Building a Green Network: Leveraging KPIs to Reach Net Zero Carbon

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Building a Green Network

Telecom operators account for 2 percent to 3 percent of total globally energy consumption, placing them at the forefront of the most energy-intensive companies worldwide.

More than 90 percent of network cost spent on energy, consisting mostly of fuel and electricity, the demand for energy-saving measures from telecom operators is growing

Importance of Network Efficiency

Cost reduction

GHG emission reduction

Achievement of Paris Agreement and SDGs

Improved network quality

Better end user experience

Energy Efficiency Standards

At product level

- ITU-T L.1310: Energy efficiency metrics and measurement methods for telecommunication equipment
- ITU-T L.1320: Energy efficiency metrics and measurement for power and cooling telecommunications and data centres equipment for
- ITU-T L.1390: Energy saving technologies and best practices for 5G RAN equipment

At site level

- ITU-T L.1350: Energy efficiency metrics of a base station site
- ITU-T L.1351: Energy efficiency measurement methodology for base station sites

At network level

- ITU-T L.1331: Assessment of mobile network energy efficiency
- ITU-T L.1332: Total network infrastructure energy efficiency metrics

Energy Efficiency Metrics of a Base Station Site

International Telecommunication Union

ITU-T L.1350

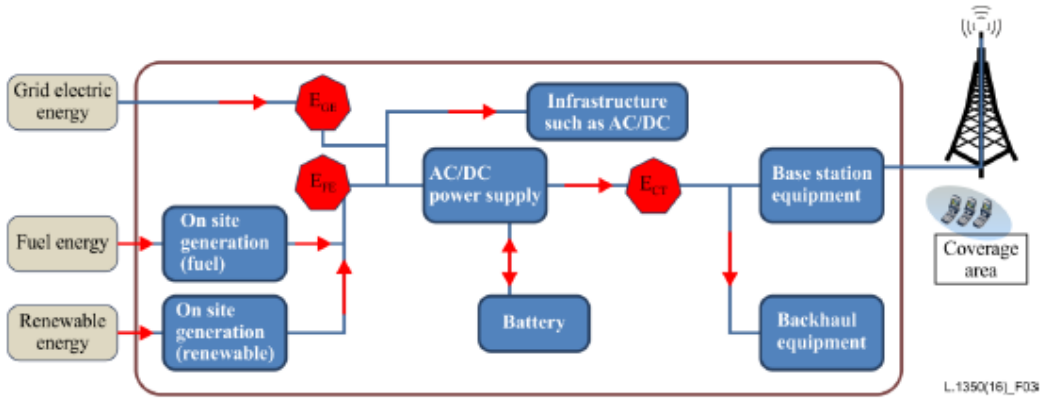
TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

(10/2016)

SERIES L: ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

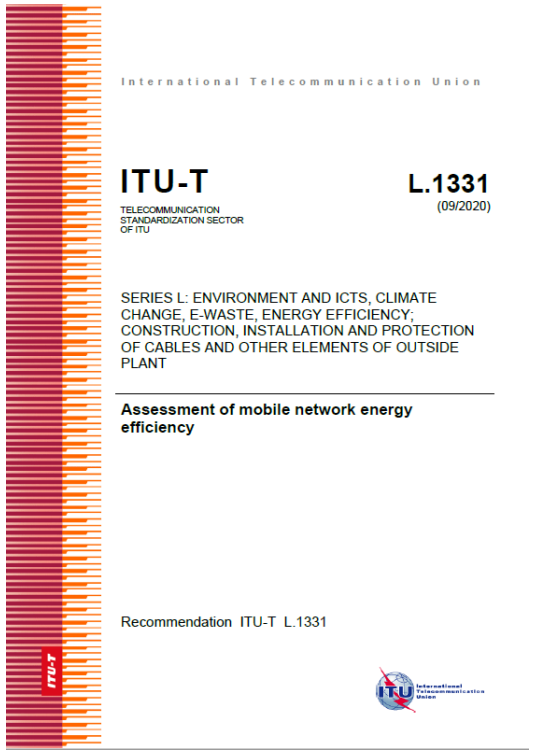
Energy efficiency metrics of a base station site

