



## **DATASmart LCI Package**

# **Manual**

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## Introduction

**DATASMART LCI Package is a dataset for North American SimaPro customers** provided by Long Trail Sustainability (LTS). This dataset was originally developed to create a North American focused dataset, based on a combination of US LCI v.1.60 and Ecoinvent v.2.2 data, modified specifically to be representative of U.S. operations. In an effort to continually provide more data, DATASMART has expanded to a larger dataset, covering more regions and industries, containing data developed by LTS and data submitted to LTS by companies and researchers.

### Overview: What's in the DATASMART LCI Package?

DATASMART consists of a wide range of materials and processes inclusive of U.S. natural gas from hydraulic fracturing, U.S. natural gas mix, geothermal electricity generation, textile production processes, waste treatment processes for white goods and electronics, Chinese based pulp and paper data, updated energy modelling and much more.

Currently for U.S. life cycle inventory (LCI) data, many life cycle assessment (LCA) practitioners utilize ecoinvent, which is primarily European data, or US LCI, which has limited data. Wherever possible, DATASMART replaces links in the ecoinvent v.2.2 unit processes with U.S.-specific data, including electricity, natural gas, soybeans, etc. The dummy processes in the US LCI data are replaced with a close proxy. The end result is a database that better represents U.S. operations. DATASMART can fill the requirements of Product Category Rules (PCRs) that require US LCI data with the dummy processes replaced with appropriate data.

Over 700 original datasets are included in DATASMART, covering such industries as textiles, packaging, bio-materials and dairy; all 50 U.S. states, 13 Canadian provinces and territories, and electricity mixes from nine U.S. NERC regions and 26 eGRID subregions have also been added. It also includes critically reviewed branded data.

*The DATASMART LCI Package is developed and maintained by LTS with one to two updates a year. It is currently only sold as a package and available in SimaPro for SimaPro 9 license holders.*

### Citing the DATASMART LCI Package:

LTS. 2023. DATASMART LCI Package. <https://longtrailsustainability.com/services/software/datasmart-life-cycle-inventory/> Accessed on <Date>.

## DATASMART DATA

All specific and relevant documentation for each individual process can be found in the documentation fields in SimaPro itself. DATASMART data is primarily unit level data and is labelled with U in the process name. In the case that data must remain confidential and these details cannot be included, the data is included at the system level and labelled with S in the process name.

### Method

The LTS 2023 Method version 1.00, created by Long Trail Sustainability, covers commonly used endpoint and midpoint impact categories, containing the ReCiPe endpoint categories, cumulative energy demand, climate change and water use (see Table 1).

*Table 1: Selected impact categories and corresponding methods and units of measure for the LTS Method.*

Impact Category	Method	Units
Human Health	ReCiPe 2016 Endpoint (H) V1.08	DALY
Ecosystems	ReCiPe 2016 Endpoint (H) V1.08	Species.yr
Resources	ReCiPe 2016 Endpoint (H) V1.08	\$
Cumulative Energy Demand	CED V1.11	MJ
Climate Change	IPCC 2021 GWP 100a V1.02	kg CO <sub>2</sub> eq.
Water Use	ReCiPe 2016 Midpoint (H) V1.08	m <sup>3</sup>

### DATASMART Original Data

DATASMART includes over 700 original datasets developed by LTS and submitted by companies and researchers. Submission into the database entails an extensive review of the data to ensure accuracy. This data includes data across many industries, including metals, agriculture, textiles, etc. Notably, DATASMART data includes:

- The 50 U.S. state electricity mixes and nine NERC region mixes at high, medium and low voltage levels. \*New\* in 2023, added 26 eGRID subregion mixes at high, medium and low voltage levels.
  - There are 27 eGRID subregions, but Puerto Rico is both a NERC region and eGRID subregion. Therefore, PR has just been included as a NERC region in this database.
- Electricity mixes for the 13 Canadian provinces and territories at high, medium, low voltage levels.
- 75 Chinese specific manufacturing processes, submitted by Ecovane, part of PRé's Partner network.

- Molybdenum data from the International Molybdenum Association.
- Household activities, including clothes washing and drying and dishwashing.
- Textile production processes including fabric treatment, cutting and sewing, and more.
- Strawberries and milk from the U.S. Dairy Greenhouse Gas Carbon Footprint project.
- Many packaging processes, including recycled containerboard and corrugate and molded pulp, including YFY Jupiter’s branded straw-based pulp.
- Many more.

### Energy Mixes

LTS has created specific energy and electricity mixes to represent recent conditions in the U.S. This data is more frequently updated and more specific than data found for U.S. energy in other databases.

