Value chain Analysis Layered Energy System (LES) for TROEF

Requirement 4.A.1 & 4.B.1 of the CO2 Performance Ladder

CO2P_Value_Chain_Analysis_TROEF
Value Chain Analysis
Version: 1.0

Table of contents

Document information

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1. Introduction

ICT Group N.V. ("ICT Group") aspires to maintain level 4 of the CO_2-prestatieladder. This report contains the results of one of the two supply chain analysis required to comply with requirement 4.A.1 of the CO_2 Performance Ladder Handbook 3.1:

> "The organization has demonstrable insight into the most material emissions from scope 3, and can submit at least 2* analyzes of GHG-generating (chains of) activities from these scope 3 emissions."

And to requirement 4.B.1:

> "The organization has formulated CO_2 reduction targets for scope 3, based on 2* analyzes from 4.A.1. Or the organization has formulated CO_2 reduction targets for scope 3, based on 2 material GHG-generating (chains of) activities. An associated action plan has been drawn up, including the measures to be taken. Objectives are expressed in absolute numbers or percentages in relation to a reference year and within a defined period"

For more information about ICT Group and the qualitative assessment of ICT Group's most material CO_2 emissions, see report '4.A.1. Most material scope 3 emissions'. For the second supply chain analysis, see report '4A1 & 4B1 Turnn".

1.1. Topic of this analysis: OrangeNXT's Layered Energy System (LES)

We chose LES for the following reasons:

1) LES is one of the products within the Product Market Combination (PMC) 'Infra & Mobility'. This PMC is ranked first in the materiality table (ICT Group, 2021). By choosing this product, we comply to the requirement that at least one of the value chain analyses should be chosen from the two most material emissions (SKAO, 2020).
2) LES has a great potential to reduce CO_2 emissions of the electricity system. By using the grid smarter renewables can be deployed more effectively and the electrification of transport can be supported.
3) We also chose LES because of its innovative nature. The product can support one of the biggest challenges of the moment, fighting climate change, by ensuring a successful energy transition. Taking part in the TROEF consortium provides opportunities to scale up the LES.

1.1.1. Layered Energy System for utility buildings based on EnergyNXT

The topic of the value chain analysis is the Layered Energy System (LES) for utility buildings that ICT Group will develop in the context of the TROEF consortium. This builds on the existing product EnergyNXT, but will be expanded with additional functionalities. Data from the use of EnergyNXT can be used to make assumptions for the effect of LES, until direct data from the deployment of LES has been gathered.

EnergyNXT
The LES developed within TROEF will be based on an existing platform called EnergyNXT. This is an energy-specific internet-of-things platform. The platform provides better insight into an organization's use of energy and creates opportunities for smart deployment and harmonization of energy production and use. The results are immediate: substantial savings in terms of energy and CO_2 emissions, and therefore lower energy bills. An additional benefit is the increased stability of the network.

