JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	Installation of High Efficiency Air Conditioning System and Chillers in Semiconductor Factory
Reference number	TH003
Monitoring period	01/04/2017 – 31/12/2017
Date of completion of the monitoring report	20/02/2018
Third-party entity (TPE)	Japan Quality Assurance Organization (JQA) (TPE-TH-003)
Project participant contracting the TPE	Sony Semiconductor Manufacturing Corporation
Date of completion of this report	14/05/2018

A.2 Conclusion of verification and level of assurance

Overall verification opinion	☒ Positive ☐ Negative
☒ Unqualified opinion	Based on the process and procedure conducted, JQA provides reasonable assurance that the emission reductions for Energy Saving for Semiconductor Factory with High Efficiency Centrifugal Chiller and Compressor ✓ Are free of material errors and are a fair representation of the GHG data and information, and ✓ Are prepared in line with the related JCM rules, procedure, guidelines, forms and other relevant documents
(If overall verification opinion is negative, please check below and state its reasons.) ☐ Qualified Opinion ☐ Adverse opinion ☐ Disclaimer	<State the reasons>

A.3. Overview of the verification results

A.3. Overview of the verification results

Item	Verification requirements	No CAR or CL remaining
The project implementation with the eligibility criteria of the applied methodology	The TPE determines the conformity of the actual project and its operation with the eligibility criteria of the applied methodology.	☒
The project implementation against the registered PDD or any approved revised PDD	The TPE assesses the status of the actual project and its operation with the registered/validated PDD or any approved revised PDD.	☒
Calibration frequency and correction of measured values with related requirements	If monitoring Option C is selected, the TPE determines whether the measuring equipments have been properly calibrated in line with the monitoring plan and whether measured values are properly corrected, where necessary, to calculate emission reductions in line with the PDD and Monitoring Guidelines.	☒
Data and calculation of GHG emission reductions	The TPE assesses the data and calculations of GHG emission reductions achieved by/resulting from the project by the application of the selected approved methodology.	☒
Avoidance of double registration	The TPE determines whether the project is not registered under other international climate mitigation mechanisms.	☒
Post registration changes	The TPE determines whether there are post registration changes from the registered PDD and/or methodology which prevent the use of the applied methodology.	☒

Authorised signatory: Mr. ☒ Ms. ☐

Last name: Asada First name: Sumio

Title: Senior Executive

Specimen signature: Date: 14/05/2018

B. Verification team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. ☒ Ms. ☐	Tadashi Yoshida	External Individual	Team leader	☒	Authorized	☒
Mr. ☒ Ms. ☐	Koichiro Tanabe	JQA	Internal reviewer	☒	Authorized	☐

Please specify the following for each item.

* *Function: Indicate the role of the personnel in the validation activity such as team leader, team member, technical expert, or internal reviewer.*

* *Scheme competence: Check the boxes if the personnel have sufficient knowledge on the JCM.*

* *Technical competence: Indicate if the personnel have sufficient technical competence related to the project under validation.*

C. Means of verification, findings and conclusions based on reporting requirements

C.1. Compliance of the project implementation and operation with the eligibility criteria of the applied methodology

<Means of verification>

The project was registered as a JCM project on 20/04/2018, which applied JCM approved methodologies TH_AM003_ver01.0 "Energy Saving by Introduction of High Efficiency Inverter Type Centrifugal Chiller" and TH_AM006_ver01.0 "Installation of Displacement Ventilation Air Conditioning Unit in the Cleanroom of Semiconductor Manufacturing Factory" under the scheme of Joint Crediting Mechanism between Kingdom of Thailand and Japan.

The project participants (PPs) are Sony Device Technology (Thailand) Co., Ltd. from Kingdom of Thailand and Sony Semiconductor Manufacturing Corporation from Japan.

