



Alliance for
Internet of Things
Innovation

IoTWeek
Dublin — June 20-23, 2022

IoTWeek - IoT and Edge Computing impact on Green Deal session • 20 June 2022

AIOTI vision on IoT and Edge Computing Carbon Footprint Measurement Methodology

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IoT and Edge Computing Carbon Footprint Measurement Methodology: Goals of the Report

Work in progress; Targeted to be published in September 2022

Goal of report:

- To help users of IoT and Edge Computing technologies and services to make informed choices on how to assess the carbon footprint of solutions and services they use, and to as well assess the benefits that IoT and Edge computing technologies bring on reducing the carbon footprint of industrial domains
- To present initiatives and standards, existing methodologies of measuring ICT carbon footprint and how they can be applied to IoT and Edge Computing
- To present selection methodology criteria and how to assess the benefits of using them in reducing the carbon footprint for several industrial domains, when applying IoT and Edge Computing technologies and services

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Methods of measuring Carbon Footprint

Existing methods on measuring Carbon Footprint

Product Environmental Footprint Methods	ISO 14044: Environmental Management: Life Cycle Assessment:
	ISO 14067: Carbon Footprint of Product
	International Life Cycle Data (ILCD)
	GHG protocol:
	Publicly Available Specification (PAS) 2050
	Publicly Available Specification (PAS) 2060
	Ecological footprint:
	BPX 30-323
Corporate Environmental Footprint Methods	Product Environmental Footprint (PEF) method
	ISO 14064:
	Global Reporting Initiative (GRI)
	CDP Water Disclosure Project
	GHG protocol: Corporate Standard
	International Life Cycle Data (ILCD)
	Defra 'Guidance on how to measure and report your greenhouse gas emissions':
	Defra Guidance on Environmental Key performance Indicators – Reporting Guidelines for UK Business
	Bilan Carbone
Organisation Environmental Footprint (OEF) method	
Specific Carbon Footprint Methods	Science-Based Targets
	Green House Gas Protocol, used in the context of SBTs

ICT Methods of measuring Carbon Footprint

Guidance for ICT companies setting science-based targets mobile networks operators, fixed networks operators and data centres operator mobile networks operators, fixed networks operators and data centres operators
ITU-T L.1470
ETSI GS OEU 020: Operational energy Efficiency for Users (OEU); Carbon equivalent Intensity measurement; Operational infrastructures; Global KPIs; Global KPIs for ICT Sites
ETSI ES 203 228: Mobile network data energy efficiency
ITU: Carbon Data Intensity for network energy performance monitoring: (A.1) TD2141-R1
Deutsche Telekom: Carbon intensity ESG KPI
BT carbon intensity
TIM carbon intensity
Network Carbon Intensity (NCI)
Overall methodology approach for ICT electricity use
Green IoT and Edge AI as Key Technological Enablers for a Sustainable Digital Transition towards a Smart Circular Economy: An Industry 5.0 Use Case

Selection Criteria for Methodologies

Selection criteria for methodologies on measuring carbon footprint

1	Recommended to use one of the standardised methods, prioritising international/global standardised methods
2	Depending on whether SBTi targets need to be covered? If yes, depends on covering SBTi Scope1 and/or SBTi Scope 2 and/or SBTi Scope 3
3	Depending on the use case and the applied industrial domain
4	What is the goal of measurement (e.g. for the operational purposes, lifecycle, production etc.)
5	Depending on whether the methodology needs to provide the necessary requirements imposed by the SPI/Product Passport regulation
6	Depending on whether there is a requirement to measure in addition to carbon footprint, as well the electrical energy footprint

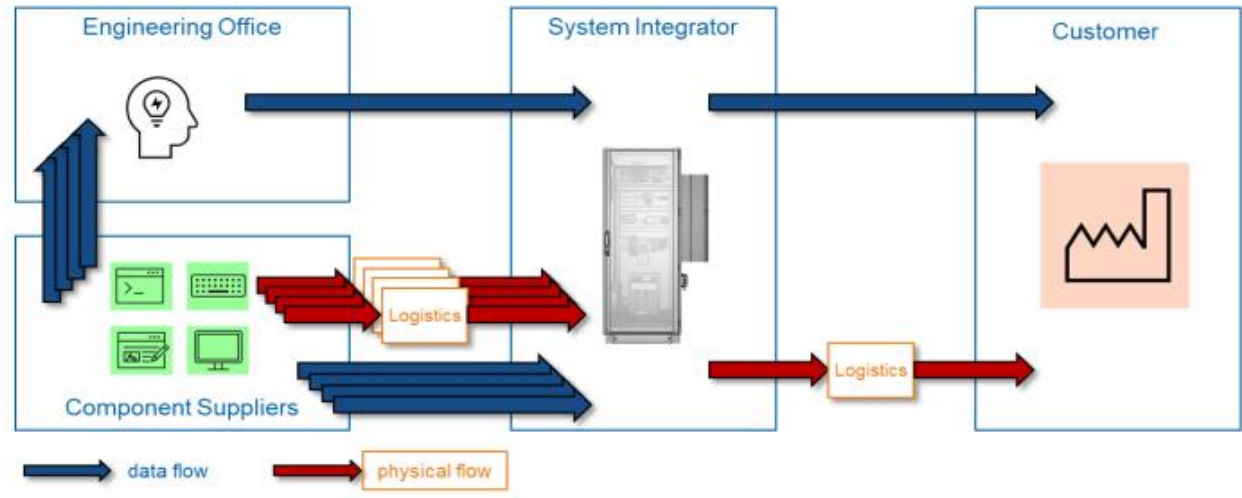
Selection criteria for methodologies on measuring the benefit of IoT and Edge Computing for Carbon Footprint reduction in industrial domains