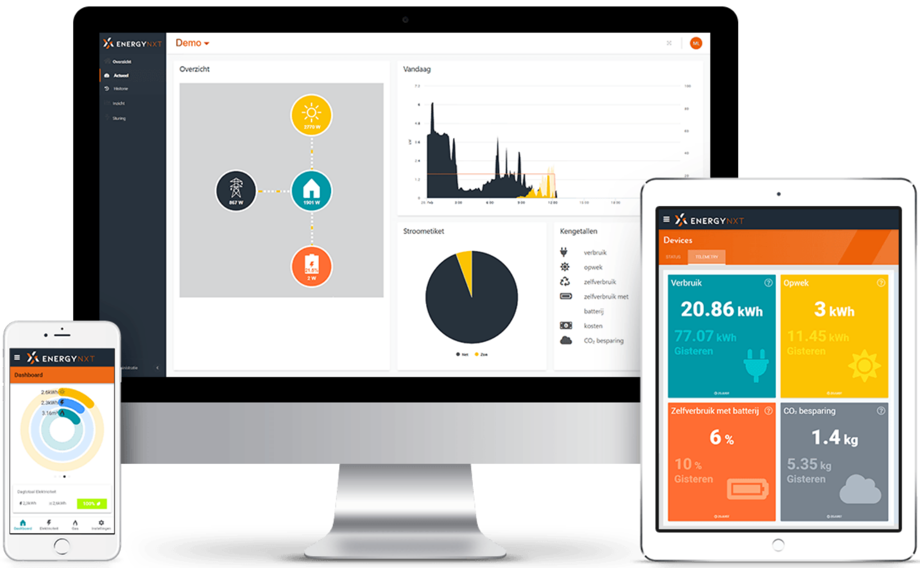

Figure 1: The EnergyNXT dashboard

Living Lab Bunnik
This fall TROEF will start a living lab at the offices of BAM in Bunnik to test LES. BAM has multiple offices at this location. This value chain analysis gives input on the type of data that needs to be collected at the living lab to analyse the impact of the LES.

1.1.2. Context: TROEF consortium

ICT Group's OrangeNXT is one of the partners in the TROEF consortium. TROEF aims to develop and internet-of-energy: by connecting energy communities, sustainable energy can be exchanged transparently and optimally between buildings and areas, resulting in the lowest possible CO_2 emissions.

The TROEF consortium consists of around ten companies and institutions with diverse specializations related to the development of the layered energy ecosystem. The consortium consists of area developers, energy service providers, platform service providers, data service providers, network operators/balance responsible parties, knowledge institutions, standardization platforms and market facilitating parties.

ICT Group's OrangeNXT is responsible for the software development of the Layered Energy System (LES) for utility buildings.

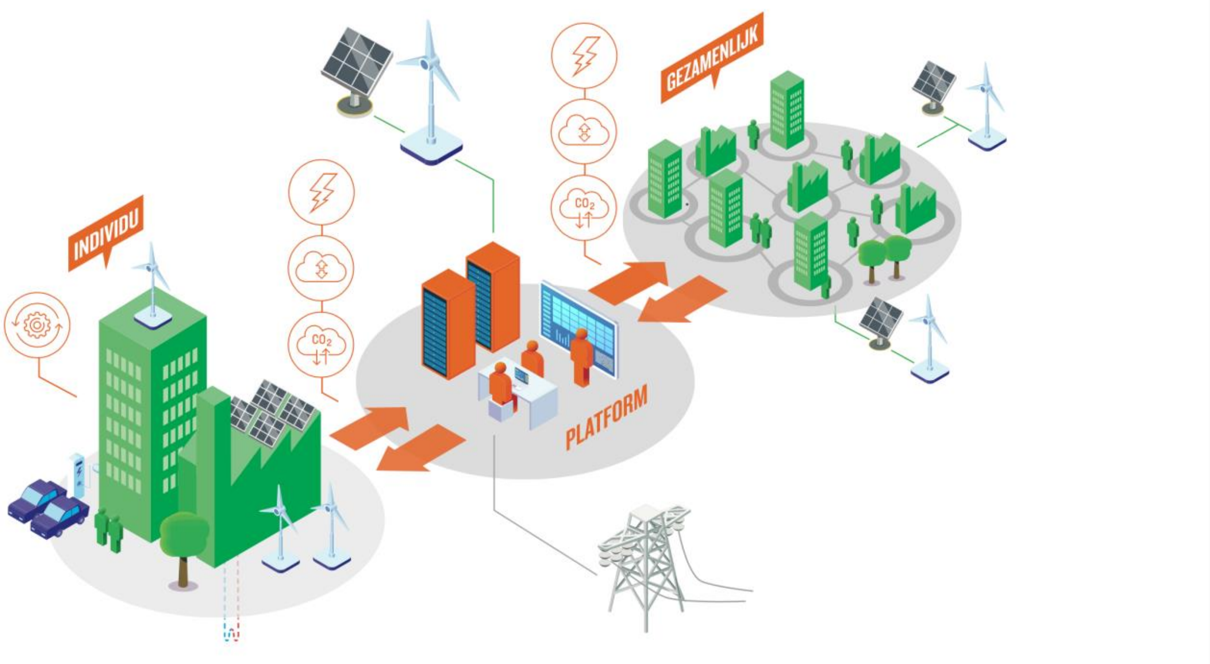

Figure 2: Visualisation of the TROEF internet-of-energy concept

1.2. Value chain analysis approach

The approach as described in the SKAO manual version 3.1; requirement 4.A.1. was followed to arrive at the value chain analysis of emissions.