The purpose of the project is to reduce CO_2 emissions from electricity consumption in the new clean room for Large Scale Integration (LSI) and image sensor manufacturing by newly installing high-efficiency centrifugal chillers and swirling induction type air conditioners. The project chiller is equipped with an inverter, which contributes to energy saving through the control of rotation speed of compressor motor of the chiller to continuously regulate temperature and humidity of the clean room. As for project air-conditioning system, it does not mix the air in the room and cools only the room's lower layer air and hence the cooling capacity becomes smaller compared to the reference system. Air flow rate also can be set lower than that of the reference system, which reduces power consumption of the fan motor.

The JCM website indicates that the starting date of the project operation is 01/04/2017

and this monitoring period is from 01/04/2017 to 31/12/2017. It is confirmed through the review of relevant documents, on-site visit and the interview with the PPs that the monitoring started on 01/04/2017 after the commissioning of the project facilities on 29/03/2017. Sony Semiconductor Manufacturing Corporation has conducted OJT training about the operation and maintenance of the project facilities during the installation. Maintenance support by the manufacturers will be also available upon request.

JQA has assessed whether the project implementation and operation after the starting date of project operation complies with the eligibility criteria of the applied methodologies during the monitoring period. After the desk review, an on-site assessment was conducted on 01/02/2018. JQA conducted a physical inspection and interviewed with the PPs listed in Section F of this verification report.

The assessment results regarding the eligibility criteria are summarized as below:

[JCM_TH_AM003]

Criterion 1

*Project chiller is an inverter type centrifugal chiller with a capacity which is less than or equal to 1,500 USRt. * 1 USRt = 3.52 kW*

Through the review of supporting documents and check of the nameplate of the chiller during on-site inspection, the project information of Criterion 1 in the PDD is confirmed as follows:

- The installed chiller is the model "ETI-50" made by Mitsubishi Heavy Industries, Ltd.
- The project chiller is an inverter type centrifugal one with a capacity of 500 USRt.

Hence, it is concluded that the project meets the criterion 1 with a satisfactory result.

Criterion 2

COP for project chiller i calculated under the standardizing temperature conditions ($COP_{PJ,tc,i}$) is more than the threshold COP values set in the table below. ("x" in the table represents cooling capacity per unit.)*

Cooling capacity per unit (USRt)	300≤ x ≤450	450< x ≤550	550< x ≤825	825< x ≤1,500
Threshold COP value	5.59	5.69	5.85	6.06

$COP_{PJ,tc,i}$ is calculated by altering the temperature conditions of COP of project chiller i ($COP_{PJ,i}$) from the project specific conditions to the standardizing conditions. $COP_{PJ,i}$ is derived from specifications prepared for the quotation or factory acceptance test data by

manufacturer.

[*Equation to calculate $COP_{PJ,tc,i}$*]

$$COP_{PJ,tc,i} = COP_{PJ,i} \times [(T_{cooling\text{-}out,i} - T_{chilled\text{-}out,i} + TD_{chilled} + TD_{cooling}) \div (37 - 7 + TD_{chilled} + TD_{cooling})]$$

$COP_{PJ,tc,i}$: *COP of project chiller i calculated under the standardizing temperature conditions*[-]*

$COP_{PJ,i}$: *COP of project chiller i under the project specific conditions [-]*

$T_{cooling\text{-}out,i}$: *Output cooling water temperature of project chiller i set under the project specific conditions [degree Celsius]*

$T_{chilled\text{-}out,i}$: *Output chilled water temperature of project chiller i set under the project specific conditions [degree Celsius]*

$TD_{cooling}$: *Temperature difference between condensing temperature of refrigerant and output cooling water temperature, 1.5 degree Celsius set as a default value [degree Celsius]*

$TD_{chilled}$: *Temperature difference between evaporating temperature of refrigerant and output chilled water temperature, 1.5 degree Celsius set as a default value [degree Celsius]*

