

Impartiality Verification Opinion

Statement No.:
C587539-2022-AG-TWN-DNV

Issued date:
25 May, 2023

Page 1 of 2

This is to verify initiate reporting of Greenhouse Gas Inventory Management Report (2022) of

TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LTD.

Scope of Verification

DNV Business Assurance (DNV) has been commissioned by TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LTD. ('tsmc' or 'the Company') to perform a verification of the greenhouse gas statements of Greenhouse Gas Inventory Management Report (2022) (hereafter the "Inventory Report") in Taiwan, ROC with respect to the sites listed in Appendix A

The Reporting Boundary for the verification including direct GHG emissions and removals, indirect GHG emissions from imported energy, indirect GHG emissions from products used by the Organization and indirect GHG emissions associated with purchased fuels and energy, but not included in Categories 1 and 2. The scope of indirect emissions, other than Imported Energy with specified/limited list of sources, was defined by tsmc's own pre-determined criteria for significance of indirect emissions, considering the intended use of the GHG inventory The further descriptions for the Reporting Boundary listed in Appendix B.

Verification Criteria and GHG Programme

The verification was performed on the basis of ISO 14064-1:2018 as well as criteria given to provide for consistent GHG emission identification, calculation, monitoring and reporting. The verification was conducted in accordance with ISO 14066:2011, ISO 14065:2013 and ISO 14064-3:2019.

Verification Statement

It is DNV's opinion that the Inventory Report (2022), which was published in April 2022, is free from material discrepancies in accordance with the verification criteria identified as stated above. The reliability of the information within the Inventory Report (2022) were verified with a specific level of assurance as listed below.

- For the Direct (Category 1) and Indirect GHG emissions from imported energy (Category 2), the reliability of the information within the Inventory Report (2022) were verified with reasonable level of assurance.
- For the other indirect GHG emissions, the involved information was verified and tested using agreed-upon procedures, AUP, defined in Inventory Report.

Chun-Nan Lin
GHG Verifier



Place and date:
Taipei, 25 May, 2023

For the issuing office:
DNV Business Assurance Co., Ltd.
29Fl., No. 293, Sec. 2, Wenhua Rd.,
Banqiao District, New Taipei City 220,
Taiwan



Management Representative

Supplement to Statement

Process and Methodology

The reviews of the Inventory Report and relevant documents, and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria. The Inventory Report correctly complies with the requirement of ISO 14064-1:2018.

Quantification of Greenhouse Gas Emission

The Inventory Report covering the period 1st January 2022 to 31st December 2022, it is DNV's opinion that 100% GHG emissions and removals identified within the Reporting Boundary has been included in the Inventory Report as claimed in accordance with the verification criteria identified as stated above, and results in quantification of GHG emissions that are real, transparent, and measurable.

Organizational Boundary of Verification

Financial Management Control Operational Management Control Equity Share

GHGs Verified

CO₂ CH₄ N₂O HFCs PFCs SF₆ NF₃

The Quantification of GHG emissions and removals in Direct and Indirect Emission Source:

Category	tonnes CO ₂ -e
1. Direct emissions	1,669,770.1166
2. Indirect GHG emissions from imported energy	9,510,082.2318

*: Unless other indicated, the Indirect Emissions was calculated based on 2021 electricity emission factor of 0.509 kg CO₂-e/kwh, which was announced by Bureau of Energy, Ministry of Economic Affairs. The Global Warming Potential (GWP) defined in IPCC AR5 (2013) has been choose and correctly referred by the Organization.

The Quantification of other indirect emissions:

Indirect Emissions Category	Subcategory	tonnes CO ₂ -e
Transportation (Category 3)	Not reported	-
Products used by organization (Category 4)	CDP1 Purchased goods and services	5,604,013.3947
	CDP3 Fuel-and-energy-related activities (not included in Scope 1 or 2)	1,715,327.6238
The use of products from the organization (Category 5)	Not reported	-

** :the details subcategory of each category could be refer later in the APPENDIX B.

The greenhouse gas statements of TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LTD. Greenhouse Gas Inventory Management Report (2022) with respect to each site are verified as listed in Appendix C

The Company avoids carbon emissions from electricity and nature gas usages of all office buildings, 160.95 million kWh and 1,780,418 cubic meters respectively in 2022, by:

- purchasing 934.93 million kWh renewable energy electricity together with its certificate T-RECs, equal to avoiding 475,878 tonnes CO₂e emission in 2022;
- purchasing 110,621,515 cubic meters carbon neutral nature gases, equal to avoiding 284,207 tonnes CO₂e emission in 2022.

