First published in the Government *Gazette*, Electronic Edition, on 19th April 2013 at 5:00 pm.

No. S 246

ENERGY CONSERVATION ACT 2012 (ACT 11 OF 2012)

ENERGY CONSERVATION (ENERGY MANAGEMENT PRACTICES) REGULATIONS 2013

ARRANGEMENT OF REGULATIONS

In exercise of the powers conferred by sections 2, 3(3), 23(1) and (2), 24(3), 25(1), 27(1) and (2), 28(1) and (2), 29(1) and (2), 30(1), (2) and (4) and 78 of the Energy Conservation Act 2012, the Minister for the Environment and Water Resources hereby makes the following Regulations:

PART I

PRELIMINARY

Citation and commencement

1. These Regulations may be cited as the Energy Conservation (Energy Management Practices) Regulations 2013 and shall come into operation on 22nd April 2013.

Definitions

2. In these Regulations, unless the context otherwise requires —

"chief executive" means any person, by whatever name described, who is in the direct employment of, or acting for or by arrangement with, a corporation, and is principally responsible for the management and conduct of the business of the corporation;

"energy" has the same meaning as in the Energy Conservation (Registrable Corporations) Order 2013 (G.N. No. S 248/2013);

"energy commodity" has the same meaning as in the Energy Conservation (Registrable Corporations) Order 2013;

"energy consumption" has the same meaning as "consumption of energy" in the Energy Conservation (Registrable Corporations) Order 2013;

"energy-consuming system" means any piece of equipment or pieces of equipment working together to perform a task or support one or more processes which consume fuel or energy commodities, including but not limited to any of the following:

(*a*) fuel combustion system;

(*b*) heating, ventilation and air-conditioning system (including air handling system);

(*c*) cooling system;

(*d*) system used to produce or generate energy commodity or commodities;

(*e*) system used for bonding, separation, conversion, treatment, testing or processing;

(*f*) system used for pumping, movement, transportation, mixing or recovery;

"feedstock" refers to any fuel or energy commodity that is used as raw material to produce products containing carbon;

"greenhouse gas" refers to any of the gases as specified in the First Schedule;

"registrable corporation" has the same meaning as in the Energy Conservation (Registrable Corporations) Order 2013;

"relevant business activity" means a business activity under the operational control of the registered corporation that —

(*a*) resulted in the corporation's registration; or

(*b*) would have qualified the corporation as a registrable corporation if it was not already so registered;

"specific energy consumption" means a measure of the energy consumption of the business activity or energy-consuming system, as the case may be, that is expressed —

(*a*) by reference to a unit of production or service that is reasonably relevant to the business activity or energy-consuming system, its energy use, or both; and

(*b*) providing a metric (number) and a measure (production unit or unit relevant to the service).

Circumstances in which activity or activities (including ancillary activities) will form part of single undertaking or enterprise

3.—(1) For the purposes of section 3(1)(*b*) of the Act, this regulation specifies the circumstances in which an activity, or a series of activities, will form part of a single undertaking or enterprise.

(2) Activities that together produce one or more products or services (referred to in this regulation as the primary production process) will form part of a single undertaking or enterprise if the activities take place at a single site.

(3) If there is another activity or series of activities (referred to in this regulation as the other production process) that —

(*a*) is under the overall control of the corporation that has overall control of the primary production process; and

(*b*) produces one or more other products or services for the primary production process (which are not used solely in the primary production process),

then provided that other production process takes place at the same site as the primary production process, all of the activities in the primary production process and the other production process will form part of a single undertaking or enterprise.

Activities to be attributable to same industry sector as principal activity

4.—(1) For the purposes of section 3(2) of the Act, this regulation specifies what activities that form part of a single undertaking or enterprise must be attributed to a particular industry sector.

(2) If activities will form part of a single undertaking or enterprise under regulation 3, then unless paragraph (3) applies, all of the activities are attributable to the particular industry sector that the principal activity for the undertaking or enterprise is attributable to.

(3) In this regulation, "principal activity", in relation to a single undertaking or enterprise, means the activity that —

(*a*) results in the production of a product or service that is produced for sale on the market; and

(*b*) produces the most value for the single undertaking or enterprise out of any of the activities forming part of the single undertaking or enterprise.

PART II

REGISTRATION OF REGISTRABLE CORPORATION

Registration of registrable corporation

5.—(1) An application to be registered as a registered corporation shall be made —

(*a*) using the relevant form provided in the electronic service provided at http://www.nea.gov.sg; and

(*b*) in the manner specified by the Director-General.

