TECHNICAL CODE

TOWARDS NET ZERO: SPECIFICATIONS FOR GREENHOUSE GAS (GHG) MEASUREMENT, ATTRIBUTION AND REPORTING IN TELECOMMUNICATIONS NETWORK ASSETS AND INFRASTRUCTURE OPERATIONS

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Development of Technical Codes

The Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) ('the Act') provides for a Technical Standards Forum designated under Section 184 of the Act or the Malaysian Communications and Multimedia Commission ('the Commission') to prepare a technical code. The technical code prepared pursuant to Section 185 of the Act shall consist of, at least, the requirements for network interoperability and the promotion of safety of network facilities.

Section 96 of the Act also provides for the Commission to determine a technical code in accordance with Section 55 of the Act if the technical code is not developed under an applicable provision of the Act and it is unlikely to be developed by the Technical Standards Forum within a reasonable time.

In exercise of the power conferred by Section 184 of the Act, the Commission has designated the Malaysian Technical Standards Forum Bhd ('MTSFB') as a Technical Standards Forum which is obligated, among others, to prepare the technical code under Section 185 of the Act.

A technical code prepared in accordance with Section 185 shall not be effective until it is registered by the Commission pursuant to Section 95 of the Act.

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Committee representation

This technical code was developed by Green ICT, Environment & Climate Change Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB), which consists of representatives from the following organisations:

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Foreword

This technical code for Towards Net Zero: Specifications for Greenhouse Gas (GHG) Measurement, Attribution and Reporting in Telecommunications Network Assets and Infrastructure Operations ('Technical Code') was developed pursuant to Section 185 of the Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) by the Green ICT, Environment & Climate Change Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB).

This Technical Code shall continue to be valid and effective from the date of its registration until it is replaced or revoked.

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Introduction

Malaysia's commitment to a sustainable future is underscored by the National Energy Transition Roadmap (NETR) and the nation's pledge to achieve net-zero greenhouse gas (GHG) emissions by 2050, in alignment with the Paris Agreement. The telecommunications network and infrastructure sector occupy a unique position in this transition, as both a significant and growing source of energy consumption and emissions, and a critical enabler of decarbonisation across other industries. This Technical Code directly supports the NETR and Malaysia's Nationally Determined Contribution (NDC) by providing standardised guidance for measuring, managing, and reducing GHG emissions arising from telecommunications network assets and infrastructure operations, in alignment with international sector pathways such as ITU-T and relevant ISO standards and provides the measurement foundation on which the sector's climate-related financial disclosures can reliably be made.

This Technical Code provides a common specification for Service Providers and Infrastructure Providers to standardise how GHG emissions are measured, attributed, demarcated, and reduced across shared and individually operated network assets. Its distinctive contribution lies in the shared nature of Malaysian telecommunications infrastructure: where a single site serves multiple organisations, no generic accounting framework determines who reports which emissions, and this Technical Code supplies the sector-specific attribution, allocation, reconciliation, and data exchange rules that make credible reporting possible. While adoption of certain provisions in this Technical Code may be guided by a readiness-based approach, it positions adopting organisations to improve operational transparency, strengthen investor and regulatory confidence, and contribute credibly toward national climate commitments. It further aligns the Malaysian telecommunications sector with growing global expectations on emissions accountability, and mitigates the risk of inconsistent, incomparable, or unverifiable sustainability claims across the industry. As international standards on net-zero alignment and climate disclosure continue to evolve, the sector is thereby equipped to demonstrate proactive and credible climate stewardship.

Network operators, infrastructure providers, regulators, and society at large are expected to benefit from the adoption of this Technical Code. Operators and infrastructure providers gain a consistent methodology for emissions measurement and target-setting, reducing duplication of effort and enabling fair benchmarking across the industry. Regulators and policymakers will benefit from better visibility of sector wide emissions performance, supporting Malaysia's ability to track and report progress against its national climate commitments. For society, this Technical Code contributes to the broader national effort of reducing the environmental footprint of essential digital infrastructure, while supporting the continued growth and reliability of telecommunications services that Malaysians depend on.

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TOWARDS NET ZERO: SPECIFICATIONS FOR GREENHOUSE GAS (GHG) MEASUREMENT, ATTRIBUTION AND REPORTING IN TELECOMMUNICATIONS NETWORK ASSETS AND INFRASTRUCTURE OPERATIONS

1. Scope

This Technical Code specifies requirements for the measurement, accounting, attribution, monitoring, reporting, and reduction of greenhouse gas (GHG) emissions associated with telecommunications network assets and infrastructure operations.

This Technical Code covers the following aspects:

a) GHG measurement, accounting and reporting;

b) energy and GHG data management and performance indicators;

c) energy efficiency, renewable energy and decarbonisation measures;

d) embodied carbon and circularity;

e) net zero targets and transition planning; and

f) GHG verification and assurance

2. Normative references

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies.

Refer to Annex A.

3. Abbreviations

For the purposes of this Technical Code, the following abbreviations apply.

Refer to Annex B.

4. Terms and definitions

For the purposes of this Technical Code, the following definitions apply.

4.1 Applicable sustainability reporting obligations

Mandatory sustainability-related financial disclosure and assurance obligations applicable to an organisation under national law or listing requirements, and the international sustainability disclosure standards on which they are based.

4.2 Base year

Historical period specified for the purpose of comparing GHG emissions over time. The base year applicable under this Technical Code, and the conditions requiring base year recalculation.

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4.3 Carbon intensity

The volume of GHG emissions per unit of service delivered, network output or operational activity, expressed in carbon dioxide equivalent (CO_2e) per unit (e.g. kg CO_2e per subscriber, per site, per terabyte of data traffic).

4.4 Colocation site

A network site at which active network equipment belonging to one or more Service Providers is hosted on passive infrastructure owned or operated by an Infrastructure Provider or another Service Provider, with energy supplied through shared or separately metered arrangements.

4.5 Decarbonisation

The progressive reduction of Greenhouse Gas (GHG) emissions from an organisation's activities, achieved primarily through energy efficiency, substitution of fossil-based energy with renewable sources, and improvements to assets and operations.

4.6 Electrical and electronic waste (e-waste)

Waste electrical and electronic equipment, including decommissioned network equipment, batteries and associated components, classified as scheduled waste under the Environmental Quality Act 1974 and its subsidiary regulations.

4.7 Embodied carbon

The GHG emissions arising from the raw material extraction, manufacturing, transport and installation of equipment or infrastructure, prior to and excluding its operational use.

4.8 Emission factor

Coefficient relating activity data to GHG emissions, expressed as mass of CO_2e per unit of activity (e.g. kg CO_2e per kWh of grid electricity, per litre of diesel).

4.9 Energy intensity

The amount of energy consumed per unit of service delivered, network output or operational activity (e.g. kWh per subscriber, kWh per site, kWh per terabyte of data traffic).

4.10 GHG emissions

The mass of greenhouse gases released to the atmosphere, expressed as CO_2e using Global Warming Potential (GWP) values from the Intergovernmental Panel on Climate Change (IPCC) Assessment Report.

4.11 GHG removal

The withdrawal of a GHG from the atmosphere by a sink, or the mechanism by which such withdrawal is achieved.

4.12 Infrastructure Provider

A licensed organisation that owns, manages or maintains passive network infrastructure, including tower structures, shelters, power systems, cooling systems, fibre and ducts, and provides access to such infrastructure to one or more Service Providers. Commonly referred to as a TowerCo in respect of tower assets.

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4.13 Net zero

The state in which an organisation has reduced its GHG emissions as far as practicable along a science-aligned pathway, and any residual emissions are counterbalanced by GHG removals.

4.14 Network asset

Any physical, virtual, or logical component within a telecommunications network infrastructure that holds value, carries data, or enables system functionality and management.

4.15 Off-grid site

A network site that is not permanently connected to a public electricity distribution grid and is powered primarily by on-site generation, typically diesel generators, supplemented where feasible by on-site renewable energy and battery storage.

4.16 Operational boundary

The boundary determining which emission sources and activities are included in the GHG inventory, comprising Scope 1, Scope 2 and the selected Scope 3 categories.

4.17 Organisational boundary

The boundary determining which operations and entities are included in the GHG inventory, established using either the equity share or the operational control consolidation approach.

4.18 Power Usage Effectiveness (PUE)

The ratio of total facility energy consumption to the energy consumption of the Information and Communications Technology (ICT) equipment within that facility.

4.19 Renewable energy

Energy derived from sources that are naturally replenished, including solar, wind, hydro, biomass and biogas, whether generated on-site or procured through recognised mechanisms.

4.20 Renewable Energy Certificate (REC)

Market instrument representing the attributes of one MWh of renewable electricity.

4.21 Residual emissions

GHG emissions that remain after all technically and economically feasible reduction measures have been implemented along the organisation's net zero pathway.

4.22 Science-based target

A GHG emission reduction target consistent with the level of decarbonisation required to limit global temperature increase in line with the Paris Agreement, as defined by the Science Based Targets initiative (SBTi) or an equivalent sector trajectory.

4.23 Service provider

Network Service Providers (NSP) and/or Network Facilities Providers (NFP) that operate active network equipment, comprising mobile network operators (MNOs), fixed network operators, and wholesale network operators, including operators of single wholesale networks.

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4.24 Sharing infrastructure

Co-located sites, site sharing and active infrastructure sharing arrangements, including multi-operator configurations and sites whose energy systems are operated by third-party energy services providers.

4.25 Scope 1 - Direct GHG emissions

GHG emissions from sources owned or controlled by the reporting organisation, including combustion of diesel in on-site generators, fuel used by Operations and Maintenance (O&M) fleet vehicles, and refrigerant leakage from cooling systems.

4.26 Scope 2 - Indirect GHG emissions from purchased energy

GHG emissions from the generation of purchased electricity, heat, steam, or cooling consumed by the reporting organisation. Scope 2 emissions are quantified using both the location-based method (grid average emission factors) and the market-based method (emission factors reflecting contractual instruments such as RECs and green tariffs).

4.27 Scope 3 - Value chain GHG emissions

All indirect GHG emissions, other than Scope 2, occurring in the upstream and downstream value chain of the reporting organisation.

5. Overview

Net zero is achieved when an organisation reduces its greenhouse gas (GHG) emissions along a science-aligned pathway to as close to zero as practicable, with any remaining residual emissions counterbalanced through recognised carbon removal mechanisms. Decarbonisation involves the progressive reduction and, where feasible, elimination of GHG emissions, with emission reduction prioritised before the use of carbon removal or offset mechanisms.

This Technical Code applies a mitigation hierarchy comprising six (6) stages as follows:

a) measure;

b) avoid;

c) optimise;

d) substitute;

e) circularity; and

f) offset.

The mitigation hierarchy begins with the establishment of a credible GHG inventory followed by measures to avoid and reduce emissions, transition towards renewable or lower-carbon energy, apply circularity practices, and ultimately neutralise residual emissions that cannot reasonably be eliminated. The mitigation hierarchy is illustrated in Figure 1.

GHG emissions from telecommunications network operations arise primarily from energy consumption and activities associated with network assets and supporting infrastructure. Direct Scope 1 emissions may arise from sources such as fuel consumption by generators and operational vehicles, as well as refrigerant leakage from cooling systems. Purchased grid electricity generally represents a significant source of indirect Scope 2 emissions, particularly from the Radio Access Network (RAN), transmission equipment, power conversion equipment and site cooling.

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Telecommunications infrastructure is commonly shared among Service Providers and TowerCos. Shared and co-located sites may involve multiple organisations using common passive infrastructure, power systems or other site facilities. These arrangements require consistent approaches to emissions demarcation, allocation, and data exchange to support credible reporting and minimise the risk of double counting.

Scope 1 and Scope 2 emissions form the core GHG reporting boundary addressed by this Technical Code. Applicable Scope 3 emissions relevant to telecommunications network operations are also addressed, including embodied carbon and circularity considerations associated with network assets and their life cycle.

Accordingly, this Technical Code provides an integrated approach to GHG measurement and accounting, emissions attribution and reporting, energy and resource efficiency, circularity, net-zero target-setting, transition planning, and verification and assurance for telecommunications network assets and infrastructure operations.

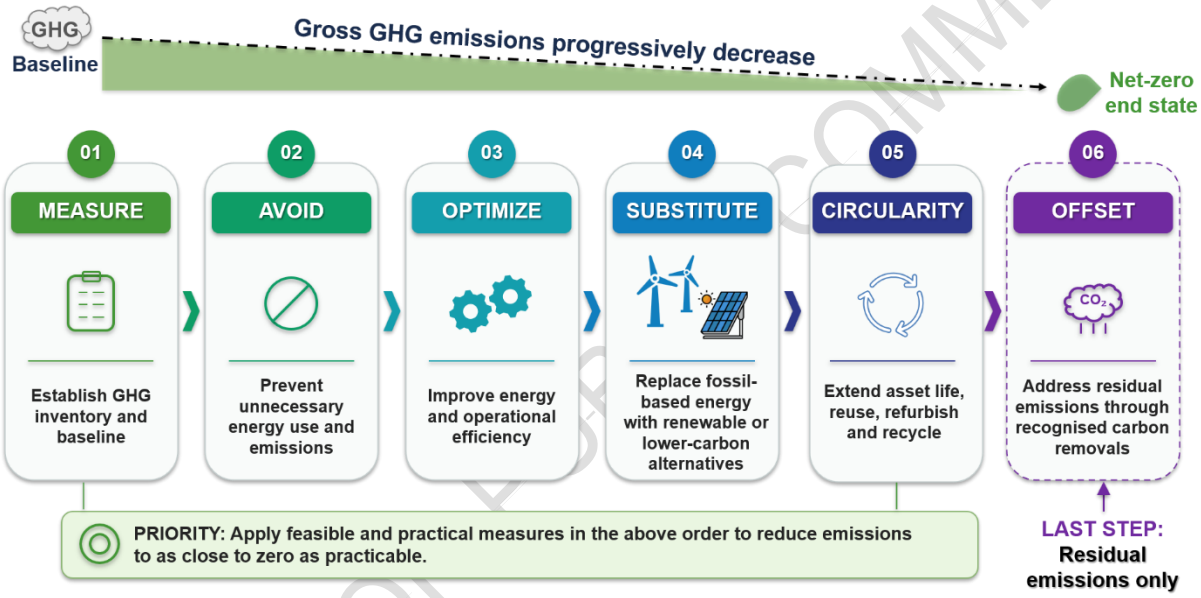

Figure 1. Mitigation hierarchy for net-zero decarbonisation planning

6. Principles, applicability and emissions demarcation

This clause establishes the principles, applicability, and boundary requirements for implementing this Technical Code. It provides the basis for determining organisational and operational boundaries, including the demarcation and allocation of GHG emissions at shared and co-located telecommunications infrastructure.

6.1 Principles

The following principles apply to the interpretation and implementation of all clauses of this Technical Code.

a) Measurement before management

Credible decarbonisation begins with a complete and accurate GHG inventory. Organisations establish measurement, monitoring and reporting capability as the foundation for target setting, optimisation planning and performance tracking.

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b) Standardised accounting

GHG emissions shall be classified, quantified and reported in accordance with recognised GHG accounting standard as the primary reference framework for inventory structure and verification, so that results are consistent and comparable across the sector and compatible with national and international disclosure frameworks.

c) Clear organisational and operational demarcation

Each organisation account for the emissions of the assets and operations under its selected consolidated approach. At shared and co-located sites, emissions are attributed in accordance with the demarcation principles of this Technical Code; therefore, emissions shall be classified consistently within each reporting organisation's inventory, with transparent demarcation and reconciliation between participating organisations.

d) Optimisation first

Emission optimisation through energy efficiency, renewable energy and operational improvement takes precedence over offsetting. Counterbalancing mechanisms are reserved for residual emissions at the net zero end state and do not substitute for reduction.

e) Proportionality and progressive implementation

Requirements are applied in proportion to organisational readiness, consistent with a phased, readiness-based approach allowing organisations to strengthen capability progressively: comprehensively for Scope 1 and Scope 2, and progressively for selected Scope 3 categories.

f) Transparency and data integrity

Emissions data, methodologies, assumptions, and exclusions are documented and disclosed in a manner that enables review, comparison and, where required, independent verification and assurance.

g) Technology neutrality

This Technical Code specifies outcomes and methods, without prescribing specific technologies, products or suppliers. Organisations may select technical solutions appropriate to their network, sites and readiness.

6.2 Recognition of existing reporting and voluntary commitments

Organisations may already report under applicable national or international sustainability or GHG reporting frameworks, such as the NSRF, IFRS S1 and S2 (ISSB), GHG Protocol Corporate Standard, and ISO 14064-1 or report under recognised voluntary commitments. Existing disclosures may be used to demonstrate conformity, provided the underlying measurement satisfies the requirements of this Technical Code.

The correspondence to national and international frameworks is summarised in Annex C.

6.3 Readiness-based applicability

Organisations shall assess and document their GHG inventory readiness in accordance with Table 1. The applicable readiness level shall be declared in the GHG inventory and reassessed at each reporting cycle. Where an organisation meets the characteristics of a higher level, it shall meet the requirements of that level. A move to a lower level shall be supported by documented justification.

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Table 1. Readiness levels and implementation requirements

Readiness level	Characteristics	Implementation requirements
Basic	Limited or no established GHG inventory	Establish a base-year inventory covering Scope 1 and Scope 2 within the first reporting cycle and prepare a documented roadmap for progressing to the Intermediate level within two further reporting cycles. Scope 3 emissions may be quantified progressively in accordance with the roadmap.
Intermediate	Established Scope 1 and Scope 2 accounting, with partial or no Scope 3 measurement	Apply all applicable Scope 1 and Scope 2 requirements from the first reporting cycle and extend measurement to applicable Scope 3 categories within two reporting cycles.
Advanced	Established inventory covering Scope 1, Scope 2 and applicable Scope 3 categories, supported by established emissions-reduction targets and climate-related disclosures	Apply all applicable requirements of this Technical Code from the first reporting cycle.

All organisations shall screen the fifteen (15) Scope 3 categories in accordance with Clause 7 to determine their applicability and potential significance. At the Basic readiness level, the screening may be qualitative, and quantification of applicable Scope 3 categories may be implemented progressively in accordance with the organisation's documented roadmap.

Applicable national regulatory or sustainability-related disclosure requirements shall take precedence over the readiness provisions of this clause. From the relevant effective date, an organisation subject to such requirements shall comply with the measurement and disclosure obligations applicable to it. This shall include, at a minimum, measurement and disclosure of Scope 1 and Scope 2 emissions and, where required, applicable Scope 3 categories, taking into account any permitted transition reliefs.

