Network LCA - cooperation tools addressing Circular Economy

Session 1 in Joint Workshop: Circular Economy of EV Batteries

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Session agenda

- Methodology and network LCA concept
- Demonstration and hands-on exercise
  - Data collection
  - Results computation and inspection
  - Local data experiments
- Feedback and discussion
- Future work

There exist various methods for sustainability and life cycle assessment

LIFE CYCLE ASSESSMENT (ISO 14040/44)

CARBON FOOTPRINT (ISO14067)

SCREENING LCA - NEW TECHNOLOGIES

ECO-EFFICIENCY ASSESSMENT (ISO 14045)

WATER FOOTPRINT (ISO 14046)

HANDPRINT (NEW METHOD)

VALUE STREAM MAPPING

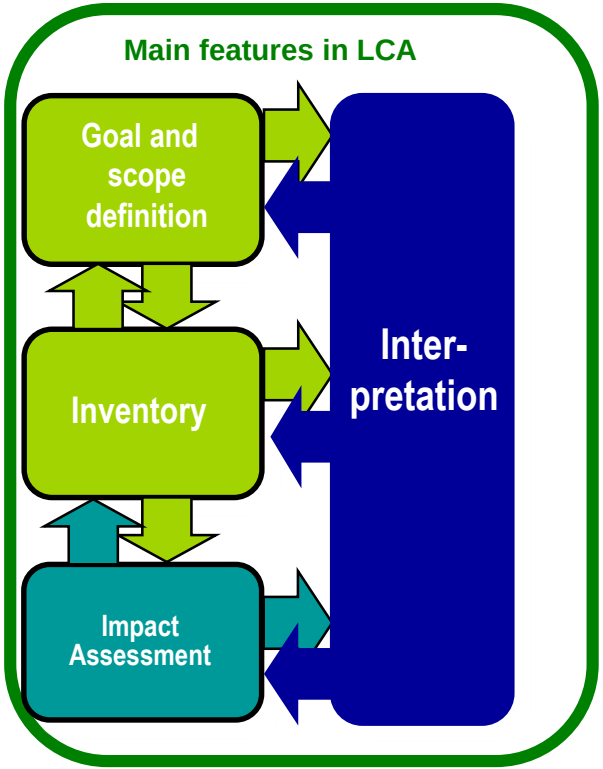
LIFE CYCLE COSTING

MODELLING AND SIMULATION

LCA= life cycle assessment
ISO = International standardization organisation

Methodological background

- Assessment of potential environmental impacts, e.g. climate change, throughout product's life cycle.
- Based on ISO standards 14040 and 14044
- Ideally all the life cycle stages and related emissions, energy, wastes and materials will be taken into account.
- The final decision on the level of detail depends on the purpose of the study, e.g. non-public preliminary screening of new technology vs. public comparative assertion on product already on market (critical review required)
- Data collection is the most crucial part of the assessment.



ISO = International Standardisation Organisation
LCA = Life Cycle Assessment

Life cycle assessment requires various types of input data

- Specific data represents the product or process under assessment collected from the actual producer or network operator.
- Average data represents generic product or process, exists already e.g. the life cycle inventory databases.
- Unit process data (UPR) represents one single operation in a network.
- Aggregated life cycle inventory (LCI) data is packed data from multiple operations in which the single operations' impact cannot be distinguished.

Commercially and publicly available LCA software tools and databases

Tools

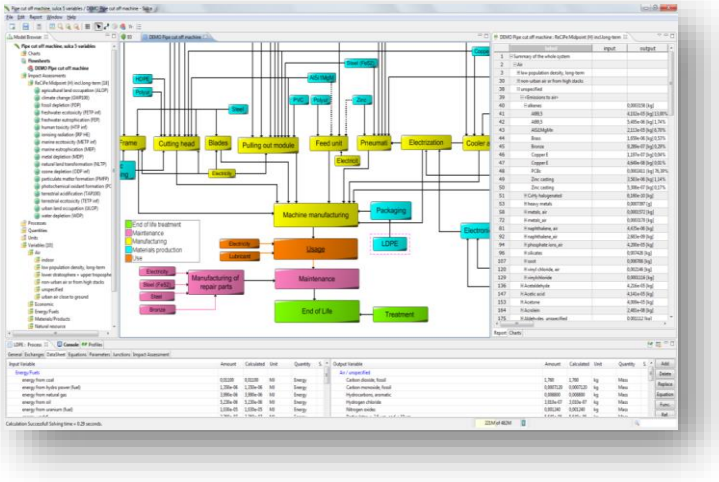
- **SULCA**
- GaBi
- SimaPRO
- OpenLCA
- Umberto