(2) Every application referred to in paragraph (1) shall be accompanied by the following information and documents:

(*a*) registered name of the corporation;

(*b*) Singapore unique entity number of the corporation;

(*c*) principal place of business;

(*d*) name of the chief executive, and his designation, contact details and identification number;

(*e*) name of corporation representative, and his designation, contact details and identification number;

(*f*) name of energy manager(s) (if any), and his designation, contact details and identification number;

(*g*) address of site of each business activity that qualifies the corporation as a registrable corporation, and that site's electricity and gas account number (if any);

(*h*) energy bills and other records (if any) of energy consumption, showing that the energy use of the business

activity has attained the energy use threshold in at least 2 out of the 3 preceding calendar years;

(*i*) the business profile of the corporation (if any);

(*j*) signed statement from the chief executive, that the information submitted is accurate and complete; and

(*k*) such other information or document as may be specified in the form provided or as may be required by the Director-General.

Circumstances in which registered corporation may apply to cancel registration

6.—(1) For the purposes of section 25(1)(*c*) of the Act, this regulation specifies the circumstances in which a registered corporation may apply to the Director-General to cancel its registration.

(2) A registered corporation may apply to cancel its registration if it has ceased its business activity and has no intention of resuming its business activity within the next 3 years.

Application to cancel registration

7.—(1) For the purposes of section 25(1) of the Act and regulation 6, an application for cancellation of registration as a registered corporation shall be made —

(*a*) using the relevant form provided in the electronic service provided at http://www.nea.gov.sg; and

(*b*) in the manner specified by the Director-General.

(2) Every application referred to in paragraph (1) shall be accompanied by the following information and documents:

(*a*) registered name of the corporation;

(*b*) Singapore unique entity number of the corporation (if any);

(*c*) address of site of each relevant business activity;

(*d*) grounds for cancelling the registration;

(*e*) details of contact person (name, designation and contact details);

(*f*) energy bills and other records (if any) showing the relevant energy consumption data, if the ground for cancelling the registration is the ground referred to in section 25(1)(*b*) of the Act;

(*g*) notice of cessation of business activity submitted by the chief executive, if the ground for cancelling the registration is the ground referred to in regulation 6(2);

(*h*) signed statement from the chief executive, that the information submitted is accurate and complete; and

(*i*) such other information or documents as the Director-General may require.

PART III

ENERGY MANAGEMENT PRACTICES OF REGISTERED CORPORATION

Periodic reporting of energy use

8.—(1) A registered corporation shall submit an energy use report by 30th June of each year, which shall cover each business activity under the operational control of the registered corporation.

(2) The report shall be prepared and reviewed by the energy manager and endorsed by the chief executive of the registered corporation, and shall be submitted by the energy manager using the electronic service provided at http://www.nea.gov.sg.

(3) The energy use report shall be made —

(*a*) using the relevant form provided in the electronic service provided at http://www.nea.gov.sg; and

(*b*) in the manner specified by the Director-General.

(4) The energy use report shall contain, in respect of each relevant business activity, the following information relating to its operation during the preceding calendar year, or part thereof (if applicable) in the case of the first report submitted after registration:

(*a*) quantity of each type of fuel or energy commodity in the inventory of the corporation as at 1st January and 31st December of that calendar year, and their net calorific value or energy content value, and unit of measure;

(*b*) quantity of each type of fuel or energy commodity purchased or sold, or used for the purposes of producing or providing energy, during that calendar year, and their net calorific value or energy content value, and unit of measure, but excluding any fuel or energy commodity purchased, used or stored for the purposes of any emergency standby generator;

(*c*) quantity of each type of fuel or energy commodity produced for the purposes of producing or providing energy, and their net calorific value or energy content value, and unit of measure;

(*d*) in respect of energy-consuming systems forming part of the business activity, the aggregate energy consumption of which shall not be less than 80% of the total energy consumption of the business activity, the following information for each energy-consuming system:

(i) type and description of energy-consuming system;

(ii) type of fuel or energy commodity used;

(iii) quantity and unit of measure of annual energy consumption;

(iv) quantity and unit of measure of each intended output of the energy-consuming system;

(v) specific energy consumption;

(vi) predicted specific energy consumption calculated on the basis that the energy-consuming system is new and clean, if available; and

(vii) the ratio of the specific energy consumption to the predicted specific energy consumption referred to in sub-paragraph (vi), if available;

(*e*) specific energy consumption;

(*f*) reasons for increase or decrease in specific energy consumption compared to that reported in the previous year to the extent necessary for a reasonable understanding of the significant factors that affected the energy efficiency of the business activity;

(*g*) information relating to items listed in the second and third columns of the Second Schedule in respect of the processes or activities resulting in greenhouse gas emissions as listed in the first column thereof;

(*h*) information on type, quantity and unit of measure of each fuel or energy commodity used as feedstock to produce products containing carbon;

(*i*) basic process diagrams showing the energy-consuming systems and the general process and energy flow; and

(*j*) such other information or document as may be required by the Director-General.

