A Semantic Knowledge Platform for the Energy Value Chain

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Motivation

To mitigate further climate change, greenhouse gas emissions need to be avoided. How exactly the transformation of the energy value chain should happen is the subject of active research and public debate. The following arguments show why keeping track of all necessary information can be a challenging task:

- **Complexity:** The (physical) energy value chain is a complex system spread over the whole world. In the creation of its parts all technological disciplines are involved.
- **Multi-Aspect:** Not only physical or technical arguments play a role. Organizational, political, social and psychological aspects can be decisive.
- **Continuous Change:** Considerations have to be continuously updated and modified in regard of technical progress and political situations.

We, the group of digital transformation at Fraunhofer ISC are developing a knowledge management system called **OpenSemanticLab** (OSL).

The target of our development is a system that is able to reflect arbitrary knowledge and data in a flexible, yet structured fashion. It puts emphasis not only on data itself but rather on the versatile relations between heterogeneous pieces of information.
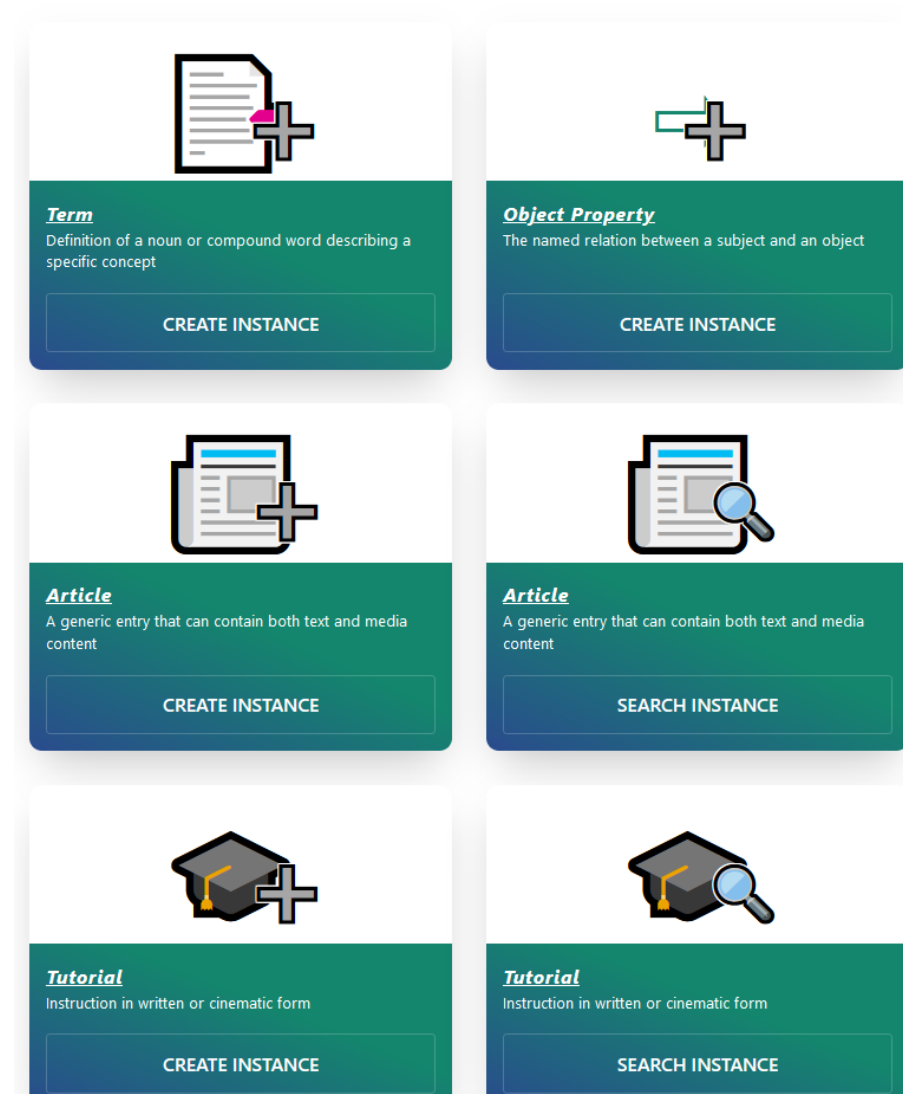
Shortcut tiles from the main page of the OpenSemanticLab demo instance[2].
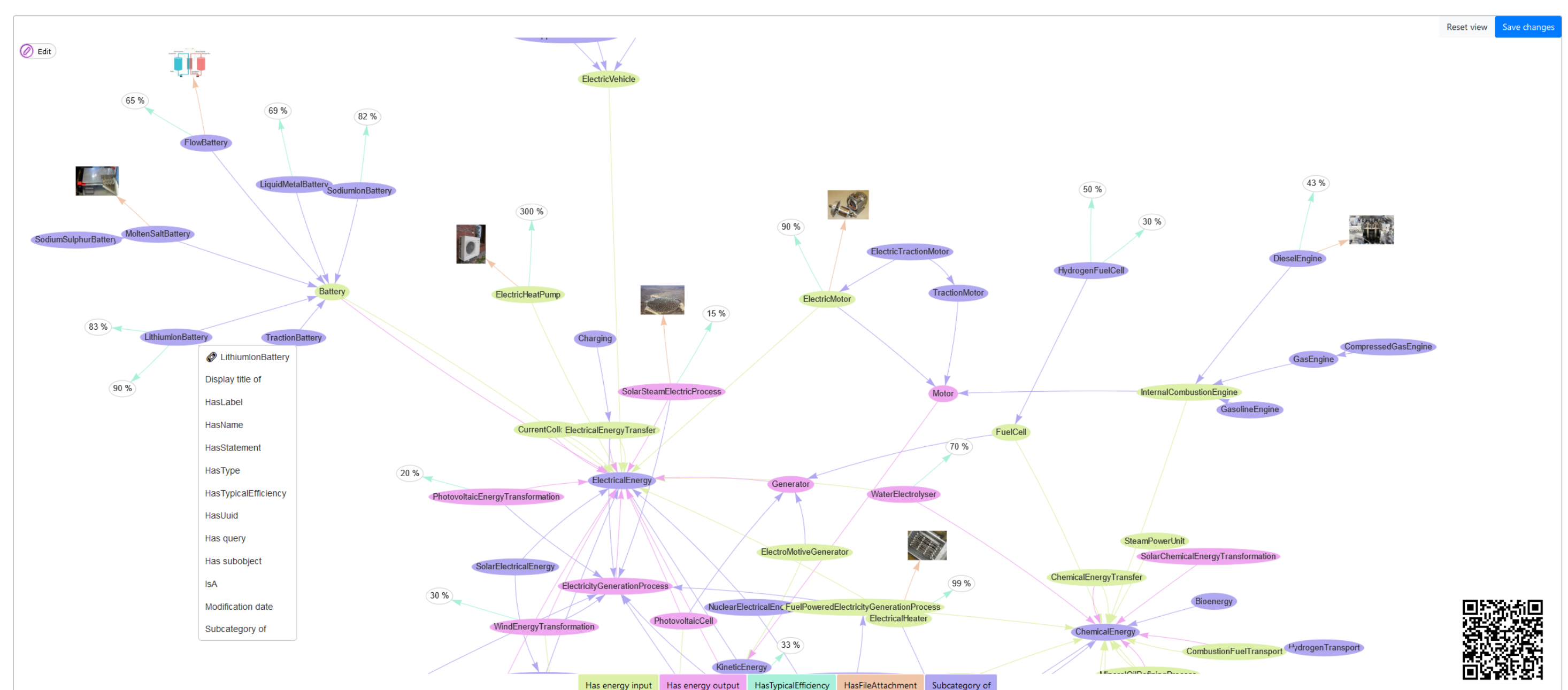
Knowledge Graph View[4]