6.4 Organisational and operational demarcation

This clause specifies how an organisation shall determine the operations included in its GHG inventory and how responsibility for direct emission sources and energy consumption shall be assigned where facilities are shared.

6.4.1 Organisational boundary

The organisation shall establish its organisational boundary using one of the consolidation approaches specified in Table 2. The selected approach shall be applied consistently to all relevant operations during the reporting period.

Table 2. Organisational-boundary approaches

Approach	Assessment consideration	Treatment
Operational control	The organisation has the full authority to introduce and implement its operating policies for the relevant operation.	Include 100 % of GHG emissions from operations under operational control.
Financial control	The organisation has the ability to direct the financial and operating policies of the relevant operation with a view to gaining economic benefits from its activities.	Include 100 % of GHG emissions from operations under financial control.
Equity share	The organisation accounts for GHG emissions from an operation according to its share of equity in the operation, reflecting its economic interest.	Include GHG emissions in proportion to its equity share or economic interest.

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For each operation, asset, facility or contractual arrangement, the organisation shall document the parties involved, the selected approach, evidence reviewed and the resulting inclusion or exclusion decision. Legal ownership, payment of an energy invoice or physical location of equipment shall not alone determine the organisational boundary.

For common telecommunications arrangements, the organisation shall assess the organisational boundary in accordance with Table 3.

Table 3. Organisational-boundary assessment for common telecommunications arrangements

Arrangement	Key evidence to review	Decision requirement
Subsidiary or wholly owned operation	Ownership records, board authority and operating-policy rights.	Apply the selected consolidation approach.
Joint venture or minority interest	Shareholders agreement, operator appointment, voting and veto rights, profit-sharing arrangement.	Determine whether operational control, financial control or equity share applies.
Leased or outsourced operation	Lease, service agreement, operating responsibility, maintenance, and energy procurement arrangements.	Determine the party that has operational control, where applicable.
TowerCo, co-located or managed network site	Site agreement, generator and cooling O&M agreement, energy contract, metering and tenant records.	Apply Table 4 and 5 after each party establishes its boundary.

Where facilities, infrastructure, equipment or energy supplies are shared by two or more organisations, the organisations involved shall apply the criteria in Table 4 to assign responsibility for each direct emission source and associated energy consumption. These criteria shall not override the organisational-boundary approach selected under Table 2.

6.4.2 Demarcation at shared and co-located infrastructure

Where telecommunications infrastructure, facilities, equipment or energy supplies are shared by two (2) or more organisations, the organisations involved shall apply the criteria in Table 4 to assign responsibility for direct GHG emission sources and associated energy consumption. The determination shall be consistent with the organisational-boundary approach established under Table 2.

Table 4. Criteria for assigning responsibility at shared and co-located facilities

Allocation criterion	Application for determining responsibility
Operation and control of emission source	The organisation responsible for operating and controlling the emission source shall report the related direct GHG emissions. This applies, for example, to generators, cooling systems and refrigerant-containing equipment.
Energy-procurement responsibility	The organisation responsible for purchasing, procuring or contracting for electricity, fuel or other energy shall retain records of the energy supply and contractual arrangement.
Ownership or control of energy-consuming equipment	Energy consumption shall be attributed to the organisation that owns, operates or controls the energy-consuming equipment, where this can be demonstrated.
Generator operation and fuel management	The organisation responsible for operating the generator, controlling generator dispatch, and managing fuel supply or fuel-use records shall report the related Scope 1 emissions.

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Table 4. Criteria for assigning responsibility at shared and co-located facilities *(continued)*

Allocation criterion	Application for determining responsibility
Cooling systems and refrigerants	The organisation responsible for operating and maintaining cooling systems, including refrigerant charging, recovery and leakage management, shall report the related direct GHG emissions.
Contractual arrangements	Tenancy, service, energy-supply, operation-and-maintenance, or other contracts shall be considered when assigning responsibilities, data access and reporting obligations.
Other technically justified allocation basis	Where metered data are unavailable, a documented allocation basis may be used, such as operating hours, connected load, equipment capacity, floor area, rack capacity or generator runtime.

6.4.3 Allocation of shared energy consumption

Where two or more organisations consume energy from a shared supply, the allocation method shall follow the hierarchy in Table 5. A lower-priority method shall only be used where a higher-priority method is not reasonably practicable. The method, assumptions and supporting data shall be documented.

Table 5. Hierarchy for allocating shared energy consumption

Priority	Allocation method	Application
1	Direct metering	A dedicated meter records actual energy consumption of each organisation.
2	Sub-metering	A main site meter is supported by sub-meters for individual circuits, tenants, or equipment.
3	Measured equipment-level consumption	Portable or equipment-level measurement is used where permanent metering is unavailable.
4	Engineering allocation	Rated load x operating hours x documented load factor, or another technically justified engineering method.
5	Documented proxy or benchmark	A representative technical or operational parameter is used only where higher-priority methods are not practicable.

For an off-grid shared site, the party operating the generation system shall report direct fuel-combustion emissions as Scope 1 where it has operational control. A tenant that purchases or acquires and consumes electricity from that system may report the associated Scope 2 emissions using supplier-specific or appropriately allocated generation data. These are different reporting scopes and are not duplicate reporting within the same scope.

The mapping of network asset categories to emission sources is provided in Annex D.

7. GHG Emissions inventory management and reporting

This clause specifies the requirements for the establishment, quantification, management, monitoring and reporting of an organisation's GHG emissions inventory. The inventory shall be prepared in accordance with the organisational and operational boundaries established under Clause 6 and shall provide a consistent, transparent and verifiable basis for emissions reduction planning, performance monitoring, target setting, disclosure and assurance.

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7.1 Inventory scope, reporting period and structure

The organisation shall maintain an inventory profile that states the reporting organisation, entities and operations included, organisational-boundary approach, reporting period, base year, emission scopes, global warming potential basis, emission factors, material exclusions and reporting unit in tCO2e.

The reporting period shall cover twelve (12) consecutive months. The organisation shall establish a base year representative of normal operations where practicable and assess recalculation where a significant structural, methodological or data-related change materially affects comparability. The GHG inventory should enable reporting at multiple levels as specified in Table 6.

Table 6. Minimum inventory reporting structure

Level	Reporting Level	Telecommunications example
1	Organisation	Total corporate GHG inventory.
2	Emissions Scope	Scope 1, Scope 2 and Scope 3.
3	Business or network function	Radio access network (RAN); transmission; core; data centre; infrastructure; logistics; and corporate operations.
4	Asset category	Macro sites; small cells; fibre infrastructure; switching facilities; data centres; fleet; and offices
5	Individual site or asset	Individual site, generator, cooling system, vehicle or other material asset, where practicable.

An illustrative inventory structure is provided in Annex E.

7.2 Emission Factors (EFs) and Global Warming Potential (GWP) values

Emission Factors (EFs) shall be used to convert activity data into the quantity of GHG emissions generated. Global warming potential (GWP) values shall be used to express the climate impact of each GHG relative to carbon dioxide and to convert the emissions into carbon dioxide equivalent (CO_2e).

The reporting organisation shall use emission factors that are appropriate to the relevant emission source, activity data, calculation method, technology, geographical boundary and reporting period. Where emissions are calculated separately by gas, the applicable GWP values shall be applied consistently across the GHG inventory.

7.2.1 Emission Factors (EFs)

Emission factors shall be:

a) obtained from authoritative sources;

b) geographically appropriate;

c) temporally appropriate;

d) representative of the relevant fuel, technology, activity, product or service;

e) traceable to their original source;

f) expressed in units compatible with the corresponding activity data;

g) applied consistently to comparable emission sources and reporting periods; and

h) reviewed periodically and updated where a more representative factor becomes available.

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Where more than one emission factor is available, the reporting organisation shall select the factor that most accurately represents the emission-generating activity. An emission factor shall not be selected solely because it produces a lower GHG emissions result.

The hierarchy in Table 7 shall be applied when selecting emission factors.

Table 7. Emission-factor selection hierarchy

Priority	Source of emission factor	Description
1	Applicable regulatory or nationally recognised sources	Emission factors issued, prescribed or endorsed by an applicable regulatory authority, government agency or nationally recognised institution.
2	Supplier- or facility-specific sources	Verified or otherwise adequately supported emission factors representing the actual product, fuel, electricity supply, equipment, facility, or service.
3	Recognised international or sector-specific sources	Emission factors published by recognised international bodies, standards organisations, industry associations or telecommunications and ICT-sector methodologies.
4	Industry-average, database or engineering sources	Industry-average factors, recognised life-cycle databases, peer-reviewed studies or engineering estimates used where no more representative factor is available.

A lower-priority factor may be used where a higher-priority factor is unavailable, unsuitable or less representative of the relevant activity. The reporting organisation shall document the reason for selecting the lower-priority factor.

Supplier-specific emission factors shall only be used where:

a) the calculation boundary is clearly defined;

b) the methodology and underlying data are sufficiently transparent;

c) the factor is applicable to the reporting period and activity concerned; and

d) appropriate verification or supporting evidence is available.

For location-based Scope 2 emissions, the applicable grid-average emission factor for the geographical area in which the electricity is consumed shall be used. For market-based Scope 2 emissions, supplier-specific factors or contractual electricity instruments shall only be used where the applicable market-based quality criteria are met.

7.2.2 Global Warming Potential (GWP) values

Emissions of individual GHGs shall be converted to carbon dioxide equivalent using 100-year global warming potential values from a specified IPCC Assessment Report, unless another basis is prescribed by an applicable regulatory or reporting requirement.

The reporting organisation shall:

a) apply the same set of GWP values consistently across the reporting inventory;

b) disclose the IPCC Assessment Report and time horizon used;

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c) avoid combining GWP values from different IPCC Assessment Reports within the same inventory, unless required by an applicable authority; and

d) assess whether historical emissions and the base year require recalculation when the selected GWP values change.

Where an emission factor is already expressed in CO_2e, an additional GWP conversion shall not be applied.

7.3 Identification, classification and quantification of GHG emission sources

The organisation shall identify all relevant GHG emission sources within the boundaries established under Clause 6 and classify each source before quantification. The assessment shall be reviewed at least once in each reporting cycle and when a material change occurs in site ownership, energy supply, network configuration, outsourcing or contractual arrangements.

Figure 2 illustrates how GHG emissions may arise across the telecommunications value chain, using an integrated telecommunications service provider as an example. It shows the relationship between network operations, supporting infrastructure, purchased equipment and services, customer use, and end-of-life activities.

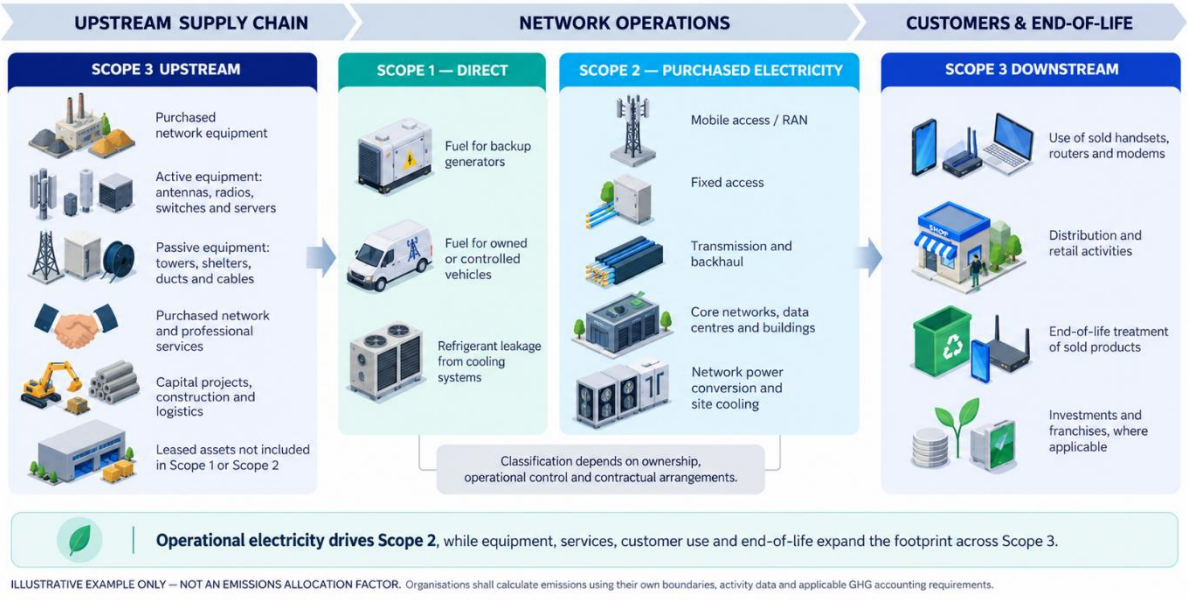

Figure 2. Illustrative mapping of GHG emission sources across the telecommunications value chain

Operational emissions primarily comprise direct Scope 1 emissions from fuel combustion and refrigerant leakage, and indirect Scope 2 emissions from purchased electricity used to operate network assets. Relevant assets may include the radio access network, fixed-access network, transmission and backhaul systems, core networks, data centres, buildings, power-conversion equipment and cooling systems.

For certain telecommunications operators, Scope 1 may represent a relatively small proportion of the combined Scope 1 and Scope 2 operational footprint, with some industry examples indicating approximately 3% to 5%. However, the contribution can vary significantly and may increase where an organisation relies heavily on fuel-based backup generation, particularly during grid outages, severe weather events or operations in off-grid and grid-constrained locations.

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The figure also demonstrates that a significant proportion of a telecommunications organisation's GHG footprint may occur within Scope 3. Upstream emissions may arise from purchased active and passive equipment, capital projects, leased assets, logistics and network services. Downstream emissions may arise from the use and end-of-life treatment of sold devices, customer equipment, distribution activities, investments and franchises, where applicable.

The sources and proportions shown are illustrative only. They shall not be treated as prescribed emission factors or allocation percentages. Each reporting organisation shall identify and quantify its emissions based on its organisational and operational boundaries, ownership and control arrangements, contractual responsibilities, relevant Scope 3 categories and available activity data.

7.3.1 Scope 1 emissions

Scope 1 comprises direct GHG emissions from sources owned or controlled by the reporting organisation. Within telecommunications operations, these emissions may arise from stationary fuel combustion in generators and backup power systems, mobile combustion from operational vehicles and equipment, refrigerant leakage from cooling systems, and releases of applicable GHGs from fire-suppression systems.

The calculation of Scope 1 emissions requires the reporting organisation to confirm its organisational boundary, identify direct emission sources, collect and validate activity data, select appropriate emission factors and GWP values, calculate emissions by source, and consolidate the results. Table 8 sets out the required calculation sequence.

Table 8. Flow for calculating Scope 1 GHG emissions

Step	Calculation stage	Required action	Telecommunications application	Required output or record
1	Confirm inventory boundary	Confirm the reporting period, organisational boundary and consolidation approach. Determine which assets and activities are owned or controlled by the reporting organisation.	Network sites, base stations, towers, exchanges, data centres, offices, warehouses, vehicles and shared facilities	Approved inventory boundary and list of included entities, sites and assets
2	Identify direct emission sources	Identify all fuel-consuming equipment, vehicles, refrigerant-containing equipment and fire-suppression systems within the boundary.	Backup generators, combined heat and power systems, service vehicles, HVAC systems, chillers, precision cooling and fire-suppression systems	Scope 1 source register
3	Confirm source applicability	Determine whether the reporting organisation owns or controls each source. Exclude sources outside its boundary and assess them under Scope 3 where applicable.	TowerCo-operated generators, tenant-owned radio equipment, outsourced vehicle fleets and leased cooling systems	Documented inclusion or exclusion decision
4	Select calculation method	Select the most representative calculation method based on the source type and data available. Direct measurement or fuel- and mass-based methods shall be prioritised overestimates.	Fuel-based method for generators and vehicles; mass-balance method for refrigerants; discharge or refill method for fire-suppression systems	Approved calculation method for each source

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Step	Calculation stage	Required action	Telecommunications application	Required output or record
5	Collect activity data	Obtain activity data for the reporting period using the preferred evidence hierarchy. Units shall be recorded consistently.	Litres of diesel or petrol; kilometres travelled; generator operating hours; kilograms of refrigerant purchased, refilled, or recovered; kilograms of extinguishing agent discharged	Completed activity-data register with supporting evidence
6	Validate activity data	Check completeness, reporting period, unit, site, asset identifier, duplicate entries, unusual movements and reconciliation with financial or operational records.	Reconcile fuel records with invoices, tank movements, fleet cards and generator logs; reconcile refrigerant top-ups with maintenance records	Validated activity data and documented exceptions
7	Select emission factors and GWP values	Select emission factors EFs and GWP values in accordance with the approved emission-factor hierarchy. Confirm that the factor boundary and unit match the activity data.	Malaysian fuel factors where applicable; vehicle-class factors; refrigerant-specific and fire-suppressant-specific GWP values	Approved EF register
8	Calculate emissions by gas	Calculate emissions for each relevant GHG. Where gas-specific factors are available, calculate CO_2, CH_4 and N_2O separately before conversion to CO_2 equivalent.	Fuel combustion from generators and vehicles; refrigerant and fire-suppressant releases	Emissions by source, gas and asset
9	Convert to CO_2 equivalent	Multiply the mass of each GHG by its applicable GWP value. Where the emission factor is already expressed in CO_2e, an additional GWP conversion shall not be applied.	Refrigerants normally require gas specific GWP conversion	Emissions in tCO_2e
10	Aggregate results	Aggregate emissions by source, site, business unit and reporting entity. Stationary combustion, mobile combustion, fugitive emissions and fire-suppression emissions shall remain separately identifiable.	Regional networks, data centres, corporate facilities and fleet operations	Consolidated Scope 1 inventory
11	Perform quality control	Review formulas, conversions, emission factors, missing data, estimates, boundary decisions and year-on-year movements. Investigate and document significant variances.	Increased diesel consumption during grid outages; refrigerant top-up spikes; newly commissioned or decommissioned sites	Quality-control record and approved adjustments

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Step	Calculation stage	Required action	Telecommunications application	Required output or record
12	Report and retain records	Report total Scope 1 emissions in tCO_2e and disclose the calculation methods, factors, GWP basis, estimates, exclusions, limitations and material changes. Retain supporting records according to the record-retention requirements.	Organisational GHG inventory and technical disclosure	Approved Scope 1 result and audit trail

7.3.1.1 Source-specific calculation requirements

The reporting organisation shall apply a calculation method appropriate to each Scope 1 emission source and the quality of available activity data. Direct measurements, actual fuel-consumption records and mass-balance methods should be prioritised over engineering estimates or proxy data.

