	Project emission is calculated by (TR-H)baseline cooling load x (KW/TR) post-retrofit efficiency	OK	OK
x. Is the energy consumption in the project activity in year y ($EP_{pj,y}$) determined ex post based on monitored values (Note: this shall be determined ex post based on monitored values)	AMS	II.C	Yes The $EP_{pj,y}$ is determined ex post based on monitored values	OK	OK
xi. Are the emission associated with grid electricity consumption, EF_{CO2y} calculated in accordance with the procedures of AMS I.D? (Note: this shall be determined based on AMS I.D)	AMS	II.C	Yes It is calculated as per AMS I.D tool to calculate the emission factor for an electricity system.	OK	OK
xii. If yes, is the calculation of the Operating Margin (OM) emission factor $EF_{gridOMy}$ based on one of the 4 methods described?	AMS	II.C	Yes EMA is calculated based on the Simple Operating margin.	OK	OK
xiii. If the simple OM method is used, is it shown that the low-cost / must-run resources constitute	AMS	II.C			



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
less than 50% of total grid generation in:					
a. average of the five most recent years, or?	AMS	II.C	Yes An average of 3 most recent years	OK	OK
b. based on long-term averages for hydroelectricity production.	AMS	II. C	NA	NA	NA
xiv. For the simple OM, are the emissions factor calculated using either of the two following data vintages:	AMS	II.C			
a. Ex-ante option?	AMS	II.C	EX-ante	OK	OK
b. Ex-post option?	AMS	II.C	NA	OK	OK
xv. Is the data vintage chosen as indicated above documented in PoA DD?	AMS	II.C	Yes	OK	OK
xvi. If the dispatch data analysis OM is chosen, is the year in which the project activity displaces grid electricity used?	AMS	II.C	NA Grid emission factor is calculated based on the simple operating margin by the regulatory authority in Singapore, which was validated by visiting their office to verify the calculation method.	NA	NA
xvii. For dispatch data analysis OM, is it indicated that the emission factor would be updated annually during monitoring?	AMS	II.C	NA	NA	NA
xviii. Is the operating margin emission factor, according to the selected method, calculated as per Step 3 of the latest version of the " Tool to calculate the emission for an electricity system?	AMS	II.C	Yes EMA calculated the emission factor based on the Tool to calculate the emission for an electricity system.	OK	OK
xix. Is the Build Margin (BM) emission factor calculated as $EF_{grid, BM, y} = \frac{\sum EG_{m,y} \times FEEL, m, y}{\sum EG_{m, y}}$?	AMS	II.C	Yes, DOE has confirmed the build margin is calculated based on two condition set by EMA. Condition 1: 5 most recent new power plant addition to grid since 2004 and condition 2; 20% of the system generation in Mwh. Both conditions were fulfil	OK	OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
xx. Is the combined margin emission factor calculated as $EF_{grid,CM,y} + EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$	AMS	II.C	Yes EMA calculated the combined margin based on the average of build margin + simple operating margin.	OK	OK
xxi. Are the percent weightages of OM and BM emission factors used as per the tool?	AMS	II.C	50%	OK	OK
xxii. For fossil fuel displaced, are reliable local or national data for the emission factor used? Note: IPCC default values should be used only when country or project specific data are not available or difficult to obtain.	AMS	II. C	NA	NA	NA
xxiii. Does the project activity displace grid electricity?	AMS	II.C	Yes	OK	OK
xxiv. If yes, is the project energy consumption determined as follows using the data of the project equipment? $EP_{p,y} = \sum (n_i \cdot p_i \cdot o_i) / (1 - l_y)$	AMS	II.C	Project energy consumption calculated using (TR-H)baseline cooling load x post-retrofit efficiency KW/TR)	OK	OK
xxv. Are the project emissions from physical leakage of refrigerants accounted for in calculations?	AMS	II.C	No PoA did not make provision for the computation of emission from refrigerants in either the baseline or the project activity as the emission from refrigerants in the CPA must be equal or lower than that of the baseline refrigerant type.	OK	OK
xxvi. Are all GHGs are defined per Article 1, paragraph 5 of the Convention considered as per the guidance by the Executive Board in para 17, report of EB 34?	AMS	II.C	PoA will be using CFC-free and those refrigerant that has a higher GWP as per IPCC guidelines than that of refrigerant of the baseline will not be included in the PoA	OK	OK
xxix. Are the values of average annual quantity of refrigerant used in year y to replace refrigerant that has leaked in year y /tonnes / year) (ie. $Q_{ref,Pjy}$) taken from Chapter 7. Emissions of fluorinated	AMS	II. C	NA	NA	NA



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
substitutes for Ozone depleting substances, Volume 3, Industrial processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories?					
xxx. Does the energy efficiency technology involve any equipment transfer from or to the project activity	AMS	II.C	NO. Replaced equipment all will scrap.	OK	OK
xxxi. If yes, are the leakages for equipment transfer considered in the calculations?	AMS	II.C	NA	NA	NA
xxxii. Is the emission reduction achieved by the project activity determined as the difference between the baseline emissions and the project emission and leakage? $ER_y = (BE_y - PE_y) - LE_y$	AMS	II.C	Emission reduction calculated by Energy saved per month = (TR-H) baseline x [(KW/TR)baseline – (KW/TR) post-retrofit] + savings in KWH Savings in KWH x Grid Emission factor = tons of CO2 emission reductions	OK	OK
xxxiii. Does the project activity involved replacing incandescent lamp with CFL?	AMS	II.C	NO	OK	OK
xxxiv. If yes, is the value of BP calculated from the formula, $BP = 1 - (\# \text{ of pieces of screw-in or lock-in efficient lighting equipment} / \text{total } \# \text{ of pieces of screw-in or lock-in lighting equipment})$, based on ex ante representative sample survey?	AMS	II.C	NA	OK	OK
xxxv. If the answer to question above is no, is the value of BP set as "1.0? Note BP is only applicable to "Project Activity under Programme of Activities (CPA of PoA)" and in other cases set BP to 1.0.	AMS	II.C	NA	OK	OK
xxxvi. If it is not demonstrated that any one of the above condition is met, are the leakages accounted	AMS	II.C	NA	OK	OK



