

Tulipa Energy Model



Package Ecosystem

PREPROCESSING

TulipaProfileFitting.jl

Fits historical time-series data to future target capacity factors.

TulipaClustering.jl

Clusters input data into representative periods to reduce the size of the problem in the time dimension.

CORE PACKAGE

TulipaEnergyModel.jl



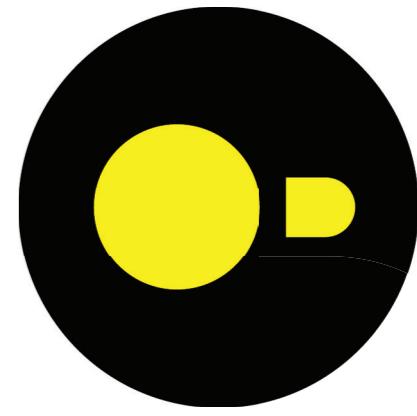
Builds investment and dispatch problem formulations using JuMP.jl – Julia's mathematical modelling package. JuMP is a key reason we chose the Julia Programming Language. Tulipa is compatible with the open-source optimizer HiGHS, as well as the commercial optimizers Gurobi and XPress.

OPTIONAL METHOD

NearOptimalAlternatives.jl

Produces multiple alternatives that are drastically different from the optimal solution, using methods such as Modelling to Generate Alternatives (MGA).

DATA-HANDLING



TulipalO.jl

Provides an accessibility wrapper to work with DuckDB from Julia that is tailored for Tulipa workflows. We chose DuckDB for its lightweight, serverless design and ease of interoperability.

We originally combined DuckDB with Julia dataframes, but in a major refactor we moved all data-handling into DuckDB to improve performance and code elegance.

Why Tulipa?

Energy system optimization models are essential for guiding policy and investment decisions in the transition to renewable energy.

But as problems grow in size and complexity, existing tools are hitting their computational limits. Leveraging innovative formulations and lean code implementation, Tulipa is built from the ground up with a focus on efficiency and flexibility – enabling it to tackle complex, European-scale problems with the detail and accuracy needed to support real-world decisions.



Partners



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