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# GHG VERIFICATION REPORT

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**COMPANY NAME:**

**Amkor Technology Malaysia Sdn Bhd**

**Reporting Period:**

**1<sup>st</sup> January 2018 to 31<sup>st</sup> December 2018**

**Report No.:**

**SQAS-GHG-EA91220001\_2018**

**Revision No.:**

**01**

## Abbreviations

ATM	Amkor Technology Malaysia Sdn Bhd
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon dioxide
EF	Emission Factor
GHG	Greenhouse Gas(es)
GWP	Global warming potential
HCFC/HFC	Hydrochlorofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt-hours
LSI	Large Scale Integration
m <sup>3</sup>	Meter cube
MT	Metric tonne
N <sub>2</sub> O	Nitrous oxide
OSH	Occupational, Safety and Health
SIRIM QAS Intl.	SIRIM QAS International Sdn Bhd
TNB	Tenaga Nasional Berhad
ISO 14064-1	ISO 14064-1:2006 Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
ISO 14064-3	ISO 14064-3:2006 Specification with guidance for the validation and verification of greenhouse gas assertions

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## 1.0 INTRODUCTION

SIRIM QAS International Sdn. Bhd. was appointed by Amkor Technology Malaysia Sdn Bhd (hereafter referred to as ATM) in January 2019 to verify the organization's GHG emissions for 2018. ATM was formerly known as Toshiba Electronics Malaysia Sdn. Bhd. and was incorporated on 1st of August 2013. ATM is located at Telok Panglima Garang Free Industrial Zone in the state of Selangor. ATM offers semiconductor packaging and test services for discrete semiconductor products and analogue LSI products. It also manufactures semiconductor devices for the world market on behalf of Amkor Technology USA, the parent company. This is the first GHG verification carried out by SIRIM QAS Intl for ATM.

## 2.0 SCOPE

The scope of the verification was to provide an independent and objective review of the information contained in the "Greenhouse Gas Emission Report for Year 2018 ATM 01/2018" and "GHG Check Sheet" (hereafter referred to as the "GHG documentation").

The verification is not meant to provide any consulting towards the client. However, documented findings may provide input for improvement of the future GHG reporting.

## 3.0 OBJECTIVES OF VERIFICATION

The objectives of the verification are as follows:

- i) To determine the accuracy of the information reported in ATM's GHG documentation for reporting period between 1<sup>st</sup> January 2018 and 31<sup>st</sup> December 2018;
- ii) To assess the completeness of the coverage of reporting for Scope 1 and 2;
- iii) To determine whether the methodology used to calculate the emissions reduction is correct and all assumptions chosen are appropriate, reasonable and/or accurate;
- iv) To verify and certify reported GHG emissions of the company.

## 4.0 VERIFICATION TEAM

Verification Team Leader : Shaiful Azmir A. Rahman

Verification Team Member : Aernida Abdul Kadir

**Shaiful Azmir A. Rahman** holds a Degree in Electrical Engineering and he is a registered Energy Manager under the Energy Commission of Malaysia. He has been qualified as lead auditor in accordance with SIRIM QAS Intl.'s qualification for Environmental Management Systems (ISO 14001) and Energy Management Systems (ISO 50001). He has been doing the management system audits and GHG verification audits for the past 5 years.

**Aernida Abdul Kadir** holds a Degree in Electrical-Electronics Engineering and a Diploma in Palm Oil Milling and Technology Management. She has been trained in validation and verification processes of the Clean Development Mechanism projects, the Gold Standard projects and the Verified Carbon Standard projects. She has been qualified as a CDM lead auditor in accordance with SIRIM QAS Intl.'s qualification criteria. She is a lead auditor for Environmental Management Systems (ISO 14001) for the past 10 years, Energy Management Systems (ISO 50001) for 5 years and a Certified Sustainability Reporting Specialist since March 2018.