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in calculations?					
c. Does the methodology provide for selection between different options for equations or parameters?	VVM	90	Yes Follow Option 1 of baseline	OK	OK
d. If yes, has adequate justification been provided (based on the choice of the baseline scenario, context of the proposed CDM project activity and other evidence provided)?	VVM	90	Base on the choice of baseline	OK	OK
e. If yes, have correct equations and parameters been used, in accordance with the methodology selected?	VVM	90	Refer to (5.e.b) above	-	-
f. Will data and parameters be monitored throughout the crediting period of the proposed CDM project activity?	VVM	91	Yes	OK	OK
g. If no, and these data and parameters will remain fixed throughout the crediting period, are all data sources and assumptions:	VVM	91	NA	NA	NA
i. Appropriate and correct?	VVM	91	NA	NA	NA
ii. Applicable to the proposed CDM project activity?	VVM	91	NA	NA	NA
iii. Resulting in a conservative estimate of the emission reductions?	VVM	91	NA	NA	NA
h. Will data and parameters be monitored on implementation and hence become available only after validation of the project activity?	VVM	91	Yes	OK	OK
i. If yes, are the estimates provided in the PoA-DD for these data and parameters reasonable?	VVM	91	Yes	OK	OK
6.Additionality of a project activity					
a. Does the PoA-DD describe how a proposed CDM	VVM	94	Yes	OK	OK



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project activity is additional?			Following Attachment A to Appendix B of the Simplified Modalities & Procedures for small scale CDM project Activities		
b. Were the following steps of the tool to assess additionality used:	EB 39	Ann 10			
i. Identification of alternatives to the project activity?	EB 39	Ann 10	NA	NA	NA
ii. Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible?	EB 39	Ann 10	NA	NA	NA
iii. Barriers analysis?	EB 39	Ann 10	Yes Barrier due to prevailing practice.	OK	OK
iv. Common practice analysis?	EB 39	Ann 10	NA	NA	NA
c. In step 1 (i) have all the sub-steps as below been followed?	EB 39	Ann 10	NA	NA	NA
i. Sub-step 1a: Define alternatives to the project activity	EB 39	Ann 10	NA	NA	NA
ii. Sub-step 1b: Consistency with mandatory laws and regulations	EB 39	Ann 10	NA	NA	NA
d. Have the following alternatives been included while defining alternatives as per sub-step 1a?	EB 39	Ann 10	NA	NA	NA
i. (a) The proposed project activity undertaken without being registered as a CDM project activity;	EB 39	Ann 10	NA	NA	NA
ii. (b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services or	EB 39	Ann 10	NA	NA	NA



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services with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;					
iii. (c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).	EB 39	Ann 10	NA	NA	NA
e. Has the project participant included the technologies or practices that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity and that have been implemented previously or are currently being introduced in the relevant country/region?	EB 39	Ann 10	NA	NA	NA
f. Has the outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity done correctly? Please briefly mention the outcome.	EB 39	Ann 10	NA	NA	NA
g. Is the alternative(s) in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution.?	EB 39	Ann 10	NA	NA	NA
h. If an alternative does not comply with all mandatory applicable legislation and regulations, has it been shown that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are	EB 39	Ann 10	NA	NA	NA



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systematically not enforced and that noncompliance with those requirements is widespread in the country?					
i. Has the outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations done correctly? Please state the outcome.	EB 39	Ann 10	NA	NA	NA
j. Has PP selected Step 2 (Investment analysis) or Step 3 (Barrier analysis) or both Steps 2 and 3?	EB 39	Ann 10	NA	NA	NA
k. In step 2, have all the sub-steps as below been followed?	EB 39	Ann 10			
i. Sub-step 2a: Determine appropriate analysis method;	EB 39	Ann 10	NA	NA	NA
ii. Sub-step 2b: Option I. Apply simple cost analysis;	EB 39	Ann 10	NA	NA	NA
iii. Sub-step 2b: Option II. Apply investment comparison analysis;	EB 39	Ann 10	NA	NA	NA
iv. Sub-step 2b: Option III. Apply benchmark analysis;	EB 39	Ann 10	NA	NA	NA
v. Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III);	EB 39	Ann 10	NA	NA	NA
vi. Sub-step 2d: Sensitivity analysis (only applicable to Options II and III).	EB 39	Ann 10	NA	NA	NA



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I. In sub-step 2a has the determination of appropriate method of analysis done as per the guidance as below?	EB 39	Ann 10	NA	NA	NA
i. Simple cost analysis if the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income (Option I).	EB 39	Ann 10	NA	NA	NA
ii. Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III). Specify option used with justification.	EB 39	Ann 10	NA	NA	NA
m. Has the below guideline followed for sub-step 2b Option I. Apply simple cost analysis? Document the costs associated with the CDM project activity and the alternatives identified in Step1 and demonstrate that there is at least one alternative which is less costly than the project activity.	EB 39	Ann 10	NA	NA	NA
n. Has the below guideline followed for sub-step 2b Option II. Apply investment comparison analysis? Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service most suitable for the project type and decision-making context. Please specify	EB 39	Ann 10	NA	NA	NA
o. Has the below guideline followed for Sub-step 2b: Option III. Apply benchmark analysis?	EB 39	Ann 10	NA	NA	NA
i. Identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context.	EB 39	Ann 10	NA	NA	NA
ii. When applying Option II or Option III, the	EB	Ann	NA	NA	NA



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financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. Only in the particular case where the project activity can be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered.	39	10			
iii. Discount rates and benchmarks shall be derived from: (a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data; (b) Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects; (c) A company internal benchmark (weighted average capital cost of the company), only in the particular case referred to above in 2. The project developers shall demonstrate that this benchmark has been consistently used in the past, i.e. that	EB 39	Ann 10	NA	NA	NA



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project activities under similar conditions developed by the same company used the same benchmark; (d) Government/official approved benchmark where such benchmarks are used for investment decisions; (e) Any other indicators, if the project participants can demonstrate that the above Options are not applicable and their indicator is appropriately justified. Please specify benchmark and justify.					
p. Has the below guideline followed for Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III)?	EB 39	Ann 10	NA	NA	NA
i. Calculate the suitable financial indicator for the proposed CDM project activity and, in the case of Option II above, for the other alternatives. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives, ODA, etc, where applicable), and, as appropriate, non-market cost and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country.	EB 39	Ann 10	NA	NA	NA
ii. Present the investment analysis in a transparent manner and provide all the relevant assumptions, preferably in the PoA-DD, or in separate annexes to the PoA-DD.	EB 39	Ann 10	NA	NA	NA