** The standardizing temperature conditions to calculate $COP_{PJ,tc,i}$*
Chilled water : Output 7 degree Celsius, Input 12 degree Celsius
Cooling water : Output 37 degree Celsius, Input 32 degree Celsius

Through the review of supporting documents and the interview with the PPs during on-site inspection, the project information of Criterion 2 in the PDD is confirmed as follows:

- The COP of project chiller ETI-50 ($COP_{PJ,tc,i}$) under the standardizing temperature conditions is calculated to be 6.15 using $COP_{PJ,i}$ (= 6.15) given by the manufacturer's test data, by the following equation:

  $COP_{PJ,tc,i} = 6.15 \times [(37 - 7 + 1.5 + 1.5) \div (37 - 7 + 1.5 + 1.5)]$
  $= 6.15$
- The COP of ETI-50 (6.15) is higher than the threshold COP of 5.69 for 500 USRt cooling capacity class, according to the methodology TH_AM003.

Hence, it is concluded that the project meets the criterion 2 with a satisfactory result.

Criterion 3

Periodical check is planned more than one (1) time annually.

Through the review of supporting documents and the interview with the PPs during on-site inspection, the project information of Criterion 3 in the PDD is confirmed as follows:

- Annual maintenance service report demonstrates that the check and maintenance of chiller has been carried out annually by the manufacturer,
- Preventive Maintenance Control Plan shows that the chillers are to be checked and

maintained annually.

Hence, it is concluded that the project meets the criterion 3 with a satisfactory result.

Criterion 4

Ozone Depletion Potential (ODP) of the refrigerant used for project chiller is zero.

Through the review of supporting documents and the interview with the PPs during on-site inspection, the project information of Criterion 4 in the PDD is confirmed as follows:

- The refrigerant type used for the project chiller is "ASAHIKLIN AK-134a (HFC-134)" produced by Asahi Glass Co., Ltd.,
- Safety Data Sheet shows that the ODP of ASAHIKLIN AK-134a (HFC-134) is zero.

Hence, it is concluded that the project meets the criterion 4 with a satisfactory result.

Criterion 5

A plan for prevention of releasing refrigerant used for project chiller is prepared.
In the case of replacing the existing chiller with the project chiller, a plan for prevention of releasing refrigerant used in the existing chiller to the air (e.g. re-use of the equipment) is prepared. Execution of this plan is checked at the time of verification, in order to confirm that refrigerant used for the existing one replaced by the project is prevented from being released to the air.

Through the review of supporting documents and the interview with the PPs during on-site inspection, the project information of Criterion 5 in the PDD is confirmed as follows:

- Letter of consent signed between Sony Device Technology (Thailand) Co., Ltd. And Sony Semiconductor Manufacturing Corporation dated 18/12/2017 was prepared to avoid the release of refrigerant into the atmosphere.
- The letter states that the maintenance for chiller is carried out in accordance with the directions given by the manufacturer "Mitsubishi Heavy Industries, Ltd." and further the collection of refrigerant from project chillers at the time of removal will be appropriately processed by the manufacturer according to "Freon Collection Guideline (2008)" of the Industrial Network for Fluorocarbon Recovery Promotion (INFREP).

Hence, it is concluded that the project meets the criterion 5 with a satisfactory result.

[JCM_TH_AM006]

Criterion 1

Displacement ventilation air conditioning unit, whose specification of velocity of the discharged air is designed to be more than 0.5 m/s and equals to or less than 1.0 m/s, is installed in the cleanroom of semiconductor plant.

Through the review of supporting documents and the interview with the PPs, the project information of Criterion 1 in the PDD is confirmed as follows:

- The velocity of discharged air by the displacement ventilation air conditioning unit is set to be 0.83 m/s to keep a proper discharge pressure in the clean room, based on the air flow capacity of the project air conditioner and the effective area of air flow inlet in the clean room.

Hence, it is concluded that the project meets the criterion 1 with a satisfactory result.