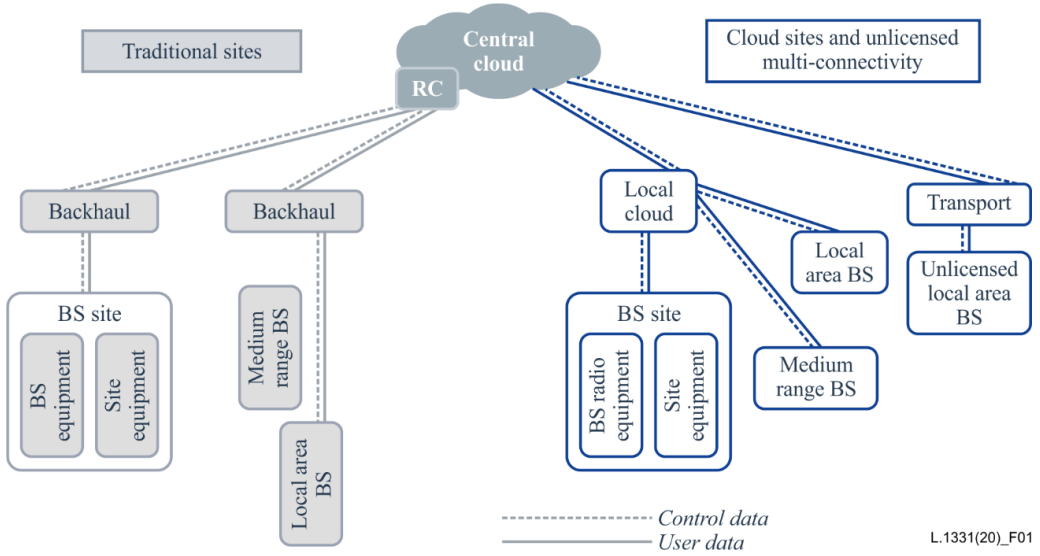
Recommendation ITU-T L.1350



$$SEE = \frac{E_{CT}}{E_{TS}} \times 100\%$$

Assessment of Mobile Network Energy Efficiency





$$EE_{MN,DV} = \frac{DV_{MN}}{EC_{MN}}$$

International Telecommunication Union

ITU-T
TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

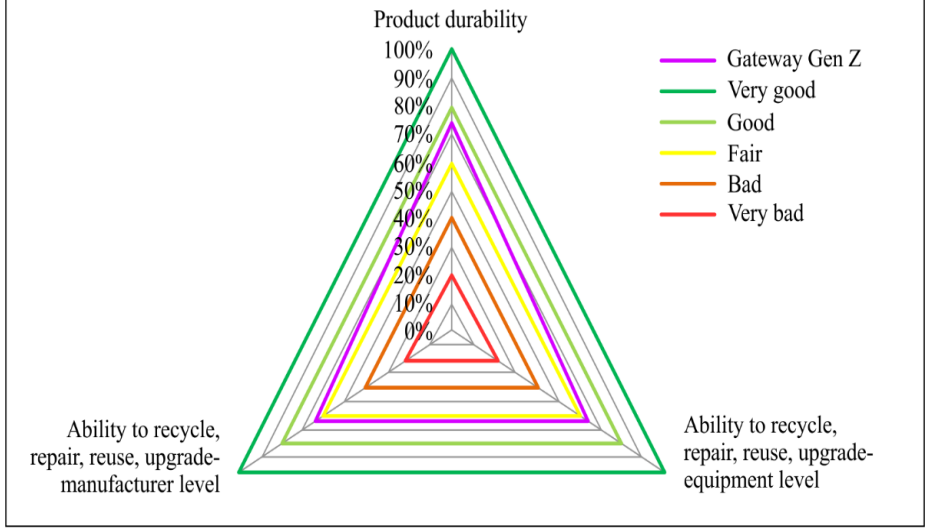
L.1023
(09/2020)