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iii. Justify and/or cite assumptions.	EB 39	Ann 10	NA	NA	NA
iv. In calculating the financial/economic indicator, the project's risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions.	EB 39	Ann 10	NA	NA	NA
v. Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated.	EB 39	Ann 10	NA	NA	NA
vi. Present in the PoA-DD a clear comparison of the financial indicator for the proposed CDM activity. Please specify details for above.	EB 39	Ann 10	NA	NA	NA
q. Has the below guideline followed for Sub-step 2d: Sensitivity analysis (only applicable to Options II and III)? Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions.	EB 39	Ann 10	NA	NA	NA
r. Has the outcome of Step 2 clearly mentioned with justification?	EB 39	Ann 10	NA	NA	NA
s. In step 3: Barrier analysis have all the sub-steps as below been followed?	EB 39	Ann 10			
i. Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity;	EB 39	Ann 10	Barrier due to prevalent practice.	OK	OK
ii. Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the	EB 39	Ann 10	NA	NA	NA



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proposed project activity).					
t. Has the below guideline followed for Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project?	EB 39	Ann 10	NA	NA	NA
i. (a) Investment barriers: For alternatives undertaken and operated by private entities: Similar activities have only been implemented with grants or other non-commercial finance terms. No private capital is available from domestic or international capital markets due to real or perceived risks associated with investment in the country where the proposed CDM project activity is to be implemented, as demonstrated by the credit rating of the country or other country investments reports of reputed origin.	EB 39	Ann 10	NA	NA	NA
ii. (b) Technological barriers: Skilled and/or properly trained labour to operate and maintain the technology is not available in the relevant country/region, which leads to an unacceptably high risk of equipment disrepair and malfunctioning or other underperformance; Lack of infrastructure for implementation and logistics for maintenance of the technology, Risk of technological failure: the process/technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed	EB 39	Ann 10	NA	NA	NA



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CDM project activity, as demonstrated by relevant scientific literature or technology manufacturer information, The particular technology used in the proposed project activity is not available in the relevant region.					
iii. (c) Barriers due to prevailing practice: The project activity is the “first of its kind”.	EB 39	Ann 10	Barrier due to prevailing practice: Prevailing practice or existing regulatory or policy requirement would have led to implementation of technology with higher emission.	OK	OK
iv. (d) Other barriers, preferably specified in the underlying methodology as examples.	EB 39	Ann 10	NA	NA	NA
u. Has the outcome from Step 3a clearly mentioned in PoA-DD?	EB 39	Ann 10	Yes Barrier due to prevailing practice.	OK	OK
v. Has the below guideline followed for Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)?	EB 39	Ann 10	NA	NA	NA
i. If the identified barriers also affect other alternatives, explain how they are affected less strongly than they affect the proposed CDM project activity. In other words, demonstrate that the identified barriers do not prevent the implementation of at least one of the alternatives. Any alternative that would be prevented by the barriers identified in Sub-step 3a is not a viable alternative, and shall be eliminated from consideration.	EB 39	Ann 10	NA	NA	NA



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ii. Provide transparent and documented evidence, and offer conservative interpretations of this documented evidence, as to how it demonstrates the existence and significance of the identified barriers and whether alternatives are prevented by these barriers.	EB 39	Ann 10	NA	NA	NA
iii. The type of evidence to be provided should include at least one of the following: (a) Relevant legislation, regulatory information or industry norms; (b) Relevant (sectoral) studies or surveys (e.g. market surveys, technology studies, etc) undertaken by universities, research institutions, industry associations, companies, bilateral/multilateral institutions, etc; (c) Relevant statistical data from national or international statistics; (d) Documentation of relevant market data (e.g. market prices, tariffs, rules); (e) Written documentation of independent expert judgments from industry, educational institutions (e.g. universities, technical schools, training centres), industry associations and others. Please specify.	EB 39	Ann 10	NA	NA	NA
w. Has the outcome from Step 3 clearly mentioned in PoA-DD?	EB 39	Ann 10			
x. In step 4: Common practise analysis has all the sub-steps as below followed?	EB 39	Ann 10	NA	NA	NA
i. Sub-step 4a: Analyze other activities similar to the proposed project activity;	EB 39	Ann 10	NA	NA	NA
ii. Sub-step 4b: Discuss any similar Options that	EB	Ann	NA	NA	NA



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are occurring.	39	10			
y. Has the below guideline followed for Sub-step 4a: Analyze other activities similar to the proposed project activity? Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Other CDM project activities are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.	EB 39	Ann 10	NA	NA	NA
z. Has the below guideline followed for Sub-step 4b: Discuss any similar Options that are occurring? If similar activities are identified, then it is necessary to demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is financially/economically unattractive or subject to barriers. This can be done by comparing the proposed project activity to the other similar activities, and pointing out and explaining essential distinctions between them that explain why the similar activities enjoyed certain benefits that rendered it financially/economically attractive (e.g., subsidies or other financial flows) and which the proposed project activity cannot use or did not face the barriers to which the proposed project activity is subject. In case similar projects	EB 39	Ann 10	NA	NA	NA



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are not accessible, the PoA-DD should include justification about non-accessibility of data/information.					
aa. Has the outcome from Step 4 clearly mentioned in PoA-DD?	EB 39	Ann 10	NA	NA	NA
bb. Has it been proved that the project is additional?	EB 39	Ann 10	Yes Additionality proved by barrier due to prevailing practice.	OK	OK
cc. Has the PP demonstrated additionality by explaining Investment barrier, Access-to-finance barrier, Technological barrier, Barrier due to prevailing practice or other barriers?	EB 35	Ann 34	CL2- There is no detailed information provided on the energy efficiency means implemented in the 5-6 buildings, which have also changed over to water cooled / high efficiency chillers. Despite the claim of several barriers (such as design and know how, ESCO competitively, etc), it is not clear how these 5-6 buildings have already implemented such projects without CDM. If so, then how is that project activity claims this as a barrier. PP has response to the CL 2 by insert more detail information on the 5-6 buildings although have higher energy efficiency where the projects implemented before CDM scheme available. Hence, CL 2 is closed.	CL2)K
dd. If Investment barrier has been explained, is it demonstrated that financially more viable alternative to the project activity would have led to higher emissions? Please explain.	EB 35	Ann 34	NA	NA	NA
ee. If Access-to-finance has been explained, is it demonstrated that the project activity could not	EB 35	Ann 34	NA	NA	NA