Table 9 specifies the preferred activity data, supporting evidence and calculation methods for stationary combustion, mobile combustion, fugitive emissions and applicable fire-suppression systems.

Table 9. Scope 1 activity data and calculation methods

Emission source	Preferred activity data	Preferred supporting evidence	Calculation method
Stationary combustion	Quantity of fuel consumed by fuel type, such as litres, kilograms, cubic metres or energy units	Fuel invoices; purchase records; tank dip readings; delivery records; fuel-issue records; generator logs; calibrated meter readings	Fuel-based method: GHG emissions = fuel consumed × applicable emission factor × unit-conversion factor
Stationary combustion - estimated data	Generator operating hours, rated load, actual load factor and fuel-consumption rate	Hour-meter records; generator specifications; maintenance logs; load-test results; engineering records	Engineering estimate: Estimated fuel consumed = operating hours × fuel-consumption rate. The estimated fuel quantity is then multiplied by the applicable emission factor.
Mobile combustion	Actual fuel consumed by fuel and vehicle type	Fuel-card records; fuel invoices; fleet-management system; vehicle logs; odometer records	Fuel-based method: GHG emissions = fuel consumed × applicable fuel emission factor × unit-conversion factor
Mobile combustion - alternative method	Distance travelled by vehicle class and fuel type	Odometer readings; mileage claims; trip logs; fleet-management records	Distance-based method: GHG emissions = distance travelled × vehicle-class emission factor × unit-conversion factor
Fugitive emissions - refrigeration and air-conditioning	Refrigerant added, recovered, returned, disposed of or remaining in inventory, by refrigerant type	Refrigerant purchase records; service reports; maintenance logs; cylinder records; equipment disposal records; contractor declarations	Mass-balance method: Refrigerant emitted = refrigerant entering inventory or equipment − refrigerant remaining, recovered, returned or otherwise accounted for

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Table 9. Scope 1 activity data and calculation methods *(continued)*

Emission source	Preferred activity data	Preferred supporting evidence	Calculation method
Fugitive emissions - top-up method	Quantity of refrigerant added to replace operational losses, by refrigerant type	Contractor service reports; work orders; refrigerant top-up records	Top-up method: Refrigerant emitted = quantity added to replace leakage, subject to verification that the addition represents operational loss
Fire-suppression systems	Quantity of applicable extinguishing agent discharged, refilled, lost or unaccounted for, by agent type	Discharge records; refill invoices; cylinder-weight records; inspection reports; inventory reconciliation	Mass-balance or discharge method: Agent emitted = quantity discharged or quantity required to restore the system, adjusted for recovered agent where applicable

7.3.1.2 Calculation equations

Scope 1 GHG emissions shall be calculated using the applicable equations, based on the emission source, activity data and type of emission factor used.

a) Fuel combustion using gas-specific emission factors.

$$E_g = AD \times EF_g \times CF$$

$$E_{CO_2e} = \sum_g (E_g \times GWP_g)$$

where:

E_g is the emission of gas g, in tonnes;

AD is the activity data, such as litres of fuel consumed;

EF_g is the emission factor for gas g;

CF is the applicable unit-conversion factor; and

GWP_g is the global warming potential of gas g.

b) Fuel combustion using a combined CO_2e emission factor.

$$\text{GHG emissions } (tCO_2e) = \frac{\text{Fuel consumed} \times \text{Emission factor } (kgCO_2e \text{ per unit})}{1,000}$$

No additional GWP conversion shall be applied where the emission factor is already expressed in CO_2e.

c) Refrigerant and fire-suppressant emissions.

$$\text{GHG emissions } (tCO_2e) = \frac{\text{Mass emitted } (kg) \times \text{GWP}}{1,000}$$

The calculation shall be performed separately for each refrigerant or extinguishing agent.

7.3.2 Scope 2 emissions

Scope 2 comprises indirect GHG emissions arising from the generation of electricity, steam, heating or cooling purchased or otherwise acquired and consumed by the reporting organisation. Within the

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telecommunications industry, these emissions principally arise from electricity used to operate radio access networks, fixed-access networks, transmission and backhaul systems, core networks, data centres, edge-computing facilities, power-conversion equipment, cooling systems and supporting premises.

The calculation of Scope 2 emissions requires the reporting organisation to identify the relevant energy-consuming assets, determine the applicable purchasing and metering arrangements, collect and validate energy-consumption data, select appropriate emission factors, and calculate and consolidate the resulting emissions. Table 10 sets out the required calculation flow, from confirming the organisational boundary to reporting the final Scope 2 results.

Table 10. Flow for calculating Scope 2 GHG emissions

Step	Calculation stage	Required action	Telecommunications application	Required output
1	Confirm organisational boundary	Identify the entities, sites, facilities and leased assets included under the selected consolidation approach.	Towers, base stations, exchanges, data centres, offices, warehouses and co-located facilities	Approved list of included entities and facilities
2	Identify purchased or acquired energy	Identify electricity, steam, heating and cooling purchased or otherwise acquired and consumed within the boundary.	Grid electricity, purchased renewable electricity, district cooling and landlord-supplied electricity	Scope 2 energy-source register
3	Identify purchasing and consumption arrangements	Determine who contracts with the energy supplier, receives the invoice, operates the consuming equipment and bears the energy cost.	Direct utility accounts, TowerCo master meters, landlord billing, pass-through charges, PPAs and shared power systems	Documented responsibility and boundary assessment
4	Map meters to assets and users	Link each utility meter, sub-meter or allocated energy record to the relevant site, equipment and reporting entity.	Separate meters for active equipment, passive infrastructure, cooling and common facilities	Meter-to-asset register
5	Collect energy data	Obtain energy consumption for the reporting period in kWh, MWh, GJ or other applicable units.	Utility bills, smart meters, energy-management systems, data-centre records and landlord statements	Complete energy-consumption dataset
6	Allocate shared consumption	Use direct metering or sub-metering. Where unavailable, apply a documented allocation method that reflects actual consumption as closely as practicable.	Shared towers, co-location sites, data centres, exchanges and common cooling systems	Allocated consumption by entity, tenant or equipment group
7	Validate activity data	Reconcile meter readings against invoices, opening and closing readings, tariff records and site-operating information. Investigate gaps, duplicates and abnormal consumption.	Missing bills, meter changes, estimated utility readings and site outages	Validated energy dataset

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Table 10. Flow for calculating Scope 2 GHG emissions *(continued)*

Step	Calculation stage	Required action	Telecommunications application	Required output
8	Select emission factors	Select geographically and temporally representative factors for the location-based method. Select eligible supplier or contractual factors for the market-based method, where applicable.	Peninsular Malaysia, Sabah, Sarawak or another relevant electricity system	Approved emission factors
9	Calculate location-based emissions	Multiply energy consumption by the applicable grid-average emission factor.	All purchased grid electricity within the reporting boundary	Location-based Scope 2 emissions
10	Calculate market-based emissions	Where applicable, apply qualifying supplier-specific factors, PPAs, green tariffs or energy-attribute instruments in accordance with the relevant quality criteria.	Contracted renewable electricity and eligible green-energy products	Market-based Scope 2 emissions
11	Aggregate and review	Aggregate results by site, network type, facility, region and reporting entity. Review year-on-year movements and intensity indicators.	RAN, fixed access, core network, data centres and offices	Consolidated Scope 2 inventory
12	Report and retain records	Report Scope 2 results, methods, factors, allocation bases, contractual instruments, estimates and limitations. Retain the supporting audit trail.	Organisational GHG inventory	Approved Scope 2 disclosure

7.3.2.1 Scope 2 calculation methods

The reporting organisation shall select a calculation method that reflects the type of energy purchased or acquired, the availability and quality of activity data, and the applicable metering arrangement. Actual metered consumption should be used wherever available. Where direct measurements are unavailable, consumption may be estimated using sub-metered data, allocated master-meter consumption, or documented engineering parameters.

Table 11 specifies the preferred activity data, supporting evidence and calculation methods for common energy sources and supply arrangements within telecommunications operations.

Table 11. Scope 2 activity data and calculation methods

Energy source or arrangement	Preferred activity data	Preferred evidence	Calculation method
Grid electricity — direct meter	Metered electricity consumed in kWh or MWh	Utility invoices, meter readings and energy-management systems	Electricity consumed × applicable grid emission factor
Grid electricity — sub-metered shared site	Electricity recorded for each tenant, equipment group or facility	Calibrated sub-meter readings, tenant statements and site-energy records	Sub-metered consumption × applicable emission factor

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Table 11. Scope 2 activity data and calculation methods *(continued)*

Energy source or arrangement	Preferred activity data	Preferred evidence	Calculation method
Grid electricity — shared master meter	Total master-meter consumption and technically justified allocation parameters	Utility invoice, equipment load, operating hours, sub-meter studies and engineering records	Allocated consumption × applicable emission factor
Purchased steam or heating	Quantity purchased in mass or energy units	Supplier invoice, meter reading or landlord statement	Purchased energy × applicable supplier or energy emission factor
Purchased cooling	Cooling consumed in refrigeration-ton-hours, kWh, MWh or other applicable units	District-cooling invoices, chilled-water meters or supplier statements	Purchased cooling × applicable emission factor
Renewable electricity under contractual instruments	Electricity matched to an eligible contractual instrument	PPA, green-tariff statement, energy-attribute certificate or supplier documentation	Market-based calculation using the eligible contractual factor; location-based calculation remains separately required where applicable
Estimated electricity consumption	Equipment load, operating hours, utilisation or representative historical consumption	Equipment specifications, operating logs, engineering studies and prior-period records	Estimated consumption × applicable emission factor

When the emission factor is expressed in $kgCO_2e/kWh$:

$$\text{Scope 2 emissions } (tCO_2e) = \frac{\text{Electricity consumed (kWh)} \times \text{Emission factor } (kgCO_2e/kWh)}{1,000}$$

7.3.2.2 Shared-service and co-location arrangements

Telecommunications infrastructure is commonly shared among Service Providers, TowerCos, data-centre operators and other parties. Electricity may be purchased centrally, supplied through a common meter, separately sub-metered, recharged to tenants or included within a bundled infrastructure service. These arrangements can affect whether the associated emissions are reported under Scope 2 or another applicable scope or category.

The reporting organisation shall assess each arrangement according to its organisational boundary, consolidation approach, operational control, contractual responsibilities, electricity-purchasing arrangement and metering configuration. Where energy is shared, consumption shall be determined using direct metering or sub-metering wherever practicable. If measured data are unavailable, a documented and consistently applied allocation method shall be used.

Table 12 summarises the operational demarcation scenarios used to support the consistent classification and allocation of energy-related emissions from shared and co-located telecommunications infrastructure. Detailed guidance and worked examples for each scenario are provided in Annex F.

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Table 12. Operational demarcation scenarios for shared telecommunications infrastructure

Scenario	Electricity arrangement	Potential reporting treatment	Required data and control
Service Provider with a direct utility meter	The Service Provider contracts with the utility and directly meters electricity consumed by its network equipment.	The Service Provider reports the purchased electricity under Scope 2.	Utility invoices, meter readings and asset-to-meter mapping
Infrastructure Provider operates the site and purchases all electricity	The Infrastructure Provider holds the utility account and operates the shared power and cooling systems. Electricity is included in the site-service fee.	The Infrastructure Provider may report electricity within Scope 2 where it falls within its organisational boundary. A Service Provider receiving a bundled infrastructure service may assess the associated emissions under Scope 3.	Site contract, utility account, operational-control assessment and tenant-energy allocation
Electricity separately supplied or recharged to tenants	The Infrastructure Provider or landlord purchases electricity and separately charges each tenant based on measured consumption.	The tenant may report the electricity under Scope 2 where it is considered purchased or acquired and consumed within the tenant's boundary. The provider shall apply a consistent treatment to avoid counting pass-through electricity as its own consumption where this is not supported by its boundary approach.	Sub-meter records, invoices, contractual terms and documented accounting policy
Shared master meter without sub-metering	Several organisations consume electricity through one meter, and tenant-level readings are unavailable.	Consumption shall be allocated using a documented method. Each organisation shall report the amount attributable to its reporting boundary under the applicable scope.	Master-meter reading, equipment inventory, rated load, measured load, operating hours and allocation calculation
Shared generator supplies electricity during grid outages	A generator supplies power to several tenants or network operators.	Fuel combustion is Scope 1 for the organisation that owns or controls the generator. Electricity acquired by another party may be Scope 2 where it is separately purchased, or Scope 3 where it forms part of a bundled site service.	Fuel records, generator-control arrangement, operating hours, electricity-output data and service contract

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Table 12. Operational demarcation scenarios for shared telecommunications infrastructure
(continued)

Scenario	Electricity arrangement	Potential reporting treatment	Required data and control
Co-located data centre	A data-centre operator purchases electricity and provides power, cooling and space to telecommunications customers.	The operator may report purchased electricity under Scope 2. The customer's classification depends on whether electricity is separately acquired and allocated or received as part of a bundled hosting service.	Data-centre contract, tenant meter or power-distribution unit readings, rack load and allocation method
On-site renewable electricity owned and operated by the reporting organisation	Solar or another renewable-energy system generates electricity for on-site consumption.	On-site electricity generation and consumption is not purchased electricity and is generally not Scope 2. Any associated direct emissions shall be considered under Scope 1 where applicable.	Generation meter, consumption meter, ownership record and treatment of renewable-energy attributes
Third-party on-site renewable-energy arrangement	A third party owns the renewable-energy system and sells electricity to the site operator.	The purchased electricity is included in Scope 2. Its market-based treatment depends on the contractual arrangement and ownership or retirement of the energy attributes.	PPA, electricity meter, invoices and energy-attribute documentation
Shared passive and active infrastructure	The Infrastructure Provider operates the tower, shelter and common facilities, while Service Providers operate their own active radio equipment.	Electricity shall be separated between active equipment, passive infrastructure and common services where practicable. Each party reports emissions according to its respective boundary and energy-acquisition arrangement.	Equipment-level sub-meters, load measurements, asset register and site-sharing agreement

The scenarios in Table 13 are illustrative. The final classification shall be determined from the reporting organisation's perspective and shall reflect the substance of the applicable ownership, control, lease, energy-supply and service arrangements.

7.3.3 Scope 3 Emissions

Scope 3 comprises other indirect GHG emissions arising across the reporting organisation's value chain that are not included in its Scope 1 or Scope 2 inventory. Upstream emissions may arise from purchased goods and services, network equipment, capital projects, fuel- and energy-related activities, outsourced services, transportation, waste and leased assets. Downstream emissions may arise from product distribution, the use and end-of-life treatment of sold products, leased infrastructure, franchises and investments.

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The applicability and significance of individual Scope 3 categories will vary according to the organisation's role, operating model and position within the telecommunications value chain. Relevant organisations may include integrated telecommunications operators, mobile and fixed-network operators, TowerCos, FiberCos, data-centre operators, satellite service providers, equipment suppliers and service-based operators.

The reporting organisation shall screen all fifteen (15) Scope 3 categories to determine their applicability and significance. Applicable categories shall be quantified using the most representative data and calculation methods reasonably available. Any category assessed as not applicable or excluded from quantification shall be supported by a documented justification.

Table 13 sets out the calculation flow for defining the value-chain boundary, screening and prioritising applicable categories, collecting and validating activity data, selecting calculation methods and emission factors, calculating emissions, and reporting the results.

Table 13. Flow for calculating Scope 3 GHG emissions

Step	Calculation stage	Required action	Telecommunications application	Required output
1	Confirm value-chain boundary	Confirm the organisational boundary and identify activities outside Scope 1 and Scope 2 that are connected to the organisation's operations, products or services.	Suppliers, contractors, TowerCos, data centres, logistics providers, retailers, customers, franchisees and investees	Defined Scope 3 boundary
2	Map the value chain	Map upstream and downstream activities from raw materials and network equipment to customers and end-of-life treatment.	Network equipment manufacturing, tower construction, cloud services, distribution, device use and recycling	Telecommunications value-chain map
3	Screen all categories	Assess all 15 Scope 3 categories for applicability. A category shall not be excluded only because primary data are unavailable.	Categories 1–8 upstream and Categories 9–15 downstream	Scope 3 screening register
4	Identify potentially significant sources	Assess categories based on expected magnitude, financial significance, influence, risk, stakeholder interest, sector relevance and data availability.	Network equipment, capital infrastructure, purchased services, energy-related activities, customer devices and investments	Prioritised category list
5	Prevent boundary overlap	Check that emissions are not already included in Scope 1 or Scope 2 and distinguish between purchased services, capital goods, transportation and leased assets.	Shared sites, leased towers, data-centre services and pass-through electricity	Documented classification decisions
6	Select calculation method	Select supplier-specific, hybrid, activity-based, average-data, asset-specific or spend-based methods according to data quality and source significance.	Supplier product footprints, equipment quantities, construction materials, passenger-kilometres and procurement expenditure	Approved calculation method

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Table 13. Flow for calculating Scope 3 GHG emissions *(continued)*

Step	Calculation stage	Required action	Telecommunications application	Required output
7	Collect activity data	Obtain physical, operational, financial or supplier-specific data for the reporting period.	Equipment purchased, project expenditure, fuel and electricity consumption, tonnes-kilometres, waste mass, travel distance and units sold	Scope 3 activity-data register
8	Select emission factors	Select factors that match the activity, geography, technology, reporting period and calculation boundary.	Cradle-to-gate product factors, upstream fuel factors, transport factors and waste-treatment factors	Approved Emission Factor Register
9	Calculate emissions	Apply the selected activity data, emission factors, allocation factors and GWP values.	Calculations by category, supplier, asset, project, product or service	Emissions by Scope 3 category
10	Address shared services	Determine the appropriate category for leased infrastructure, bundled electricity, cloud services, co-location and outsourced network operations.	TowerCo services, FiberCo capacity, hosted data centres and managed network services	Shared-service classification record
11	Aggregate and review	Aggregate emissions by category and review for missing sources, duplication, abnormal movements and methodological inconsistencies.	Consolidated upstream and downstream inventory	Reviewed Scope 3 inventory
12	Report and improve	Report emissions separately by category and disclose exclusions, methods, assumptions, estimates, limitations and data-quality improvement plans.	Organisational GHG disclosure	Approved Scope 3 results and audit trail

7.3.3.1 Telecommunications-specific Scope 3 categories

The relevance of each Scope 3 category depends on the reporting organisation's position within the telecommunications value chain, its operating model and the nature of its relationships with suppliers, contractors, customers, lessees, franchisees and investees.