The underlying U.S. electricity and natural gas mix are based on eGRID2021, U.S. Environmental Protection Agency (EPA) data published in January 2023. See Table 2 for more details.

*Table 2: Underlying U.S. electricity mix (Source: U.S. EPA)*

	2021
Hard coal	21.9%
Oil	0.6%
Natural gas	38.5% (71% shale)
Petroleum coke	0.5%
Biomass	1.3%
Nuclear	18.9%
Hydro	6.0%
Geothermal	0.4%
Solar PV	2.8%
Wind	9.2%
Unknown purchased fuel (0.1%) was added to the highest energy source, natural gas.	

**U.S. Electricity mixes**

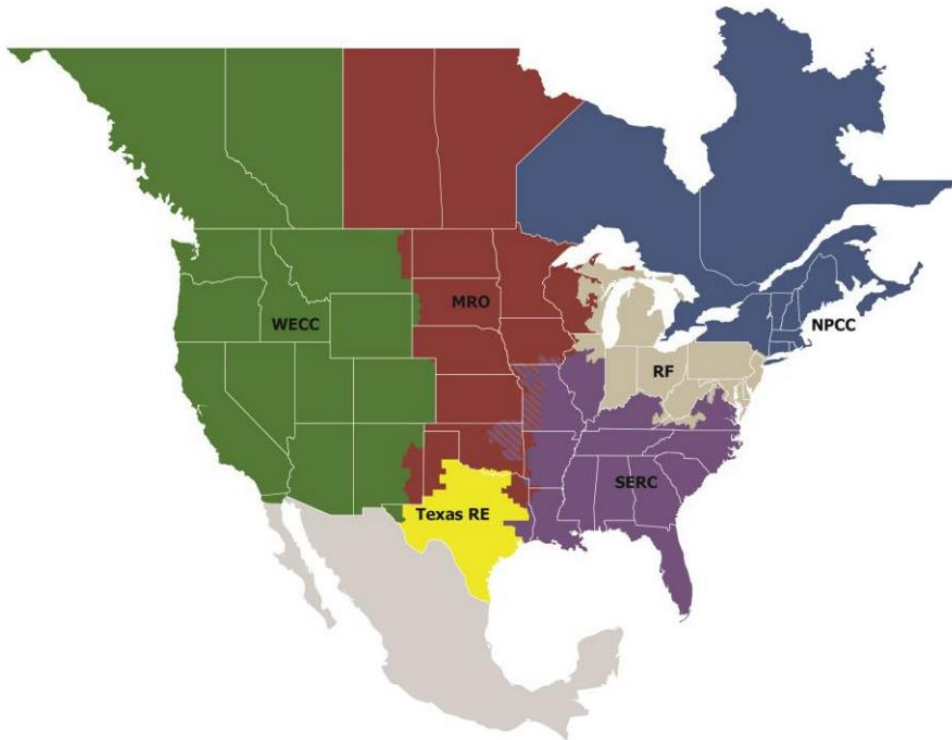
LTS has created electricity mixes for the 50 U.S. state and the District of Columbia electricity mixes (production + import), the nine U.S. NERC regions (see Table 3 and map in Figure 1, note: Alaska, Hawaii, and Puerto Rico not shown in map), the 26 U.S. eGRID subregions (see map in Figure 2), and the U.S. country average, at the production, high, medium and low voltage levels, based on 2021 U.S. EPA data.

*Table 3: Names and abbreviations of the nine NERC regions (Source: U.S. EPA)*

NERC Region	NERC Name
AK	Alaska
HI	Hawaii
MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
PR	Puerto Rico
RFC	Reliability First Corporation
SERC	SERC Reliability Corporation
TRE	Texas Regional Entity
WECC	Western Electricity Coordinating Council

Note that as of 2019, FRCC was no longer a NERC region (FERC, 2019)

Note that as of 2020, ASCC and HICC were no longer included as NERC regions in the EIA data.



*Figure 1: Map of U.S. NERC regions (Source: U.S. EPA)*

Table 4: Names and abbreviations of the 26 eGRID subregions (Source: U.S. EPA)