(5) The energy use report shall, in respect of every other business activity under the operational control of the corporation that is not a relevant business activity, state the following in relation to the operation of all such business activities during the preceding calendar year, or part thereof (if applicable) in the case of the first report submitted after registration:

(*a*) the estimated aggregate energy consumption as a percentage of the corporation's total energy consumption during the same period;

(*b*) the estimated aggregate energy production as a percentage of the corporation's total energy production during the same period; and

(*c*) the estimated aggregate greenhouse gas emissions as a percentage of the corporation's total greenhouse gas emissions during the same period.

(6) Any quantity or figure required in paragraph (4)(*d*)(iii) to (vi), (*g*) or (*h*) may be expressed either as a measured value or an estimated value.

(7) The Director-General may extend the time prescribed in paragraph (1) for the submission of the report on such terms as he deems fit, if he is satisfied, on written application accompanied by supporting documents —

(*a*) that the registered corporation required to submit the report is unable to comply with the requirement due to circumstances beyond the corporation's reasonable control; or

(*b*) that an extension of any such time would be otherwise appropriate having regard to the circumstances of the case.

Records to be kept

9.—(1) A registered corporation shall keep and maintain complete and accurate records of the information prescribed in paragraph (2) for not less than 5 years after the date of creation or receipt of the record.

(2) The information referred to in paragraph (1) is as follows:

(*a*) records of purchase of every type of fuel or energy commodity;

(*b*) records of consumption of every type of fuel or energy commodity and other similar records;

(*c*) detailed process diagrams showing the energy-consuming systems and the general process and energy flow and other similar records;

(*d*) measurement data on energy consumption of energy-consuming systems or equipment and other similar records, as well as specifications and calibration records of measurement equipment or systems and other similar records;

(*e*) measurement data on energy consumption of various systems or equipment before and after implementation of any energy efficiency measure and other similar records, as

well as specifications and calibration records of measurement equipment or systems and other similar records; and

(*f*) records relied upon by the corporation to provide the information referred to in regulation 8(4)(*g*) or (*h*).

(3) The records kept and maintained pursuant to this regulation may be kept and maintained in electronic form.

Energy efficiency improvement plan

10.—(1) A registered corporation shall submit an energy efficiency improvement plan by 30th June of each year, covering each business activity under the operational control of the registered corporation.

(2) The plan shall be prepared and reviewed by the energy manager and endorsed by the chief executive of the registered corporation, and shall be submitted by the energy manager using the electronic service provided at http://www.nea.gov.sg.

(3) The energy efficiency improvement plan shall be made —

(*a*) using the relevant form provided in the electronic service provided at http://www.nea.gov.sg; and

(*b*) in the manner specified by the Director-General.

(4) The plan shall cover a period of not less than one year and not more than 5 years, which shall start from 1st January of the year of submission.

(5) The plan shall include the following information in respect of each relevant business activity:

(*a*) description of energy efficiency measures to be implemented or completed, and the following information in respect of each measure:

(i) estimated start and end dates;

(ii) projected reduction in energy consumption together with underlying assumptions;

(iii) projected improvement in specific energy consumption together with underlying assumptions;

(iv) projected improvement in the ratios referred to in regulation 8(4)(*d*)(vii), if available, that would be affected by the measures;

(v) estimated cost; and

(vi) name of person responsible for implementation;

(*b*) update on the progress of energy efficiency measures described in the previous energy efficiency improvement plan submitted; and

(*c*) for each measure implemented before the end of the preceding year, the following information:

(i) estimated or measured difference in energy consumption attributable to each measure;

(ii) estimated or measured difference in specific energy consumption attributable to each measure;

(iii) difference in ratios referred to in regulation 8(4)(*d*)(vii), if available, attributable to each measure; and

(iv) description of how each difference referred to in sub-paragraph (i), (ii) or (iii) was measured and verified.

(6) The plan shall include a description of energy efficiency measures to be implemented or completed in respect of each business activity that is not a relevant business activity.

(7) Every application under section 31B(2) of the Act for a waiver of the application of section 28(1) of the Act shall —

(*a*) be in writing;

(*b*) state the reasons for the registered corporation's inability to comply with the requirements; and

(*c*) be accompanied by supporting documents.

[S 752/2017 wef 01/01/2018]

Appointment of energy manager

11.—(1) A registered corporation shall appoint from among its employees not less than one energy manager who shall possess the qualifications prescribed in paragraph (4).

(2) Subject to paragraph (3), a registered corporation shall notify the Director-General of every appointment of an energy manager within 30 days after the appointment using the electronic service provided at http://www.nea.gov.sg.

(3) A registered corporation shall notify the Director-General of the appointment of its first energy manager not later than 30 days after registration.