1	Recommended to use one of the standardised methods, prioritising international/global standardised methods
2	Depending on the IoT and Edge Computing Infrastructure to be used to reduce the carbon footprint
3	Depending on whether there is a requirement to measure in addition to carbon footprint as well the electrical energy footprint
4	Depending on whether SBTi targets need to be covered? If yes, depends on covering SBTi Scope1 and/or SBTi Scope 2 and/or SBTi Scope 3
5	Depending on the use case and the applied industrial domain
6	What is the goal of measurement (e.g. for the operational purposes, lifecycle, production etc.)
7	Depending on whether the methodology needs to provide the necessary requirements imposed by the SPI/Product Passport regulation

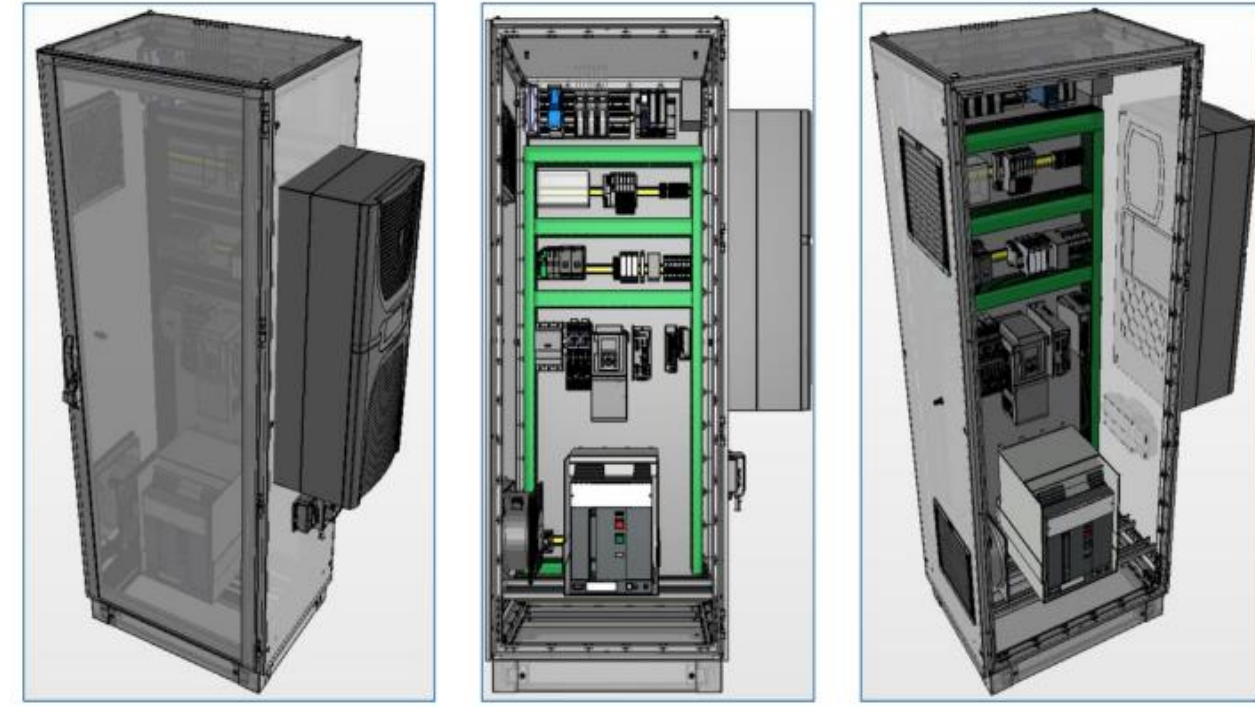
ZVEI-Show-Case "PCF@Control Cabinet" - Example of selected methodology to measure Carbon Footprint in Smart Manufacturing

Goal of ZVEI-Show-Case "PCF@Control Cabinet"

- A flexible, efficient and future-proof concept for the technical implementation of a digital product passport and demonstrates its feasibility using a demonstrator
- It has been presented at the [Hannover Messe](#) event in Germany during 30 May – 2 June 2022, where the product carbon footprint of a control cabinet is calculated

