

## NEEDS in openLCA



Version: openLCA 1.5

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## 1 The NEEDS Life Cycle Inventory Database

The NEEDS Life Cycle Inventory Database is the European reference life cycle inventory database of future electricity supply systems created within the NEEDS project (New Energy Externalities Developments for Sustainability). The NEEDS LCI database contains international industrial life cycle inventory data on:

- future electricity supply systems (advanced fossil, hydrogen, fuel cells, offshore wind, photovoltaics, solar thermal, biomass, advanced nuclear, wave energy)
- future material supply
- future transport services.

The LCI datasets available in this database are designed to be used in long-term environmental technology assessment. The datasets contain descriptive information about the technology. Public technical reports, available for download, complement the documentation. Different scenarios for the technology development/electricity mix are considered in the database:

1. Today
2. 2025, pessimistic, 440ppm
3. 2025, pessimistic, BAU
4. 2025, realistic-optimistic, 440ppm
5. 2025, very optimistic, 440ppm
6. 2025, very optimistic, Renew
7. 2050, pessimistic, 440ppm
8. 2050, pessimistic, BAU
9. 2050, realistic-optimistic, 440ppm
10. 2050, very optimistic, 440ppm
11. 2050, very optimistic, Renew

Additional information about the NEEDS project and LCI database can be checked at:

<http://www.needs-project.org>

## 2 NEEDS in openLCA – What's new?

The first version of the NEEDS database in openLCA Nexus contained only 187 processes, whereas the current version (i.e. version 2) contains 794 system processes and 139 unit

processes<sup>1</sup>. The reason behind is that the reference function of the EcoSpold1 datasets provided in the NEEDS website is equal for the same technology/electricity mix and the different scenarios. The ecoSpold1 import of openLCA generates the universally unique identifier (UUID) of the process based on the reference function name, unit, category, subcategory, process geography, if it is an infrastructure process and if it is a unit or system process. Consequently, when importing the NEEDS ecoSpold1 xml files into openLCA, the same UUID was set for all the different scenarios and only the dataset of the first scenario was imported into the software (i.e. the software considered that the dataset already existed when trying to import the rest). This issue was not identified then as no error is shown during the import if the dataset already exists (i.e. process with equal UUID), so the database was provided incomplete in Nexus. In order to solve this problem, the original ecoSpold1 files were modified to make the reference function unique for each of the files. After all the processes were imported in openLCA, some refactoring of the database was carried out:

1. **Renaming of processes:** the name pattern “reference function name | scenario details” was used (Figure 1). If the dataset corresponded to a unit process, then “ | U” was added at the end of the name too.

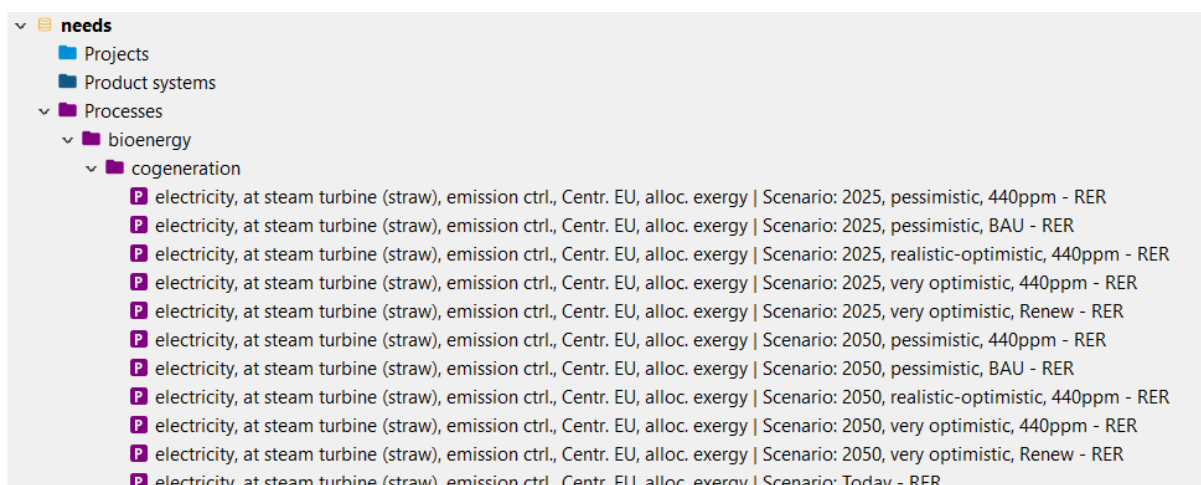


Figure 1. Example of process names in NEEDS, openLCA 1.5

2. **Categorization of product flows:** after the ecoSpold1 import, all the product flows remain uncategorized. The category path of the processes for which they are quantitative references was used for each product. However, additional work was needed if:
  - The same product was quantitative reference of processes with different category paths: this was only happening with datasets which were included in the category

<sup>1</sup> 794 ecoSpold1 datasets can be downloaded from the NEEDS website. Some of them contain at the end additional unit processes which have been also included in the openLCA database. These may correspond to system processes of NEEDS or to other unit processes modelled in the project.