Verification Opinion

Verified without Qualification



Appendix A to Statement No. C587539-2022-AG-TWN-DNV

APPENDIX A

The greenhouse gas assertion of TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LTD. Greenhouse Gas Inventory Management Report (2022) with respect to the following sites:

Site	Address
F2	No. 121 Park Ave. III, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F3	No. 9, Creation Rd. I, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F5	No. 121 Park Ave. III, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F6	No. 1, Nan-Ke North Rd., Tainan Science Park, Tainan, Taiwan, R.O.C.
F8	No. 25, Li-Hsin Rd., Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F3E	No. 6, Creation Rd. II, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F12 P1/2	No. 8, Li-Hsin Rd. VI, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F12 P3	No. 6, Creation Rd. II, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F12 P4/5	No. 168, Park Ave. II, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F12 P6	No. 166, Park Ave. II, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F12 P7	No. 188, Park Ave. II, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F12 P8	No. 168, Kehuan Rd., Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
F14A	No. 1-1&1-2, Nan-Ke North Rd., Tainan Science Park, Tainan, Taiwan, R.O.C. No. 5, Section 2, Huanxi Rd., Tainan Science Park, Tainan, Taiwan, R.O.C.
F14B	No. 17, Nan-Ke 9 th Rd., Tainan Science Park, Tainan, Taiwan, R.O.C.
F14 P7	No.1, Sanbaozhu Rd., Tainan Science Park, Tainan, Taiwan, R.O.C.
F15	No. 1, Keya 6 th Rd., Daya Dist., Taichung City, Taiwan, R.O.C.
F15B	No. 1, Xinke Rd., Daya Dist., Taichung City, Taiwan, R.O.C.
F18P1	No. 8, Beiyuan 2nd Rd., Anding Dist., Tainan City 745, Taiwan, R.O.C.
F18P2	(Phase 2) No. 8, Beiyuan 2nd Rd., Anding Dist., Tainan City 745, Taiwan, R.O.C.
F18P3	(Phase 3) No. 8, Beiyuan 2nd Rd., Anding Dist., Tainan City 746, Taiwan, R.O.C.
F18P4	(Phase 4) No. 8, Beiyuan 2nd Rd., Anding Dist., Tainan City 747, Taiwan, R.O.C.
F18P5	(Phase 5) No. 8, Beiyuan 2nd Rd., Anding Dist., Tainan City 747, Taiwan, R.O.C.
F18P6	(Phase 6) No. 8, Beiyuan 2nd Rd., Anding Dist., Tainan City 747, Taiwan, R.O.C.
AP2B	No. 18-1, Nanke 7th Rd., Shanhua Dist., Tainan City 741014, Taiwan (R.O.C.)
AP2C	(Phase 2)No. 18-1, Nanke 7th Rd., Shanhua Dist., Tainan City 741014, Taiwan (R.O.C.)
AP3	No.101, Longyuan 6th Rd., Longtan Dist.,Taoyuan City 325, Taiwan, R.O.C
AP5	No. 5, Keya West Rd., Daya Dist., Taichung City, Taiwan, R.O.C.
AP6	1, Kezhuan 1st Rd., Zhunan Township,Hsinchu Science Park, Miaoli County350012, Taiwan