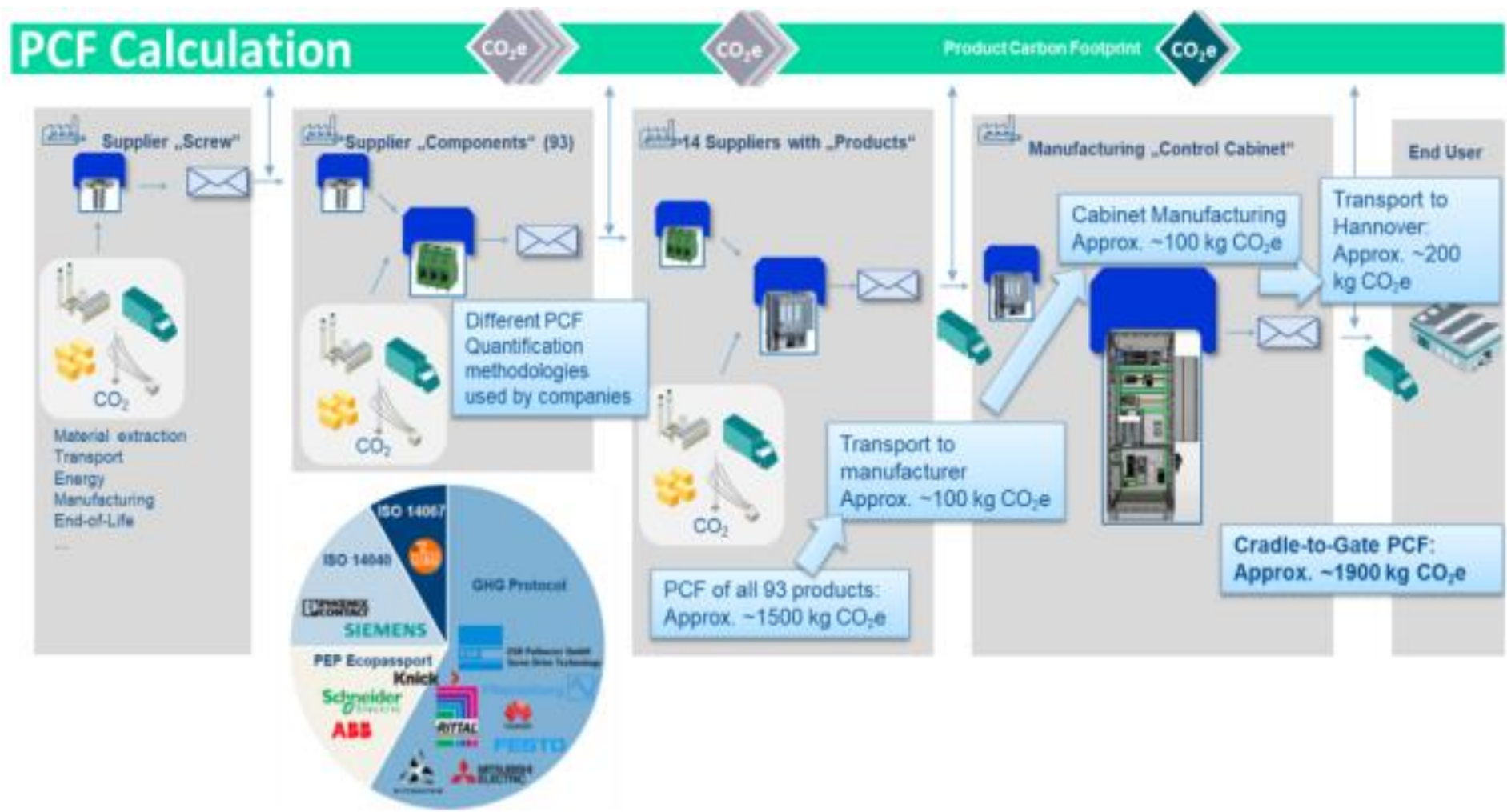


Data and component flow in the system integration process
Source [ZVEI white paper](#)



CAD-model of the control cabinet presented at the Hannover Fair 2022
Source [ZVEI white paper](#)

ZVEI-Show-Case "PCF@Control Cabinet" - Example of selected methodology to measure Carbon Footprint in Smart Manufacturing



Recommendations

- Currently several PCF methodologies available:
 - Not all PCF calculation methods are equivalent and comparable
 - Selection criteria can be used to help stakeholders to select the most suitable PCF methodology for each considered scenario and industry sector
- Currently several ICT (e.g., IoT and Edge) carbon footprint methodologies available that can be used to measure the benefits of ICT on reducing carbon footprint of industrial sectors:
 - Not all ICT carbon footprint calculation methods are equivalent and comparable
 - Selection criteria can be used to help stakeholders to select the most suitable ICT carbon footprint calculation methodology to measure the benefits of ICT on reducing carbon footprint in industrial sectors



Thank you for listening

Any questions?

You can find us at [@AIOTI_EU](https://twitter.com/AIOTI_EU) or email sg@aioti.eu