1.2.1. Data collection

The manual says the following about data collection:

> "For a chain analysis it is not necessary to immediately request extensive data from all kinds of suppliers. It usually has clear added value to request some crucial data from one or a few suppliers, so selectively. That is often sufficient for a good first version of a chain analysis."

Data was collected through interviews with Heine van Wieren and Peter Lamers of ICT Group. Additional sources and studies were used to substantiate the supply chain analysis, for references see the Sources chapter.

2. Value chain analysis Layered Energy System

As indicated in Handbook 3.1 of the CO_2 Performance Ladder, the chain analysis follows the structure described in chapter 4 of “A Corporate Accounting and Reporting Standard” (WBCSD, 2004). The analysis consists of the following parts:

- Describe the value chain (section 2.1)
- Determine which scope 3 categories are relevant (section 2.2)
- Identify partners along the value chain (section 2.3)
- Quantify scope 3 emissions (section 2.4).

2.1. Describe the value chain

To start the analysis, a general description of the value chain is provided. We start by identifying the system boundaries. Then we describe the value chain and the process map (figure 3).

2.1.1. System boundaries

The system boundaries determine which processes and activities are included in the overall analysis. This to define where to stop tracking energy and material uses of processes: otherwise the analysis would be infinite.

This analysis focusses on the LES and its functioning within the energy community. The following system boundaries are set:

- For this analysis the full life cycle of hardware and software provided by ICT Group is considered.
- For this analysis the full life cycle analysis of other technologies needed to make the energy community function, such as solar panels, wind turbines, charging stations for electric vehicles and batteries are outside the scope of this analysis. They are an essential part of the functioning of the energy system, but ICT Group has little influence over the development and deployment of these technologies. Instead, only the reduced CO_2 eq emissions due to a reduction of energy use will be taken into account.

2.1.2. Value chain

A simplified version of the value chain is depicted in figure 3. In every phase of the value chain energy and materials are added, and emissions to air, soil and water are released. Transport takes place between the phases. For this analysis only CO_2 equivalent (CO_2 eq) is considered as an emission, in accordance with the requirements of the CO_2 Performance Ladder.

As seen in the process map, LES consists of both software and hardware. These two components come together in the use phase. For software the life cycle stages of material acquisition & pre-processing and end-of-life are not applicable, due to the immaterial nature of software. For hardware the full lifecycle is applicable.

