

Development of a User-Friendly Database for the Energy Model

Generator TIMES

The transformation of the energy system requires significant changes in infrastructure, technologies, regulatory frameworks, and market structures. Energy models provide a rigorous way to simulate and evaluate these changes in advance, thereby helping to optimize the transition pathway.

TIMES is an energy model generator developed within the IEA/ETSAP initiative and implemented in the GAMS modeling environment. Unlike many other commonly used generators, TIMES is particularly suitable for representing the entire energy system across all sectors. While it is less tailored to highly granular analyses of variable renewables, the required temporal resolution can be achieved with appropriate configuration.

As part of a national contribution to IEA/ETSAP projects, material flows will be represented more comprehensively in the global TIAM model to better understand resulting energy demands as well as the material requirements associated with the expansion of renewable energy technologies.

TIMES and the TIAM model currently suffer from a limited user interface. This project therefore aims to lay the foundation for an improved interface by developing a structured database and associated connectors.

The database structure follows the logic of the TIMES model generator. It comprises sets (one- or multi-dimensional) and parameters that reference these sets. Conceptually, the model organizes around energy carriers, conversion processes, and demands. Depending on the scenario, parameters may take multiple values for a given variable.

The project will develop the database together with interfaces to GAMS and to end users. The user interface should be simple, transparent, and support automated model operation.

Accompanying Lectures

Two lectures are available:

- Fundamentals of Energy Modelling (ED180003)
- Modelling of Energy Systems (EI70870)

Both provide an excellent foundation for the methodological underpinnings of the project—the first with a stronger mathematical focus, the second with a techno-economic perspective.

Milestones

1. Baseline database structure with documentation
2. Database implementation
3. Database–GAMS interface
4. User interface for the database

Timeline

Work Package	Share of Time	Short Description
Understanding the model structure	15%	Understanding the model; installation, tutorials, initial runs
Database selection	10%	Identify open-source databases; check TIMES compatibility
Concept development	10%	Database structuring; graphical schema
Implementation	25%	Build the database; link data sources; develop special relations for TIMES entities
Interface to GAMS	10%	Connect the TIMES model to GAMS
User interface	25%	GUI development; usability and visualization; user documentation
Extensive testing	10%	Validate all interfaces; performance and stress tests; final report

Note: Percentages refer to the share of total project duration and are executed sequentially.

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