Criterion 2

The project displacement ventilation air conditioning unit is constituted of at least cooling coil, HEPA (high efficiency particular air) or ULPA (ultra low penetration air) filter and air supply fan in one unit.

Through the review of supporting documents and the interview with the PPs, the project information of Criterion 2 in the PDD is confirmed as follows:

- HEPA is used in Class 10,000 areas with a cooling coil and air supply fan, while ULPA is used in Class 1,000 areas with a cooling coil and air supply fan.

Hence, it is concluded that the project meets the criterion 2 with a satisfactory result.

Criterion 3

The project displacement ventilation air conditioning unit is designed to meet the threshold values of Class 6 or class 7 of airborne particulate cleanliness class set by ISO 14644-1:2015.

Through the review of the design drawings of the clean rooms for class 6 and class 7 and the interview with the PPs, the project information of Criterion 3 in the PDD is confirmed as follows:

- The displacement ventilation air conditioning units are installed and operated to meet the threshold values of Class 6 and Class 7 based on ISO 14644-1:2015,
- The number of ventilation times for the clean room is set 40 times for class 7 and 80 times for class 6.

Hence, it is concluded that the project meets the criterion 3 with a satisfactory result.

Criterion 4

The project displacement ventilation air conditioning unit only supplies cooled air.

Through the review of the design drawing of air conditioning system and the interview with the PPs, the project information of Criterion 4 in the PDD is confirmed as follows:

- The displacement ventilation air conditioning units only supplies air cooled by the chilled water.

Hence, it is concluded that the project meets the criterion 4 with a satisfactory result.

In conclusion, JQA confirms that the project implementation and operation comply with all eligibility criteria stipulated in TH_AM003 and TH_AM006.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the actual project and its operation are in compliance with the eligibility criteria of the applied methodologies TH_AM003 and TH_AM006 during this monitoring period.

C.2. Assessment of the project implementation against the registered PDD or any approved revised PDD

<Means of verification>

JQA has assessed the status of the actual project and its operation with the registered PDD through the desk review, on-site visit and interviews with the PPs. The assessment results are

summarized as follows;

[Physical features of the project]

Through the desk review, on-site visit and interview with the PPs, it is confirmed that the chillers and the displacement ventilation air conditioner were installed in the new clean room for Large Scale Integration (LSI) and image sensor manufacturing to reduce CO_2 emissions from electricity consumption and the commissioning of these equipment was completed on 29/03/2017. The installation of these equipment complies with the description of the PDD.

[Monitoring points]

Two monitoring parameters, i.e., power consumption of project chiller ($EC_{PJ,i,p}$) and power consumption of project displacement ventilation air conditioning unit ($EC_{PJ,DV,i,j,k,p}$), are measured by electricity meter.

1. $EC_{PJ,i,P}$: Power consumption of project chiller *i* during the period *p* [MWh/p]
2. $EC_{PJ,DV,i,j,k,p}$: Power consumption of project displacement ventilation air conditioning unit *i* during the period *p* [MWh/p]

It is confirmed through the on-site inspection that the electricity meter has been installed for each of chillers and displacement ventilation air conditioning unit, and has been monitoring the electricity consumption of them.

The monitoring points of power consumption for chiller and displacement ventilation air conditioning unit are located at the right position, respectively. These monitoring data are continuously monitored by electricity meter and are automatically transmitted to the server at Sony Device Technology (Thailand) Co., Ltd. for recording. Detailed information on the monitoring data of these power consumptions is described in Section C.4.

[Monitoring structure]

The monitoring structure has been established and the roles and responsibilities of the personnel are consistent with the description in Monitoring Structure Sheet. It is confirmed through the on-site visit and the interview with the PPs that the monitoring activity has been appropriately implemented during the monitoring period, in line with the monitoring plan of the registered PDD.

JQA confirms through the on-site visit for the first verification that the physical features of the project in the registered PDD are in place and the PPs have operated the project as per the

registered PDD.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the project has been operated in accordance with the registered PDD during the monitoring period, and no changes are found from the description of the registered PDD.