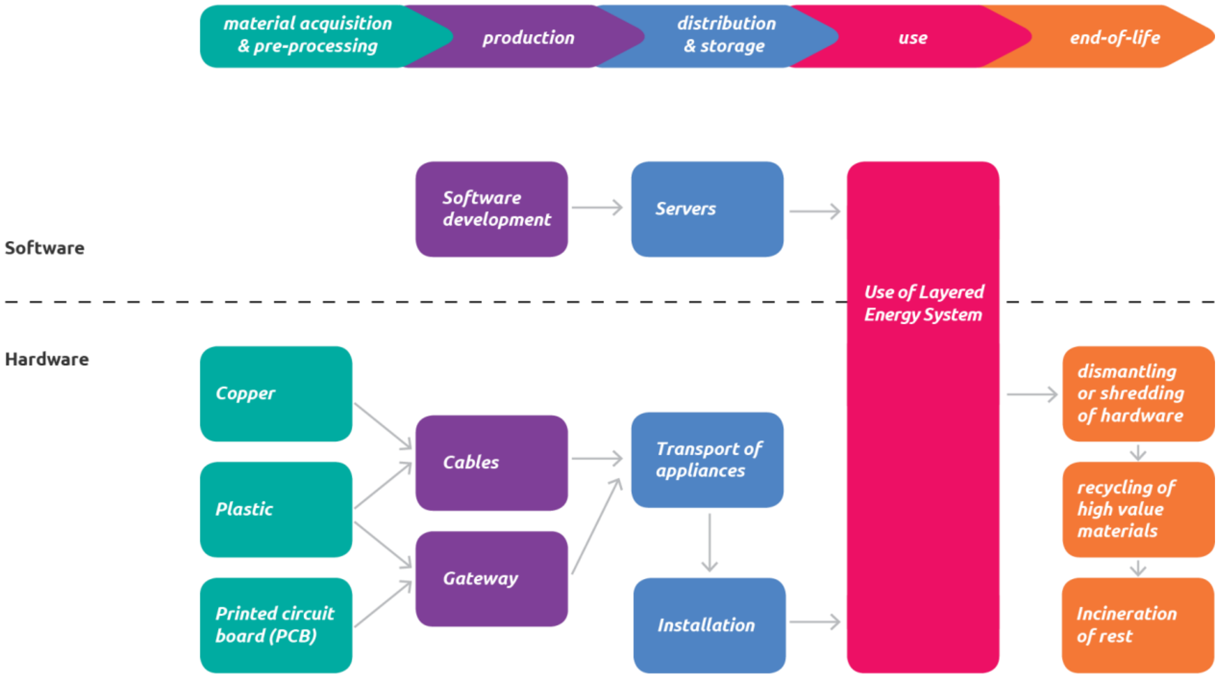

Figure 3: Process map of LES

Material acquisition & pre-processing

Software
Not applicable due to the immaterial nature of software.

Hardware
The main materials used are copper & plastic for cables and plastic & printed circuit board (PCB) for gateways. A full list of all materials will be included in the calculation of CO_2eq emissions.

Production

Software
The production phase is the software development and testing process. The main source of emissions is the developers' activities, which include:

- Heating, lighting and air conditioning used for buildings used by developers and testers
- Energy used by equipment used for development and testing
- Consumables used during the development and testing process (e.g. office supplies)
- Business trips related to the development and testing process

Hardware
Gateway and cables to appliances connected to the gateway, such as charging stations for electric vehicles or batteries.

Distribution & Storage

Software

The software is distributed digitally. According to “GHG Protocol, ICT sector guidance, ch 6 p. 8”, the following distribution steps need to be included:

- Storage and hosting of the software by servers (including mirror servers, if relevant)
- Network usage for transferring and downloading the software
- Using the end user's computer to download the software

Hardware

The gateway and cables are ordered from suppliers and transported to ICT Group, and after that to BAM´s offices in Bunnik. There they will be installed.

Use
TROEF’s main aim is to reduce electricity and material use. But the software and hardware also use electricity and materials to function. The following consequences for the CO_2 impact will be calculated in the use paragraph of this supply chain analysis.

Electricity use:

- The LES and the cloud service by Azure use electricity.

Electricity savings:

- Behavior change of users due to increased transparency of their electricity use.
- Balancing the net – avoiding transport & transformer losses due to local renewable electricity use and storage.

Materials savings:

- Balancing the net – avoiding investments in strengthening the net.

End-of-Life

Software
Not applicable due to the immaterial nature of software.

Hardware
The gateway & cables will be discarded at the end of their life. Valuable materials, such as copper, can be recycled. The other materials will be incinerated.

2.2. Relevant scope 3 categories

Table 1 shows the relevant scope 3 categories per step in the chain, in accordance with the GHG Protocol (WRI & WBCSD, 2011). GHG Protocol has developed guidelines to provide clarity on how specific industries can apply GHG Protocol standards. GHG Protocol, ICT sector guidance (2017) was used to determine which scope 3 categories are relevant.