## 5.0 CONFIDENTIALITY

The members of the verification team from SIRIM QAS International Sdn. Bhd. have given undertakings not to disclose any confidential information that may have been provided to them by ATM during the verification process, including information contained in this verification report, to any third party, without the approval of ATM unless such disclosure is required by law. If required by law, ATM will be informed of the information disclosed.

## 6.0 DISCLAIMER

The verification has been based on the information provided for the reporting year i.e. 1<sup>st</sup> January 2018 to 31<sup>st</sup> December 2018 only.

## 7.0 METHODOLOGY

The SIRIM QAS International Sdn. Bhd. verification process consisted of the following phases:

- i) Off-site documents review of activity data sources and the calculation of GHG emissions provided by ATM manufacturing site;
- ii) Verification audit planning;
- iii) On-site visit to ATM plant in Teluk Panglima Garang which included interviews with relevant personnel;
- iv) Preparation and issuance of verification audit findings;
- v) Resolution of outstanding issues; and
- vi) Issuance of final verification report.

### Duration of Verification

The verification of the GHG documentation was carried out in April to June 2019 with details as follows:

Off-site document review	: 22 <sup>nd</sup> March 2019
On-site verification	: 1 <sup>st</sup> & 2 <sup>nd</sup> April 2019
Issuance of findings	: 3 <sup>rd</sup> April 2019
Verification findings	: 9 <sup>th</sup> April to 30 <sup>th</sup> May 2019
Preparation of draft report	: 14 <sup>th</sup> , 24 <sup>th</sup> & 25 <sup>th</sup> June 2019
Preparation of final report	: 28 <sup>th</sup> June 2019

The following list of the documents were reviewed during the verification:

- i) Greenhouse Gas Emission Report For Year 2018 ATM 01/2018 dated 25<sup>th</sup> June 2019;
- ii) GHG Check sheet dated 30<sup>th</sup> May 2019;
- iii) UK Government GHG Conversion Factors for Company Reporting (2017);
- iv) Greenhouse Gas Protocol, Fifth Assessment Report (AR5) Global Warming Potential;
- v) IPCC Guidelines for National Greenhouse Gas Inventories;
- vi) WRI GHG Protocol.

## 8.0 REPORT ON FINDINGS

### 8.1 ORGANIZATIONAL & OPERATIONAL BOUNDARIES

ATM applies an operational control approach to boundary-setting, assigning all emissions from activities it controls including those undertaken by contractors. The operational boundary is set based on categories of GHG-producing activities within the organizational boundary, defined by ATM. In accordance with clause 4.2.2, 4.2.3 and 4.2.4 of the ISO 14064-1, the quantification of the GHG emissions included the following:

Emissions category	GHG scope	GHG sources	GHGs types
Direct emission	Scope 1	Diesel consumption for standby Generator and Fire Fighting Standby Pump	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
		Petrol consumption for company cars and forklifts	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
		CO <sub>2</sub> consumption for use in the fire protection system	CO <sub>2</sub>
		LPG consumption for cooking device used by the canteen	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
		Refrigerant consumption for the split unit air-conditioners and chillers	HFCs
Energy indirect emissions	Scope 2	Electricity consumption used by the plant	CO <sub>2</sub>

It can be confirmed that the reporting only accounts for Scope 1 and Scope 2 emissions. It has also been verified that there were neither GHG sinks nor reservoirs included within the operational boundaries of ATM. And, there were no emissions from the use of biomass in any of ATM's facilities. Hence, these emissions had been omitted from the GHG inventory and documentation.

### 8.2 REPORTING PERIOD

The reporting period covers from 1<sup>st</sup> January 2018 to 31<sup>st</sup> December 2018.

### 8.3 BASE YEAR

As this was the first verification, in accordance with clause 5.3.1 of ISO 14064-1, the 2018 data had been considered as the base year.

### 8.4 METHODOLOGY, GHG DATA AND EMISSION FACTORS

The intent of this section was to verify the accuracy and the appropriateness of the methodologies selection, GHG activity data involved in the GHG computation, starting from the identification of GHG sources, the data collection and compilation system and the selection of the emission factors. It shall be in accordance with the requirements stipulated under clause 4.3.3, 4.3.4 and 4.3.5 of ISO 14064-1.