Data sources

- ecoinvent
- ELCD (ILCD database)
- PlasticsEurope
- worldsteel
- EAA – European Aluminium Association
- …

ELCD = European Reference Life Cycle Data

LCA software tool SULCA 5.0



- The network LCA has been developed on top of SULCA. SULCA is an LCA software developed and maintained by VTT.
- Interacts with Life cycle inventory databases (such as ecoinvent) and impact assessment methods.
- VTT conducts LCA calculations and training workshops with SULCA tools.

Life cycle modelling → **Data collection** → **Calculation and impact assessment** → **Analysis and interpretation of results**

SULCA

Software for calculation of LCA, Carbon- and Water footprints

Common challenges related to data collection

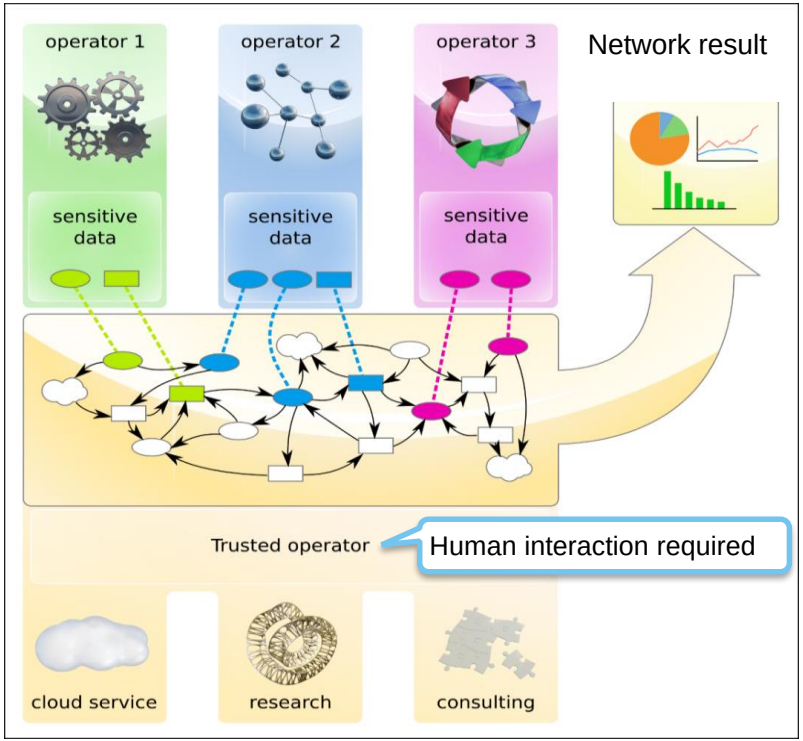
- Resource required vs. benefits received.
- Confidentiality e.g. the production recipes.
- The common unwillingness of data providers to reveal their data performance indicators.
- Lack of common terminology between various operators.