eGRID Subregion	eGRID Subregion Name	eGRID Subregion Description
AKGD	ASCC Alaska Grid	South/Central Alaska
AKMS	ASCC Miscellaneous	Most of Alaska
AZNM	WECC Southwest	Southwest US
CAMX	WECC California	Southwest Coast/Most of California
ERCT	ERCOT All	Most of Texas
FRCC	FRCC All	Most of Florida
HIMS	HICC Miscellaneous	Hawaii excluding Oahu
HIOA	HICC Oahu	Oahu Island
MROE	MRO East	Eastern Wisconsin
MROW	MRO West	Upper Midwest
NEWE	NPCC New England	New England
NWPP	WECC Northwest	Northwest US
NYCW	NPCC NYC/Westchester	New York City
NYLI	NPCC Long Island	Long Island, New York
NYUP	NPCC Upstate NY	Upstate New York
PRMS	Puerto Rico Miscellaneous	Puerto Rico
RFCE	RFC East	Mid Atlantic
RFCM	RFC Michigan	Most of Michigan
RFCW	RFC West	Ohio Valley
RMPA	WECC Rockies	Colorado-Eastern Wyoming
SPNO	SPP North	Kansas-Western Missouri
SPSO	SPP South	Texas Panhandle-Oklahoma
SRMV	SERC Mississippi Valley	Lower Mississippi Valley
SRMW	SERC Midwest	Middle Mississippi Valley
SRSO	SERC South	Southeast US, Gulf Coast
SRTV	SERC Tennessee Valley	Tennessee Valley
SRVC	SERC Virginia/Carolina	Virginia/Carolinas

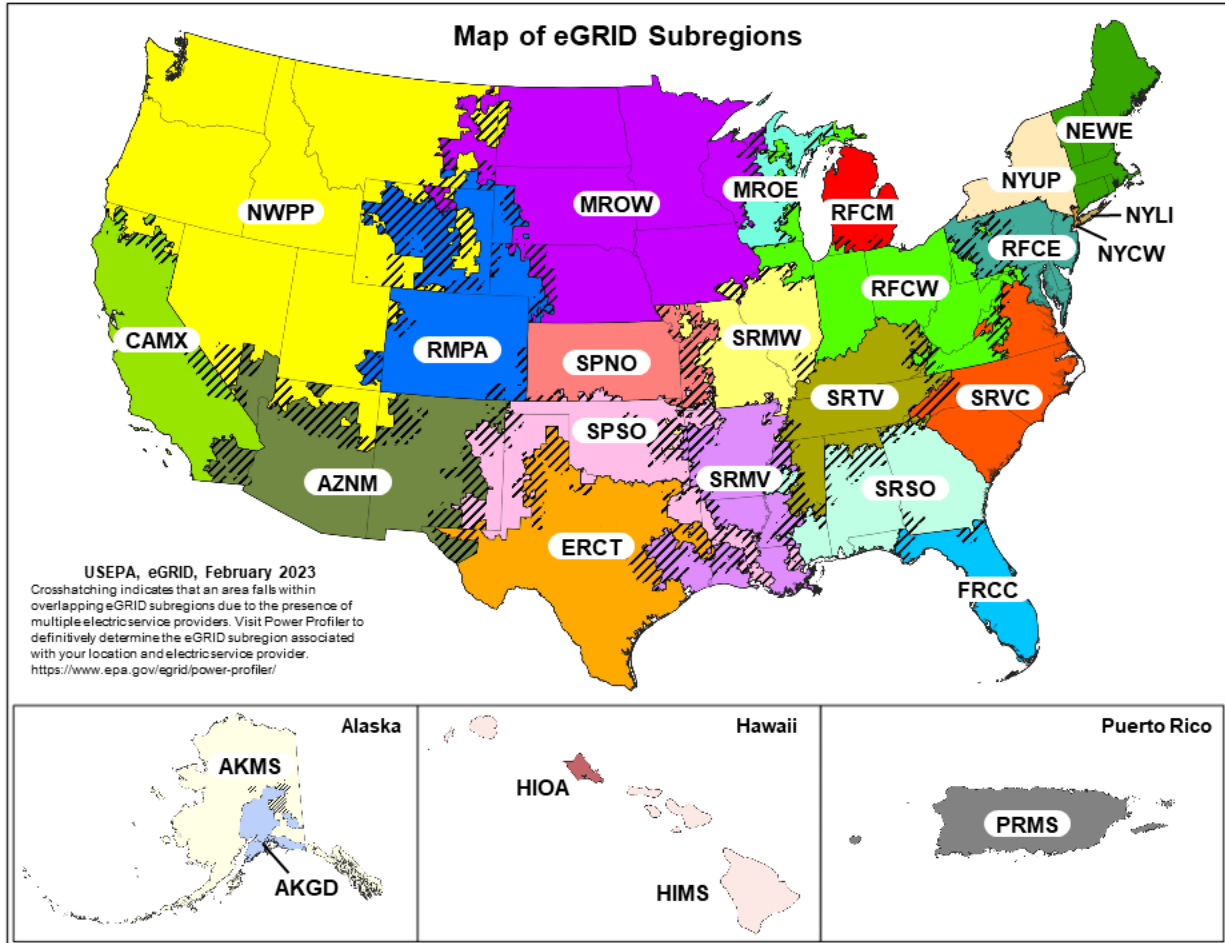


Figure 2: Map of U.S. eGRID subregions (Source: U.S. EPA)

### Canadian Provinces and Territories Electricity Mixes

LTS created Canadian electricity mixes for the Canadian country average and the 13 Canadian provinces and territories (see map in Figure 3) at the production, high, medium and low voltage levels, based on data from the Government of Canada in 2021.