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access appropriate capital without consideration of the CDM revenues? Please explain.					
ff. If Technological barrier has been explained, is it demonstrated that a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions? Please explain.	EB 35	Ann 34	NA	NA	NA
gg. If prevailing practise barrier has been explained, is it demonstrated that the prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions? Please explain.	EB 35	Ann 34	Yes 1. There is no existing regulatory or policy requirements that request building owner to replace the chiller with efficient 0.65KW/TR or better. 2. NEA letter dated on 13 July 2010 reference no. NEA/EP/RCD/10-00068-1 support not many buildings have the energy efficient 0.65KW/TR or better. 3. Only few buildings in Singapore which build before 2006 have better electricity efficient < 0.65kw/TR.	OK	OK
hh. If other barrier has been explained, is it demonstrated that other barriers such as institutional barriers or limited information, managerial resources, organizational capacity, or capacity to absorb new technologies would prevent the project activity any way?	EB 35	Ann 34	NA	NA	NA
ii. Have the project participants identified the most relevant barrier?	EB 35	Ann 34	Yes Barrier due to prevailing practice.	OK	OK



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jj. Have the project participants provided transparent and documented third party evidence such as national/international statistics, national/provincial policy and legislation, studies/surveys by independent agencies etc. to demonstrate the most relevant barrier? Please explain.	EB 35	Ann 34	Yes NEA letter dated on 13 July 2010 reference no. NEA/EP/RCD/10-00068-1 support not many buildings have the energy efficient 0.65KW/TR or better. Data from (EASe) Energy Efficiency Improvement Assistance scheme that 4 buildings have achieved 0.65KW/TR prior to 2006.	OK	OK



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<i>a. Prior consideration of the clean development mechanism</i>					
a. Is the project activity start date prior to the date of publication of the PoA-DD for stakeholder comments?	VVM	98	NA for PoA	NA	NA
b. If yes, were the CDM benefits considered necessary in the decision to undertake the project as a proposed CDM project activity?	VVM	98	NA	NA	NA
c. Is the start date of the project activity, reported in the PoA-DD, in accordance with the "Glossary of CDM terms", which states that "The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins."?	VVM	99	NA	NA	NA
d. Does the project activity require construction, retrofit or other modifications?	VVM	99	NA	NA	NA
e. If yes, is it ensured that the date of commissioning cannot be considered as the project activity start date?	VVM	99	NA	NA	NA
f. Is it a new project activity (project activities with starting date on or after 02 August 2008) or an existing project activity (project activities with a start date before 02 August 2008)?	VVM	100	NA	NA	NA
g. For a new project, for which PoA-DD has not been published for global stakeholder consultation or a new methodology proposed to the Executive Board before the project activity start date, had the PP informed the Host Party DNA and/or the UNFCCC secretariat in writing of	VVM	101	NA	NA	NA



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the commencement of the project activity and of their intention to seek CDM status? (Provide reference to such confirmation from Host Party DNA and/or UNFCCC secretariat).					
h. For an existing project activity, for which the start date is prior to the date of publication of the PoA-DD for global stakeholder consultation, are the following evidences provided:	VVM	102	NA	NA	NA
i. evidence that must indicate that awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project, including, inter alia:	VVM	102	NA	NA	NA
a. minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a proposed CDM project activity?	VVM	102	NA	NA	NA
ii. reliable evidence from project participants that must indicate that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation, including, inter alia:	VVM	102	NA	NA	NA
a. contract with consultants for CDM/PoA-DD/methodology services?	VVM	102	NA	NA	NA
b. Emission Reduction Purchase Agreements or other documentation related to the sale of the potential CERs (including correspondence with	VVM	102	NA	NA	NA



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multilateral financial institutions or carbon funds)?					
c. evidence of agreements or negotiations with a DOE for validation services?	VVM	102	NA	NA	NA
d. submission of a new methodology to the CDM Executive Board?	VVM	102	NA	NA	NA
e. publication in newspaper?	VVM	102	NA	NA	NA
f. interviews with DNA?	VVM	102	NA	NA	NA
g. earlier correspondence on the project with the DNA or the UNFCCC secretariat?	VVM	102	NA	NA	NA
h. Has the chronology of events including time lines been appropriately captured and explained / detailed in the PoA-DD?	VVM	102	NA	NA	NA
<i>b. Identification of alternatives</i>					
a. Does the approved methodology that is selected by the proposed CDM project activity prescribe the baseline scenario and hence no further analysis is required?	VVM	105	Yes	OK	OK
b. If no, does the PoA-DD identify credible alternatives to the project activity in order to determine the most realistic baseline scenario?	VVM	105	NA	NA	NA
c. Does the list of alternatives given in the PoA-DD ensure that:	VVM	106			
i. the list of alternatives includes as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity?	VVM	106	NA	NA	NA
ii. the list contains all plausible alternatives that the DOE, on the basis of its local and	VVM	106	NA	NA	NA



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sectoral knowledge, considers to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity?					
iii. the alternatives comply with all applicable and enforced legislation?	VVM	106	NA	NA	NA
<i>c. Investment analysis</i>					
a. Has investment analysis been used to demonstrate the additionality of the proposed CDM project activity?	VVM	108	NA	NA	NA
b. If yes, does the PoA-DD provide evidence that the proposed CDM project activity would not be:	VVM	108	NA	NA	NA
i. the most economically or financially attractive alternative?	VVM	108	NA	NA	NA
ii. economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)?	VVM	108	NA	NA	NA
c. Was this shown by one of the following approaches?	VVM	109	NA	NA	NA
i. The proposed CDM project activity would produce no financial or economic benefits other than CDM-related income. Document the costs associated with the proposed CDM project activity and the alternatives identified and demonstrate that there is at least one alternative which is less costly than the proposed CDM project activity.	VVM	109	NA	NA	NA
ii. The proposed CDM project activity is less economically or financially attractive than at	VVM	109	NA	NA	NA



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least one other credible and realistic alternative.					
iii. The financial returns of the proposed CDM project activity would be insufficient to justify the required investment.	VVM	109	NA	NA	NA
d. Is the period of assessment limited to the proposed crediting period of the CDM project activity?	EB 51	Ann 58	NA	NA	NA
e. Does the project IRR and equity IRR calculations reflect the period of expected operation of the underlying project activity (technical lifetime), or - if a shorter period is chosen - include the fair value of the project activity assets at the end of the assessment period?	EB 51	Ann 58	NA	NA	NA
f. Does the IRR calculation include the cost of major maintenance and/or rehabilitation if these are expected to be incurred during the period of assessment?	EB 51	Ann 58	NA	NA	NA
g. Do the project participants justify the appropriateness of the period of assessment in the context of the underlying project activity, without reference to the proposed CDM crediting period?	EB 51	Ann 58	NA	NA	NA
h. Does the cash flow in the final year include a fair value of the project activity assets at the end of the assessment period?	EB 51	Ann 58	NA	NA	NA
i. Has the fair value been calculated in accordance with local accounting regulations where available, or international best practice?	EB 51	Ann 58	NA	NA	NA