Network LCA tool- background

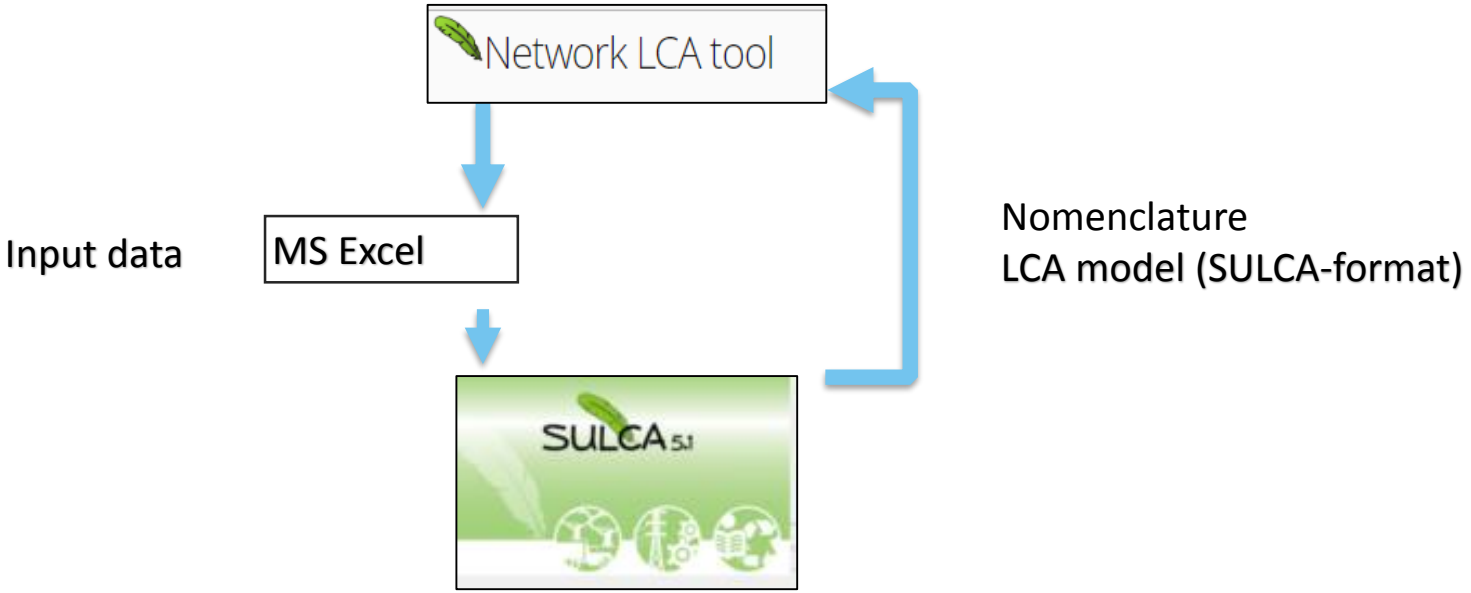
- Circular economy requires tools which facilitate collaboration between various value chain partners
- The network LCA tool has been developed in the EIT Raw Materials project Modelling Factory
- The network can be built inside an organization or from various network actors from different organizations

Network LCA tool- concept

- Network LCA is tool for LCA data collection, data analysis and sharing the LCA results inside the network.
- Operators inside the network feed own process data via web browser without software installations.
- Trusted operator assigns the data and result view rights only to the selected operators.
- Operator can inspect independently how the changes to their local data affects the network level results.



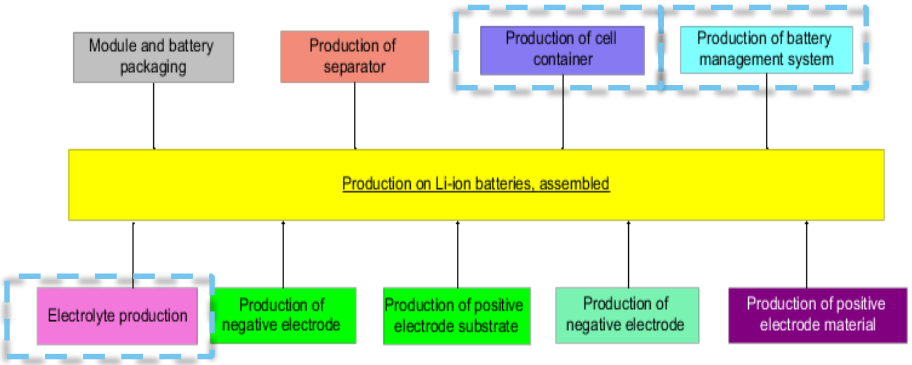
Network LCA - software interactions



Agenda

- Methodology and concept
- Demonstration
  - Data collection
  - Results computation and inspection
  - Local data experiments
- Feedback and discussion
- Future work

Demonstration's top-level flowsheet: cradle-to-gate model of Li-Battery



- Functional unit: 1 kg Li-ion Battery
- Type of battery : Nickel-Cobalt-Manganese
- Aside snapshot from the mode Top-level view. The demonstrated sublevels are circulated.
- The core data for the model is generic and public (Majeau-Bettez et al 2011).
- The Life cycle inventory data e.g. electricity production is from ecoinvent database: https://www.ecoinvent.org/

Demonstration’s groupwork – introduction of 3 groups

- First group represent the Administrator (Trusted operator) and company producing Battery management system. Responsible for LCA data collection. Requests missing data entries from two companies. Trusted operator sees all operators’ data and has access to LCA software.