Table 14 identifies the fifteen (15) Scope 3 categories and provides examples of their potential application to telecommunications activities. The examples are illustrative and shall not be interpreted as requiring every category to be quantified by every reporting organisation.

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Table 14. Scope 3 categories and telecommunications applications

Category	Scope 3 category	Telecommunications application examples
1	Purchased goods and services	Network components, non-capitalised equipment, antennas, radios, routers, switches, servers, batteries, cables, cloud services, outsourced network operations, maintenance, security and professional services
2	Capital goods	Towers, shelters, fibre infrastructure, base-station equipment, data-centre equipment, generators, cooling systems, buildings and renewable-energy systems capitalised during the reporting period
3	Fuel- and energy-related activities not included in Scope 1 or Scope 2	Upstream production and transportation of purchased fuels; upstream electricity emissions; and transmission and distribution losses
4	Upstream transportation and distribution	Third-party transportation and warehousing of purchased equipment, batteries, cables, towers, fuel and construction materials where the service is paid for by the reporting organisation
5	Waste generated in operations	Electronic waste, batteries, cables, packaging, scrap metal, construction waste, scheduled waste and other waste treated by third parties
6	Business travel	Air, rail, bus, taxi, hired vehicle and hotel accommodation, where included in the selected methodology
7	Employee commuting	Employee travel between residences and offices, network facilities, data centres or other workplaces; teleworking may be included where relevant
8	Upstream leased assets	Leased towers, offices, warehouses, vehicles, data-centre space or network facilities not included in Scope 1 or Scope 2
9	Downstream transportation and distribution	Transportation, storage and distribution of sold handsets, routers, modems and other products after the point of sale, where not paid for by the reporting organisation
10	Processing of sold products	Processing of intermediate products sold to another organisation; generally, more relevant to equipment and component manufacturers
11	Use of sold products	Electricity consumed during the expected use of sold handsets, routers, modems, set-top boxes and other powered customer-premises equipment
12	End-of-life treatment of sold products	Recycling, recovery, treatment and disposal of sold devices, batteries, routers, modems, cables and other customer equipment
13	Downstream leased assets	Operation of towers, fibre assets, network equipment, data-centre space or customer-premises equipment owned by the reporting organisation and leased to other parties but not included in Scope 1 or Scope 2
14	Franchises	Branded retail outlets, service centres and other franchise operations not included in Scope 1 or Scope 2
15	Investments	Equity investments, joint ventures, project finance and other investments outside the organisational boundary

7.3.3.2 Scope 3 calculation methods

The reporting organisation shall select a calculation method that is appropriate to the relevant Scope 3 category, emission source and availability of data. Supplier-specific and physical activity-based methods should be prioritised for significant emission sources. Average-data, hybrid or spend-based

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methods may be used where more representative data are unavailable, provided that the assumptions and limitations are documented.

Table 15 specifies the preferred activity data and calculation approaches for common Scope 3 emission sources across the telecommunications value chain.

Table 15. Activity data and calculation methods

Source or category	Preferred activity data	Calculation approach
Purchased goods and services	Quantity, mass or units purchased; supplier product footprint; procurement expenditure	Quantity purchased × cradle-to-gate emission factor; or expenditure × environmentally extended input-output factor
Capital goods	Equipment quantity, material mass, project bill of quantities, supplier footprint or capital expenditure	Quantity or mass × cradle-to-gate factor; supplier-specific product emissions; or expenditure × factor
Upstream fuel emissions	Fuel consumed by type	Fuel consumed × upstream fuel emission factor
Upstream electricity and transmission losses	Electricity consumed in kWh or MWh	Electricity consumed × applicable upstream or transmission-and-distribution loss factor
Transportation and distribution	Mass transported, distance and transport mode	Tonnes transported × distance × transport-mode emission factor
Waste generated	Waste mass by material and treatment method	Waste mass × treatment-specific emission factor
Business travel	Passenger distance by mode, nights stayed or travel expenditure	Passenger-kilometres × mode-specific factor; hotel nights × factor; or expenditure × factor
Employee commuting	Employees, commuting distance, travel mode, working days and occupancy	Employees × return distance × commuting days × mode-specific factor
Leased assets	Electricity, fuel, floor area, equipment load or operating hours	Actual energy consumed × factor; or representative asset intensity × activity
Use of sold products	Units sold, rated power, usage profile, product life and location	Units sold × annual energy use × expected lifetime × electricity factor
End-of-life treatment	Product mass, units sold, material composition and treatment route	Product mass × treatment share × treatment-specific factor

General equation

$$\text{Scope 3 emissions } (\text{tCO}_2\text{e}) = \frac{\text{Activity data} \times \text{Emission factor}}{\text{applicable unit-conversion factor}}$$

Where gas-specific factors are used:

$$\text{Scope 3 emissions } (\text{tCO}_2\text{e}) = \sum_{g} \left(E_g \times GWP_g \right)$$

The reporting organisation shall ensure that the emission factor boundary corresponds with the selected Scope 3 category. For example, a cradle-to-gate factor may be appropriate for purchased equipment but shall not automatically be used for operational energy or end-of-life emissions.

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7.3.3.3 Shared-service and co-location arrangements

Shared and co-located telecommunications arrangements require specific assessment because they may comprise purchased services, leased assets, purchased energy or a combination of these. Examples include tower-sharing services, leased network facilities, purchased fibre capacity, hosted data-centre services, outsourced network operations and bundled power or cooling services.

The reporting organisation shall assess each arrangement according to its organisational boundary, consolidation approach, asset ownership, operational control, contractual terms, metering arrangements and responsibility for energy procurement. Emissions already included in the organisation's Scope 1 or Scope 2 inventory shall not also be reported under Scope 3.

Table 16 summarises the principal classification scenarios for shared telecommunications services. Detailed guidance and worked examples are provided in Annex F.

Table 16. Scope 3 classification scenarios for shared telecommunications services

Scenario	Arrangement	Potential Scope 3 treatment for the service recipient	Required assessment
Bundled TowerCo service	The Service Provider pays a single fee for tower space, power, cooling, security and maintenance without separately acquiring electricity.	Category 1, purchased goods and services, may apply to the bundled service. Category 8 may apply where the arrangement constitutes an upstream leased asset.	Contract substance, lease identification, energy arrangement and organisational boundary.
Leased tower or network facility	The reporting organisation leases and operates an asset, but the associated energy use is not included in its Scope 1 or Scope 2 inventory.	Category 8, upstream leased assets	Consolidation approach, operational control, lease terms and energy data
Electricity separately acquired from an infrastructure provider	Electricity is separately metered, invoiced and acquired by the tenant for consumption within its boundary.	Normally assessed under Scope 2 rather than Scope 3.	Electricity contract, invoices, sub-metering and boundary determination
Outsourced network operation and maintenance	A contractor operates equipment, performs maintenance and consumes fuel using assets outside the reporting organisation's control.	Category 1 for purchased services; Category 4 may apply to separately procured transportation.	Service scope, asset control, contractor fuel data and transport responsibility
Cloud or hosted data-centre service	Computing, storage, cooling and electricity are supplied as a bundled service.	Category 1 may apply. Category 8 may apply where an identifiable asset is leased and excluded from Scope 1 and Scope 2.	Service-versus-lease assessment, energy allocation and supplier emissions data
Purchased fibre or network capacity	The organisation purchases transmission capacity without owning or controlling the underlying network.	Category 1, purchased services	Contracted capacity, supplier-specific data and service expenditure

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Table 16. Scope 3 classification scenarios for shared telecommunications services *(continued)*

Scenario	Arrangement	Potential Scope 3 treatment for the service recipient	Required assessment
Generator electricity included in a site-service fee	The Infrastructure Provider controls the generator and supplies backup electricity as part of the service.	Category 1 or Category 8, depending on whether the arrangement is a service or leased asset	Generator control, electricity charging mechanism, lease assessment and service contract
Assets owned and leased to customers	The reporting organisation owns towers, fibre infrastructure or equipment operated by lessees outside its boundary.	Category 13, downstream leased assets	Ownership, lessee control, energy consumption and treatment under Scope 1 and Scope 2
Shared construction project	Several operators fund or use common tower, fibre or data-centre infrastructure.	Category 2 based on the reporting organisation's attributable share of the capital asset, where applicable	Ownership share, contractual funding, bill of quantities and allocation basis
Joint venture outside the organisational boundary	The reporting organisation has an interest in a network entity not consolidated within Scope 1 and Scope 2.	Category 15, investments, subject to the applicable investment accounting method	Equity interest, financing arrangement and investee emissions

The scenarios in Table 16 are illustrative. The final classification shall reflect the substance of the relevant ownership, lease, service and energy-supply arrangements.

7.4 Data quality requirements

The reporting organisation shall establish and maintain controls to ensure that GHG activity data, emission factors, calculations, allocations and estimates are sufficiently complete, accurate, consistent, timely, representative and traceable for their intended use.

Data quality shall be assessed with consideration of:

a) completeness of emission sources, sites and reporting periods;

b) accuracy of measurements, calculations and data transfers;

c) consistency of methods, units and boundaries between reporting periods;

d) temporal, geographical and technological representativeness;

e) traceability to supporting evidence;

f) reliability of allocation and estimation methods; and

g) the significance of the emission source to the GHG inventory.

7.4.1 Data hierarchy

The reporting organisation shall apply the data hierarchy specified in Table 17 when collecting activity data. The highest-quality data reasonably available shall be used.

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Table 17. GHG activity-data hierarchy

Tier	Data classification	Description	Telecommunications examples
Tier 1	Primary measured data	Data obtained directly from calibrated or otherwise controlled measurement systems associated with the relevant asset or activity	Utility meters; smart meters; sub-meters; generator fuel meters; tank measurements; vehicle fuel records; refrigerant recovery or charging records.
Tier 2	Primary documentary or supplier data	Data obtained from invoices, transaction records, supplier statements or other documentary evidence specific to the reporting organisation	Utility invoices; fuel invoices; fuel-card records; purchase records; landlord statements; waste manifests; supplier-specific activity or emissions data.
Tier 3	Engineering-derived data	Data calculated using equipment specifications, measured operating parameters or documented engineering assumptions	Rated equipment load multiplied by operating hours and load factor; generator fuel-consumption curves; cooling-load estimates; technically justified shared-site allocation.
Tier 4	Estimated or proxy data	Data derived from historical trends, representative peer sites, industry averages, expenditure, or other indirect indicators	Comparable-site consumption; historical interpolation; industry-average assumptions; floor-area allocation; spend-based estimates

Where data from more than one tier are available, the reporting organisation shall select the data that most accurately represents the relevant activity. A lower-tier source may be used where a higher-tier source is incomplete, unreliable or not representative, provided that the reason is documented.

Tier 3 and Tier 4 data shall be clearly identified. For significant emission sources, the reporting organisation shall establish an improvement plan to progressively replace lower-tier data with measured, supplier-specific or otherwise more representative data.

7.4.2 Missing data

The reporting organisation shall identify missing, incomplete or anomalous data before calculating GHG emissions. Reasonable efforts shall be made to recover the original records or obtain replacement data from the responsible data owner, supplier, landlord, Infrastructure Provider or Service Provider.

Where the required data cannot be obtained, the reporting organisation shall apply a documented estimation method. The method shall be selected according to the nature of the data gap and shall produce a reasonable representation of the missing activity as shown in Table 18.

Table 18. Methods for estimating missing activity data

Estimation method	Application	Indicative formula
Historical interpolation or extrapolation	Used where the asset and operating conditions are reasonably comparable with an earlier or adjacent period	Estimated activity = comparable-period activity × documented adjustment factor
Peer-site estimation	Used where a site is comparable in technology, capacity, climate, operating hours and service level to a site with complete data	Estimated activity = representative peer-site intensity × relevant operating parameter
Engineering calculation	Used where equipment specifications and operating information are available	Estimated energy = rated power × operating hours × load factor

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Table 18. Methods for estimating missing activity data *(continued)*

Estimation method	Application	Indicative formula
Master-meter allocation	Used for shared or co-located sites without complete sub-metering	Allocated activity = master-meter consumption × documented allocation share
Intensity-based estimation	Used where an established operational intensity is available	Estimated activity = applicable intensity × traffic, floor area, rack capacity, subscriber, asset or other relevant driver
Spend-based estimation	Used primarily for Scope 3 screening or where physical data are unavailable	Estimated emissions = expenditure × applicable spend-based emission factor

The reporting organisation shall document:

a) the site, source, category and reporting period affected;

b) the reason the data are unavailable;

c) the estimation method and calculation used;

d) the source of assumptions, ratios and proxy data;

e) the proportion of the inventory based on estimated data;

f) the uncertainty associated with the estimate; and

g) the corrective action required to improve future data availability.

Estimated data shall be separately identifiable in the GHG inventory and shall be replaced with actual data where these subsequently become available before the inventory is finalised.

7.4.3 Uncertainty assessment

The reporting organisation shall assess uncertainty for significant emission sources and categories. The assessment may be quantitative, qualitative or a combination of both, depending on the data and methodology available.

Sources of uncertainty may include:

a) meter accuracy and calibration status;

b) incomplete or missing activity data;

c) emission-factor uncertainty;

d) estimation and modelling assumptions;

e) allocation of consumption at shared or co-located sites;

f) equipment-load and operating-hour assumptions;

g) supplier-specific data limitations;

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h) Scope 3 models and spend-based calculations;

i) GWP values and conversion factors; and

j) organisational and operational boundary interpretation.

Where sufficient information is available, quantitative uncertainty should be expressed as a range, percentage or confidence interval. Where quantitative assessment is not practicable, the qualitative classification in Table 19 may be applied.

Table 19. Indicative qualitative uncertainty classification

Classification	General characteristics	Telecommunications example
Low	Directly measured or supplier-specific data supported by reliable evidence and an authoritative emission factor.	Calibrated electricity meter combined with the applicable grid emission factor.
Moderate	Documentary or partially measured data involving limited estimation or allocation.	Fuel invoices with a minor reporting-period adjustment; sub-metered data with a small data gap.
Moderate to high	Engineering-derived data or allocation based on several assumptions.	Shared-site electricity allocated using rated equipment load, operating hours and load factors.
High	Proxy, industry-average or spend-based data with limited source-specific evidence.	Spend-based Scope 3 estimate or peer-site proxy applied to a materially different facility.

Uncertainty classifications shall be supported by documented criteria and applied consistently. High-uncertainty sources that are significant to the inventory shall be prioritised for data-quality improvement.

7.4.4 GHG data quality register

The reporting organisation shall establish and maintain a GHG Data Quality Register covering all significant emission sources and categories.

The register shall contain, at a minimum:

a) emission scope and, where applicable, Scope 3 category;

b) emission source, reporting entity and relevant site or asset;

c) activity data, unit and reporting period;

d) data source, supporting evidence and responsible data owner;

e) measurement, allocation or estimation method;

f) data-quality tier and proportion of estimated data, where applicable;

g) significant assumptions, limitations and uncertainty classification;

h) identified data gaps, control weaknesses and required corrective actions;

i) validation and approval status, including the reviewer and review date; and

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j) reference to the retained supporting records.

The register shall be reviewed and updated during each reporting cycle. Material changes to data sources, meters, calculation methods, allocation approaches, emission factors or organisational boundaries shall be documented.

Data included in the final GHG inventory shall be subject to documented review and approval. Any subsequent correction shall remain traceable to the original data, reason for the amendment, approving person and supporting evidence.

A GHG data quality register template is provided in Annex G. The reporting organisation may adapt the template, provided that the minimum information specified above is retained.

7.5 Telecommunications GHG and energy intensity indicators

The reporting organisation shall report absolute GHG emissions together with one or more intensity indicators relevant to its operating model and telecommunications activities.

Intensity indicators are necessary because telecommunications networks may experience continuing growth in data traffic, subscribers, network coverage, sites, and digital services. Absolute emissions alone may therefore not fully demonstrate whether the energy and carbon efficiency of the network is improving or deteriorating.

GHG and energy-intensity indicators enable the reporting organisation to:

a) evaluate emissions and energy consumption relative to network output or service activity;

b) monitor operational efficiency across reporting periods;

c) distinguish efficiency improvements from changes caused by network or business growth;

d) identify high-consumption or high-emission networks, facilities and sites;

e) compare the performance of similar assets or operating units;

f) support the establishment and monitoring of energy-efficiency and emissions-reduction targets; and

g) assess whether network activity is growing independently of energy consumption and GHG emissions.

Service Providers should select indicators that reflect network traffic, subscribers, network sites or other relevant service outputs. TowerCos should select indicators that reflect sites, tenancies, tower capacity, facility usage or other relevant infrastructure outputs.

The selected indicators shall:

a) use clearly defined numerators and denominators;

b) be consistent with the organisational and operational boundaries of the GHG inventory;

c) use verified or otherwise controlled emissions, energy and operational data;

d) be calculated consistently between reporting periods;

e) use a denominator that meaningfully represents the organisation’s activities; and

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f) disclose material changes in methodology, boundary, assumptions or data sources.

The reporting organisation shall document:

a) the name, purpose and definition of each indicator;

b) the calculation formula and unit;

c) the emission scope or energy source included;

d) the operational boundary and reporting period;

e) the sources of numerator and denominator data; and

f) relevant assumptions, exclusions and limitations.

Examples of telecommunications-specific GHG and energy-intensity indicators and their calculation methods are provided in Table 20.

An improvement in GHG or energy intensity shall not be presented as an absolute emissions reduction unless total absolute emissions have also decreased. Similarly, an increase in absolute emissions does not necessarily indicate declining efficiency where network activity has increased. Both absolute emissions and intensity performance shall therefore be considered when evaluating progress.