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j. Does the fair value calculations include both the book value of the asset and the reasonable expectation of the potential profit or loss on the realization of the assets?	EB 51	Ann 58	NA	NA	NA
k. Was depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, added back to net profits for the purpose of calculating the financial indicator (e.g. IRR, NPV)?	EB 51	Ann 58	NA	NA	NA
l. Has taxation been included as an expense in the IRR/NPV calculation in cases where the benchmark or other comparator is intended for post-tax comparisons?	EB 51	Ann 58	NA	NA	NA
m. Are the input values used in all investment analysis valid and applicable at the time of the investment decision taken by the project participant?	EB 51	Ann 58	NA	NA	NA
n. Is the timing of the investment decision consistent and appropriate with the input values?	EB 51	Ann 58	NA	NA	NA
o. Are all the listed input values been consistently applied in all calculations?	EB 51	Ann 58	NA	NA	NA
p. Does the investment analysis reflect the economic decision making context at point of the decision to recommence the project in the case of project activities for which implementation ceases after the commencement and where implementation is recommenced due to consideration of the CDM?	EB 51	Ann 58	NA	NA	NA



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q. Have project participants supplied the spreadsheet versions of all investment analysis?	EB 51	Ann 58	NA	NA	NA
r. Are all formulas used in this analysis readable and all relevant cells be viewable and unprotected?	EB 51	Ann 58	NA	NA	NA
s. In cases where the project participant does not wish to make such a spreadsheet available to the public has the PP provided an exact read-only or PDF copy for general publication?	EB 51	Ann 58	NA	NA	NA
t. In case the PP wishes to black-out certain elements of the publicly available version, is it justifiable?	EB 51	Ann 58	NA	NA	NA
u. Was the cost of financing expenditures (i.e. loan repayments and interest) included in the calculation of project IRR?	EB 51	Ann 58	NA	NA	NA
v. In the calculation of equity IRR, has only the portion of investment costs which is financed by equity been considered as the net cash outflow?	EB 51	Ann 58	NA	NA	NA
w. Has the portion of the investment costs which is financed by debt been considered a cash outflow in the calculation of equity IRR? (this is not allowed)	EB 51	Ann 58	NA	NA	NA
x. Was a pre-tax benchmark being applied?	EB 51	Ann 58	NA	NA	NA
y. In cases where a post-tax benchmark is applied, is actual interest payable taken into account in the calculation of income tax?	EB 51	Ann 58	NA	NA	NA
z. In such situations, was interest calculated according to the prevailing commercial interest	EB 51	Ann 58	NA	NA	NA



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rates in the region, preferably by assessing the cost of other debt recently acquired by the project developer and by applying a debt-equity ratio used by the project developer for investments taken in the previous three years?					
aa. In cases where a benchmark approach is used is the applied benchmark appropriate to the type of IRR calculated?	EB 51	Ann 58	NA	NA	NA
bb. Has local commercial lending rates or weighted average costs of capital (WACC) selected as appropriate benchmarks for a project IRR?	EB 51	Ann 58	NA	NA	NA
cc. Has required/expected returns on equity selected as appropriate benchmark for equity IRR?	EB 51	Ann 58	NA	NA	NA
dd. In case benchmarks supplied by relevant national authorities selected is it applicable to the project activity and the type of IRR calculation presented?	EB 51	Ann 58	NA	NA	NA
ee. In the cases of projects which could be developed by an entity other than the project participant is the benchmark applied based on publicly available data sources which can be clearly validated?	EB 51	Ann 58	NA	NA	NA
ff. Have internal company benchmarks/expected returns (including those used as the expected return on equity in the calculation of a weighted average cost of capital - WACC) been applied in cases where there is only one possible project developer?	EB 51	Ann 58	NA	NA	NA
gg. In such cases, have these values been used for	EB	Ann	NA	NA	NA