#### 8.4.1 Methodology

With reference to the associated GHG emissions reported in section 8.2 of this report, the primary methodology used to collect and calculate emissions data was by multiplying the GHG activity data by appropriate GHG emission factors and the GWP. It has been verified that the methodologies applied were appropriate and consistent with the references and sources, tabulated as follows:

Quantification methodology	Reference/Source
Scope 1 : 1. Diesel consumption for standby Generator and Fire Fighting Standby Pump 2. LPG consumption for cooking device used by the canteen	Energy: Volume 2 Chapter 2 Stationary combustion, IPCC 2006; Where the emissions of GHGs were calculated by multiplying the fuel purchased with a default emission factor.
Scope 1 : Petrol consumption for company cars and forklifts	Energy: Volume 2 Chapter 3 Mobile combustion, IPCC 2006; Where the emissions of GHGs were calculated by multiplying the fuel purchased (diesel and petrol) with a default emission factor.
Scope 1: CO <sub>2</sub> consumption for use in the fire protection system	WRI GHG Protocol; Multiplying the emissions of a refrigerant in (kg) by its GWP.



Scope 1: Refrigerant consumption for the split unit air-conditioners and chillers	WRI GHG Protocol; Multiplying the emissions of a refrigerant in (kg) by its GWP.
Scope 2: Emission from electricity consumption	Energy: Chapter 2 Stationary combustion, IPCC 2006; Multiplying the kWh consumption with a default emission factor.

It can be confirmed that the methodologies applied in the quantification of GHGs were found to be appropriate and in accordance with the published information.

#### 8.4.2 GHG activity data

Based on the data verification, it has been verified that these data has been measured and monitored accordingly for ATM's GHG computation input :

Activity data	Unit	Source of data
Diesel for Genset	Litre	Consumption report from Genset Log Book 2018
Petrol for company vehicles	Km	Based on mileage report of Company Car Log Book
Petrol for Forklift	Litre	Invoice from purchased of petrol
LPG for cooking devices	Kg	Invoice from purchased LPG cyclinders
Electricity	kWh	Monthly bills by utility provider (TNB)

For the following information, it has been confirmed that these data has been based on ATM's estimation. As the source of estimation cannot be further justified during the conduct of audit, the amount of GHGs determined from these source were not considered in the final computation.

Activity data	Source of data
Refrigerant for the split unit air – conditioning system	Maintenance activities
Refrigerant for the chillers	Maintenance activities
Fire fighting equipment – fire extinguishers and fire fighting diesel standby pump	OSH activities

### 8.4.3 Global Warming Potential

As the reporting period was for 2018, the Global Warming Potential (GWP) applied has been consistent with that reported in the Fifth Assessment Report (2014) of the IPCC. Following GWPs were applied:

GHG	GWP
Carbon dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	28
Nitrous Oxide (N <sub>2</sub> O)	265

### 8.4.4 Emission factors and other parameters

As for the emission factors, it can be confirmed that credible sources were used. The following sources were referred to:

Emission factors	Reference/Source
Fuel (diesel, petrol and LPG)	UK Government GHG Conversion Factors for Company Reporting (2017)
Electricity (grid)	Study on Grid Connected Electricity Baselines in Malaysia Year 2014 (by Malaysia Green Technology Corporation)

### 8.4.5 Summation

The selection and collection of the accepted GHG data was consistent with the requirements of the selected quantification methodology. This was inline with the requirements provided in ISO 14064-1. Accordingly, the selection of the GHG activity, GHG emission factors and other default values shall be :

- i) consistent with the requirements of the selected quantification methodology;
- ii) derived from a recognized origin sources;
- iii) appropriate for the GHG source concerned;
- iv) current at the time of quantification;

- v) take account of quantifications uncertainty and are calculated in a manner intended to yield accurate and reproducible results; and
- vi) consistent with the intended use of the GHG inventory.