Table 20. Indicators for service and TowerCos

Services	Indicator	Indicative formula
Service Providers	Network energy intensity	Network electricity consumption (kWh) ÷ network data traffic (TB)
	Network carbon intensity	Network GHG emissions (tCO_2e) ÷ network data traffic (TB)
	Emissions per subscriber	Relevant GHG emissions (tCO_2e) ÷ average number of subscribers
	Energy per subscriber	Network electricity consumption (kWh) ÷ average number of subscribers
	Emissions per network site	Relevant GHG emissions (tCO_2e) ÷ number of operational sites
	Energy per network site	Network electricity consumption (kWh) ÷ number of operational sites
	Renewable electricity percentage	Qualifying renewable electricity consumed ÷ total electricity consumed × 100
	Diesel consumption per off-grid site	Diesel consumed (litres) ÷ number of off-grid sites
	Data-centre power usage effectiveness	Total data-centre energy consumption ÷ ICT equipment energy consumption
TowerCos	Energy per site	Total site electricity consumption (kWh) ÷ number of operational sites
	Energy per tenancy	Total site electricity consumption (kWh) ÷ number of active tenancies
	Emissions per site	Relevant GHG emissions (tCO_2e) ÷ number of operational sites

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Table 20. Indicators for service and TowerCos *(continued)*

Services	Indicator	Indicative formula
	Emissions per tenancy	Relevant GHG emissions (tCO_2e) ÷ number of active tenancies
	Renewable-energy contribution	Qualifying renewable electricity consumed ÷ total electricity consumed × 100
	Diesel consumption per off-grid site	Diesel consumed (litres) ÷ number of off-grid sites

Note. Intensity indicators are intended to complement, and not replace, the reporting of absolute Scope 1, Scope 2 and applicable Scope 3 emissions.

8. Green specifications

Minimum decarbonisation expectations for in-scope network assets and infrastructure operations are specified in this clause at the level of principles and outcomes. Measures should be considered in the order of the mitigation hierarchy such as prioritising energy efficiency, followed by energy storage and hybridisation, on-site renewable generation, and renewable electricity procurement.

8.1 Energy management

An energy management system (EnMS) should be established for the licensed network assets. Where an organisation's energy consumption meets or exceeds the threshold prescribed under applicable national energy efficiency and conservation legislation, the organisation shall, as a minimum, comply with the statutory requirements for that legislation, including the appointment of a registered energy manager, the implementation of an EnMS, and the conduct of energy audits and energy efficiency reporting. The applicable threshold and statutory obligations shall be determined in accordance with the prevailing legislation and its subsidiary regulations, including the Energy Efficiency and Conservation Act 2024 (Act 861), where applicable. Beyond this statutory baseline, the EnMS shall be developed in proportion to the applicable readiness level, as specified in Table 21.

Table 21. Energy management system requirements by readiness level

Readiness level	Energy management system (EnMS) requirements
Advanced	An EnMS certified to ISO 50001, integrating the statutory energy management obligations where applicable.
Intermediate	An EnMS aligned with ISO 50001, comprising, as a minimum, an energy policy, energy review, energy baseline, energy performance indicators, and documented improvement objectives.
Basic	A documented energy review and improvement plan within the first reporting cycle.

Energy-consuming network functions should be optimised through automated, data-driven control, which may employ Artificial Intelligence (AI) and machine learning techniques, including load-adaptive radio resource management, scheduled and traffic-triggered sleep modes, and predictive maintenance. Such optimisation shall operate within applicable service quality obligations, regulatory requirements, and data protection law.

8.1.1 Energy efficiency measures

Energy efficiency-measures shall be evaluated, and where feasible, implemented in the following areas.

a) network equipment.

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Energy efficiency measures for network equipment should include but are not limited to the following.

i) Activation of equipment power-saving features such as dynamic carrier and channel shutdown, symbol and slot muting, and deep sleep modes that reduce radio power draw during low-traffic periods.

ii) Traffic-aware capacity management that activates capacity layers and cells only when demand requires.

iii) Network modernisation, including replacement of legacy generation equipment with higher-efficiency multiband radios and single-RAN configurations, and phased shutdown of superseded network technologies subject to regulatory direction and service continuity.

iv) AI- or software-assisted network energy optimisation, in which network monitoring and traffic-prediction algorithms schedule sleep states and power-saving features across the estate, operating within applicable service quality obligations.

b) power systems.

High-efficiency rectifiers with partial-load module optimisation, right-sizing of power plant to actual site load, and appropriate battery systems with condition monitoring.

c) cooling and shelters.

Setpoint optimisation within equipment limits, high-efficiency and free-cooling solutions where site conditions permit, passive shelter measures, and relocation of power and battery systems to outdoor-rated configurations where equipment ratings permit. Refrigerant inventories, leak repair records and recovery at decommissioning shall be maintained.

d) diesel generators.

Right-sizing, hybrid cyclic operation with battery storage to minimise runtime, fuel monitoring, and tracking of fuel displaced by renewable and battery operation.

As summarised in Figure 3, the structured energy efficiency and decarbonisation measures provide a comprehensive operational roadmap for optimizing our network assets. Adhering to these engineering guidelines and continuously logging achievements in the Savings Register ensures verified, long-term operational emission reductions.

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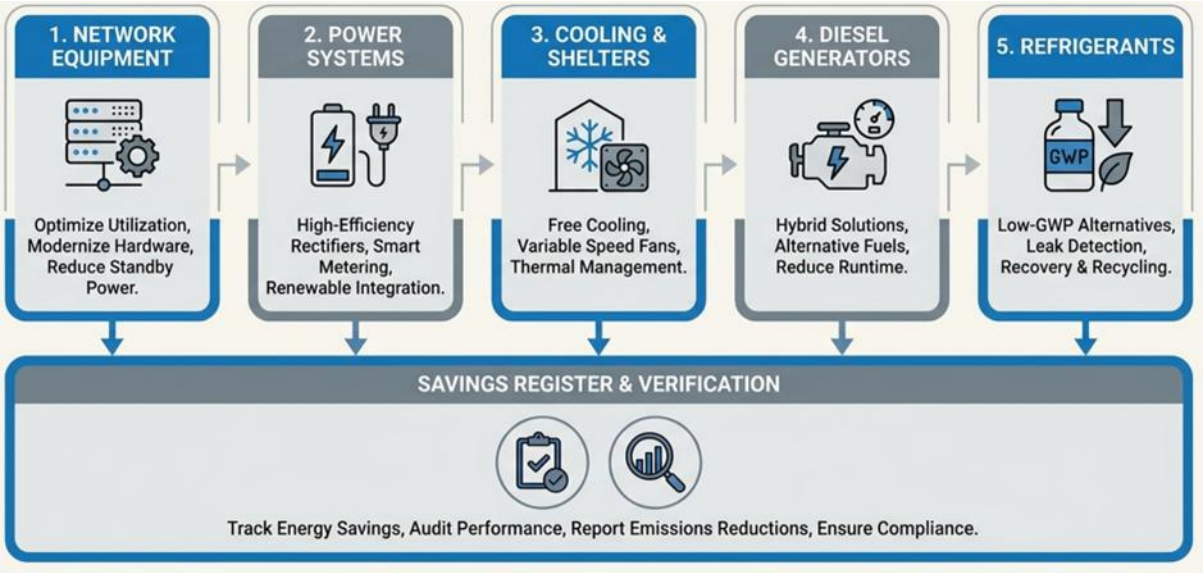

Figure 3. Energy efficiency and decarbonisation measures

A register of implemented measures, including the expected and achieved energy savings, shall be maintained. The achieved energy savings shall be verified using a documented methodology.

8.1.2 Energy and carbon intensity metrics

Core energy and carbon intensity indicators shall be reported for each reporting cycle using consistent denominators, as specified in Table 22.

Each indicator shall be reported against the organisation's base year, or the earliest cycle for which the indicator is available, to establish the baseline from which performance is tracked. Denominators and calculation methods shall remain consistent across reporting cycles so that year-on-year comparison is valid; any change of basis shall be disclosed, and the baseline restated accordingly.

Table 22. Energy and carbon intensity indicators

Areas	Description	Unit and disaggregation	Related measures and indicative saving
Service Providers	Network energy intensity, carbon intensity (location-based and market-based), and average site energy consumption	a) kWh per terabyte b) $kgCO_2e$ per terabyte c) kWh per site	Dynamic carrier shutdown and AI-assisted sleep scheduling (radio access typically the largest load); Network modernisation to multiband/single-RAN. Savings site-specific quantified per site in the measures register in 8.1
TowerCos	Total site energy consumption and site energy per tenancy, on the methodological basis of Recommendations ITU-T L.1310, L.1320, L.1331 and L.1350	a) kWh per site b) kWh per site per tenancy	Rectifier partial-load optimisation, cooling setpoint optimisation, outdoor-rated relocation, hybrid diesel operation. Savings site-specific; quantified in the measures register.

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8.2 Renewable energy deployment

Renewable energy deployment shall be based on documented site assessment and sized to the site load, with generation metered or logged to substantiate reporting. At off-grid and hybrid sites, renewable generation and storage shall be configured to maximise diesel displacement.

Renewable should be considered in the following order of preference, prioritising options that provide greater direct emissions reduction:

a) on-site generation for self-consumption

Solar photovoltaic systems on towers, rooftops, shelters or available ground area, sized so that generated energy is substantially consumed on site, delivering a direct reduction in purchased electricity and, at off-grid and hybrid sites, in diesel consumption.

b) on-site generation with storage and grid export where permitted

on-site generation may be combined with battery energy storage to increase self-consumption and, where net energy metering or an equivalent scheme applies, to export surplus generation.

c) direct renewable supply through contracted arrangements

Procurement of renewable electricity delivered through the grid under recognised supply schemes or power purchase agreements, where the renewable attributes are conveyed with the electricity.

d) unbundled attribute purchase

Renewable energy certificates and equivalent instruments applied where direct supply or on-site deployment is constrained.

This prioritised pathway and its four core procurement tiers are visually mapped in Figure 4, which serves as the operational framework guidance for selection and compliance across all network sites.

Figure 4. Renewable energy hierarchy.

8.3 Renewable energy procurement and claims

Where on-site renewable energy deployment is not technically or operationally feasible, or is insufficient to meet electricity demand, renewable electricity may be procured through recognised mechanisms, including the Green Electricity Tariff (GET), Malaysia Renewable Energy Certificates (mREC), the Corporate Renewable Energy Supply Scheme (CRESS), power purchase agreements (PPAs) or equivalent mechanisms.

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Renewable electricity and associated contractual instruments used for market-based Scope 2 reporting shall meet the applicable quality criteria, including:

a) verified issuance and ownership of the renewable energy attribute;

b) retirement or cancellation of the attribute on behalf of the reporting organisation;

c) appropriate alignment between the generation vintage and reporting period;

d) consistency with the applicable market boundary; and

e) prevention of double counting or double claiming of the renewable energy attribute.

The reporting organisation shall maintain appropriate evidence to substantiate renewable electricity procurement and associated claims.

Renewable electricity generated on-site and consumed by the reporting organisation, renewable electricity procured through recognised mechanisms, and the associated market-based Scope 2 emissions shall be disclosed for each reporting period. Any renewable energy certificate or other environmental attribute used to support a renewable electricity claim shall not be claimed by more than one organisation.

8.4 Remote monitoring and energy management platforms

Energy consumption shall be monitored through platforms capable of collecting and analysing site-level energy data. The monitoring platform shall support, where applicable, the following functions:

a) Energy consumption analysis and trending.

b) Equipment performance monitoring.

c) Detection of and alerting on abnormal energy usage.

d) Tracking of renewable energy generation.

e) Tracking of diesel generator runtime and fuel consumption.

f) Battery condition monitoring.

Monitoring data shall support the reporting requirements of Clause 7, with the metering basis of each data stream classified against the data quality tiers of 7.4. Monitoring platforms shall comply with applicable cybersecurity and data protection requirements.

8.5 Embodied carbon and circularity

Embodied carbon shall be considered in the design and procurement of network assets, with supplier product carbon data sought through procurement. Serviceable equipment shall be evaluated for redeployment or refurbishment before disposal, and decommissioned equipment managed in the order reuse, refurbishment, licensed material recovery, and disposal only where recovery is not practicable, with electrical and electronic waste meeting the applicable scheduled waste classification managed in accordance with the Environmental Quality (Scheduled Wastes) Regulations 2005.

Producer responsibility for network equipment across its life cycle should be recognised in procurement and asset management. Organisations should give preference to suppliers and arrangements that provide for take-back, return, refurbishment or recycling of equipment at end of life, and should

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participate in extended producer responsibility arrangements where these apply, so that responsibility for end-of-life treatment is shared across the value chain rather than resting solely with the operator.

Embodied carbon should be quantified using applicable recommendation supported by environment product declarations.

Figure 5 shows the five (5) measures ranked by priority, with producer responsibility spanning all of them. Value-retention options are preferred; disposal applies only where recovery is not practicable.

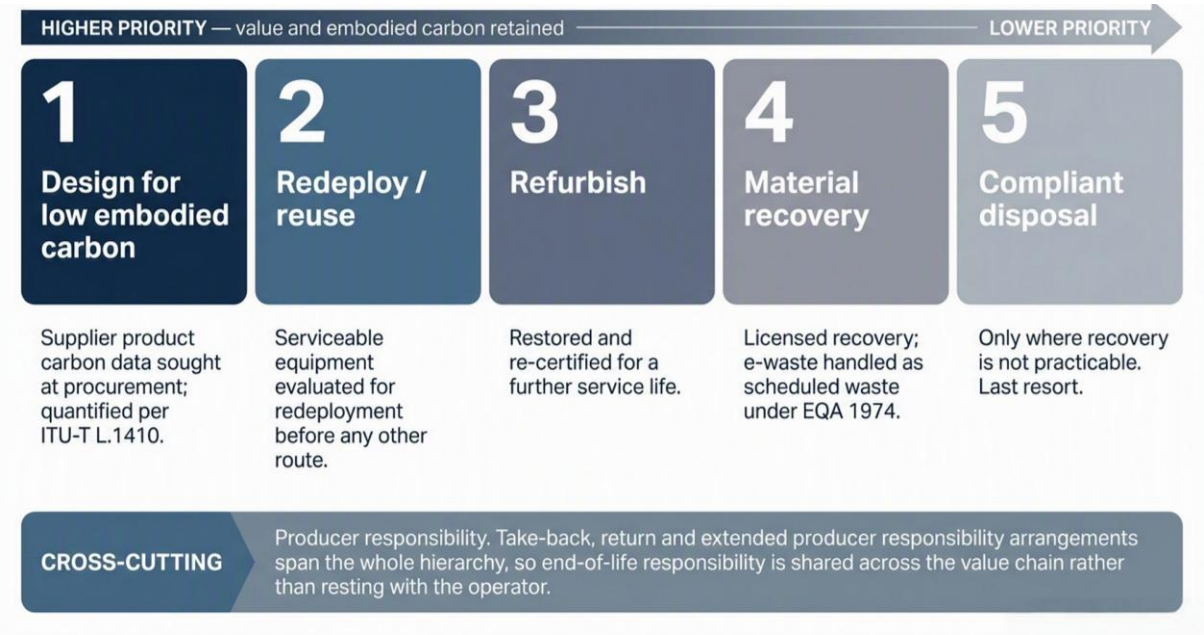

Figure 5. Value-retention hierarchy for embodied carbon and circularity

9. Net Zero Targets and Near-Term Transition

9.1 Target setting and transition plan

GHG emission reduction targets shall be established against the base year, covering Scope 1 and Scope 2 emissions, and should progressively cover the selected Scope 3 categories as data quality permits. Targets shall be consistent with a science-aligned sector trajectory; for telecommunications network operations, the trajectory of Recommendation ITU-T L.1470 applies. Organisations at the Basic level, and organisations establishing targets for the first time, may in the initial reporting cycles align their targets with the national economy-wide emission reduction commitment and the national energy transition pathway, in proportion to their operations, progressing to a science-aligned sector trajectory as their inventory and capability mature.

Targets shall be documented with the information necessary for transparent disclosure, including the basis of the target adopted, the scope of emissions covered, the base year and target year, the metric and reduction sought, whether the target is absolute or intensity-based, and the extent to which it relies on emission removals. Where an organisation is subject to mandatory sustainability-related financial disclosure, its targets shall be disclosed in accordance with those obligations.

Organisations at the Advanced level should seek independent validation of their targets through the SBTi or an equivalent recognised process and shall disclose whether and by whom their targets have been validated.

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A documented transition plan shall be established and approved by the organisation's governance body, setting out the decarbonisation measures, planned to deliver the targets, dated milestones, responsibilities, and resourcing. Progress against the plan shall be reviewed at least each reporting cycle and disclosed with the GHG inventory in a manner consistent with the transition plan disclosure requirements.

Provides indicative, non-binding milestones consistent with the ITU-T L.1470 trajectory and sector guidance are provided in Table 23. These milestones may be adapted according to the organisation's readiness level and transition plan.

Table 23. Indicative energy and carbon reduction milestones

Horizon	Target or outcome	Implementation milestone
First reporting cycle	Base year Scope 1 and Scope 2 inventory established and assured per Clause 7.6	a) Transition plan approved. b) Target setting initiated, aligned with the organisation's applicable disclosure obligations.
Early transition (within the first two to three reporting cycles)	Measurable Scope 1 and Scope 2 reduction against base year	a) ENMS established per readiness level. b) Renewable deployment programme underway. c) Emissions and progress disclosed in line with applicable mandatory sustainability reporting obligations.
National interim milestone (aligned to the national 2030 emissions target)	Scope 1 and Scope 2 reduction consistent with the ITU-T L.1470 trajectory, or with the national economy-wide target for organisations at the Basic level	a) Selected Scope 3 categories measured. b) On-site renewable generation at technically feasible sites. c) Diesel displacement measurable.
Net zero horizon (aligned to the national net zero commitment)	Residual emissions minimised and addressed	a) Transition plan substantially delivered. b) Residual emissions counterbalanced through removals only.

9.2 Residual emissions and the net zero end state

Residual emissions at the net zero target date shall be limited to the minimum practicable level, consistent with Recommendation ITU-T L.1471 and the SBTi Corporate Net-Zero Standard and shall be counterbalanced exclusively through carbon dioxide removals with durable storage. Emission avoidance or reduction credits shall not be applied to net zero claims. Instruments procured through recognised platforms, may be used where they meet these criteria. Any claim of 100 % renewable electricity shall be substantiated by instruments meeting 8.3.

10. Verification and assurance

10.1 Basis of assessment

Conformity with this Technical Code shall be assessed against the requirements applicable to the organisation's readiness level under 6.3. The readiness self-assessment checklist in Annex H shall be completed and updated for each reporting cycle, with the declared readiness level and assessment outcome disclosed with the GHG inventory. Where an organisation is subject to mandatory sustainability-related financial disclosure, the verification and assurance under this clause shall be conducted to support those disclosure obligations, and a single process may serve both purposes.

Conformity with this Technical Code shall be verified through the mechanisms specified in Table 24.

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Table 24. Conformity verification mechanisms

Mechanism	Requirements
Self-assessment	Against the readiness level specified in 6.3, using the checklist in Annex H. The assessment shall be completed and declared for each reporting cycle.
Internal audit	Shall be performed at least annually.
Independent assurance	The GHG inventory and related disclosures shall be independently assured, at limited assurance as a minimum, progressing to reasonable assurance in line with the organisation's applicable disclosure obligations, and conducted against a recognised assurance standard such as ISAE 3410, ISO 14064-3 or equivalent.