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similar projects with similar risks, developed by the same company or, if the company is brand new, would have been used for similar projects in the same sector in the country/region?	51	58			
hh. Has a minimum clear evidence of the resolution by the company's Board and/or shareholders been provided to the effect as above?	EB 51	Ann 58	NA	NA	NA
ii. Has a thorough assessment of the financial statements of the project developer - including the proposed WACC - to assess the past financial behaviour of the entity during at least the last 3 years in relation to similar projects been conducted?	EB 51	Ann 58	NA	NA	NA
jj. Does the risk premiums applied in the determination of required returns on equity reflect the risk profile of the project activity being assessed, established according to national/international accounting principles? (It is not considered reasonable to apply the rate general stock market returns as a risk premium for project activities that face a different risk profile than an investment in such indices.)	EB 51	Ann 58	NA	NA	NA
kk. Has an investment comparison analysis and not a benchmark analysis used when the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services?	EB 51	Ann 58	NA	NA	NA
ll. Have variables, including the initial investment	EB	Ann	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
cost, that constitute more than 20% of either total project costs or total project revenues been subjected to reasonable variation (positive and negative) and the results of this variation been presented in the PoA-DD and be reproducible in the associated spreadsheets?	51	58			
mm. Have a corrective action been raised for a variable to be included in the sensitivity analysis which constitute less than 20% and have a material impact on the analysis ?	EB 51	Ann 58	NA	NA	NA
nn. Is the range of variations selected is reasonable in the project context?	EB 51	Ann 58	NA	NA	NA
oo. Dos the variations in the sensitivity analysis at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances?	EB 51	Ann 58	NA	NA	NA
pp. In cases where a scenario will result in the project activity passing the benchmark or becoming the most financially attractive alternative, is an assessment done of the probability of the occurrence of this scenario in comparison to the likelihood of the assumptions in the presented investment analysis, taking into consideration correlations between the variables as well as the specific socio-economic and policy context of the project activity?	EB 51	Ann 58	NA	NA	NA
qq. Was the plant load factor defined ex-ante in the CDM-PoA-DD according to one of the following options:	EB 51	Ann 58	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
i. The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval?	EB 51	Ann 58	NA	NA	NA
ii. The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company)?	EB 51	Ann 58	NA	NA	NA
rr. Was a thorough assessment of all parameters and assumptions used in calculating the relevant financial indicator, and determine the accuracy and suitability of these parameters using the available evidence and expertise in relevant accounting practices conducted?	VVM	111	NA	NA	NA
ss. Were the parameters cross-checked against third-party or publicly available sources, such as invoices or price indices?	VVM	111	NA	NA	NA
tt. Were feasibility reports, public announcements and annual financial reports related to the proposed CDM project activity and the project participants reviewed?	VVM	111	NA	NA	NA
uu. Was the correctness of computations carried out and documented by the project participants assessed?	VVM	111	NA	NA	NA
vv. Was the sensitivity analysis by the project participants to determine under what conditions variations in the result would occur, and the likelihood of these conditions assessed?	VVM	111	NA	NA	NA
ww. Is the type of benchmark applied is	VVM	112	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
suitable for the type of financial indicator presented?					
xx. Do any risk premiums applied determining the benchmark reflect the risks associated with the project type or activity?	VVM	112	NA	NA	NA
yy. To determine this, was it assessed whether it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark by:	VVM	112	NA	NA	NA
i. assessing previous investment decisions by the project participants involved?	VVM	112	NA	NA	NA
ii. determining whether the same benchmark has been applied?	VVM	112	NA	NA	NA
iii. determining if there are verifiable circumstances that have led to a change in the benchmark?	VVM	112	NA	NA	NA
zz. Did the project participants rely on values from Feasibility Study Reports (FSR) that are approved by national authorities for proposed CDM project activities?	VVM	113	NA	NA	NA
xx. If yes:	VVM	113	NA	NA	NA
i. has the FSR been the basis of the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially	VVM	113	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
changed?					
ii. Are the values used in the PoA-DD and associated annexes fully consistent with the FSR?	VVM	113	NA	NA	NA
iii. If not, was the appropriateness of the values validated?	VVM	113	NA	NA	NA
iv. On the basis of its specific local and sectoral expertise, is confirmation provided, by cross-checking or other appropriate manner, that the input values from the FSR are valid and applicable at the time of the investment decision?	VVM	113	NA	NA	NA
d Barrier analysis					
a. Has barrier analysis been used to demonstrate the additionality of the proposed CDM project activity?	VVM	115	Yes barriers due to prevailing practices CL2 closed.	CL 2	OK
b. If yes, does the PoA-DD demonstrate that the proposed CDM project activity faces barriers that:	VVM	115	Barrier due to prevailing practices	CL 2	OK
i. prevent the implementation of this type of proposed CMD project activity?	VVM	115	Refer to CL 2 Closed	CL 2	OK
ii. do not prevent the implementation of at least one of the alternatives?	VVM	115	Refer to CL 2 closed	CL 2	OK
c. Are there any issues that have a clear direct impact on the financial returns of the project activity, other than: risk related barriers, for example risk of technical failure, that could have negative effects on the financial performance; or	VVM	116	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
barriers related to the unavailability of sources of finance for the project activity? {If yes, these issues cannot be considered barriers and shall be assessed by investment analysis. [Refer to (6.c) above]}					
d. Were the barriers determined as real by:	VVM	117			
i. assessing the available evidence and/or undertaking interviews with relevant individuals (including members of industry associations, government officials or local experts if necessary) to determine whether the barriers listed in the PoA-DD exist?	VVM	117	Refer to CL 2-closed Discussion with Trane engineering teams from Trane Singapore. Trane Singapore is a manufacturer and services providers of energy efficient heating, ventilation and air conditioning (HVAC) systems in commercial, industrial and institutional buildings.	CL 2	OK
ii. ensuring that existence of barriers is substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics?	VVM	117	Refer to CL 2-closed Prevailing practice supported by NEA (National Environmental Agency) letter ref: NEA/EP/RCD/10-00068-1 dated on 13 July 2010 on the subject of “ System energy efficiencies of chiller plants and the practice of computing data at 1 minute interval in Singapore” that confirmed the system energy efficiency of 0.65 kW/TR or better are not prevailing in Singapore and the practice of sampling data and monitoring system energy efficiency at 1 minute intervals is also rare.	CL 2	OK
iii. Is existence of a barrier substantiated only by the opinions of the project participants? (If yes, this barrier cannot be considered as adequately substantiated)	VVM	117	NO	CL 2	OK
e. Were the barriers determined as preventing the	VVM	117	Refer to CL 2-closed	CL 2	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
implementation of the project activity but not the implementation of at least one of the possible alternatives by applying local and sectoral expertise to judge whether a barrier or set of barriers would prevent the implementation of the proposed CDM project activity and would not equally prevent implementation of <i>at least one of</i> the possible alternatives, in particular the identified baseline scenario?					
<i>e. Common practice analysis</i>					
a. Is this a proposed large-scale or first-of-its kind small-scale project activity?	VVM	119	NA	NA	NA
b. If yes, was common practice analysis carried out as a credibility check of the other available evidence used by the project participants to demonstrate additionality?	VVM	119	NA	NA	NA
c. Was it assessed whether the geographical scope (e.g. defined region) of the common practice analysis is appropriate for the assessment of common practice related to the project activity's technology or industry type? (For certain technologies the relevant region for assessment will be local and for others it may be transnational/global.	VVM	120	NA	NA	NA
d. Was a region other than the entire host country chosen?	VVM	120	NA	NA	NA
e. If yes, was the explanation why this region is more appropriate assessed?	VVM	120	NA	NA	NA
f. Using official sources and local and industry	VVM	120	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
expertise, was it determined to what extent similar and operational projects (e.g., using similar technology or practice), other than CDM project activities, have been undertaken in the defined region?					
g. Are similar and operational projects, other than CDM project activities, already "widely observed and commonly carried out" in the defined region?	VVM	120	NA	NA	NA
h. If yes, was it assessed whether there are essential distinctions between the proposed CDM project activity and the other similar activities?	VVM	120	NA	NA	NA
7. Monitoring plan					
a. Does the PoA-DD include a monitoring plan?	VVM	122	Yes Defined at section A.4.4.2	OK	OK
b. Is this monitoring plan based on the approved monitoring methodology applied to the proposed CDM project activity?	VVM	122	Yes Based on AMS-II.C version 13	OK	OK
c. Was the list of parameters required by the selected methodology identified?	VVM	123	Yes	OK	OK
d. Does the monitoring plan contain all necessary parameters?	VVM	123	Yes	OK	OK
e. Are the parameters clearly described?	VVM	123	Yes Described in section E.7	OK	OK
f. Do the means of monitoring described in the plan comply with the requirements of the methodology?	VVM	123	Yes According to AMS-II.C version 13	OK	OK
g. Do the devices installed replace existing devices?	AMS	II.C	Yes	OK	OK
h. if yes, are the number and "power" of a representative sample of the replaced devices recorded	AMS	II.C	Yes Data stored in EMS which can be physical verify	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
in a way to allow for a physical verification by DOE?			data by DOE.		
i. Is this monitored while replacement is underway to avoid (e.g that 40W lamps are recorded as 100W lamps), greatly inflating the baseline	AMS	II.C	Yes Verified the list of components and their respective Data will monitor the energy use of the building and energy saving	OK	OK
j. Do the devices installed have a constant current (ampere) characteristics?	AMS	II.C	Yes	OK	OK
k. If yes, does the monitoring consist of monitoring either the “ power” and “Operating hours” or the “energy use” of the devices installed using an appropriate method as defined in para 13 of the methodology?	AMS	II.C	Metering the energy use of the equipment.	OK	OK
l. Has the project participant opted for recording the “ power” of the device installed (e.g lamp or refrigerator) using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters.	AMS	II.C	NA	NA	NA
m. If no, has the project participant opted for meter the “ energy use” of an appropriate sample of the devices installed?	AMS	II.C	Metering the energy use of the equipment	OK	OK
n. In either case above, did the monitoring include annual checks of a sample of non-metered systems to ensure that they are still operating?	AMS	II.C	NA	NA	NA
o. Do the devices installed have a variable current (ampere) characteristics?	AMS	II.C	NA	NA	NA
p. If yes, did the monitoring consist of metering the “ energy use” of an appropriate sample of the	AMS	II.C	NA	NA	NA