- Second group represents Electrolyte company. Administrator grants access rights to the main level results and to Electrolyte (sub-) level data.

- Third group represents Cell container company. Administrator grants access rights to the main level results and to Cell container (sub-) level data.

Demonstration’s groupwork

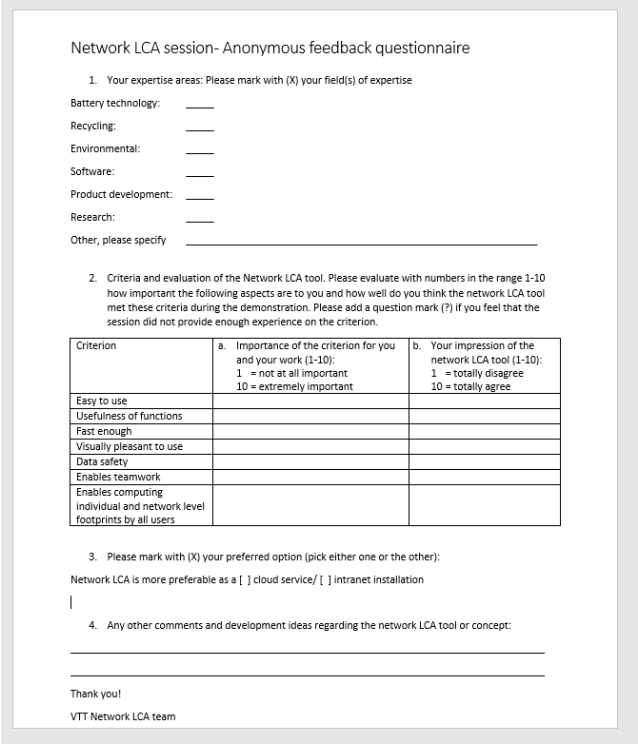
- Let’s start working in groups

- Network LCA short link to join the demo session 1

https://bit.ly/2rYsgbg

Feedback

- Let’s take a moment to fill in the form
- Your feedback is highly appreciated



Network LCA session- Anonymous feedback questionnaire

1. Your expertise areas: Please mark with (X) your field(s) of expertise

Battery technology: ____
Recycling: ____
Environmental: ____
Software: ____
Product development: ____
Research: ____
Other, please specify _____

2. Criteria and evaluation of the Network LCA tool. Please evaluate with numbers in the range 1-10 how important the following aspects are to you and how well do you think the network LCA tool met these criteria during the demonstration. Please add a question mark (?) if you feel that the session did not provide enough experience on the criterion.

Criterion	a. Importance of the criterion for you and your work (1-10): 1 = not at all important 10 = extremely important	b. Your impression of the network LCA tool (1-10): 1 = totally disagree 10 = totally agree
Easy to use		
Usefulness of functions		
Fast enough		
Visually pleasant to use		
Data safety		
Enables teamwork		
Enables computing individual and network level footprints by all users		

3. Please mark with (X) your preferred option (pick either one or the other):

Network LCA is more preferable as a [ ] cloud service/ [ ] intranet installation

4. Any other comments and development ideas regarding the network LCA tool or concept:

_____

_____

Thank you!

VTT Network LCA team

Summary

- Network LCA tool enables
  - ✓ Possibility to work through web-browser without software installations
  - ✓ LCA data collection with possibility to use pre-defined variable and unit lists → combatibility with the specific LCA model's nomenclature
  - ✓ Management of input data collection form versions
  - ✓ Publishing selected parts of LCA results, input data and model to the network members
  - ✓ Running data experiments individual and network level footprint assessment

- The current development version is cloud-based but can be transferred to intranet service

Future work

- Utilizing LCA results in Friday's session in electric vehicle economy level models
- Network LCA consortium continues network LCA tool development work. If interested in development and testing network LCA, please contact sami.majaniemi@vtt.fi

- VTT is currently starting LCA data collection on Li-batteries

Thank you

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