(4) With effect from 1st April 2014, no person may be employed as an energy manager unless he —

(*a*) holds a Singapore Certified Energy Manager (Professional Level) certificate issued by the Institution of Engineers, Singapore; or

(*b*) holds such other qualification and experience which the Director-General may approve as being, in his opinion, substantially equivalent to any qualification referred to in sub-paragraph (*a*).

(5) An application by a person under paragraph (4)(*b*) for approval of his qualification and experience to be appointed as an energy manager shall be made in writing and be accompanied by the following:

(*a*) a copy of the applicant's certificate showing his qualification as an energy manager;

(*b*) a copy of the applicant's university degree or equivalent qualification;

(*c*) written evidence of the applicant's practical experience in the work of energy management, which shall include details of the duration and a description of the practical experience; and

(*d*) such other evidence or particulars as the Director-General considers necessary to determine the application.

(6) A person who is aggrieved by the Director-General's decision in refusing to grant an approval under paragraph (4)(*b*) may, within 30 days after the date he is notified of the Director-General's decision, appeal to the Minister in writing.

(7) The Minister may, after considering the appeal, dismiss or allow the appeal, unconditionally or subject to such conditions as he thinks fit, and the decision shall be confirmed, rescinded or varied in such manner as the Minister may decide.

(8) The Minister may, in considering an appeal under paragraph (6), give the appellant an opportunity to make representations in writing.

(9) The decision of the Minister in any appeal under paragraph (6) shall be final.

(10) A person shall not be employed or act as an energy manager for more than one corporation at any point in time.

(11) If an energy manager vacates his appointment —

(*a*) the registered corporation shall, within 30 days after the vacation of the appointment, notify the Director-General of that fact using the electronic service provided at http://www.nea.gov.sg; and

(*b*) if the energy manager who vacates his office is the only energy manager of a registered corporation, the registered corporation shall notify the Director-General of the appointment of the substitute energy manager within 90 days after the vacation of the appointment.

(12) If the only energy manager of a registered corporation vacates his appointment, the corporation may designate another employee to perform the energy manager's responsibilities pending the appointment of another energy manager.

(13) Every application under section 31B(4) of the Act for a waiver of the application of section 30(1) of the Act shall —

(*a*) be in writing;

(*b*) state the reasons for the registered corporation's inability to comply with the requirements; and

(*c*) be accompanied by supporting documents (if any).

[S 752/2017 wef 01/01/2018]

FIRST SCHEDULE

Regulation 2

GREENHOUSE GASES

1. Carbon dioxide
2. Methane
3. Nitrous oxide
4. Sulphur hexafluoride
5. Nitrogen trifluoride
6. A hydrofluorocarbon of a kind prescribed in Table 1
7. A perfluorocarbon of a kind prescribed in Table 2.

Table 1

Hydrofluorocarbons (HFCs)	**Chemical Formula**
HFC-23	CHF_3
HFC-32	CH_2F_2
HFC-41	CH_3F
HFC-125	CHF_2CF_3
HFC-134	CHF_2CHF_2
HFC-134a	CH_2FCF_3
HFC-143	CH_2FCHF_2
HFC-143a	CH_3CF_3
HFC-152	CH_2FCH_2F
HFC-152a	CH_3CHF_2
HFC-161	CH_3CH_2F
HFC-227ea	CF_3CHFCF_3
HFC-236cb	$CH_2FCF_2CF_3$
HFC-236ea	CHF_2CHFCF_3
HFC-236fa	$CF_3CH_2CF_3$

FIRST SCHEDULE — *continued*

HFC-245ca	$CH_2FCF_2CHF_2$
HFC-245fa	$CHF_2CH_2CF_3$
HFC-365mfc	$CH_3CF_2CH_2CF_3$
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$

Table 2

Perfluorocarbons (PFCs)	**Chemical Formula**
PFC-14	CF_4
PFC-116	C_2F_6
PFC-218	C_3F_8
PFC-318	c-C_4F_8
PFC-3-1-10	C_4F_{10}
PFC-4-1-12	C_5F_{12}
PFC-5-1-14	C_6F_{14}

SECOND SCHEDULE

Regulation 8(4)(*g*)

DATA ON PROCESSES AND ACTIVITIES RESULTING IN GREENHOUSE GAS EMISSIONS

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
Chemical Industry		
1. Acrylonitrile production	(1) Type of process (For example, SOHIO process)	
	(2) Amount of acrylonitrile produced	Tonne acrylonitrile produced
	(3) CO_2 emission factor	Tonne CO_2/tonne acrylonitrile produced
	(4) CH_4 emission factor	Kilogramme CH_4/tonne acrylonitrile produced