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
devices installed?					
q. If yes, did the monitoring also include annual check of a sample of non-metered systems to ensure that they are still operating?	AMS	II.C	NA There is no non-metered systems. The chiller is under metering solution which all data will be monitored and measured using EMS.	NA	NA
r. In case of project activities under programme of activities, if the replaced equipment is scrapped, is an independent monitoring of scrapping of replaced equipment implemented as required under the methodology?	AMS	II.C	Replaced equipment is scrapped and third party scrap records will be monitored.	OK	OK
s. Did the monitoring include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other?	AMS	II.C	chiller number indicated on the scrapped equipment.	OK	OK
t. Are provisions made in the monitoring plan to store the scrapped equipment until such correspondence have been checked?	AMS	II.C	Yes Old chillers from the baseline scenario is scrapped and tracked by third party is included in the monitoring plan.	OK	OK
u. Is the scrapping of replaced equipment clearly documented and independently verified?	AMS	II.C	Yes It is documented by the third independent party to scrapped and provided with scrapped record.	OK	OK
v. Are the monitoring arrangements described in the monitoring plan feasible within the project design?	VVM	123	Yes	OK	OK
w. Does the monitoring plan provide details regarding calibration of monitoring equipment / instruments or does it include zero check as a substitute for calibration)	EB 24	37	Yes Trane maintenance plan	OK	OK
x. Are the following means of implementation of the monitoring plan sufficient to ensure that the emission reductions achieved by/resulting from the proposed CDM	VVM	123	Yes	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
project activity can be reported ex post and verified:					
i. data management procedures?	VVM	123	Yes. By EMS monitoring system	OK	OK
ii. quality assurance procedures?	VVM	123	Yes. By EMS monitoring system	OK	Ok
iii. quality control procedures?	VVM	123	Yes. By EMS monitoring system	OK	OK
8. Sustainable development					
a. Does the CDM project activity assists Parties not included in Annex I to the Convention in achieving sustainable development?	VVM	125	Yes Refer to Letter of Approval from DNA Singapore and UK London	OK	OK
b. Does the letter of approval by the DNA of the host Party confirm the contribution of the proposed CDM project activity to the sustainable development of the host Party?	VVM	126	Yes	OK	OK
9. Local stakeholder consultation					
a. Were local stakeholders (public, including individuals, groups or communities affected, of likely to be affected, by the proposed CDM project activity or actions leading to the implementation of such an activity) invited by the PPs to comment on the proposed CDM project activity prior to the publication of the PoA-DD on the UNFCCC website?	VVM	128	Yes Stakeholder meeting conducted on 3 Feb 2010 and the PoA-DD and CPA-DD webhosted on the UNFCCC website for public comments on 20 Aug 2011 to 18 Sept 2011	OK	OK
b. Have comments by local stakeholders that can reasonably be considered relevant for the proposed CDM project activity been invited?	VVM	129	Yes	OK	OK
c. Is the summary of the comments received as	VVM	129	Yes	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
provided in the PoA-DD complete?					
d. Have the project participants taken due account of any comments received and described this process in the PoA-DD?	VVM	129	Yes Meeting minutes and also recorded by video camera	OK	OK
10 Environmental impacts					
a. Have the project participants submitted documentation on the analysis of the environmental impacts of the project activity?	VVM	131	Environmental analysis done at CPA level	OK	OK
b. Have the project participants undertaken an analysis of environmental impacts?	VVM	132	NO No regulation required. 1.	OK	OK
c. Does the host Party require an environmental impact assessment?	VVM	132	NO No host party regulation on environmental impact assessment need to be done for a cooling system installation or replacement activity	OK	OK
d. If yes, have the project participants undertaken an environmental impact assessment?	VVM	132	NA	NA	NA

Table 2: validation activities (delete this table if the project activity is not a programme of activities)

CHECKLIST QUESTION	Ref	§	COMMENTS	Draft Concl	Final Concl
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VALIDATION REPORT

CHECKLIST QUESTION	Ref	§	COMMENTS	Draft Concl	Final Concl
1. Project design of programme of activities (delete this table if the project activity is not a programme of activities)					
a. Are the operational and management arrangements which have been established by the coordinating / managing suitable for the PoA being validated?	VV M	165	Yes	OK	OK
b. Are these arrangements sufficient to ensure that the coordinating / managing entity will have control of all records and information related to the implementation of individual CPAs and will be in the position to ensure each CPA is being operated in accordance with the specific requirements of the programs?	VV M	165	Yes Refer section 3B.	OK	OK
c. Are the specified eligibility criteria in the PoA-DD sufficient to ensure that all CPAs would comply with the CDM requirements applicable to the PoA, including inter alia the means of demonstrating the additionality of the CPA and the applicability of the applied methodology?	VV M	166	Yes Refer section 3B.	OK	OK
d. Does any proposed CPA, which a coordinating / managing entity wishes to include in the PoA, comply with the eligibility criteria specified in the PoA-DD?	VV M	167	Yes 1 st real CPA has been demonstrated it has fulfilled the eligibility defined in the PoA-DD.	OK	OK
e. Does the proposed small-scale project activity meet the requirements of the simplified modalities and procedures for small-scale CDM project activities?	VV M	135	Yes The PoA and CPA meet the requirements of the simplified modalities and procedures for small-scale CDM project activities.	OK	OK