C.3. Compliance of calibration frequency and correction of measured values with related requirements

<Means of verification>

The power consumption of project chillers and displacement ventilation air conditioning unit during the monitoring period is measured by electricity meters which are installed and managed by the PPs. As per the applied methodologies TH_AM003 and TH_AM006, the electricity meter is required to be calibrated in case a calibration certificate issued by an entity accredited under national/international standards is not provided. The electricity meters used in the project activity, which is Model ME96SSR-MB (Class 1.0) manufactured by Mitsubishi Electric Corporation, are calibrated by the manufacturer at the time of factory shipment, and performance of the meter is guaranteed by the manufacturer for ten years without a calibration. It is confirmed through the review of the test report issued by the manufacturer that the electricity meter was calibrated at the time of factory shipment and performance of the meter is guaranteed for ten years without a calibration.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the electricity meter was appropriately calibrated by the manufacturer at the time of factory shipment and its calibration frequency is in compliance with the manufacturer's requirements. Therefore, no correction of the measured value is required.

C.4. Assessment of data and calculation of GHG emission reductions

<Means of verification>

JQA has assessed the data and calculation of GHG emission reductions achieved by the project activity as follows:

(a) The corresponding Monitoring Report Sheet of the applied methodology has been used;

Through the review of the monitoring report for the project which is titled as AM003 (Chiller)_20180220v2.xlsx and AM006 (Air conditioner)_20180220v2.xlsx, it is confirmed that the Monitoring Report Sheets (MRS(input), MRS(input_separate) and MRS(calc_process)) of applied methodologies TH_AM003 and TH_AM006 are appropriately used.

(b) A complete set of data for the monitoring period for all parameters monitored ex post was provided to the verification team in the form of several kinds of files.

Monitoring Report Sheet (MRS) provided by the PPs contains a complete set of the monitored data on power consumption of chillers (3 units) and displacement ventilation air conditioners (3 units) during the monitoring period of 01/04/2017 – 31/12/2017. The monitored data of chillers and air conditioners are separately provided by use of Monitoring Spreadsheet JCM_TH_AM003_ ver01.0 and JCM_ TH_ AM006_ ver01.0, respectively. It is confirmed through the review of these monitored data that the monitored power consumption data are fully provided for the monitoring period of 01/04/2017–31/12/2017.

(c) Information provided in the monitoring report has been checked with sources such as plant logbooks, inventories, purchase records, laboratory analysis;

JQA has reviewed the correctness of monitored data given in the MRSs for chiller and displacement ventilation air conditioning units through cross-checking them with the monthly power consumption data provided by the PPs.

Parameters	Monitored values	Method to check values in the monitoring report with sources
$EC_{PJ,i,P}$ for chiller (TH_AM003)	528.2 MWh/p	The value of power consumption for chillers in the monitoring report (MRS sheet) is cross-checked with its monthly power consumption data which aggregate the daily data downloaded from the server.
$EC_{PJ,DV,i,j,k,P}$ for displacement	530.3 MWh/p	The value of power consumption for displacement ventilation air conditioning units in the monitoring

ventilation air conditioning unit (TH_AM006)		report (MRS sheet) is cross-checked with its monthly power consumption data which aggregate the daily data downloaded from the server.

It is confirmed through the cross-check of the monitored data in the MRS sheet with the monthly power consumption data that the values of power consumption by chillers and displacement ventilation air conditioning units in the MRS sheets are fully consistent with those of monthly power consumption data and further reference emissions, project emissions and emission reductions in the MPS sheets are correctly calculated.

(d) Any assumptions used in emission calculations have been justified;

Through the review of the MRS and the interview with the PPs, it is confirmed that no assumption has been used in emission calculations and hence no justification is required.

(e) Appropriate emission factors, default values, and other reference values have been correctly applied.