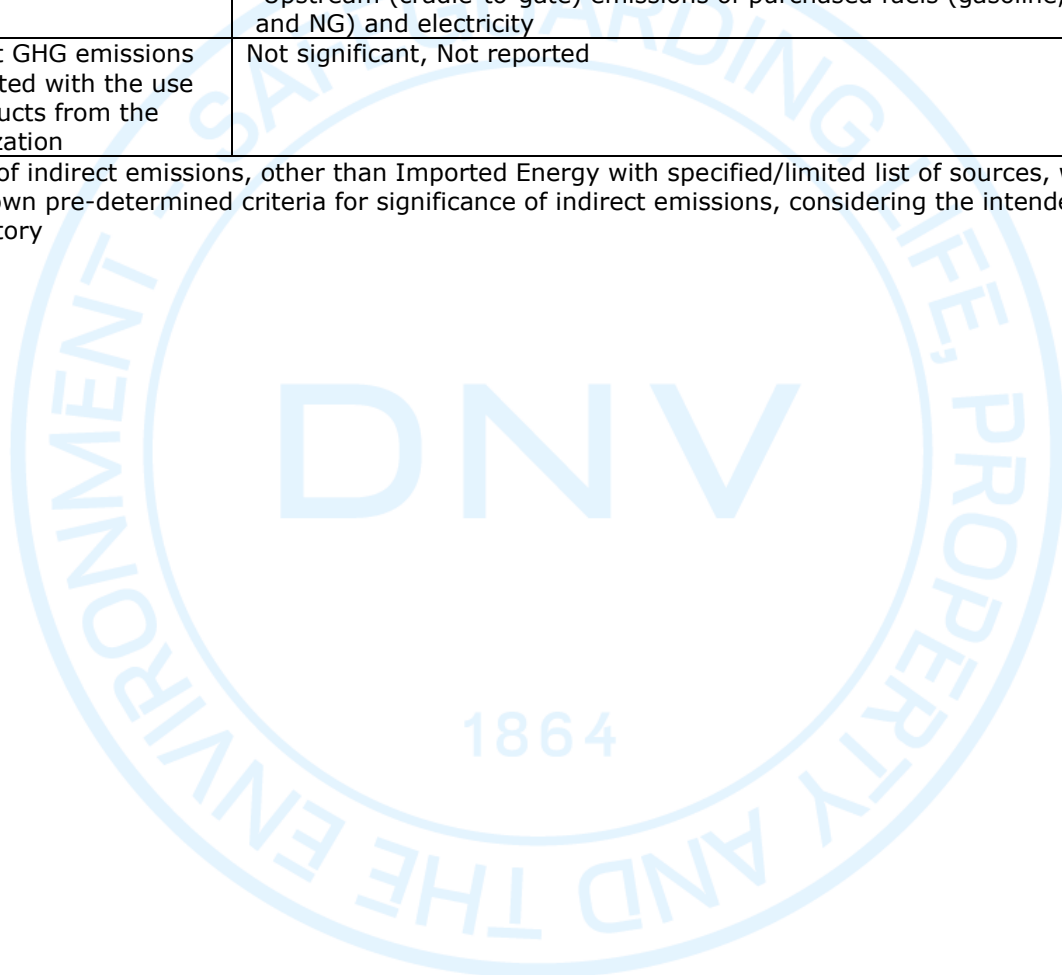


APPENDIX B

The Reporting Boundary of TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LTD. Greenhouse Gas Inventory Management Report (2022)

Category	Reporting Boundary
Direct GHG emissions and removals	Mainly from Fluorinated GHG emissions from semiconductor manufacturing, other GHG sources or sinks inside organizational boundaries and that are owned or controlled by the organization
Indirect GHG emissions from imported energy	the amount of greenhouse gas emissions produced by the input of electricity and energy.
Indirect GHG emissions from transportation	Not significant, Not reported
Indirect GHG emissions from products used by the Organization	<ul style="list-style-type: none"> - Upstream (cradle-to-gate) emissions of selected purchased goods, such as main raw material-wafer /auxiliary raw material material/Bulk gas/packaging material. The selection principle and emission factor are from the tsmc's carbon footprint report verified by a third party - Upstream (cradle-to-gate) emissions of purchased fuels (gasoline, diesel, and NG) and electricity
Indirect GHG emissions associated with the use of products from the Organization	Not significant, Not reported

The scope of indirect emissions, other than Imported Energy with specified/limited list of sources, was defined by tsmc's own pre-determined criteria for significance of indirect emissions, considering the intended use of the GHG inventory



APPENDIX C

Quantification of Direct GHG emissions and Indirect GHG emissions from Imported Energy (Tonnes CO₂-e):