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
2. Adipic acid production	(1) Amount of adipic acid produced	Tonne
	(2) N_2O emission factor	Kilogramme N_2O/tonne adipic acid produced
3. Ammonia production	(1) Amount of ammonia produced	Tonne
	(2) Fuel requirement for ammonia production, by type of fuel	Gigajoule of fuel/tonne ammonia produced
	(3) Carbon content of fuel	Kilogramme carbon/Gigajoule
	(4) Carbon oxidation factor of fuel	Fraction
	(5) Amount of urea produced	Kilogramme
4. Carbide production	(1) Type of carbide produced (For example, silicon carbide [SiC], calcium carbide [CaC_2])	
	(2) If based on raw material used —	
	(*a*) Raw material (For example, petroleum coke) consumption	Tonne
	(*b*) CO_2 emission factor	Tonne CO_2/tonne raw material used
	(*c*) CH_4 emission factor	Kilogramme CH_4/tonne raw material used
	(3) If based on carbide produced —	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(*a*) Amount of carbide produced	Tonne
	(*b*) CO_2 emission factor	Tonne CO_2/tonne carbide produced
	(*c*) CH_4 emission factor	Kilogramme CH_4/tonne carbide produced
	(4) Calcium carbide used in acetylene production	Tonne
	(5) CO_2 emission factor	Tonne CO_2/tonne carbide used in acetylene production
5. Carbon black production	(1) Type of process (For example, furnace black process, thermal black process, acetylene black process)	
	(2) Amount of carbon black produced	Tonne carbon black produced
	(3) CO_2 emission factor	Tonne CO_2/tonne carbon black produced
	(4) CH_4 emission factor	Kilogramme CH_4/tonne carbon black produced
6. Caprolactam, glyoxal and glyoxylic acid production	(1) Type of chemical produced	
	(2) Amount of chemical produced	Tonne
	(3) N_2O emission factor	Kilogramme N_2O/tonne chemical produced

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
7. Ethylene dichloride (EDC)/ Vinyl chloride monomer (VCM) production	(1) Type of process (For example, direct chlorination process, oxychlorination process, balanced process)	
	(2) Amount of ethylene dichloride or vinyl chloride monomer produced	Tonne EDC produced or tonne VCM produced
	(3) CO_2 emission factor	Tonne CO_2/tonne EDC produced or tonne CO_2/tonne VCM produced
	(4) CH_4 emission factor	Kilogramme CH_4/tonne EDC produced or kilogramme CH_4/tonne VCM produced
8. Ethylene oxide production	(1) Type of process	
	(2) Amount of ethylene oxide produced	Tonne ethylene oxide produced
	(3) CO_2 emission factor	Tonne CO_2/tonne ethylene oxide produced
	(4) CH_4 emission factor	Kilogramme CH_4/tonne ethylene oxide produced
9. Ethylene production	(1) Type of feedstock	
	(2) Amount of ethylene produced	Tonne

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(3) CO_2 emission factor	Tonne CO_2/tonne ethylene produced
	(4) CH_4 emission factor	Kilogramme CH_4/tonne ethylene produced
10. Fugitive emissions from oil and natural gas systems from venting, flaring, oil and natural gas production and upgrading, natural gas processing, natural gas transmission and storage, transport of oil, oil refining, oil and natural gas distribution	(1) Type of fuel (oil, natural gas)	
	(2) Type of activity	
	(3) Type of greenhouse gas emitted	
	(4) Amount of process or activity	Tonne or volume in cubic metres of process or activity
	(5) Emission factor	Tonne greenhouse gas/tonne or volume in cubic metres of process or activity
11. HCFC-22 production	(1) Amount of HCFC-22 produced	Kilogramme
	(2) HFC-23 emission factor	Kilogramme HFC-23/kilogramme HCFC-22 produced

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
12. By-product emissions of greenhouse gases from production of fluorinated compounds other than HCFC-22	(1) Type of greenhouse gas emitted as by-product from production of principal fluorinated compound	
	(2) Type of principal fluorinated compound produced	
	(3) Amount of principal fluorinated compound produced	Kilogramme
	(4) By-product emission factor	Kilogramme by-product gas emitted/kilogramme fluorinated compound produced
13. Fugitive emissions from production of fluorinated compounds other than HCFC-22	(1) Type of fluorinated compound produced	
	(2) Amount of fluorinated compound produced	Kilogramme
	(3) Fugitive emission factor	Kilogramme fugitive gas emitted/kilogramme fluorinated compound produced
14. Methanol production	(1) Type of process (For example, conventional steam reforming process, combined steam reforming process)	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(2) Type of feedstock	
	(3) Amount of methanol produced	Tonne
	(4) CO_2 emission factor	Tonne CO_2/tonne methanol produced
	(5) CH_4 emission factor	Kilogramme CH_4/tonne methanol produced
15. Nitric acid production	(1) Amount of nitric acid produced	Tonne
	(2) N_2O emission factor	Kilogramme N_2O/tonne nitric acid produced
16. Soda ash production	(1) If based on raw material used —	
	(*a*) Amount of trona utilised	Tonne
	(*b*) CO_2 emission factor	Tonne CO_2/tonne trona utilised
	(2) If based on carbide produced —	
	(*a*) Amount of natural soda ash produced	Tonne
	(*b*) CO_2 emission factor	Tonne CO_2/tonne natural soda ash produced
17. Titanium dioxide production, including titanium slag, synthetic rutile and rutile titanium dioxide	(1) Type of production	
	(2) Amount of production	Tonne