Through the review of the MRS and the interview with the PPs, it is confirmed that emission factors, default values, and other reference values have been correctly applied.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the monitored data and the calculation of GHG emission reductions achieved by the project activity, in accordance with the applied methodologies TH_AM003 and TH_AM006, are appropriate and correct.

C.5. Assessment of avoidance of double registration

<Means of verification>

It is confirmed that a written confirmation from the PPs regarding no registration under other international climate mitigation mechanisms was provided at the time of validation and the declaration letter signed by the PP's representative in the MoC was submitted to the Joint

Committee. In addition, it is re-confirmed through the check of the relevant website and the interview with PPs that the project has not been registered under any other mechanisms.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issues was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the project has not been registered under other international climate mitigation mechanisms.

C.6. Post registration changes

<Means of verification>

It is confirmed through the review of documents and the on-site assessment that the project has not been changed from the registered PDD and/or methodology.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the project has not been changed from the registered PDD and/or methodology.

D. Assessment of response to remaining issues

An assessment of response to the remaining issues including FARs from the validation and/or previous verification period, if appropriate

No issues including FAR from the validation are remained. As this is the first verification, no issues from the previous verification are also remained.

E. Verified amount of emission reductions achieved

Year	Verified Reference Emissions (tCO_2e)	Verified Project Emissions (tCO_2e)	Verified Emission Reductions (tCO_2e)
2017	3,004.5	599.5	2,404
2018	n/a	n/a	n/a
2019	n/a	n/a	n/a
2020	n/a	n/a	n/a
2021	n/a	n/a	n/a
2022	n/a	n/a	n/a
2023	n/a	n/a	n/a
2024	n/a	n/a	n/a
2025	n/a	n/a	n/a
Total (tCO_2e)			2,404

F. List of interviewees and documents received

F.1. List of interviewees

- Hironori Sakamoto, Managing Director, Sony Device Technology (Thailand) Co., Ltd.
- Yoshiro Fujiyama, Executive Director, Sony Device Technology (Thailand) Co., Ltd.
- Chiaki Nomura, Executive Director, Sony Device Technology (Thailand) Co., Ltd.
- Rapin Pensook, Executive Director, Sony Device Technology (Thailand) Co., Ltd.
- Apirome Puangchareanpor, Assistant General Manager, Sony Device Technology (Thailand) Co., Ltd.
- Somya Nathomtong, Assistant General Manager, Sony Device Technology (Thailand) Co., Ltd.
- Manattida Temiyakul, Sony Device Technology (Thailand) Co., Ltd.
- Chihiro Kudo, General Manager, Sony Technology (Thailand) Co, Ltd.
- Hirotoshi Kikuchi, Assistant Manager, Sony Technology (Thailand) Co, Ltd.
- Nobutaka Kawashita, Senior General Manager, Sony Semiconductor Manufacturing Corporation
- Takeshi Yamada, Manager, Sony Semiconductor Manufacturing Corporation
- Kazuyuki Amano, Sony Semiconductor Manufacturing Corporation
- Yasuhiro Takemura, Senior Manager, E-Square Inc.
- Kenichi Uchida, Manager, E-Square Inc.

F.2. List of documents received

1. Monitoring Report Sheet (Draft), AM003 (Chiller)_20180220v2.xlsx and AM006 (Air conditioner)_ 20180220v2.xlsx
2. Project Design Document, ver. 2.0, 20/02/2018
3. Validation Report, 22/03/2018 (JCM_TH003_Val_Rep.pdf)
4. JCM Modalities of Communication Statement Form (MoC) dated 22/11/2017
5. Approved Methodology JCM_TH_AM003_ver01.0, 21/08/2017, JC3, Annex 6
6. Monitoring Spreadsheet JCM_TH_AM003_ver01.0.xlsx
7. Approved Methodology JCM_TH_AM006_ver01.0, 21/08/2017, JC3, Annex 8
8. Monitoring Spreadsheet JCM_TH_AM006_ver01.0.xlsx
9. JCM Glossary of Terms (JCM_TH_Glossary_ver01.0)
10. JCM Project Cycle Procedure (JCM_TH_PCP_ver02.0)
11. JCM Modalities of Communication Statement Form (JCM_TH_F_MoC_ver01.0)
12. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_TH_GL_PDD_MR_ver02.0)
13. JCM Guidelines for Validation and Verification (JCM_TH_GL_VV_ver01.0)
14. JCM Verification Report Form (JCM_TH_F_Vrf_Rep_ver02.0)
15. Layout of chiller and displacement ventilation air conditioning unit in the clean room of semiconductor plant