Life cycle stage	Relevant scope 3 categories	Relevant life cycle stage
1. Material acquisition & pre-processing	1. Purchased goods and services	Yes, only for hardware
2. Production	1. Purchased goods and services 2. Capital goods 5. Waste generated in operations 6. Business travel	Yes
3. Distribution & Storage	9. Transportation and distribution of sold products	Yes
4. Use	11. Use of sold products	Yes
5. End-of-life	12. End-of-life treatment of sold products	Yes, only for hardware

Table 1: Relevant scope 3 categories

2.3. Identify partners in the value chain

Table 2 lists the partners involved in the supply chain.

Supply chain phase	Partners
1. Material acquisition & pre-processing	Suppliers of production facility of hardware
2. Production	TROEF consortium: AM, BAM, Entrnce International Holding, KPN, OrangeNXT (ICT Group), Stedin Netbeheer, Stichting Hogeschool Utrecht, NEN, Technische Universiteit Eindhoven and Tymlez. Production facilities for hardware
3. Distribution & Storage	Microsoft Azure (servers)
4. Use	Users at the BAM offices in Bunnik
5. End-of-Life	Waste companies

Table 2: Partners in the value chain

2.4. Quantify scope 3 emissions

The analysis of Troef is detailed in table 3. A calculation sheet is also available in Excel, which can be requested for additional information.

Results

We are analyzing Troef in a new pilot project. Because of this, we don't have concrete results on the effects of Troef on behaviour change and balancing the net. We made the following estimates:

Behavior change & smart systems: 10-35% reduction

Research shows that insight into energy use can contribute 10-20% to more efficient use of energy. A further saving of >15% is possible through active control of building installations and smart combination of building data and user data, without investing in new measures. E.g. switching on ventilation half an hour before the space is booked in a utility building) and then switch it off. Or only illuminate certain parts of the building if necessary (compartmentation).

Because this is quite a large range (10% minimum, 35% maximum) we are reporting two scenario's of energy saving. A low scenario of 10% and a high scenario of 35%.

Balancing the net: 30% less investments

By managing peaks, preventing congestion and contributing to balance, the consortium expects a lower investment requirement of -30%, in the energy network. Unfortunately data solely on a decrease of investment in strengthening the net isn't enough to calculate the CO_2 impact. This is something to add when more data is generated during the pilot.

Life cycle phase	Ton CO2e Troef	Remarks
1 & 2 Materials & Production	13	
3. Distribution & Storage	0.0002	
4a. Use hardware	0.001	
4b. Use energy system	-22[1] tot -77[2]	*Not complete, effects on balancing the net aren't taken into account due to lack of data*
5. End-of-Life	0.0001	
Total	**-7 tot -64**	

Table 3: Results

[1] Saving 10% energy
[2] Saving 35% energy

3. Reduction targets (4.B.1)

For requirement 4.B.1 we have drawn up the following reduction targets. The requirements for this are as follows:

> “The organization has formulated CO_2 reduction targets for scope 3 on the basis of 2 analyzes from 4.A.1. Or the organization has formulated CO_2 reduction targets for scope 3, based on 2 material GHG-generating (chains of) activities. An associated action plan has been drawn up, including the measures to be taken. Objectives are expressed in absolute numbers or percentages in relation to a reference year and within a defined period.” (CO2 performance ladder manual 3.1)

3.1. Targets

Troef has formulated the following goals for 2024.

- 20% CO2 reduction within one building through insight and sustainability measures
- 50% CO2 reduction within one local energy community (with an average of 50 connected buildings)
- Improving the instantaneous carbon footprint of the energy mix across all connected energy communities by 70%

3.2. Measures

We contribute to Troef with the following activities:

3.2.1. Develop dashboard building & community

Both dashboards will monitor consumption, self-consumption (using solar & wind energy generated locally) and a CO_2 profile. They will enable users to ‘trade’ energy when energy prices are low (for instance when a lot of renewable energy is produced) limiting losses of energy on our net. It can also couple direct sourcing of energy with ‘sourcing at a distance’ to energy community. They are the tool to drive lower CO_2 emissions.

3.2.2. Improve data quality using results of the pilot

The dashboard also enables us to generate direct data to improve our supply chain analysis. Because we are just starting at the moment we worked with estimates in our analysis. We will replace these estimates with direct data.

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