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(3) CO_2 emission factor	Tonne CO_2/tonne produced
Electronics Industry		
18. Integrated circuit or Semiconductor production	(1) Type of fluorinated compound used	
	(2) Type of process (For example, plasma etching thin film, cleaning chemical vapour deposition (CVD) tool chambers, furnace (diffusion), nitride removal (etching), cleaning of low k CVD reactors)	
	(3) If consumption of fluorinated compound is non-metered —	
	(*a*) Quantity of fluorinated compound purchased for use in the process	Kilogramme of fluorinated compound purchased for use in the process
	(*b*) Fraction of gas remaining in gas cylinder (heel) after use	Fraction
	(4) If consumption of fluorinated compound is metered —	Kilogramme of fluorinated compound fed into the process
	quantity of fluorinated	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	compound fed into the process	
	(5) Fraction of fluorinated compound destroyed	Fraction
	(6) Fraction of fluorinated compound volume used in processes with emission control technologies	Fraction
	(7) Fraction of fluorinated compound destroyed by the emission control technology	Fraction
	(8) Emission factor for by-product emissions of CF_4	Kilogramme by-product emissions of CF_4/kilogramme of fluorinated compound used in process
	(9) Emission factor for by-product emissions of C_2F_6	Kilogramme by-product emissions of C_2F_6/kilogramme of fluorinated compound used in process
	(10) Emission factor for by-product emissions of C_3F_8	Kilogramme by-product emissions of C_3F_8/kilogramme of fluorinated compound used in process
	(11) Type of abatement technology (For example, plasma abatement, cryogenic absorption, membrane separation, chemical-	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	thermal abatement, thermal oxidation)	
19. Photovoltaic material production	(1) Type of fluorinated compound used (For example, CF_4, C_2F_6)	
	(2) Fraction of annual plant production capacity utilisation	Fraction
	(3) Annual manufacturing design capacity	Million square metres of substrate processed
	(4) Fraction of photovoltaic material manufacture that uses fluorinated compounds	Fraction
	(5) Fluorinated compound emission factor	Grams of fluorinated compound/square metres of substrate processed
20. Thin-film-transistor (TFT) flat panel display production, liquid crystal display production	(1) Type of fluorinated compound used (For example, CF_4, NF_3, SF_6)	
	(2) Fraction of annual plant production capacity utilisation	Fraction
	(3) Annual manufacturing design capacity	Giga square metres of glass processed
	(4) Fluorinated compound emission factor	Grams of fluorinated compound/square metres of glass processed

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
21. Use of C_6F_{14} asheat transfer fluid	(1) Fraction of annual plant production capacity utilisation	Fraction
	(2) Annual manufacturing design capacity	Giga square metres of silicon consumed
	(3) C_6F_{14} emission factor	Kilogramme C_6F_{14}/square metres of silicon consumed
Metal Industry		
22. Aluminium production	(1) Type of technology (For example, Centre-Worked Prebake [CWPB], Side-Worked Prebake [SWPB], Vertical Stud Soderberg [VSS], Horizontal Stud Soderberg [HSS])	
	(2) Amount of aluminium produced	Tonne aluminium produced
	(3) CO_2 emission factor	Tonne CO_2/tonne aluminium produced
	(4) CF_4 emission factor	Kilogramme CF_4/tonne aluminium produced
	(5) C_2F_6 emission factor	Kilogramme C_2F_6/tonne aluminium produced
23. Ferroalloys production	(1) Type of ferroalloy	
	(2) Amount of ferroalloy produced	Tonne ferroalloy produced
	(3) CO_2 emission factor	Tonne CO_2/tonne ferroalloy produced