16-1. Specification of chiller “ETI-50” manufactured by Mitsubishi Heavy Industries, Ltd.

16-2. Specification of chiller “ETI-50”

17. Operation manual of chiller “ETI-50” manufactured by Mitsubishi Heavy Industries, Ltd.

18-1. Specification of displacement ventilation air conditioning unit SWIT-1

18-2. Specification of displacement ventilation air conditioning unit SWIT-2

18-3. Relationship between flow rate of air conditioning unit and differential pressure

18-4. Design of air conditioning system

19. Operation manual of displacement ventilation air conditioning unit SWIT

20-1. Design of clean room 1 K class

20-2. Design of clean room 10K class

20-3. Standard of clean room (ISO 14644-1)

21. Safety data sheet (SDS) of the refrigerant Asahiklin AK-134a manufactured by AGC
22. Letter of Consent between Sony Device Technology (Thailand) Co., Ltd. and Sony
23. Freon Collection Guideline (2008) by the Industrial Network for Fluorocarbon Recovery Promotion (INFREP)
24. Preventive maintenance control plan prepared by Sony Device Technology (Thailand) Co., Ltd.
25. Annual Maintenance Servicing Report of chiller issued by Mitsubishi Heavy Industries – Mahajak Air Conditioners Co., Ltd.

26-1. Specification of electricity meter ME96SSR-MB (Class 1.0) manufactured by Mitsubishi Electric Corporation

26-2. Calibration test report of electricity meter issued by Mitsubishi Electric Corporation Fukuyama Works, dated 25/07/2016

26-3. Calibration frequency recommended by the manufacturer

27. Monitoring points of power consumption for air compressor and chiller

28. Schematic diagram of monitoring structure

29. Training record conducted 16/12/2015

30. Display of power consumption on the monitoring screen

31. Daily data of power consumption for air compressors and chillers in April 2017

32. Monthly power consumption data during 01/04/2017 – 31/12/2017

33. Operation logbook data of equipment including chiller and air conditioning unit

Annex Certificates or curricula vitae of TPE's verification team members, technical experts and internal technical reviewers

Statement of competence

Name: Dr. Tadashi Yoshida

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	2014/12/22
Verifier	2014/12/22
Team leader	2014/12/22

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	2014/12/22
TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	2015/11/12
TA 4.6. Other manufacturing industries	2014/12/22
TA 5.1. Chemical industry	2014/12/22
TA 10.1. Fugitive emissions from oil and gas	2014/12/22
TA 13.1. Solid waste and wastewater	2014/12/22
TA 14.1. Afforestation and reforestation	-

Statement of competence

Name: Mr. Koichiro Tanabe

Qualified and authorized by Japan Quality Assurance Organization.

Function	Date of qualification
Validator	-
Verifier	2014/12/22
Team leader	2014/12/22

Technical area within sectoral scopes	Date of qualification
TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	2014/12/22
TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	-
TA 4.6. Other manufacturing industries	2014/12/22
TA 5.1. Chemical industry	2014/12/22
TA 10.1. Fugitive emissions from oil and gas	2014/12/22
TA 13.1. Solid waste and wastewater	2014/12/22
TA 14.1. Afforestation and reforestation	-