


Session 1: METIS in a nutshell

METIS 1 – Dissemination event

4 Initial mission (in 2015)

- | Call for Tenders ENER/C2/2014-639
- | Provide stronger analytical capabilities to EC
- | Increase transparency
- | Offer a platform for coordination of related analyses across EU

4 The METIS project

- | Consortium:  | OPTIMIZATION SOLUTIONS
- | Project duration: 2015-2018
- | Budget: 3.0 M€



Type of user	Typical questions	User needs
Policy-makers & analysts	<ul style="list-style-type: none"> • What is the impact of a power/gas supply disruption? • What are the benefits of new infrastructure projects? • What is the impact of new flexible power usages? 	<ul style="list-style-type: none"> • Easy-to-use graphical interface • Intuitive study process • Modify key data and launch simulation • Have access to detailed results
Developers	<ul style="list-style-type: none"> • Develop models for specific flexible usages • Build a new scenario • Refine the model on the biomass sector 	<ul style="list-style-type: none"> • Ensure full transparency • Advanced API to access/modify detailed data/constraints • Publish releases for analysts

- ▣ METIS is used by a community of modellers
 - | EC staff
 - | JRC (more than 10 users)
 - | Member States (Belgium, Federal Planning Bureau)
 - | Consortium members

- ▣ Presentation of tool, data, results at workshops and conferences
 - | ENTSOs, MSs, academic conferences

- ▣ Around 40 reports & technical notes

	Module	Studies
Power systems	Power system module (TN1 + TN6)	S4 – Generation and system adequacy analysis S2 – Assessing TYNDP 2014 PCI list (power) S7 – The role and need of flexibility in 2030 S7b – Flexibility in 2030: focus on storage S11 – Effects of high RES shares on power systems
Power markets	Power market and stochasticity module (TN2 + TN3)	S12 - Assessing market design options in 2030 S16 – Weather-driven revenue uncertainty for producers S18 – Simulating electricity market bidding and price caps
Gas system and markets	Gas module (TN 7)	S5 – Impacts of PCIs on gas security of supply
Heat	Heat module (TN 8)	S6 – System benefits of decentralised heat pumps S9 – Cost-efficient district heating development
Synergies between energy vectors	Demand module (TN 8)	S13 – Electric vehicles: power system impacts and RES integration S8 – The role and potential of power-to-X in 2050 S1 – Synergies between energy networks S14 – Market revenues and producer risks
Other documentation	Technical Notes 4 + 5	Overview of European Electricity Markets METIS introduction and architecture
	html documentation	Description of all assets, KPIs, behaviours etc.

4 METIS website

METIS - Modelling the European Energy System

METIS is a mathematical model providing analysis of the European energy system for electricity, gas and heat. It simulates the operation of energy systems and markets on an hourly basis over a year, while also factoring in uncertainties like weather variations. For example, it can analyse the hour-by-hour impact of using more renewable energy.

The model can be used at national or regional level.

METIS is used by the European Commission to further support its evidence-based policy making, for electricity and gas. Recently it has been used to inform the Commission's proposals for a new energy market design, as well as renewable energy and energy security issues.

Related documents

Overview and Technical Documents

- METIS Introduction and architecture
- Power System Module
- Power Market Module
- Gas System Module
- Integration of PRIMES scenarios into METIS
- METIS detailed html documentation
- Questions and answers about METIS

Studies

- Assessing market design options in 2030
 - Technical Note - Overview of European Electricity Markets
 - Technical note - Methodology for the integration of PRIMES scenarios into METIS
 - Technical Note - METIS market module configuration for Study S12: Focus on day-ahead, intraday and balancing markets
- A common approach for generation and system adequacy
- The role and need of flexibility in 2030: Focus on Energy Storage
- Weather-driven revenue uncertainty for power producers and ways to mitigate it

<https://ec.europa.eu/energy/en/data-analysis/energy-modelling/metis>

4 html documentation

METIS 1.0

Search docs

ASSET MODELS

Library documentation

API documentation

INDICATORS

KPI documentation

- Balancing activation
- Balancing activation costs
- Balancing activation revenues
- Balancing needs
- Balancing reserve payments
- Capacity Factor
- CO2 emissions (balancing)
- Congestion Hours
- Congestion Rent
- Consumer Surplus
- Consumption decrease
- Consumption (detailed)
- Consumption increase
- Curtailment
- Curtailment (balancing)
- Curtailment cost
- Curtailment cost (balancing)
- Curtailment cost (electricity detailed)
- Curtailment (electricity detailed)
- Demand
- Demand peak

Production costs

Indexed by

- scope
- zone
- energy
- test case
- technology

The KPI computes the total production costs in a given zone, for a given energy and a given technology.

For electricity production, costs fall in various categories: variable cost, fuel cost (both for generation and running capacity), start-up cost, CO2 emission cost, and running capacity cost (independent of fuel cost).

$$variableCost_{technology,zone,energy} = \sum_t productionCost_{technology,zone,energy} \cdot production_t^{technology,zone,energy}$$

$$fuelCost_{technology,zone,energy} = \sum_t fuelCost_{zone,energy} \cdot fuelConsumption_t^{technology,zone,energy}$$

$$co2EmissionsCost_{technology,zone,energy} = \sum_t co2EmissionIndexedCost_{zone,energy} \cdot co2Emissions_t^{technology,zone,energy}$$

$$runningCapacityCost_{technology,zone,energy} = \sum_t runningCapacityCost_t^{technology,zone,energy}$$

$$startUpCost_{technology,zone,energy} = \sum_t startUpCost_t^{technology,zone,energy}$$

Production costs (electricity detailed)

Indexed by

- scope
- zone
- energy
- test case
- technology
- cost component

The KPI computes the detailed production costs in a given zone, for a given technology, associated to the electricity production.

https://ec.europa.eu/energy/sites/ener/files/metis_detailed_html_documentation.zip

4 METIS 2

- | Project duration: 2018-2021
- | Integration of distribution and transmission **grid modelling**
 - ↳ Dedicated data collection
 - ↳ Flow-based vs NTC
 - ↳ Grid model to assess the impacts of local flexibility solutions
- | Includes **six studies** to test the model development, assess market design features and the future role and magnitude of flexibility measures
- | Develop a **web-based version** of METIS to visualise assumptions and results

Thank you for your attention!

Contact

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Interested in further information?

<https://ec.europa.eu/energy/en/data-analysis/energy-modelling/metis>