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(4) CH_4 emission factor	Kilogramme CH_4/tonne ferroalloy produced
24. Iron and steel production	(1) Type of steelmaking method (For example, basic oxygen furnace, electric arc furnace, open hearth furnace, pig iron furnace [not converted into steel], direct reduced iron [DRI] production, sinter production, pellet production)	
	(2) Amount of steel or iron production	Tonne crude steel, pig iron, DRI, sinter or pellet produced
	(3) CO_2 emission factor	Tonne CO_2/tonne production
	(4) CH_4 emission factor	Kilogramme CH_4/tonne production
25. Lead production	(1) Source and furnace type (For example, imperial smelt furnace production, direct smelting production, treatment of secondary raw materials)	
	(2) Amount of lead produced	Tonne lead produced
	(3) CO_2 emission factor	Tonne CO_2/tonne lead produced
26. Magnesium production	(1) Type of raw material (magnesite, dolomite)	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(2) Amount of primary magnesium produced	Tonne primary magnesium produced
	(3) CO_2 emission factor	Tonne CO_2/tonne primary magnesium produced
	(4) Amount of magnesium casting	Tonne magnesium casting
	(5) SF_6 emission factor	Kilogramme SF_6/tonne magnesium casting
27. Zinc production	(1) Type of process (For example, waelz kiln, pyrometallurgical, electro-thermic)	
	(2) Amount of zinc produced	Tonne zinc produced
	(3) CO_2 emission factor	Tonne CO_2/tonne zinc produced
Mineral Industry		
28. Cement production (if clinker used is produced in Singapore)	(1) Each type of cement produced	
	(2) Mass of each type of cement produced	Tonne
	(3) Clinker fraction in cement	Fraction
	(4) Imports for consumption of clinker	Tonne
	(5) Exports of clinker	Tonne

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(6) CO_2 emission factor for the clinker in cement	Tonne CO_2/tonne clinker
29. Glass production	(1) Total glass production	Tonne
	(2) CO_2 emission factor for glass production	Tonne CO_2/tonne glass
	(3) Average annual cullet ratio	Fraction
30. Lime production	(1) Type of lime produced	
	(2) Mass of lime produced	Tonne
	(3) CO_2 emission factor for lime production	Tonne CO_2/tonne lime
31. Other uses of carbonates in production, including ceramics production, non-metallurgical magnesia production and use of soda ash in production	(1) Type of process where carbonates are used	
	(2) Mass of carbonate consumed	Tonne
	(3) Emission factor for carbonate consumption	Tonne CO_2/tonne carbonate
Adiabatic uses of SF_6 and PFCs		
32. Adiabatic uses of SF_6 and PFCs	(1) Type of applications (For example,	

SECOND SCHEDULE — *continued*

First column	*Second column*		*Third column*
Process or Activity	*Data on processes and activities to be provided*		*Unit of measure*
		production of car tyres, production of shoe soles, production of tennis balls)	
	(2)	Type of greenhouse gas used	
	(3)	Quantity of the SF_6 or PFCs used in producing this application type 3 years preceding current reporting year	Tonne
Manufacture and use of SF_6 in sound-proof glazing			
33. Use of SF_6 in manufacture of sound-proof glazing	(1)	SF_6 purchased to fill windows assembled in current reporting year	Tonne SF_6
	(2)	SF_6 emission factor during assembly	Fraction
34. Use of SF_6 in installed sound-proof glazing	(1)	Amount of SF_6 in installed windows in current reporting year	Tonne SF_6
	(2)	Leakage emission factor	Fraction
35. Disposal of SF_6 in sound-proof glazing	(1)	Amount left in windows at end of lifetime (disposed of in current reporting year)	Tonne SF_6
	(2)	Fraction of SF_6 recovered	Fraction

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
N_2O Emissions from Medical Applications and in Aerosol Products		
36. N_2O emissions from medical applications [For example, anaesthetic use, analgesic use, veterinary use] and in aerosol products	(1) Type of applications (Medical applications, propellant in aerosol products)	
	(2) Quantity of N_2O supplied in this application type in current reporting year	Tonne
	(3) Quantity of N_2O supplied in this application type in year preceding current reporting year	Tonne
	(4) N_2O emission factor	Fraction
SF_6 and PFC Emissions from Use of Tracers and Production of Optical Cables		
37. SF_6 and PFC emissions from use of tracers or production of optical cables	(1) Type of applications	
	(2) Type of greenhouse gas used	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(3) Quantity of SF_6 or PFCs used in this application type in current reporting year	Tonne
	(4) Quantity of SF_6 or PFCs used in this application type in year preceding current reporting year	Tonne
Use of HFCs and PFCs as Substitutes for Ozone Depleting Substances		
38. Use of HFCs or PFCs as foam blowing agents to produce closed cell foam	(1) Type of HFCs or PFCs used	
	(2) Amount of HFC or PFC blown into closed cell foam	Tonne
	(3) Lifetime of closed cell foam	Years
	(4) First year losses of the HFC or PFC — Foam manufacture and installation	Tonne
	(5) Second and subsequent years — Annual emission factor for the HFC or PFC (in-situ losses from foam use, as a percentage of the amount of HFC or	Percentage