VALIDATION REPORT

CHECKLIST QUESTION	Ref	§	COMMENTS	Draft Concl	Final Concl
f. Does the project activity qualify within the thresholds of the three possible types of small scale project activities? (Type i: project activities-renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts, Type ii: project activities-energy efficiency improvement project activities which reduce energy consumption, on the supply and / or demand side, by up to the equivalent of 15 gigawatt hours per year, Type iii: project activities- other project activities that both reduce the anthropogenic emissions by sources and directly emit less than 60 kilotonnes of carbon dioxide equivalent annually.)	VV M	136	PoA and CPA are qualified under Type ii project.	OK	OK
g. Does the project activity conform to one of the approved small-scale categories	VV M	136	Yes	OK	OK
h. Does the project activity apply the relevant tool and methodology?	VV M	136	Yes It has follow the approved methodology AMS II.C version 13 and its relevant tools defined in the methodology.	OK	OK
i. Are the small-scale methodologies applied in conjunction with general guidelines to SSC CDM methodologies, which provides guidelines on equipment capacity, equipment performance / lifetime, baseline identification for type-II/III Greenfield project activities, sampling and other monitoring related issues?	VV M	136	NA	NA	NA
j. Is the project activity a debundle component of a large-scale project, ie. Is there a registered small-scale CDM project activity or an application to register	VV M	136	No. It has verified by CME and DOE from UNFCCC website the project activities are not debundle	OK	OK



BUREAU
VERITAS

VALIDATION REPORT

CHECKLIST QUESTION	Ref	§	COMMENTS	Draft Concl	Final Concl
another CDM project activity: (a) with the same project participants, (b) in the same project category and technology / measure, and (c) registered with the previous 2 years and (d) whose project boundary is within 1 km of the proposed boundary of the proposed small-scale activity at the closest points?	.		component of large project.		
k. Is an assessment of the environmental impacts of the proposed CDM project activities required by the host Party.	VV M	136	No. Refer above section 10. It is not a requirement from Singapore.	OK	OK
l. Is the project additional?	VV M	137	Yes. Refer above section 6.	OK	OK



VALIDATION REPORT

Table 3; Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 1 and 2	Summary of project owner response	Validation team conclusion
<p>CL 1: AMS II.E is related to energy efficiency & fuel savings initiatives implemented together. In this project, there is only improvement in energy efficiency through the replacement of chillers at multiple sites(Please clarify). (Also please see the footnote below).</p>	<p>3AOii 4b-iv 5b-c,f,g,k</p>	<p>We, CRX the CME have duly changed the methodology to AMSIIC-Version 13 and have also amended the relevant parts of the SSC PoA-DD that reflect this change including the eligibility criteria for CPAs to join this SSC-PoA known as CARE.</p> <p>We also wish to state that the calculation for emission reductions from refrigerant gases (as provided for by AMSIIC) have not been included as allowed by EB34 paragraph 17(b) as this PoA only considers CPAs that use refrigerant gases that have a lower GWP from the baseline.</p> <p>It therefore does not allow CPAs that make a changeover to a refrigerant gas that has a higher GWP than that of the baseline. The PoA also disallows the use of refrigerant gases that have been disallowed under the Montreal Protocol.</p>	<p>Verified that the PoA-DD version 3 dated on 25 Nov 2011 and CPA-DD version 2 dated on 25 Nov 2011 have been changed to methodology AMS II.C version 13. Validation is according to the methodology AMS II.C version 13.</p> <p>CL1 closed.</p>
<p>CL 2. There is no detailed information provided on the energy efficiency means</p>	<p>3Aov-i & ii 4b-ii 6cc</p>	<p>We, CRX, the CME have duly addressed the additionality issue by producing evidence of Prevailing practice in the SSC-</p>	<p>Verified the addtionality has rewrite to provide more detail description such as design/know-how, ESCO competitively, etc to support the barrier due</p>



VALIDATION REPORT

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 1 and 2	Summary of project owner response	Validation team conclusion
<p>implemented in the 5-6 buildings, which have also changed over to water cooled / high efficiency chillers. Despite the claim of several barriers (such as design and know how, ESCO competitively etc)It is not clear ,how these 5-6 buildings have already implemented such projects without CDM. If so , then how is it that the project activity claims this as a barrier?.</p>	6d	<p>PoA-DD and also duly described projects that have improved efficiency of their chiller plants by methods of only optimization or partial shut down which are not allowed under this PoA.</p> <p>In addition, these buildings could not be considered under any CDM incentive as they were implemented before July 2006 when Singapore acceded to the Kyoto Protocol. The other points (such as design/know-how, ESCO competitiveness, etc) are support indications of how the objective of our PoA is still non-prevailing practice.</p> <p>Finally the letter we have produced from the Singapore DNA – dated July 13 2010 and duly provided to the DOE - clearly states that the objectives of our PoA (such as 0.65kw/RT and measurement and monitoring at 1-min intervals) is not prevailing practice.</p>	<p>to prevailing practice for buildings to achieve < 0.65 kWh/TR efficiency and monitoring at 1-min intervals.</p> <p>CL2 closed.</p>
<p>CL 3: Excel sheet on CER estimation has not been provided.</p>	3A-vii 3A-b-v-iii 5eb	<p>We, CRX, the CME have duly provided the excel sheet on the precise estimation of CERs for the first CPA-DD Capricorn. All raw data has also been previously provided</p>	<p>CER calculation in excel sheet has been submitted to DOE to validate the CER calculation.</p> <p>CL 3 closed.</p>



VALIDATION REPORT

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 1 and 2	Summary of project owner response	Validation team conclusion
		to the DOE during site visit of Oct 12, 2011	

AMS IIE : Technology/measure

This category comprises any energy efficiency and fuel switching measure implemented at a single building, such as a commercial, institutional or residential building, or group of similar buildings, such as a school, district or university.

AMS IIC: Technology/measure

This methodology comprises activities that encourage the adoption of energy-efficient equipment/appliance (e.g., lamps, ballasts, refrigerators, motors, fans, air conditioners, pumping systems) at many sites. These technologies may replace existing equipment or be installed at new sites.