

Open-source data, tools and energy system models for civil society protection

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Find this slide deck: <https://iriepin.com/uploads/euciv.pdf>

This talk as blog post: <https://iriepin.com/uploads/euciv.html>



What is PyPSA?

Our research focus:

- **Cost-effective pathways** to reduce greenhouse gas emissions
- **Evaluation** of grid expansion, hydrogen strategies, carbon management strategies
- **Co-optimisation** of generation, storage, conversion and transmission **infrastructure**
- **Algorithms** to improve the tractability of models
- **All open source** and open data

PyPSA



A python software toolbox for simulating and optimising modern power systems.

[Documentation »](#)

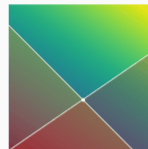
PyPSA-Eur



A Sector-Coupled Open Optimisation Model of the European Energy System

[Documentation »](#)

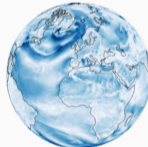
Linopy



Linear optimization interface for N-D labeled variables.

[Documentation »](#)

Atlite



A Lightweight Python Package for Calculating Renewable Power Potentials and Time Series

[Documentation »](#)

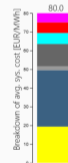
Powerplantmatching



A toolset for cleaning, standardizing and combining multiple power plant databases.

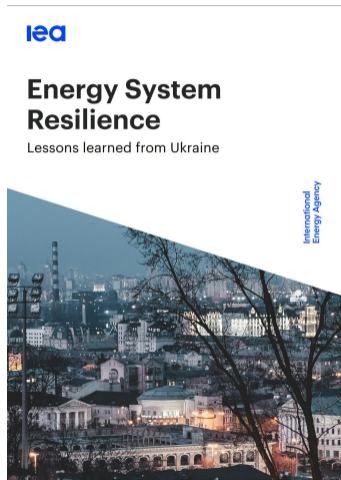
[Documentation »](#)

Model Energy

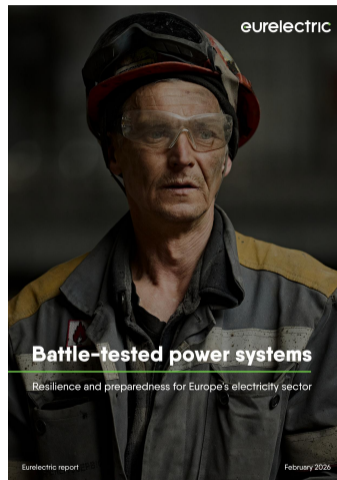


An online toolkit for calculating renewable electricity supplies.

Academic and institutional work on energy system resilience



IEA, *Energy System Resilience* (2026)



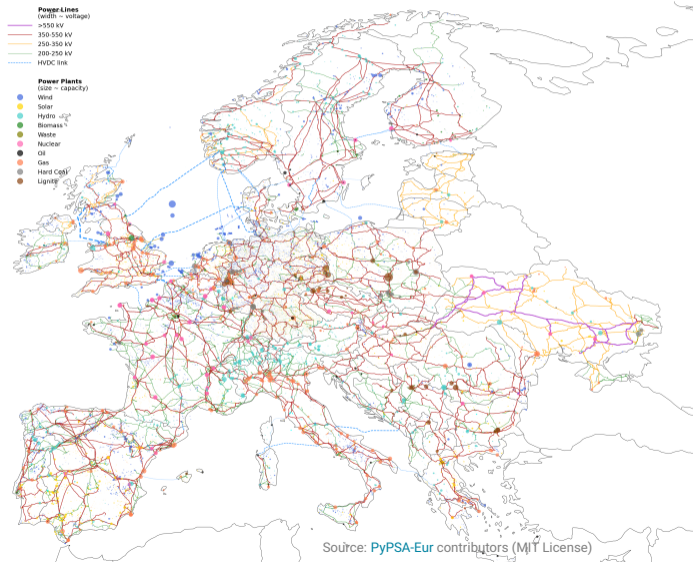
Eurelectric, *Battle-tested Power Systems* (2026)