OpenSemanticLab (OSL)

- **OPEN:** OSL is built on open-source-software such as media-wiki, the software behind Wikipedia, as well as diverse viewing and editing tools. Its source code is freely accessible on github[1]
- **SEMANTIC:** Data is treated within its context and metadata with a focus on relations between pieces of information and their meaning.
- **LAB:** OSL has its origin in materials research laboratories where heterogeneous information has to be documented, organized and linked. Since the system is, however, agnostic of the specific kind of information it will presumably be renamed to "OpenSemanticWorld".

OSL is an online platform and can be accessed with any device that has a modern web browser.

Features

- **Electronic Lab Notebook** including a markup-editor, presentation functionality, specialized editors such as drawing tools, diagram editors, spreadsheet editor, chemical formulas…
- **Multi Media Content** such as explanation videos.

- **Search Engine:** For easy access of information.
- **Python API:** All data within OSL can be accessed via a dedicated python API. By the use of JSON-Schema typed JSON-LD (linked data) entities can be exported or imported making OSL AI-ready.

Demo Platform

For the 791. W.E. Heraeus Seminar, we imported the **Open Energy Ontology[3]**. It is a structured system of scientific terms and relations that shall serve as a scaffold for information that can be added from now on in our **openly accessible demo-platform[2]**. Inside OSL it can be annotated and enriched with data or media content.

- **View existing content:** existing articles, and data can be viewed without login. Follow the link to the demo page[2].
- **Get started:** In order to test the editing features and write a practice article, you can log in with your ORCID-ID. Visit the 971. Heraeus Seminar Page[5] where explanations and tutorials are linked.

- **Contribute:** Share some of your expert knowledge and link it to the Open Energy Ontology.

Benefits

Linking information in a fine-granular fashion with controlled vocabulary makes it possible to **automatically update** values and downstream tables or visualizations.

A **community-maintained** knowledge graph can bring ontologies into application and deliver precise and proven answers.

Logical Conclusions can then be drawn programmatically, harnessing the power of **digitalization** and **artificial intelligence**.

Contact

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1   OSL Github Page: https://github.com/OpenSemanticLab
2   OSL Demo Main Page: https://demo.open-semantic-lab.org/wiki/Main_Page
3   Open Energy Ontology: https://openenergy-platform.org/ontology/
4   OSL Demo Energy Graph: https://demo.open-semantic-lab.org/wiki/Category:OSW1d9795e5c175529a9232221ab3a4320e
5   OSL Page for the 971. W.E. Heraeus Seminar: https://demo.open-semantic-lab.org/wiki/Item:OSW5eb075ae1caf4f31ac7994334cb3f673