SERIES L: ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

Assessment method for circular scoring

Recommendation ITU-T L.1023

Circularity score diagram



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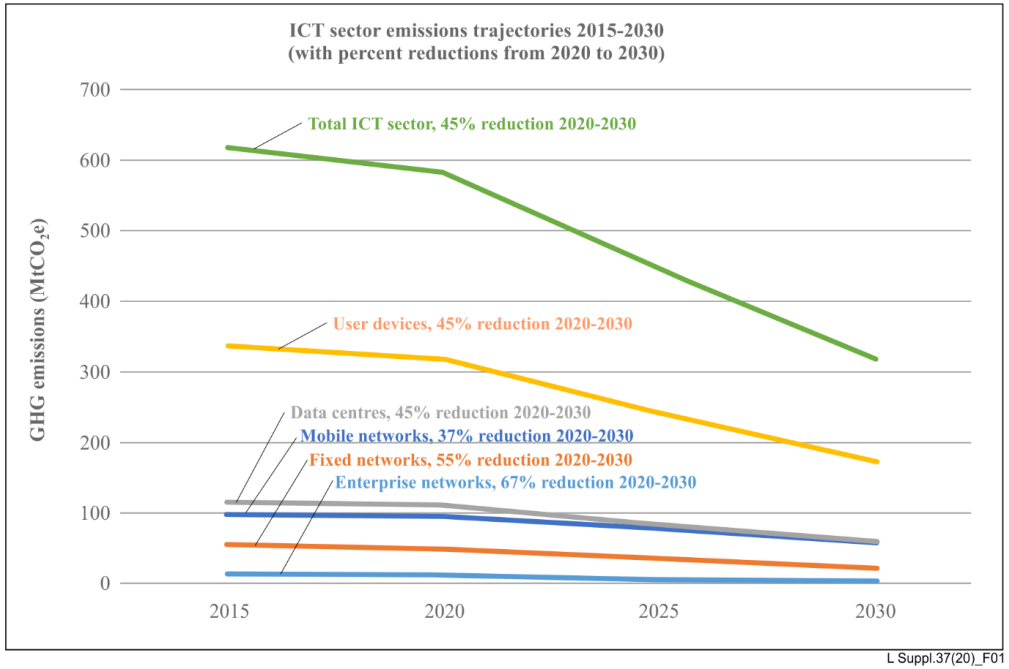
Carbon Data Intensity for Network Energy Performance Monitoring



Data traffic from cellular and fixed broadband networks will grow at a 29% compound annual growth rate (CAGR) from 2018 to 2024.

It is necessary to define an indicator to show how the increase efficiency in term of GHG of a network linking the amount of GHG emitted to the services provided by the network.

Some operators use internal indicator to evaluate their network emission and give an indication on how they are reducing the contribution of network at their emission.

A common indicator is needed to measure the carbon intensities in network infrastructure, such as Public Telecom Network (PTN), Non-Public Network (NPN)

Applicable to the green decarbonization performance of network facilities.

Not suitable for a horizontal comparison between different types of network facilities,

It is suitable for comparisons between similar network facilities in different regions.

However, it is a suitable benchmark to track over time for a particular operator the evolution of network functionality.