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	PFC blown into closed cell foam)	
39. Use of HFCs or PFCs as foam blowing agents to produce open cell foam	(1) Type of HFCs or PFCs used	
	(2) Amount of HFC or PFC used to produce the foam	Tonne
40. Use of HFCs and PFCs in aerosols	(1) Type of HFCs or PFCs contained in aerosol products used	
	(2) Quantity of HFCs or PFCs contained in aerosol products used	Tonne
41. Use of HFCs and PFCs in fire protection equipment	(1) Type of HFCs or PFCs used in the equipment	
	(2) Amount of the HFC or PFC in the equipment used	Tonne
	(3) Amount of the HFC or PFC in equipment disposed	Tonne
42. Use of HFCs or PFCs in refrigeration and air-conditioning equipment	(1) Type of HFCs or PFCs used in the equipment	
	(2) Amount of the HFC or PFC topped up in the equipment	Kilogramme

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(3) Amount of the HFC or PFC in equipment disposed	Tonne
43. Use of HFCs and PFCs in solvents	(1) Type of HFCs or PFCs used	
	(2) Quantity of the HFC or PFC used	Tonne
44. Other applications of HFCs and PFCs (For example, sterilisation equipment, tobacco expansion applications, solvents in the manufacture of adhesive coatings and inks)	(1) Type of HFCs or PFCs used	
	(2) Quantity of the HFC or PFC used	Tonne
	(3) Emission factor (loss occurred)	Fraction
Use of Lubricants and Paraffin Waxes		
45. Use of lubricant	(1) Amount of lubricant consumed	Terajoule
	(2) Carbon content of lubricant	Tonne of Carbon/Terajoule
	(3) Fraction oxidised during use	Fraction

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
46. Use of paraffin wax	(1) Amount of paraffin wax consumed	Terajoule
	(2) Carbon content of paraffin wax	Tonne of Carbon/Terajoule
	(3) Fraction oxidised during use	Fraction
Use of SF_6 in Airborne Warning and Control Systems		
47. Use of SF_6 in Airborne Warning and Control Systems (AWACS)	(1) Number of AWACS	
	(2) SF_6 emission factor	Kilogramme SF_6/AWACS
Use of SF_6 in Electrical Equipment		
48. Use of SF_6 in electrical equipment	(1) Type of equipment (For example, sealed-pressure, closed-pressure, gas-insulated transformers)	
	SF_6 emissions from manufacturing	
	(2) Amount of SF_6 used by equipment manufacturers	Tonne SF_6
	(3) SF_6 emission factor during manufacture	Fraction
	SF_6 emissions during equipment installation	

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(4) Capacity of new equipment filled onsite	Tonne SF_6
	(5) SF_6 emission factor during installation	Fraction
	SF_6 emissions from equipment use	
	(6) Capacity of installed equipment	Tonne SF_6
	(7) SF_6 emission factor during use	Fraction
	SF_6 emissions from equipment disposal	
	(8) Capacity of disposed equipment	Tonne SF_6
	(9) Fraction of SF_6 remaining at disposal	Fraction
Use of SF_6 in Particle Accelerators		
49. Use of SF_6 in industrial and medical particle accelerators	(1) Type of applications (For example, industrial accelerator [high voltage: 0.3-23 megavolts], industrial accelerator [low voltage: <0.3 megavolts], medical [radiotherapy])	
	(2) Number of particle accelerators that use SF_6	Number
	(3) SF_6 charge factor	Kilogramme SF_6/particle accelerator

SECOND SCHEDULE — *continued*

First column	*Second column*	*Third column*
Process or Activity	*Data on processes and activities to be provided*	*Unit of measure*
	(4) SF_6 emission factor	Fraction
50. Use of SF_6 in university and research particle accelerators	(1) Number of university and research particle accelerators	Number
	(2) SF_6 use factor	Fraction
	(3) SF_6 charge factor	Kilogramme SF_6/particle accelerator
	(4) SF_6 emission factor	Fraction
Any Other Process or Activity Resulting in Greenhouse Gas Emissions		
51. Any other process or activity resulting in greenhouse gas emissions	(1) Type of process or activity	
	(2) Amount of process or activity	Tonne raw material or product from the process or activity
	(3) Type of greenhouse gas emitted	
	(4) Greenhouse gas emission factor(s)	Tonne greenhouse gas/tonne raw material or product from the process or activity.

Made this 17th day of April 2013.

CHOI SHING KWOK
Permanent Secretary,
Ministry of the Environment and
Water Resources,
Singapore.

[MEWR C030/01/129 V 5; AG/LLRD/SL/92C/2012/1 Vol. 3]