## 8.5 CALCULATION OF GHG EMISSIONS AND REMOVALS

From the review of the information reported in the latest AMT GHG documentation and with the reference to verifiable and acceptable data as reported in section 8.4.2 of this report, it can be concluded that the calculation of GHG emissions has been carried out in accordance with the quantification methodology as specified in section 8.4.1 of this report. This is in compliance with requirement stipulated in clause 4.3.6 of the ISO 14064-1. The final GHGs emission from the identified sources were summarized as follows:

Emissions category	GHG scope	GHG sources	CO <sub>2</sub> e emissions (Tonne)
Direct emission	Scope 1	Diesel consumption for standby Generator	8.679
		Petrol consumption for company cars and forklifts	76.046
		LPG Consumption for cooking device used in the Canteen	29.632
<b>Total direct emissions (Scope 1)</b>			<b>114.36</b>
Energy Indirect emission	Scope 2	Electricity consumption by the plant	32,849.206
<b>Total energy indirect emissions (Scope 2)</b>			<b>32,849.21</b>
<b>Total 2018 GHG emissions for AMT</b>			<b>32,963.57</b>

## 9.0 MANAGEMENT SYSTEM AND QUALITY ASSURANCE

From the assessment carried out by the verification team, it was found that the overall approach used to calculate the GHG emissions were technically sound as it was traceable to known standard and reference. All findings noted during the verification process have been duly corrected.

## 10.0 AREAS FOR IMPROVEMENT

Following are the areas for improvement which need to be taken into consideration in the future reporting;

1. The tool used through “UK Government GHG Conversion Factors for Company Reporting (2017) Spreadsheet has an expiry date i.e. 31<sup>st</sup> July 2018.
2. Reported GHG emissions shall be traceable to verifiable GHG activities and data. GHG quantifications need to be supported with auditable evidence.
3. The establishment of an internal quality assurance team can help to increase the level of accuracy of the GHG inventory and calculation.
4. Implementation of a structured database system for emissions information will improve reporting efficiency, reduce risk of misreporting and improve the quality of information available for decision-makers.
5. It is recommended for ATM to expand the operational boundaries to consider reporting on emissions under Scope 3. It may not be material emissions but it will enhance the GHG reporting coverage.

## 11.0 VERIFICATION STATEMENT

SIRIM QAS International Sdn Bhd was engaged by Amkor Technology Sdn Bhd to review the “ATM Greenhouse Gas Emission Report for Year 2018 ATM 01/2018” (dated 25<sup>th</sup> June 2019) and relevant supporting documents detailing the calculations of the GHG emissions. The GHG report covers the period from 1<sup>st</sup> January to 31<sup>st</sup> December 2018. The assessment was based on the ISO 14064-3:2006 requirements.

The Facility Department (Environmental Section) of Amkor Technology was responsible for the preparation and reporting of GHG emissions data, and the reported GHG emissions. The development and maintenance of records and reporting procedures in accordance with the ISO 14064-1:2006 requirements, including the calculation and determination of GHG emissions reduction from the organization was the responsibility of the Environmental Section.

It is the responsibility of SIRIM QAS International Sdn Bhd verification team to express an independent verification statement on the GHG assertion of the company for the period from 1<sup>st</sup> January to 31<sup>st</sup> December 2018.

With reference to the verified emission in section 8.4.2 and 8.5 of this report that, it can be concluded that the GHG emissions for the period from 1st January to 31st December 2018 as verified by SIRIM QAS International Sdn Bhd to a limited level of assurance, consistent with the agreed verification scope, objectives and criteria, were summarized as follows:

Total direct emissions (Scope 1)	114.36	MTCO <sub>2</sub> e
Total energy indirect emissions (Scope 2)	32,849.21	MTCO <sub>2</sub> e
Total 2018 GHG emissions for ATM	<b>32,963.57</b>	MTCO <sub>2</sub> e

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