NCIe Benefits

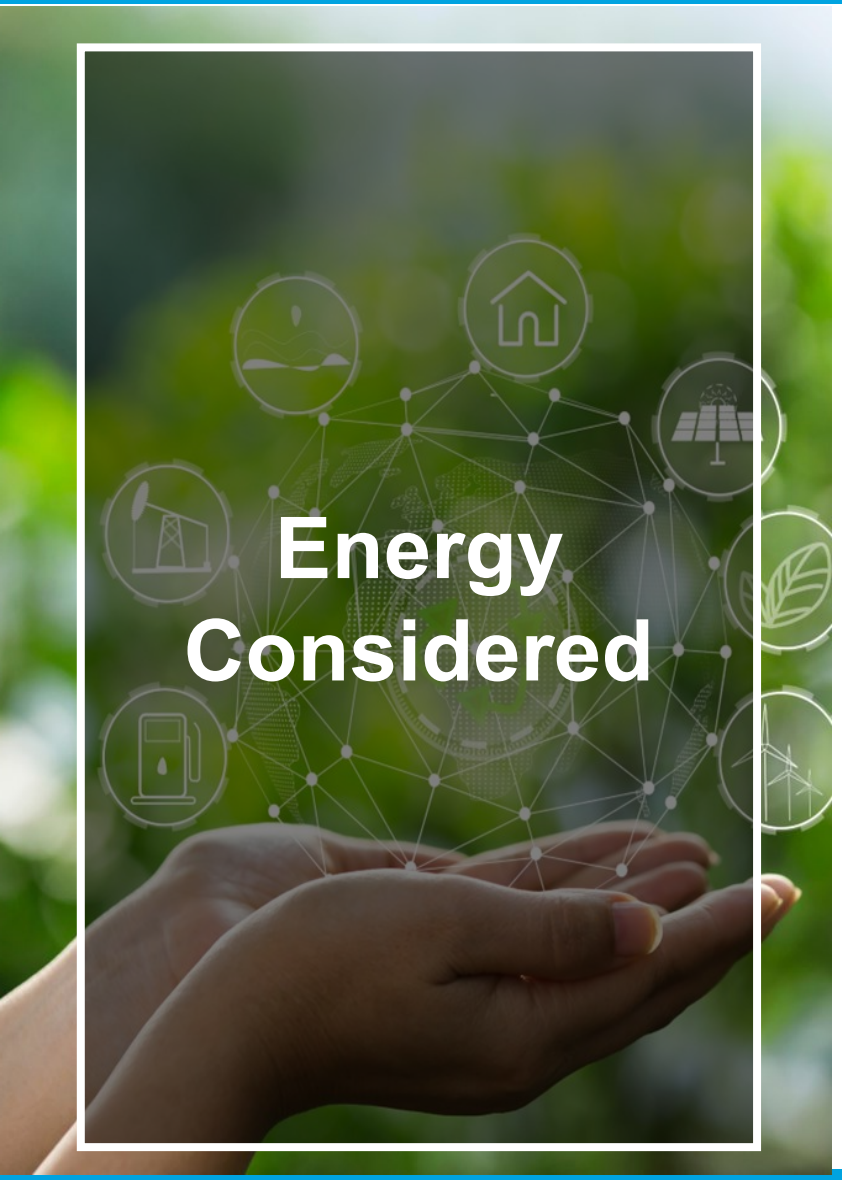
- A tool to see how infrastructure network evolve in terms of GHG emissions.
- Network Owner can control in a simple way network performance
- Controlling the volume/traffic of data deriving from monitoring system the amount and the source of energy used by network.

$$NCIe\left(\frac{kgCO_2e}{TB}\right) = \frac{Total\ Carbon\ Emission\ of\ network\ operation}{Total\ Data\ traffic}$$

- NOTE: The unit TB refers to Terabytes and is equivalent at 2^{40} bytes or $8 * 2^{40}$ bits.
- The KPI is calculated as below formula considering the total energy consumption of network divided by the amount of data traffic managed by the network:

$$NCIe = \frac{E_{total}}{Total\ Data\ traffic} * EF = \frac{\sum E_j * EF_j}{\sum Data\ traffic_j}$$

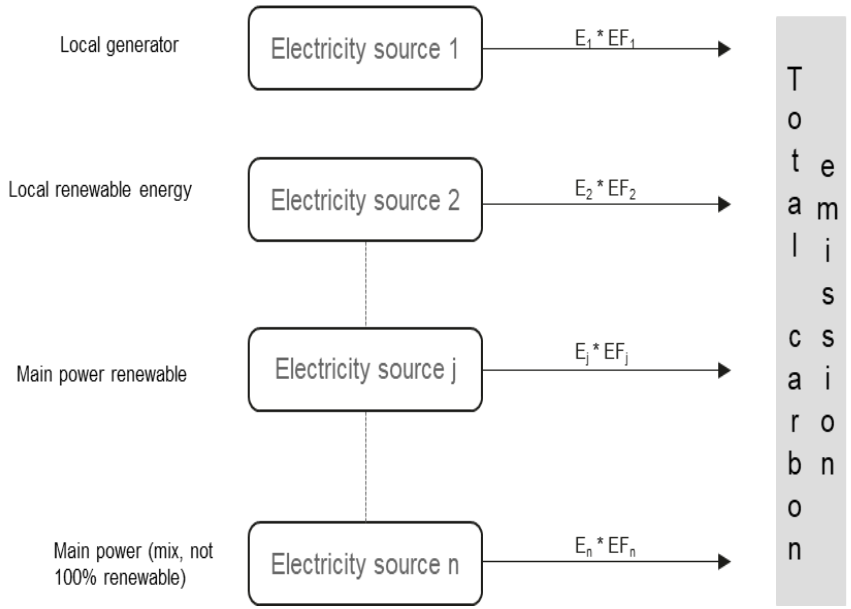
- Total data traffic is the total traffic/volume of network under consideration in TeraBytes (TB)
- EF (kg CO¬2e/kWh) is the emission factor represented by the mass of carbon emitted per kWh of electricity.