- Alberta
- Ontario
- British Columbia
- Saskatchewan
- Manitoba
- Yukon
- Northwest Territories
- Nunavut
- Quebec
- New Brunswick
- Newfoundland and Labrador
- Nova Scotia
- Prince Edward Island
- Canada



Figure 3: Map of Canadian Provinces and Territories (Source: Sporcle)



## Modified Ecoinvent 2.2 Data

DATASMART replaces links in the ecoinvent v.2.2 unit processes with U.S.-specific data (largely energy and fuel) in order to better represent production in the U.S. It contains over 3,000 modified ecoinvent datasets, such as chemicals, metals, energy, transport and waste treatment processes. This data is also used in the background of the DATASMART original datasets.

### Data Selection

Some data were not modified completely with upstream U.S. specific processes and can be ignored. This data has been moved to a category called “alternative” data or “Non-RNA<sup>1</sup> processes.” Therefore, we recommend considering the “alternative” data obsolete and ignoring this data. If this data has been used in your projects, we suggest that you select the appropriate Ecoinvent 2.2 data in its place.

LTS has left a recommended process in the main folder and moved the processes which should not be used to the “Non-RNA processes” folder. The following symbols are used to represent the geography of the country that the original process was based on.

Symbol	Country
-	RER (Europe)
**	DE (Germany)
*	CH (Switzerland)

We selected the recommended processes according to the following decision tree:

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<sup>1</sup> RNA stands for the ‘rest of North America’.

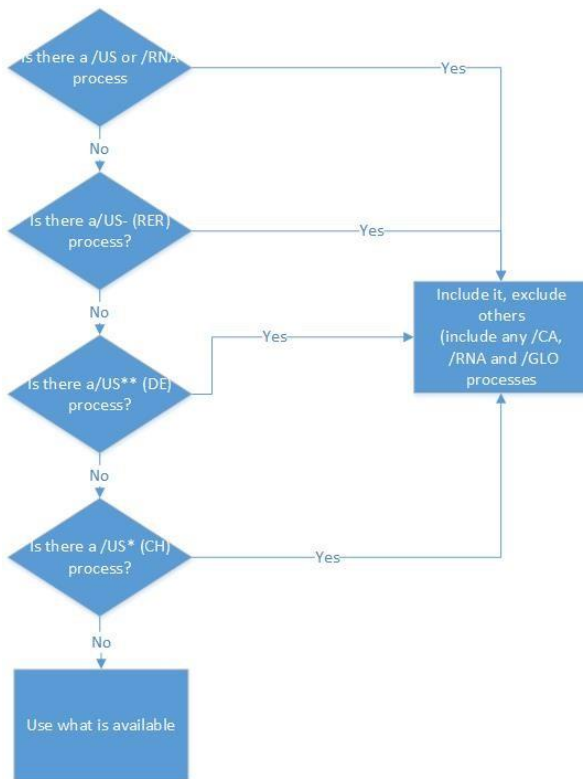


Figure 2: Decision tree used to select data for use in modified ecoinvent 2.2 data.

The decision tree was based on LTS’s empirical experience with U.S. manufacturers indicating that a European average was more similar to the U.S. condition than a particular country average and that manufacturing conditions in Germany are in general more similar to the U.S. than in Switzerland. If this is not the case for a particular piece of data, it can still be found under a subcategory with the same name as the parent category with the word “alternative” after the parent category name.

### Modified US LCI 1.60 Data

The US LCI database contains “dummy processes” (i.e. an empty process; no environmental burdens) and recommends that these dummies be filled. DATASMART replaced 146 of the 186 dummy processes with an ecoinvent proxy using U.S. energy (detailed in *DATASMART - US-EI Dataset - Dummy USLCI Processes Replaced with Proxies.xlsx*, which is available upon request). Some of the dummy processes were not replaced if they were not available in the ecoinvent dataset, or if they were intentionally empty because they followed the cut-off approach. The end result is a more comprehensive database that better represents U.S. operations. DATASMART can fill the requirements of Product Category Rules (PCRs) that require US LCI data with the dummy processes replaced with appropriate data.

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