Site	Direct emissions and removals	Indirect GHG emissions from imported energy	Fluorinated GHG emissions from semiconductor manufacturing	Reduced Fluorinated GHG emissions by abatement system
F2	75,902.7877	77,270.8996	70,878.4618	65,254.0054
F3	125,857.5798	170,664.8496	111,226.3451	147,968.5960
F5	61,371.5999	98,678.5916	57,662.9157	44,764.3534
F6	150,771.9973	194,433.0118	102,424.9005	87,764.5866
F8	100,135.2001	186,160.9551	91,763.0509	168,915.8860
F3E	15,660.1056	65,222.7054	12,711.4590	94,323.4143
F12 P1/2	47,818.5124	277,358.5792	26,911.4844	128,513.7000
F12 P3	22,422.5596	140,750.0490	8,247.2526	118,298.6720
F12 P4/5	34,245.5805	315,378.0288	13,503.4325	89,835.4050
F12 P6	18,643.5880	248,116.7328	5,036.6133	25,863.1820
F12 P7	35,819.6977	383,396.7168	14,812.1202	57,275.4010
F12 P8	10,814.8917	161,354.2913	4,579.1337	34,617.9710
F14A	213,810.8103	759,649.0409	134,405.5797	563,356.2210
F14B	102,177.7302	682,479.7489	46,842.0223	438,119.5780
F14 P7	55,783.3171	366,396.9312	5,911.5675	136,679.3260
F15	143,659.5438	870,557.9137	57,858.4054	775,117.4110
F15B	192,297.7655	1,706,148.4544	98,572.6412	727,481.6940
F18P1	46,891.4231	470,510.0308	29,139.6235	235,981.9941
F18P2	56,227.3073	508,257.6138	38,887.8884	235,933.8087
F18P3	45,563.5929	479,913.7890	33,466.6020	334,679.3732
F18P4	29,105.9033	312,559.4077	13,822.6394	189,630.1890
F18P5	27,538.8954	317,107.9671	12,117.2733	140,381.9324
F18P6	9,145.7424	188,563.5613	2,916.8162	19,203.5790
AP2B	30,524.4346	98,723.6896	6,432.1720	38,406.8900
AP2C	1,051.4354	26,879.8110	832.6221	8,167.5620
AP3	11,277.8543	213,947.7664	418.2492	23,860.4830
AP5	924.7231	105,422.3039	0.0000	0.0000
AP6	4,325.5376	84,178.7911	2,376.5185	8,585.5880
Total	1,669,770.1166	9,510,082.2318	1,003,757.7902	4,938,980.8021

Quantification of Indirect GHG emissions from products used by organization:

Site	Upstream (cradle-to-gate) emissions of purchased goods (Tonnes CO ₂ -e)	Upstream (cradle-to-gate) emissions of purchased fuels (gasoline, diesel, and NG) and electricity (Tonnes CO ₂ -e)	Total indirect GHG emissions from products used by the Organization (Tonnes CO ₂ -e)
F2	16,226.8602	14,226.7913	30,453.6516
F3	119,449.1066	30,384.8556	149,833.9622
F5	39,870.6678	18,329.9179	58,200.5857
F6	93,494.6968	34,276.1461	127,770.8429
F8	65,201.2374	34,007.9857	99,209.2231
F3E	31,669.8555	12,177.7843	43,847.6398
F12 P1/2	65,961.4210	49,424.1433	115,385.5643
F12 P3	57,931.6217	25,425.4415	83,357.0632
F12 P4/5	127,946.5418	57,566.0589	185,512.6007
F12 P6	76,770.4745	46,224.0204	122,994.4949
F12 P7	99,292.7500	71,166.0455	170,458.7955
F12 P8	31,232.1830	30,245.4129	61,477.5959
F14A	381,209.0385	135,659.6337	516,868.6722
F14B	330,296.7776	122,945.1573	453,241.9349
F14 P7	198,210.9497	65,428.3154	263,639.2651
F15	559,574.6966	154,851.4998	714,426.1964
F15B	991,984.3619	305,160.8098	1,297,145.1717
F18P1	590,649.5285	85,315.2408	675,964.7693
F18P2	560,269.8426	91,134.0819	651,403.9244
F18P3	521,242.5482	85,173.3385	606,415.8866
F18P4	446,057.8459	58,238.0943	504,295.9402
F18P5	6,869.7240	58,359.9082	65,229.6322
F18P6	5,161.1381	34,349.5797	39,510.7178
AP2B	110,655.7222	17,632.2411	128,287.9632
AP2C	8,923.7257	4,804.1694	13,727.8951
AP3	63,660.4494	38,936.2317	102,596.6810
AP5	3,682.6919	18,483.3785	22,166.0704
AP6	516.9378	15,401.3404	15,918.2782
Total	5,604,013.3947	1,715,327.6238	7,319,341.0185