“agricultural means of production/buildings” in addition to other categories. After reviewing the name of processes and products it was concluded that this categorization was likely to be a mistake from the data generators (Figure 2), so the processes were moved to more meaningful categories, and afterwards their reference products were also categorized accordingly. It should be noted additionally that the description of all these processes was: “The inventory refers to a compost plant over the lifetime of 25 years. The compost plant is constructed for a treating capacity of 10‘000 tons biogenic waste per year. The total turnover of the plant over the entire lifetime of 25 years amounts thus 250‘000 tons biogenic waste.”, which supports the conclusion that an error occurred with the metadata information of those processes.

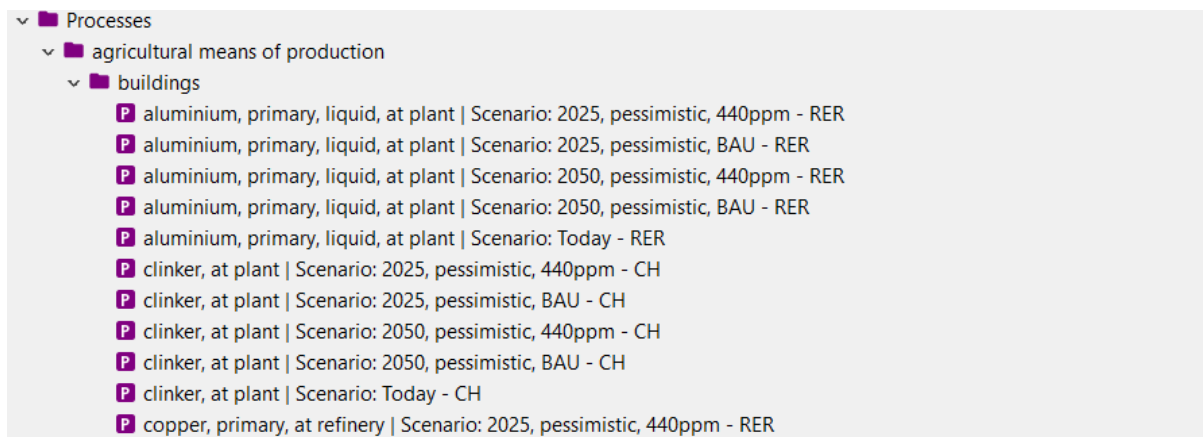


Figure 2. Example of processes with category "agricultural means of production/buildings" in the original ecoSpold1 files

- ecoinvent v.2.2 product flows were used as inputs in some of the unit process datasets: a mapping by flow name and location was conducted between NEEDS and ecoinvent v.2.2. The UUIDs and category paths from ecoinvent v.2.2 were applied to the intermediate flows included in NEEDS, so that ecoinvent processes can be easily used as providers. The sentence “ecoinvent v.2.2 product flow” was added in the description of the flow too.
  - Intermediate flows without provider were used as inputs in some of the unit process datasets: a new flow category “NEEDS dummy products” was created and the unproduced flows placed on it.
3. **Removal of duplicate unit processes:** the process “electricity, hard coal, at power plant 600 MW” for all scenarios was included in multiple ecoSpold1 files. Therefore, duplicate datasets were deleted leaving only one process per scenario.
  4. **Removal of duplicate sources:** sources with the same name and information were imported with the ecoSpold1 files. Thus, duplicates were removed and the processes

using them updated accordingly. The year of the source was added to the name to facilitate the identification of sources to the users.

### 3 Converting own models using the old NEEDS database of Nexus

If you used the old NEEDS database from openLCA Nexus to create your own models and you want to use them now with the new version of NEEDS available for openLCA, you can:

1. export your processes using NEEDS products as JSON-LD format (i.e. File → Export → JSON-LD), and
2. import them into a database containing the new NEEDS datasets (i.e. File → Import → JSON-LD).

The UUIDs of the product flows are equal between the two versions of the NEEDS database in Nexus; thus, after importing your processes you are going to be able to select as provider of the NEEDS products any of the datasets producing them in the new NEEDS database (i.e. different datasets available per technology/electricity mix for each scenario).

You could also import the new “needs.zolca” file downloaded from Nexus into your existing database in openLCA. By doing this, the old NEEDS processes will remain also in your database. You could differentiate them from the new ones based on the new process name pattern followed (see section 2 of this report).

### 4 Feedback & Contact

If you have other questions not addressed by this report, need further clarifications on any of the points commented, or have comments about the NEEDS database in openLCA, please contact us:

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