PyPSA-Eur extended to cover Ukraine and Moldova

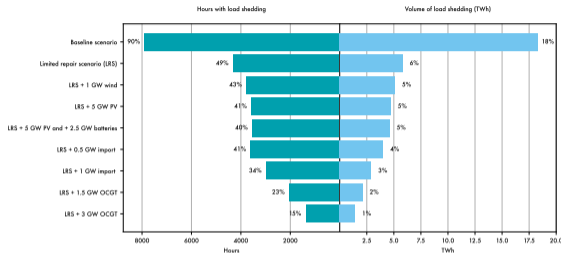
In 2022, our group extended **PyPSA-Eur** to cover **Ukraine and Moldova** – to support work on Ukraine's energy crisis caused by the Russian full-scale invasion.

Several research groups have built upon this data extension:

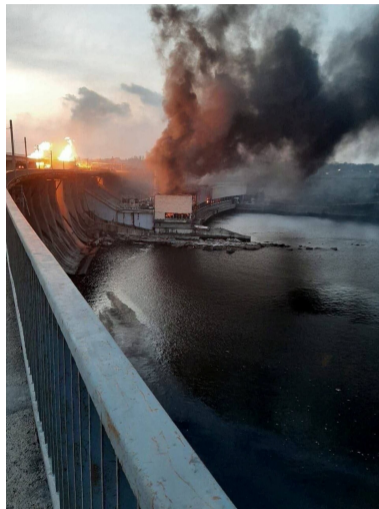
- [Green Deal Ukraine](#)
- [Sotnyk et al., 2024](#)
- [Zachmann et al., 2025](#)
- [Tröndle et al., 2024](#)
- [Oxford EPG report](#)



Mitigating Ukraine's Looming Electricity Crisis



1951 HOURS
with electricity outages in 2024



Source: Photo by Reuters (credit: Denys Shmyhal); left top: <https://ssrn.com/abstract=4930511>; left bottom: dixigroup.org

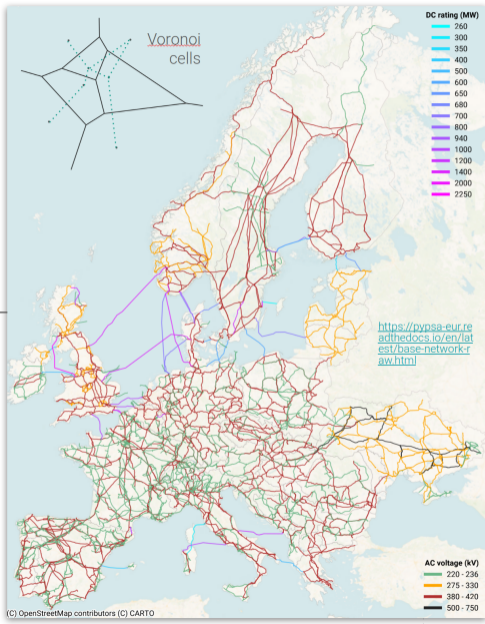
Power grid topology

OpenStreetMap data



Apply **standard line types** for capacity and parameters.

Calculate **dynamic line rating** potential from weather data.



TYNDP projects



European network with

- ~5,800 buses
- ~7,300 AC lines (>220 kV)
- 36 HVDC links (+TYNDP)

<https://www.nature.com/articles/s41597-025-04550-7>

Security by obscurity is a dangerous fallacy

The assumption: restrict access to infrastructure data so adversaries can't use it. If they don't know where the lines run, they can't attack them.

The reality: anyone who looks can find it

- commercial satellite imagery at **50 cm resolution**
- drone imagery and street-level photos
- commercial geospatial datasets
- public grid studies and regulatory filings
- web archives and cached maps



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About RESILIENT project: <https://resilient-project.github.io/>

Info PyPSA: <https://pypsa.org/>