Grid electricity:
Most of the energy consumed comes from local grid electricity.

Backup energy:
A small proportion of energy comes from backup diesel, or other types, generators such as e.g. solar panels.

Local generate energy:
energy provided by local generators not used for backup functionality, e.g. Solar, wind generator.



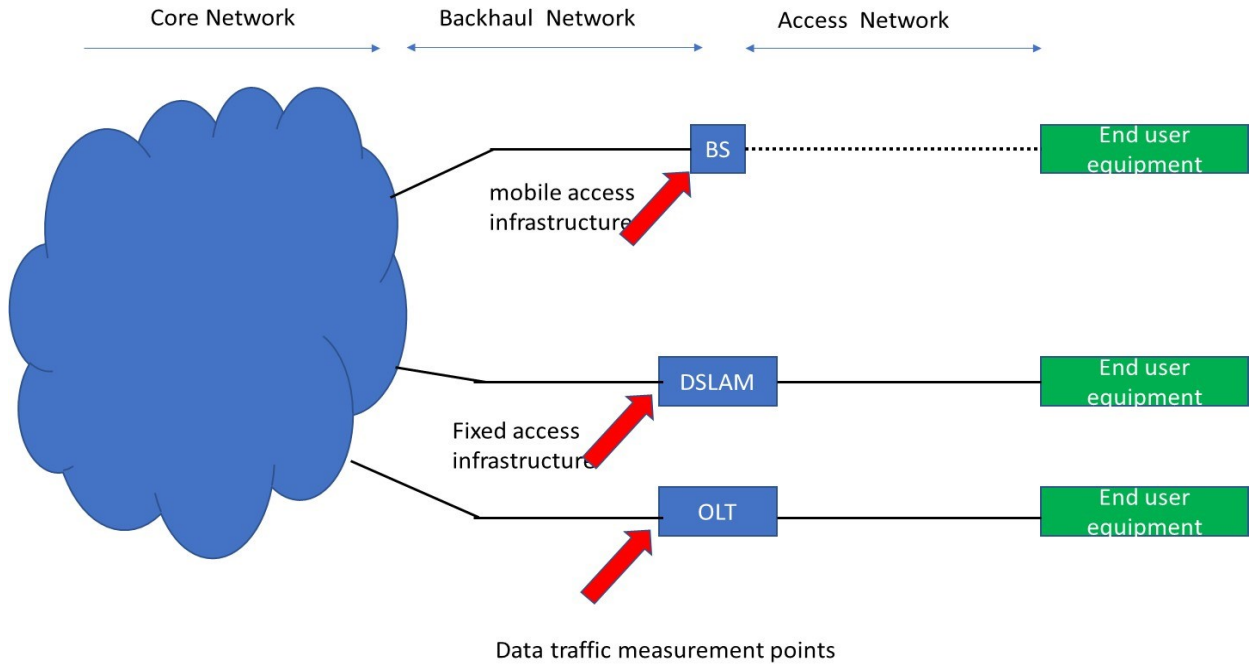
The emission factor for all three types of energy shall consider the electricity supply chain.

KPI Calculation

The KPI calculation period should be 1 year. (it is possible use also shorter period: 1 month, 1 week)

Data derived by monitoring system

The network traffic will be measured at aggregated point of user interface



The strategies

- ITU-T L.1471 and ITU-T L.1470

Emission Measurement

- The methodologies ITU-T L.1410
- The KPI L.1333

Evaluating results

- Methodologies for net zero:
- L.GHGemission_DC
- L.GHGemission_BS

Solutions to reach Net Zero

- Best practices: L.MM&BP_BS L.MM&BP_DC
- “ICT enablement” ITU-T L.1480
- Circular economy KPI ITU-T L.1023

The GOAL

Zero CO_2 by 2050

Thank you!

Questions? Interested in learning more?
Let us know!