10.2 Evidence

Records sufficient to support verification and assurance shall be maintained. The records shall include the following:

a) GHG inventory and methodology documentation.

b) Base year disclosure and recalculation policy.

c) Metering and data quality register.

d) Emission factors register.

e) Shared-site demarcation methodology and data exchange records.

f) Target documentation and transition plan.

g) Circularity and e-waste management records.

The basis of preparation and any records needed to reconcile the inventory to the organisation's sustainability-related financial disclosures, where such disclosures are made.

10.3 Assurance

An internal audit of conformity shall be performed at least annually. Independent third-party assurance shall be obtained in accordance with the readiness-tiered requirements. No additional assurance cycle is required under this clause. Independent assurance shall be obtained as set out below; no additional assurance cycle is imposed beyond that necessary to meet these provisions and any applicable statutory assurance obligation.

a) Scope 1 and Scope 2 emissions shall be subject to independent assurance at a limited assurance as a minimum of limited assurance, in accordance with ISAE 3410, ISO 14064-3 or an equivalent recognised standard.

b) An organisation subject to a mandatory assurance obligation for its sustainability-related disclosures shall obtain assurance no later than, and at no lesser level than, that obligation requires; including any phased escalation from limited to reasonable assurance provided for under that obligation. a single assurance engagement may serve both that obligation and this Technical Code.

c) For organisations not subject to a mandatory assurance obligation, the following shall apply:

   i) Basic level – a documented internal review shall be performed for each reporting cycle, with a documented roadmap towards independent assurance.

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ii) Intermediate level – independent limited assurance shall be obtained within two reporting cycles of attaining the Intermediate level; and

iii) Advanced level – independent assurance shall be obtained for each reporting cycle, with reasonable assurance encouraged where practicable.

Independent assurance shall be conducted in accordance with a recognised assurance or verification standard, such as ISO 14064-3, ISAE 3410 or an equivalent recognised.

d) Reasonable assurance is recommended for organisations at the Advanced level, and for any emissions figure used in a public net zero or 100 % renewable electricity claim.

10.4 Continuous improvement

A corrective action register shall be maintained for material findings arising from self-assessment, internal audit or assurance, with actions tracked to closure and reviewed by the organisation's governance body each reporting cycle.

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Annex A
(normative)

Normative references

The Energy Efficiency and Conservation Act 2024 (Act 861)

The Environmental Quality Act 1974

ISO 14064-1. *Greenhouse gases: Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*

ISO 14064-3, *Greenhouse gases: Part 3: Specification with guidance for the verification and validation of greenhouse gas statements*

ISO 50001, *Energy management systems: Requirements with guidance for use*

Recommendation ITU-T L.1310, *Energy efficiency metrics and measurement methods for telecommunication equipment*

Recommendation ITU-T L.1320, *Energy efficiency metrics and measurement for power and cooling equipment for telecommunications and data centres*

Recommendation ITU-T L.1331, *Assessment of mobile network energy efficiency*

Recommendation ITU-T L.1350, *Energy efficiency metrics of a base station site*

Recommendation ITU-T L.1410, *Methodology for environmental life cycle assessments of information and communication technology goods, networks and services*

Recommendation ITU-T L.1420, *Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations*

Recommendation ITU-T L.1470, *Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement*

Recommendation ITU-T L.1471, *Guidance and criteria for information and communication technology organizations on setting net zero targets and strategies*

ISAE 3410, *Assurance Engagements on Greenhouse Gas Statements*, International Auditing and Assurance Standards Board

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard

Greenhouse Gas Protocol - GHG Protocol Scope 2 Guidance: An amendment to the GHG Protocol Corporate Standard

Greenhouse Gas Protocol - Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard

RE100, *Technical Criteria*

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Annex B
(normative)

Abbreviations

AAU	Active Antenna Unit
BESS	Battery Energy Storage System
CMA	Communications and Multimedia Act 1998
CO_2e	Carbon Dioxide Equivalent
CPE	Customer Premises Equipment
CRESS	Corporate Renewable Energy Supply Scheme
DOE	Department of Environment
ENMS	Energy Management System
EPD	Environmental Product Declaration
ESG	Environmental, Social and Governance
GET	Green Electricity Tariff
GHG	Greenhouse Gas
GSMA	GSM Association
GWP	Global Warming Potential
ICT	Information and Communications Technology
IFRS	International Financial Reporting Standards
IPCC	Intergovernmental Panel on Climate Change
ISSB	International Sustainability Standards Board
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
MNO	Mobile Network Operator
NDC	Nationally Determined Contribution
NEM	Net Energy Metering
NETR	National Energy Transition Roadmap
NSRF	National Sustainability Reporting Framework
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
PPA	Power Purchase Agreement
PUE	Power Usage Effectiveness

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RAN	Radio Access Network
RE	Renewable Energy
REC	Renewable Energy Certificate
RRU	Remote Radio Unit
SBT	Science-Based Target
SBTi	Science Based Targets initiative
SFR 2030	MCMC Sustainability Framework and Roadmap 2030
tCO_2e	Tonnes of Carbon Dioxide Equivalent
TNB	Tenaga Nasional Berhad
UNFCCC	United Nations Framework Convention on Climate Change
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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Annex C
(informative)

Mapping to national and international references

The table below summarises the references to which each part of this Technical Code corresponds.

Provision of this Technical Code	Corresponding references
Introduction and Overview	National Energy Transition Roadmap (NETR); Malaysia NDC; MyTMAP2030 Strategic Thrust No. 4; Bursa Malaysia sustainability reporting requirements; National Sustainability Reporting Framework (NSRF)
Clause 6.2 (recognition of existing reporting and voluntary commitments)	NSRF; IFRS S1 and IFRS S2; GHG Protocol Corporate Standard; ISO 14064-1
Clause 6.4.1 (organisational boundary)	GHG Protocol Corporate Standard; ISO 14064-1
Clauses 6.4.2 and 6.4.3 (shared and co-located infrastructure)	GHG Protocol Corporate Standard; GHG Protocol Scope 2 Guidance; ISO 14064-1
Clause 7.2 (emission factors and GWP values)	GHG Protocol Corporate Standard; ISO 14064-1; applicable IPCC guidance
Clause 7.3 (Scope 1, Scope 2 and Scope 3 emissions)	GHG Protocol Corporate Standard; GHG Protocol Scope 2 Guidance; GHG Protocol Corporate Value Chain (Scope 3) Standard; ISO 14064-1; GSMA Scope 3 Guidance for Telecommunications Operators
Clause 7.4 (data quality requirements)	GHG Protocol Corporate Standard; ISO 14064-1
Clause 7.5 (GHG and energy intensity indicators)	ITU-T L.1310, L.1320, L.1331 and L.1350; ETSI ES 203 228
Clauses 8.1 to 8.3 (energy management, energy efficiency and performance monitoring)	ISO 50001; ITU-T L.1310; ITU-T L.1320; ITU-T L.1331; ITU-T L.1350; ETSI ES 203 228
Clauses 8.4 and 8.5 (renewable energy, procurement and claims)	GHG Protocol Scope 2 Guidance and Scope 2 Quality Criteria; applicable national renewable energy procurement mechanisms
Clause 8.6 (embodied carbon and circularity)	ITU-T L.1410; ETSI ES 203 199; ITU-T L.1031; Environmental Quality Act 1974 and applicable subsidiary regulations
Clause 9 (net-zero targets and near-term transition)	ITU-T L.1470; ITU-T L.1471; SBTi Corporate Net-Zero Standard; relevant ICT sector science-based target guidance
Clause 10 (verification and assurance)	ISO 14064-3; ISAE 3410; ISAE 3000 (Revised); applicable sustainability reporting and assurance requirements.

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Annex D
(informative)

Asset coverage and emission source reference table

The table below maps common telecommunications network asset categories to emission sources within the scope of this Technical Code and provides indicative classification under Scope 1, Scope 2 and Scope 3. The categories shown are representative; organisations may map emission sources according to their own asset-management classification. At shared and co-located sites, attribution between organisations shall be determined in accordance with Clause 6.4, while the classification of attributed emissions shall be determined in accordance with Clause 7.3.

Network asset category	In-scope emission source(s)	Indicative GHG classification
Macro cell tower / rooftop site	Grid electricity; diesel generator; refrigerant leakage	Scope 2 (electricity, attributed by allocation at shared sites); Scope 1 (generator fuel, refrigerants: system operator); Infrastructure Provider may report tenant electricity under Scope 3 Cat 13
Small cell / micro / indoor system	Electricity via host facility	Scope 2 (consuming organisation, by documented allocation); host may report under Scope 3 Cat 13
Transmission / backhaul	Electricity at hub sites; leased-line and wholesale transmission services	Scope 2 (own hub electricity); Scope 3 Cat 1 (purchased transmission services)
Core / switching centre	Electricity, including cooling load; refrigerant leakage	Scope 2 (electricity and cooling); Scope 1 (refrigerants where cooling plant is on site)
Edge compute node (co-located with RAN)	Electricity share	Scope 2 (consuming organisation, by documented allocation per Clause 6.4)
Off-grid site	Diesel combustion in the site power system; on-site renewable generation	Scope 1 (system operator, per Clause 6.4.2); tenants report consumption as Scope 2 using the site generation-mix factor; renewable generation appears as reduced Scope 1 and displacement indicators per Clause 8
Power system (rectifiers, UPS, generator set)	Generator fuel; electrical conversion losses; equipment embodied carbon	Scope 1 (fuel, within the site rows above); conversion losses form part of site electricity (Scope 2); Scope 3 Cat 2 (embodied carbon)
Cooling assets (air conditioning, free cooling, refrigerant plant)	Refrigerant leakage; electricity consumption	Scope 1 (refrigerants); Scope 2 (electricity, within site consumption)
Shelter / cabinet / tower structure	Embodied carbon of construction materials; end-of-life treatment	Scope 3 Cat 2 (capital goods); Scope 3 Cat 5 (end-of-life waste)
O&M fleet	Vehicle fuel	Scope 1 (mobile combustion)
Decommissioned equipment and e-waste	End-of-life treatment and recovery	Scope 3 Cat 5 (waste generated in operations); managed per the circularity provisions of Clause 8

Note: Customer premises equipment (CPE) is not separately shown in this table. Where applicable, emissions associated with CPE shall be classified according to the reporting organisation's organisational boundary and the relevant Scope 3 category.

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Annex E
(informative)

GHG inventory for a multi-site mobile network operator

This Annex provides a worked example of how a multi-site mobile network operator may structure its annual GHG inventory. It illustrates how emission sources and activity data associated with network sites, core-network facilities, offices, vehicle fleets, shared infrastructure and value-chain activities may be classified, quantified and consolidated under Scope 1, Scope 2 and applicable Scope 3 categories.

The example supports the application of Clauses 6 and 7. It does not replace the requirements for determining organisational boundaries, classifying emission sources, selecting emission factors and GWP values, assessing data quality or documenting calculation methods.

All quantities, sources and calculation approaches presented in this annex are illustrative. They do not represent sector benchmarks, performance targets or prescribed reporting thresholds.

E.1 Organisational profile and inventory structure

The reporting organisation in this worked example is a mobile network operator with operations throughout Malaysia. It operates mobile network sites, exchanges, core-network facilities, offices, standby and off-grid generators, service vehicles and refrigerant-containing cooling systems.

The organisation also purchases network equipment and construction services, participates in shared-site and MOCN arrangements and sends decommissioned telecommunications equipment to licensed recovery facilities.

For this example, the organisation applies the operational-control approach specified in 6.4.1. Emission sources and activities within its organisational boundary are classified under Scope 1 or Scope 2, as applicable. Relevant activities outside its organisational boundary are assessed under the applicable Scope 3 categories..

E.2 GHG inventory structure

Figure E.1 provides an overview of how the illustrative emission sources, activity data, supporting evidence and calculation methods are brought together to produce the annual GHG inventory.

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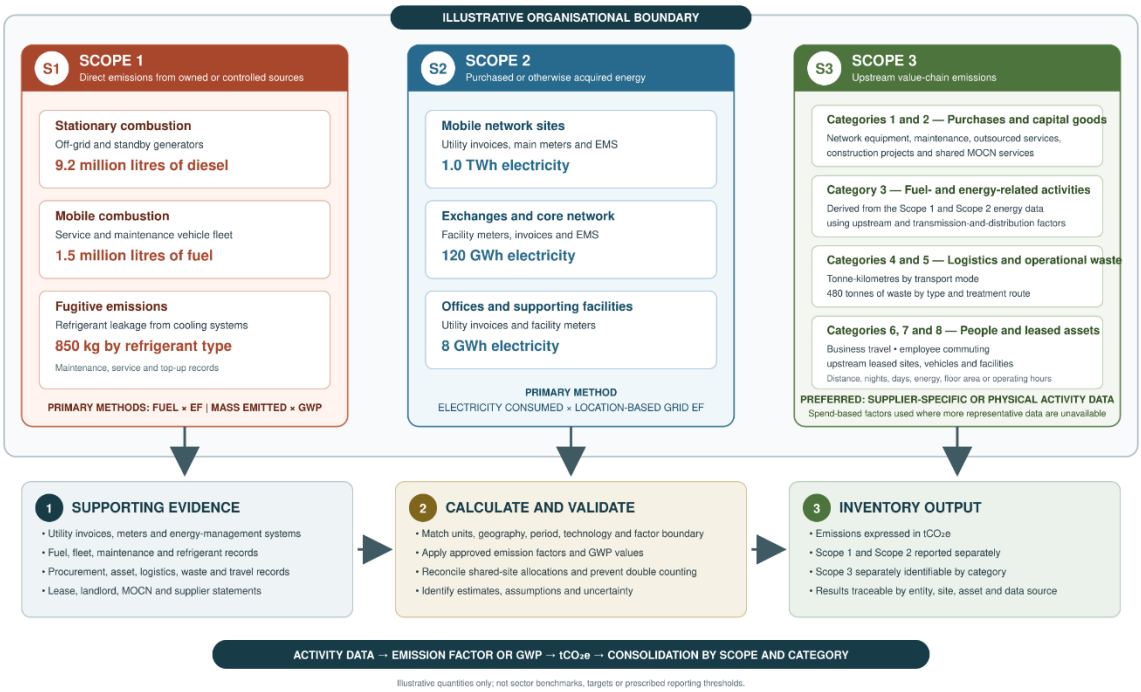

Figure E.1: Illustrative GHG inventory structure for a multi-site mobile network operator

The detailed activity data, supporting evidence and indicative calculation approaches are presented in Table E.1.

E.3 Annual activity-data inventory

Table E.1 presents the principal emission sources and activities identified for this worked example. It also shows their scope classification, illustrative annual activity data, principal supporting evidence and indicative calculation approach.

The table does not represent an exhaustive list for every telecommunications organisation. The applicable emission sources and categories depend on the organisation's organisational boundary, operating model, assets, contractual arrangements and position within the telecommunications value chain.

Table E.1: Illustrative annual activity-data inventory for a multi-site mobile network operator

Emission source or activity	Scope or category	Illustrative annual activity data	Principal data source	Indicative calculation approach
Purchased electricity—mobile network sites	Scope 2	1.0 TWh	Utility invoices, site main meters and energy-management systems	Electricity consumed × applicable location-based grid emission factor
Purchased electricity—exchanges and core-network facilities	Scope 2	120 GWh	Utility invoices, facility main meters and energy-management systems	Electricity consumed × applicable location-based grid emission factor
Purchased electricity—offices and supporting facilities	Scope 2	8 GWh	Utility invoices and facility meters	Electricity consumed × applicable location-based grid emission factor

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Emission source or activity	Scope or category	Illustrative annual activity data	Principal data source	Indicative calculation approach
Diesel—off-grid and standby generators	Scope 1	9.2 million litres	Fuel-purchase records, delivery records, tank readings and generator logs	Diesel consumed × applicable diesel-combustion emission factor
Fleet fuel—petrol and diesel	Scope 1	1.5 million litres	Fuel-card records, invoices and fleet-management records	Fuel consumed by type × applicable fuel emission factor
Refrigerant leakage from cooling systems	Scope 1	850 kg, recorded by refrigerant type	Maintenance records, service reports and refrigerant top-up records	Refrigerant emitted × applicable GWP
Non-capitalised network equipment, maintenance, and outsourced services	Scope 3 Category 1—purchased goods and services	Equipment units, material quantities, supplier emissions data and expenditure by category	Procurement records, supplier product data, invoices and contracts	Supplier-specific emissions; physical quantity × emission factor; or expenditure × spend-based factor
Capitalised network equipment and construction projects	Scope 3 Category 2—capital goods	Equipment units, material quantities, project bills of quantities and capital expenditure	Asset register, procurement records, project records and supplier EPDs	Supplier-specific product emissions; quantity or mass × cradle-to-gate factor; or capital expenditure × factor
Fuel- and energy-related activities not included in Scope 1 or Scope 2	Scope 3 Category 3	Derived from electricity and fuel activity data above	Scope 1 and Scope 2 energy records	Fuel or electricity consumption × applicable upstream and transmission-and-distribution factor
Upstream transportation and distribution	Scope 3 Category 4	Tonne-kilometres by transport mode or logistics expenditure	Logistics contracts, delivery records and freight invoices	Mass transported × distance × transport-mode emission factor; or expenditure × factor
Waste generated in operations, including decommissioned network equipment and e-waste	Scope 3 Category 5	480 tonnes by waste type and treatment route	Waste inventories, consignment notes and licensed-recovery documentation	Waste mass × treatment-specific emission factor
Business travel	Scope 3 Category 6	Passenger-kilometres, hotel nights and travel expenditure	Travel-management system, booking records and expense claims	Travel activity × applicable mode-specific emission factor
Employee commuting	Scope 3 Category 7	Employee numbers, commuting distance, transport mode and working days	Employee survey, human-resources records and attendance data	Employees × commuting distance × commuting days × transport-mode factor
Upstream leased network sites, vehicles or facilities not included in Scope 1 or Scope 2	Scope 3 Category 8	Electricity, fuel, floor area, equipment load or operating hours	Lease agreements, landlord statements, sub-meter records and site records	Actual energy consumption × factor; or representative asset intensity × activity

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Emission source or activity	Scope or category	Illustrative annual activity data	Principal data source	Indicative calculation approach
Shared MOCN or managed-network services where electricity is included in a bundled service	Scope 3 Category 1	Allocated electricity, supplier-reported emissions or annual service expenditure	MOCN agreement, host-operator allocation statement, invoices and supplier emissions report	Allocated service emissions or service expenditure × applicable factor

Supplier-specific and physical activity-based methods should be prioritised where reasonably available, as they generally provide more representative results. Spend-based methods may be used for screening purposes or where more representative data or methods are not reasonably available, subject to the data-quality and documentation requirements of 7.4.

E.4 Shared-site and MOCN treatment

Shared-site and MOCN arrangements require particular attention because electricity, cooling, infrastructure access and network capacity may be supplied separately or combined within a service arrangement. The appropriate GHG classification depends on the organisational boundary and the substance of the applicable contractual and energy-supply arrangements.

For this worked example, the classification is determined as follows:

a) electricity directly purchased or acquired by the reporting organisation for equipment within its organisational boundary is classified under Scope 2;

b) electricity included within a bundled tower, managed-network or MOCN service is treated as part of the purchased service and assessed under Scope 3 Category 1, unless the arrangement is more appropriately classified as an upstream leased asset under Category 8;

c) electricity separately metered, invoiced and acquired by a participating MNO may be classified under Scope 2 where the contractual and operational arrangements support that treatment; and

d) electricity reported under Scope 1 or Scope 2 by the reporting organisation is not additionally reported under its Scope 3 inventory.

A separately stated electricity charge does not, by itself, determine the scope classification. The assessment considers the substance of the arrangement, including the electricity-supply contract, site-sharing or MOCN agreement, metering configuration, energy-procurement responsibility and organisational boundary.

For the MOCN arrangement in this example:

a) the host MNO reports electricity purchased to operate the shared radio access network under Scope 2; and

b) participating MNOs report their allocated electricity-related share under Scope 3 Category 1 where electricity forms part of the purchased MOCN service.

E.5 Inventory consolidation and quality control

Scope 1, Scope 2 and Scope 3 results should remain separately identifiable and should not be combined into a single undifferentiated total. Scope 3 emissions should also remain separately identifiable by applicable category.

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Table E.2: Illustrative GHG inventory consolidation structure

Inventory component	Required presentation
Scope 1—stationary combustion	Generator emissions consolidated by fuel type, site, region and reporting entity
Scope 1—mobile combustion	Fleet emissions consolidated by fuel and vehicle type
Scope 1—fugitive emissions	Refrigerant emissions reported separately by refrigerant type and GWP value
Scope 2—location-based	Purchased electricity emissions calculated using the applicable geographical grid emission factor
Scope 2—market-based	Reported separately where eligible contractual instruments are used, and the applicable quality criteria are met
Scope 3	Emissions reported separately for each applicable Scope 3 category
Shared-site allocations	Amounts reconciled with master-meter, host-operator or supplier data and retained by site or arrangement
Estimated data	Separately identified and disclosed with the estimation method and uncertainty classification
Exclusions	Supported by documented applicability or materiality justification

Scope 1, Scope 2 and Scope 3 results shall not be combined into a single undifferentiated total. Scope 3 categories shall remain separately identifiable.

Before the inventory is approved, the reporting organisation should perform the following checks:

a) reconcile electricity consumption with utility invoices, meter records and site registers;

b) reconcile generator fuel consumption with purchase, delivery, tank and operating-hour records;

c) verify that refrigerant data are recorded separately by refrigerant type;

d) confirm that capitalised and non-capitalised purchases are classified consistently between Scope 3 Categories 1 and 2;

e) confirm that Scope 3 Category 3 is calculated using the underlying Scope 1 and Scope 2 energy data without duplicating operational combustion or purchased-electricity emissions;

f) reconcile shared-site and MOCN allocations with master-meter or host-operator totals;

g) ensure that emissions already included in the organisation’s Scope 1 or Scope 2 inventory are not additionally reported under Scope 3;

h) identify estimated or proxy data and document the estimation method;

i) investigate material year-on-year variances; and

j) retain evidence supporting the activity data, emission factors, calculations, allocations, exclusions, review and approval.

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E.6 Interpretation of the GHG inventory

The following points should be considered when interpreting and applying this worked example:

a) The emission sources and activity data in Table E.1 are illustrative. Each organisation should identify the emission sources and Scope 3 categories applicable to its activities and organisational boundary in accordance with 6.4 and 7.3.

b) Purchased equipment and construction activities are classified under Scope 3 Category 1 or Category 2 according to whether the relevant item is treated as an operating purchase or a capital asset under the organisation's consistently applied financial accounting policy.

c) Decommissioned network equipment used in the organisation's operations is generally assessed under Scope 3 Category 5 as waste generated in operations. Scope 3 Category 12 applies to the end-of-life treatment of products sold by the reporting organisation.

d) The same physical emissions may appear in different scopes in the separate inventories of participating organisations. For example, electricity may be Scope 2 for a host MNO and Scope 3 Category 1 for an MNO purchasing a bundled MOCN service. These amounts should not be aggregated when determining the physical GHG emissions associated with the shared site or when preparing a sector-level emissions total, as this would result in double counting.

e) The worked example illustrates inventory structure and calculation logic only. The emission factors, GWP values, activity quantities, allocation methods and materiality decisions applied by an organisation should reflect the applicable reporting period, geography, technology, contractual arrangements and reporting requirements.

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Annex F
(informative)

GHG demarcation and allocationat a shared tower site

This Annex provides worked examples illustrating the allocation and classification of GHG emissions among organisations operating at shared telecommunications sites. It demonstrates the application of the organisational boundary, operational demarcation and shared-energy allocation requirements of 6.4, including the reconciliation and allocation of site-level energy consumption and associated GHG emissions based on the respective operational responsibilities and energy-acquisition arrangements of participating organisations.

The examples are illustrative. The appropriate GHG scope classification shall be determined in accordance with the applicable requirements of Clauses 6 and 7, taking into account each organisation's organisational boundary, contractual arrangements, operational control, metering configuration and responsibility for energy acquisition.

F.1 Scenario 1: Grid-connected shared tower site

This scenario illustrates the GHG emissions demarcation and allocation for a grid-connected shared tower site where multiple Service Providers operate telecommunications equipment at infrastructure managed by a TowerCo. The example demonstrates the treatment of shared electricity consumption and direct emission sources based on the respective operational and energy-acquisition arrangements.

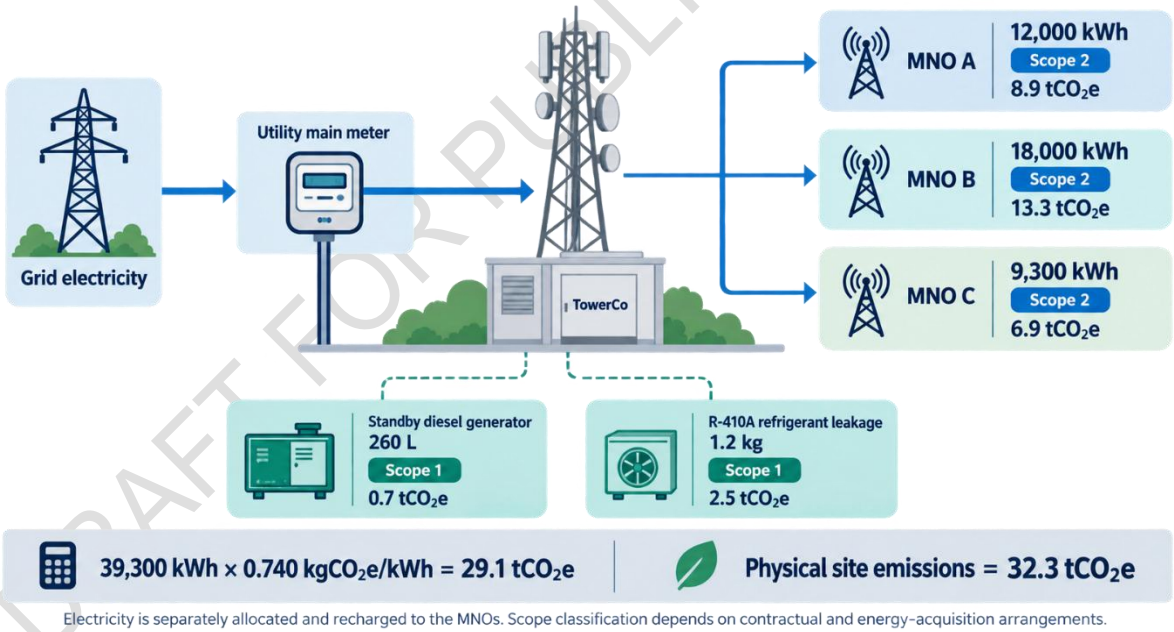

Figure F.1. Illustrative configuration of a grid-connected shared tower site

F.1.1 Site configuration

A grid-connected tower site is operated by an Infrastructure Provider, referred to in this example as TowerCo. The site accommodates active telecommunications equipment belonging to three Service Providers: MNO A, MNO B and MNO C.

TowerCo:

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a) operates the tower, shelter, common electrical systems and site cooling;

b) maintains a standby diesel generator and refrigerant-containing cooling system; and

c) purchases grid electricity through a single utility main meter.

For this worked example, it is assumed that the site electricity is separately allocated and recharged to the three MNOs under the site-service agreements. Accordingly, each MNO treats its allocated electricity as purchased or acquired electricity and reports the associated emissions under Scope 2.

The allocation includes the electricity attributable to the respective MNO's active equipment and its allocated share of common site services. TowerCo does not report an additional Scope 2 amount for the same electricity in this example.

If electricity is instead included in a bundled tower service and is not separately acquired by an MNO, the MNO shall assess whether the associated emissions fall under Scope 3 rather than Scope 2.

F.1.2 Electricity-consumption data

The utility's main meter records total monthly electricity consumption of 39,300 kWh.

MNO A and MNO B have reliable sub-metered consumption data:

a) MNO A: 12,000 kWh;

b) MNO B: 18,000 kWh.

Direct metering is not reasonably practicable for MNO C. Its electricity consumption is therefore estimated using the engineering-allocation method specified in 6.4.3:

$$\text{Allocated electricity} = \text{equipment load} \times \text{operating hours}$$
$$12.5\ \text{kW} \times 744\ \text{hours} = 9{,}300\ \text{kWh}$$

The allocated electricity reconciles with the utility main meter:

$$12{,}000 + 18{,}000 + 9{,}300 = 39{,}300\ \text{kWh}$$

The calculation assumes that 12.5 kW represents the average operating load of MNO C's equipment. Where rated capacity is used instead, an appropriate and documented load factor should be applied.

F.1.3 Direct emission sources

TowerCo owns or operationally controls the following direct emission sources:

a) the standby diesel generator; and

b) the cooling system containing R-410A refrigerant.

The generator fuel combustion and refrigerant leakage are therefore reported by TowerCo as Scope 1 emissions.

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Table F.1. Monthly activity data, allocation and GHG emissions

Energy or emission source	Activity data	Allocation or calculation basis	Reported by	Scope	GHG Emissions (tCO_2e)
Grid electricity—whole site	39,300 kWh	Utility main meter; allocated to the MNOs below	Reconciliation total	—	29.1
MNO A electricity	12,000 kWh	Sub-metered consumption	MNO A	Scope 2	8.9
MNO B electricity	18,000 kWh	Sub-metered consumption	MNO B	Scope 2	13.3
MNO C electricity	9,300 kWh	12.5 kW × 744 hours	MNO C	Scope 2	6.9
Standby-generator diesel	260 litres	Fuel purchase and generator records	TowerCo	Scope 1	0.7
R-410A refrigerant leakage	1.2 kg	Refrigerant top-up and service records	TowerCo	Scope 1	2.5
				Total Emissions (tCO_2e)	32.3

Note: The final row represents the physical emissions associated with the site for reconciliation purposes. It is not the GHG inventory total of any single organisation.

F.1.4 Emission factors and GWP value

The emission factors and GWP value used in this worked example are shown in Table F.2. They are illustrative and are not prescribed emission factors or GWP values for the application of this Technical Code.

Table F.2. Emission factors and GWP values applied

Emission source	Factor or GWP value	Illustrative source
Grid electricity (Peninsular Malaysia)	0.740 $kgCO_2e/kWh$	MEIH Grid Emission Factors, version dated 16 January 2026, base year 2024
Diesel	2.662 $kgCO_2e$/litre	DEFRA 2025
R-410A (refrigerant)	GWP 2,088	IPCC Fourth Assessment Report, 100-year GWP

For application of this Technical Code, emission factors and GWP values are selected in accordance with 7.2, taking into account the applicable reporting period, geography, technology and calculation boundary.

F.1.5 Calculation results

The electricity emissions are calculated as follows:

$$39{,}300\ \text{kWh} \times 0.740\ \text{kgCO}_2\text{e/kWh} \div 1{,}000 = 29.1\ \text{tCO}_2\text{e}$$

The standby-generator emissions are:

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$$260 \text{ litres} \times 2.662 \text{ kgCO}_2\text{e/litre} \div 1{,}000 = 0.7 \text{ tCO}_2\text{e}$$

The refrigerant emissions are:

$$1.2 \text{ kg} \times 2{,}088 \div 1{,}000 = 2.5 \text{ tCO}_2\text{e}$$

The illustrative physical emissions associated with the site are therefore:

$$29.1 + 0.7 + 2.5 = 32.3 \text{ tCO}_2\text{e}$$

This presentation makes clear that:

a) the MNOs report their allocated purchased electricity as Scope 2;

b) TowerCo reports generator fuel and refrigerant leakage as Scope 1; and

c) the site-level total is used only to reconcile the physical emission sources and shall not be reported as the inventory total of a single organisation.

F.2 Scenario 2: Off-grid shared site

This scenario illustrates the GHG emissions demarcation and allocation for an off-grid shared tower site supplied by a hybrid power system comprising diesel generation, solar photovoltaic generation and battery storage. The example demonstrates the treatment of emissions associated with on-site electricity generation and electricity supplied to multiple Service Providers.

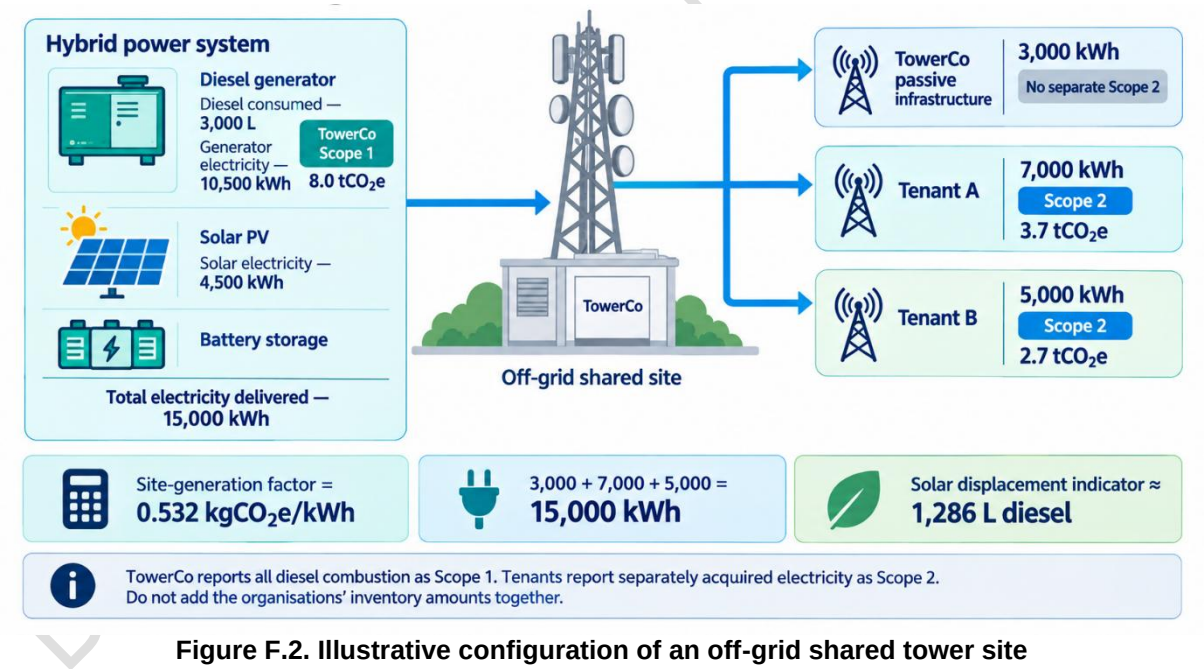

Figure F.2. Illustrative configuration of an off-grid shared tower site

F.2.1 Site configuration

An off-grid shared tower site is operated by an Infrastructure Provider, referred to as TowerCo. The site accommodates telecommunications equipment belonging to two Service Providers: Tenant A and Tenant B.

TowerCo owns or operationally controls the hybrid power system, comprising:

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a) a diesel generator;

b) a solar photovoltaic system;

c) battery storage; and

d) the electrical distribution system.

The hybrid system supplies electricity to TowerCo's passive infrastructure, and the active telecommunications equipment operated by both tenants.

For this worked example, it is assumed that electricity supplied to Tenant A and Tenant B is separately measured or allocated and charged under the applicable site-service agreements. The tenants therefore treat the electricity as purchased or acquired electricity and report the associated emissions under Scope 2.

Where electricity is provided as part of a bundled infrastructure service and is not separately acquired by a tenant, the tenant shall assess the associated emissions under the applicable Scope 3 category.

F.2.2 Monthly activity data

The following monthly data are available:

Table F.3. Monthly data

Activity	Quantity
1.0 Diesel consumed by the generator	3,000 litres
2.0 Electricity generated from diesel	10,500 kWh
3.0 Electricity generated from solar	4,500 kWh
4.0 Total electricity delivered to the site	15,000 kWh
(a) Electricity consumed by TowerCo's passive infrastructure	3,000 kWh
(b) Electricity consumed by Tenant A	7,000 kWh
(c) Electricity consumed by Tenant B	5,000 kWh

The electricity allocation reconciles with the total electricity delivered:

3,000+7,000+5,000=15,000 kWh

F.2.3 Scope classification

The diesel generator is owned or operationally controlled by TowerCo. TowerCo therefore reports all emissions from diesel combustion as Scope 1.

TowerCo does not report Scope 2 emissions for electricity generated and consumed from its own diesel and solar generation systems because the electricity is not purchased or acquired from another organisation.

Tenant A and Tenant B report the electricity acquired from TowerCo as Scope 2, based on the amount consumed and the allocated site-generation emission factor.

Under the assumptions specified in F.2.1, the illustrative classification is summarised in Table F.4.

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Table F.4. Illustrative GHG classification for the off-grid shared site

Organisation	Activity	Inventory treatment
TowerCo	Diesel consumed by the site generator	Scope 1
TowerCo	Self-generated electricity consumed by passive infrastructure	No separate Scope 2 reporting
Tenant A	Electricity acquired from TowerCo	Scope 2
Tenant B	Electricity acquired from TowerCo	Scope 2

F.2.4 Site-generation emission factor

The generator combustion emissions are calculated using the applicable diesel emission factor:

$$3{,}000 \text{ litres} \times 2.662 \text{ kgCO}_2\text{e/litre} = 7{,}986 \text{ kgCO}_2\text{e}$$

The site-generation emission factor is calculated by dividing the generator combustion emissions by the total electricity delivered from the combined diesel and solar system:

$$\text{Site-generation emission factor} = \frac{7{,}986 \text{ kgCO}_2\text{e}}{15{,}000 \text{ kWh}} = 0.5324 \text{ kgCO}_2\text{e/kWh}$$

Rounded for reporting:

$$\text{Site-generation emission factor} = 0.532 \text{ kgCO}_2\text{e/kWh}$$

Solar generation is assigned zero operational combustion emissions in this calculation. Its inclusion in the electricity supplied reduces the average site-generation emission factor.

The factor represents operational generation emissions only. It does not include the embodied emissions associated with manufacturing, transporting, or installing the diesel generator, solar panels, or battery system.

Energy or emission flow	Quantity	Calculation basis	Reported by	Scope	Reported emissions (tCO_2e)
Diesel combustion—site power system	3,000 litres	Fuel records × diesel emission factor	TowerCo	Scope 1	8.0
Electricity consumed by passive infrastructure	3,000 kWh	TowerCo's allocated consumption; already covered by generator Scope 1	TowerCo	No separate Scope 2	—
Electricity consumed by Tenant A	7,000 kWh	7,000 × 0.5324 $kgCO_2e$/kWh	Tenant A	Scope 2	3.7
Electricity consumed by Tenant B	5,000 kWh	5,000 × 0.5324 $kgCO_2e$/kWh	Tenant B	Scope 2	2.7
Electricity-allocation reconciliation	15,000 kWh	3,000 + 7,000 + 5,000	—	—	—

F.2.5 Emissions reconciliation

For physical site reconciliation, the generator emissions may be allocated across all electricity users:

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Electricity user	Consumption	Allocated physical emissions
Diesel combustion—site power system	3,000 litres	Fuel records × diesel emission factor
TowerCo passive infrastructure	3,000 kWh	1.6 tCO_2e
Tenant A	7,000 kWh	3.7 tCO_2e
Tenant B	5,000 kWh	2.7 tCO_2e
Total	15,000 kWh	8.0 tCO_2e

The reconciliation confirms that the emissions allocated according to electricity consumption equal TowerCo's total Scope 1 emissions from generator combustion:

$$1.6 + 3.7 + 2.7 = 8.0\ tCO_2e$$

The 1.6 tCO_2e allocated to TowerCo's passive infrastructure is not reported as a separate Scope 2 amount. It is a physical allocation of the generator's Scope 1 emissions for reconciliation and performance analysis.

Notes:

a) TowerCo reports the full generator-combustion emissions as Scope 1 because it operates and controls the generator and fuel supply.

b) Tenant A and Tenant B report their acquired electricity as Scope 2. TowerCo's Scope 1 emissions and the tenants' Scope 2 emissions represent the same physical generation emissions from different organisations' reporting perspectives. These amounts should not be aggregated when determining a sector-level physical emissions total, as this would result in double counting

c) Each tenant's classification depends on the substance of its contractual energy arrangement. Electricity included in a bundled tower service may require Scope 3 treatment instead of Scope 2 treatment.

F.2.6 Solar-displacement indicator

During the month, the solar system generated 4,500 kWh. The generator's observed electricity output per litre of diesel was:

$$\frac{10{,}500\ \text{kWh}}{3{,}000\ \text{litres}} = 3.5\ \text{kWh/litre}$$

The indicative diesel displacement associated with the solar generation is:

$$\frac{4{,}500\ \text{kWh}}{3.5\ \text{kWh/litre}} = 1{,}286\ \text{litres}$$

The result may be reported as an operational diesel-displacement indicator. The result may be reported as an operational diesel-displacement indicator but should not be presented as verified avoided emissions unless an appropriate baseline, operating conditions and calculation methodology have been established.

F.2.7 Estimation where direct measurements are unavailable

Actual meter readings, fuel-purchase records and generator logs should be used where available. Engineering estimation may only be used where direct measurement is unavailable or incomplete.

For a generator with a rated capacity of 30 kVA, a power factor of 0.8 and an average load factor of 70%, the estimated operating load is:

$$30\ \text{kVA} \times 0.8 \times 70\% = 16.8\ \text{kW}$$

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For 744 operating hours:

Table F.4. Engineering estimation of electricity generation

Parameter	Value
Generator rated capacity	30 kVA
Power factor	0.8
Average load factor	70%
Estimated operating load	16.8 kW
Operating hours	744 hours
Estimated electricity generation	12,499 kWh

Table F.5. Engineering estimation of diesel consumption

Parameter	Value
Diesel consumption rate at 70% load	3.4 litres/hour
Operating hours	744 hours
Estimated diesel consumption	2,529.6 litres

The engineering estimates in Table F.4 and Table F.5 constitute a separate fallback example and shall not be combined with the measured 3,000-litre consumption and 15,000-kWh electricity data used in the main scenario.

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F.3 Scenario 3: Multi-Operator Core Network (MOCN) shared site

This scenario illustrates the GHG emissions demarcation and allocation for a shared telecommunications site operating under a Multi-Operator Core Network (MOCN) arrangement. The example demonstrates the treatment of electricity consumption associated with shared radio access network equipment between the host operator and participating Service Providers.

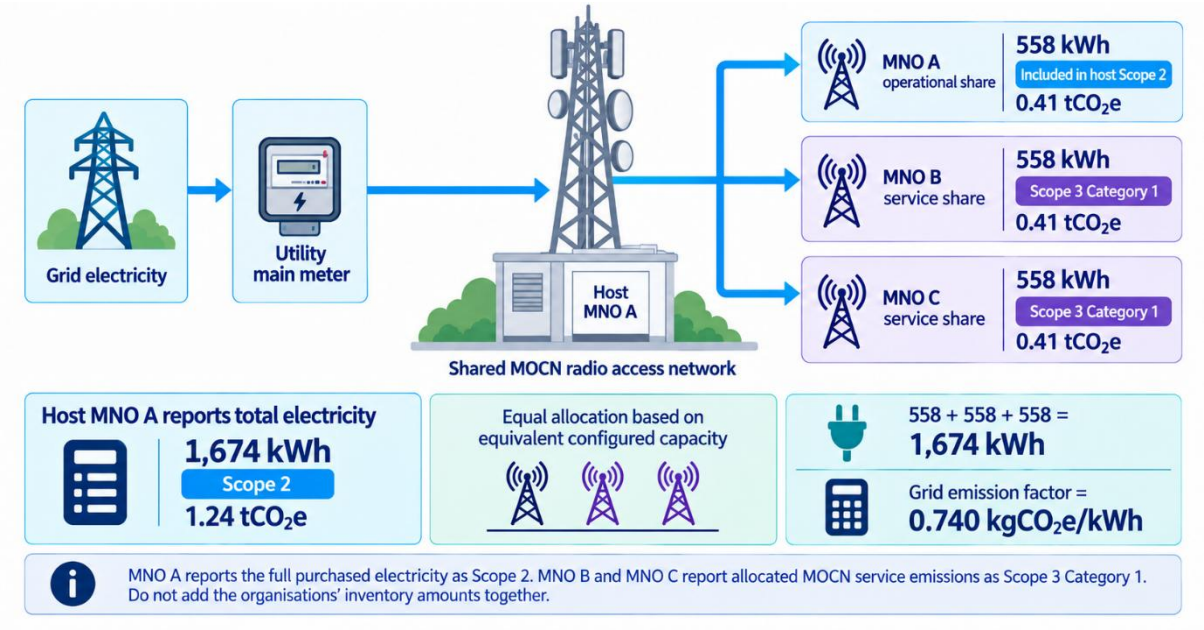

Figure F.3. Illustrative configuration of a Multi-Operator Core Network (MOCN) shared site

F.3.1 Site configuration

A grid-connected telecommunications site operates under a **Multi-Operator Core Network (MOCN)** arrangement. The site is hosted and operated by **MNO A**, which provides shared radio access network equipment and related site services to two participating Service Providers:

a) MNO B; and

b) MNO C.

Under the MOCN arrangement, the participating MNOs share specified radio access network resources, while each MNO maintains responsibility for its respective core-network services and customers.

MNO A:

a) operates the shared MOCN radio equipment;

b) purchases electricity through the site utility account;

c) maintains the electricity and operational records; and

d) charges MNO B and MNO C for their participation in the shared network service.

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For this worked example, electricity is included in the MOCN service provided to MNO B and MNO C and is not separately purchased or acquired by the participating MNOs. Accordingly:

a) MNO A reports the electricity consumed by the shared MOCN equipment under Scope 2; and

b) MNO B and MNO C report their allocated share of the MOCN service emissions under Scope 3 Category 1—purchased goods and services.

F.3.2 Electricity-consumption data

The total monthly electricity consumption attributable to the shared MOCN equipment is **1,674 kWh**. Where direct equipment-level measurements for each participating MNO are unavailable, electricity may be allocated using a documented method that reflects the utilisation of the shared network. For this example, the participating MNOs have equivalent configured capacity and the consumption is allocated equally:

$$\text{Allocation per MNO} = \frac{1{,}674\ \text{kWh}}{3} = 558\ \text{kWh}$$

The allocation is used to determine each participant's share of the shared-service emissions. It does not reduce the total Scope 2 electricity reported by MNO A as the host operator.

Where the participating MNOs do not have equivalent capacity or utilisation, the allocation should be based on more representative parameters, such as:

a) measured equipment power consumption;

b) configured radio capacity;

c) number of carriers or radio units;

d) network traffic;

e) operating hours; or

f) another technically justified allocation driver.

F.3.3 Emissions calculation

Using the illustrative Peninsular Malaysia grid emission factor of **0.740 kgCO_2e/kWh**, the emissions associated with the total shared MOCN electricity consumption are:

$$1{,}674\ \text{kWh} \times 0.740\ \text{kg}CO_2\text{e/kWh} \div 1{,}000 = 1.24\ \text{t}CO_2\text{e}$$

The allocated emissions for each participating MNO are:

$$558\ \text{kWh} \times 0.740\ \text{kg}CO_2\text{e/kWh} \div 1{,}000 = 0.41\ \text{t}CO_2\text{e}$$

Table F.6. Monthly MOCN energy allocation and reporting treatment

Energy or emission flow	Allocated electricity	Allocation method	Reported by	Reporting treatment	GHG Emissions (tCO_2e)
Shared MOCN equipment—total	1,674 kWh	Utility meter or allocated site consumption	MNO A, as host operator	Scope 2	1.24

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MNO A allocated operational share	558 kWh	One-third of shared consumption	MNO A	Included within MNO A's Scope 2 total	0.41
MNO B allocated service share	558 kWh	One-third of shared consumption	MNO B	Scope 3 Category 1	0.41
MNO C allocated service share	558 kWh	One-third of shared consumption	MNO C	Scope 3 Category 1	0.41
Allocation reconciliation	1,674 kWh	558 + 558 + 558	—	—	1.24

Notes.

1. NO A reports the full 1.24 tCO_2e under Scope 2 because it purchases the electricity and operates the shared MOCN equipment. The 0.41 tCO_2e attributed to MNO A represents its operational share for internal allocation and shall not be reported as an additional emission amount.

2. MNO B and MNO C report their allocated service emissions under Scope 3 Category 1 because electricity is included in the MOCN service and is not separately acquired by them.

3. MNO A's Scope 2 emissions and the tenants' Scope 3 emissions reflect the same underlying electricity consumption from different organisations' reporting perspectives. These amounts shall not be added together when determining the physical emissions of the shared site.

F.3.4 Alternative treatment for separately acquired electricity

Where electricity is separately metered, invoiced and acquired by MNO B or MNO C, the respective electricity consumption may be classified as Scope 2 instead of Scope 3.

The classification shall be supported by:

a) utility or electricity-supply contracts;

b) invoices or separate electricity charges;

c) meter or sub-meter records;

d) the MOCN or site-sharing agreement; and

e) the organisation's documented boundary and accounting policy.

F.3.5 Emission factor applied

Emission source	Factor	Illustrative source
Grid electricity—Peninsular Malaysia	0.740 $kgCO_2e$/kWh	MEIH Grid Emission Factors, version dated 16 January 2026, base year 2024

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Annex G
(informative)

GHG data quality register template

This Annex provides a template for recording and assessing the quality of activity data used in GHG emissions quantification and reporting. The GHG Data Quality Register may be used to document the data source, data owner, measurement or estimation method, data-quality tier, uncertainty, identified data gaps and corrective actions for each relevant emission source or activity.

The register supports consistent data-quality assessment, traceability and review and assists organisations in identifying opportunities to improve data quality over successive reporting cycles.

The template may be adapted to suit the organisation's operational arrangements, data availability and reporting requirements, provided that the minimum information specified in 7.4.4 is retained

An example of a GHG Data Quality Register is provided in Table G.1.

Table G.1. GHG Data Quality Register template

ID	Scope/ category	Source and site or asset	Activity data and unit	Data source/ evidence reference	Data owner	Method[1]	Data-quality tier[2] / uncertainty[3]	Data gap / corrective action	Review status
001									
002									
003									
004									
005									

[1]**Method:**
M = measured; A = allocated; E = estimated.

[2]**Data-quality tier:**
Tier 1 = measured; Tier 2 = documentary or supplier data; Tier 3 = engineering-derived; Tier 4 = proxy or estimated.

[3]**Uncertainty:**
L = low; M = moderate; H = high.

Overall comments:

Reviewer: _____ **Review date:** _____
Approved by: _____ **Approval date:** _____

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Annex H
(informative)

Readiness self-assessment checklist

This Annex provides a self-assessment checklist to support an organisation in assessing its readiness against the requirements of 6.3 and the verification and assurance provisions of Clause 10.

The checklist is intended to assist an organisation in evaluating its GHG measurement, reporting, emissions-management and transition capabilities and in identifying areas requiring further improvement. It does not replace the readiness-level criteria specified in 6.3.

The self-assessment should be completed for each reporting cycle and whenever a material change occurs that may affect the organisation's readiness level. The applicable readiness level shall be determined and declared in accordance with 6.3.

H.1. Foundations, boundaries and governance

No.	Question	Yes / No
1	Has the organisation established and documented its organisational and operational boundaries for GHG reporting in accordance with 6.4?	
2	For shared and co-located infrastructure, has the organisation documented the applicable GHG emissions demarcation and energy-allocation methods in accordance with 6.4?	
3	Has responsibility for GHG measurement, reporting and decarbonisation been assigned to an appropriate function or person?	

H.2.Scope 1 and Scope 2 measurement

No.	Question	Yes / No
4	Do you collect electricity consumption for our sites and facilities from utility bills or site main meters, covering substantially all of our estate?	
5	Do you track diesel and other fuel purchased for generators and vehicles from purchase or fuel card records?	
6	Do you record refrigerant top-ups to cooling systems from maintenance records?	
7	Do you know which emission factor we apply to each of these, and where each factor comes from?	
8	Have you selected a base year, and documented when its numbers would be recalculated?	
9	Have you completed at least one full year of Scope 1 and Scope 2 emissions in tCO_2e?	
10	Where data is missing or estimated, do you record how the gap was filled and which lines are estimates?	

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H.3 Scope 3 emission

No.	Question	Yes / No
11	Have you identified which of the selected Scope 3 categories (purchased goods and services, capital goods, fuel- and energy-related, upstream transport, waste; Category 13 for TowerCos) are relevant to your organization?	
12	Do you ask equipment suppliers for product carbon data (EPDs or equivalent) in procurement?	
13	Have you measured at least one Scope 3 category with real activity data?	

H.4 Energy and emissions reduction measures

No.	Question	Yes / No
14	Have you completed an energy review identifying our biggest energy uses, with a written improvement plan (or an ENMS aligned to, or certified against, ISO 50001)?	
15	Do you maintain a register of energy-saving measures implemented, with expected and achieved savings?	
16	Can you monitor site energy, generator running and renewable generation through a monitoring platform for a meaningful part of the estate?	
17	Do you report energy and carbon intensity indicators (e.g. kWh and $kgCO_2e$ per terabyte, or per site) on consistent definitions year to year?	
18	Have you assessed sites for on-site renewable energy, and deployed it where feasible?	
19	Where do you claim renewable electricity (GET, mREC, CRESS or similar), do the instruments meet the quality requirements and are they disclosed by type?	
20	Do you redeploy or refurbish serviceable equipment before disposal, and send e-waste only to licensed recovery facilities with consignment documentation?	

H.5 Targets, reporting and assurance

No.	Question	Yes / No
21	Have you set emission reduction targets against our base year, consistent with a science-aligned trajectory (e.g. ITU-T L.1470)?	
22	Do you have a governance-approved transition plan with dated milestones, reviewed at least yearly?	
23	Do you publish or disclose our emissions and progress (internally to governance, and externally where required, e.g. NSRF, IFRS S2, Bursa)?	
24	Has you inventory been independently assured (limited or reasonable), or internally reviewed with findings tracked to closure?	
25	Have your targets been independently validated (e.g. SBTi or equivalent)?	

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H.6 Readiness level

Level	Score band	Essential items
Basic	Below 40%	a) Q1 (reporting boundary defined) b) Q4 (electricity data collected) c) Q5 (fuel data tracked)
Intermediate	40% to 74%	a) Basic items,plus b) Q2 (shared-site demarcation method) c) Q8 (base year set), d) Q9 (one full year of Scope 1 and 2) e) Q23 (disclosure made)
Advanced	75% and above	a) Intermediate items, plus b) 11 (Scope 3 categories identified) c) Q21 (targets set) d) Q24 (assured or internally reviewed with findings closed)

Notes:

1. Both tests apply. An organisation that reaches a score band but has not satisfied that level's essential items is placed at the level below until those items are addressed, which keeps the essential capabilities ahead of overall breadth.

2. Where a question is not applicable to an organisation (for example, a category it does not operate), it is excluded from the denominator rather than scored as "No".

3. An organisation meeting a higher level's profile applies that level, consistent with Clause 6.3.

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