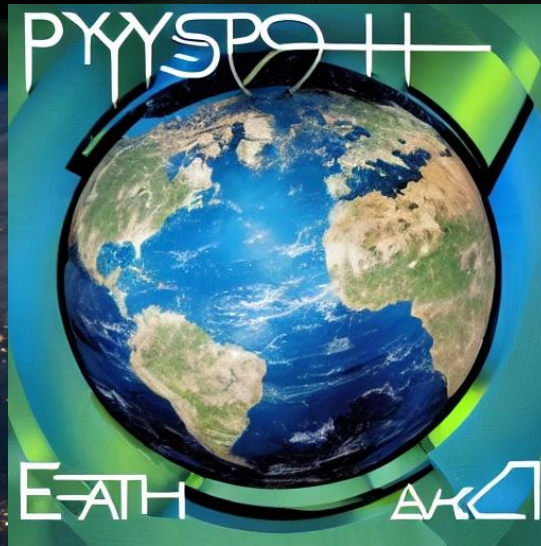


1st PyPSA user meeting

“What the heck is PyPSA-Earth?”



21.10.2022,
Ekaterina Fedotova (Central Asia lead PyPSA-Earth),
Maximilian Parzen (Co-director PyPSA-Earth)





Grassroots initiative that aims to accelerate and cost-optimize the world's transition to sustainable, accessible and reliable energy with open-source planning tools and open data.

FRAMEWORK AND MODELS FOR ENERGY SYSTEM MODELLING

PyPSA

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



Documentation
Source Code
Category: Framework
Maintained: pypsa.org

PyPSA-Eur

An open optimisation model of the European transmission system.



Documentation
Source Code
Category: Model
Maintained: pypsa.org

PyPSA-Eur-Sec

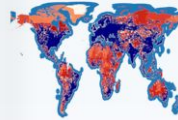
A sector-coupled open optimisation model of the European energy system.



Documentation
Source Code
Category: Model
Maintained: pypsa.org

PyPSA-Earth

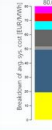
A flexible open sector-coupled optimization model of the global energy system.



Documentation
Source Code
Category: Model
Maintained: pypsa-meets-earth

Model.Scenarios

An online toolkit for running and exploring PyPSA-Eur-Sec scenarios.



Documentation
Source Code
Category: Model+Front-End
Maintained: pypsa.org

Model.Energy

An online toolkit for calculating renewable electricity supplies around the world.



Documentation
Source Code
Category: Model+Front-End
Maintained: pypsa.org

OPEN COMMUNITY

Check out our Discord server

The heart of the community life is happening on Discord (which we describe as better Slack alternative). We hold there all our meetings, coffee breaks and exchanges. Discord provides voice channels, text channels, and event stages. This also allows you to meet up or host your own events if desired.



Maintained: pypsa-meets-earth

Check out our Github Repository

You can find our developments in the GitHub repository, where you can join our community, create issues, share ideas and discuss with us. All of our developments are open source and GPL3 or MIT licensed, meaning they must stay open. Even the website you are looking at is open source. Feel free to use it and suggest improvements.



Maintained: pypsa-meets-earth

Check out our Documentation

The documentation describes in more detail how you can contribute, how our project is structured and further provides the code documentation. Additionally, we share learning materials and some relevant talks and papers in the room of PyPSA and Earth modelling. The documentation is also open, feel free to make it better.



DATA FOR ENERGY SYSTEM MODELLING

Atlite

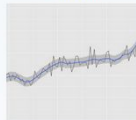
Convert weather data to energy systems data.



Documentation
Source Code
Category: Data
Maintained: pypsa.org

Demand-Creator

A machine learning toolbox to create demand-timeseries in subnational resolution.



Source Code
Category: Data
Maintained: pypsa-meets-earth

Detect-Infra

A machine learning pipeline to detect infrastructure from satellite images.



Source Code
Category: Data
Maintained: pypsa-meets-earth

Powerplantmatching

A toolbox to combine multiple powerplant databases.



Documentation
Source Code
Category: Data
Maintained: pypsa.org

Technology Data

A tool that compiles assumptions on energy system technologies.



Documentation
Source Code
Category: Data
Maintained: pypsa.org

OPEN SOURCE SOLVER INTERFACES AND SUPPORT

Linopy

Linear optimization interface for Python.



Documentation
Source Code
Category: Solver interface
Maintained: pypsa.org

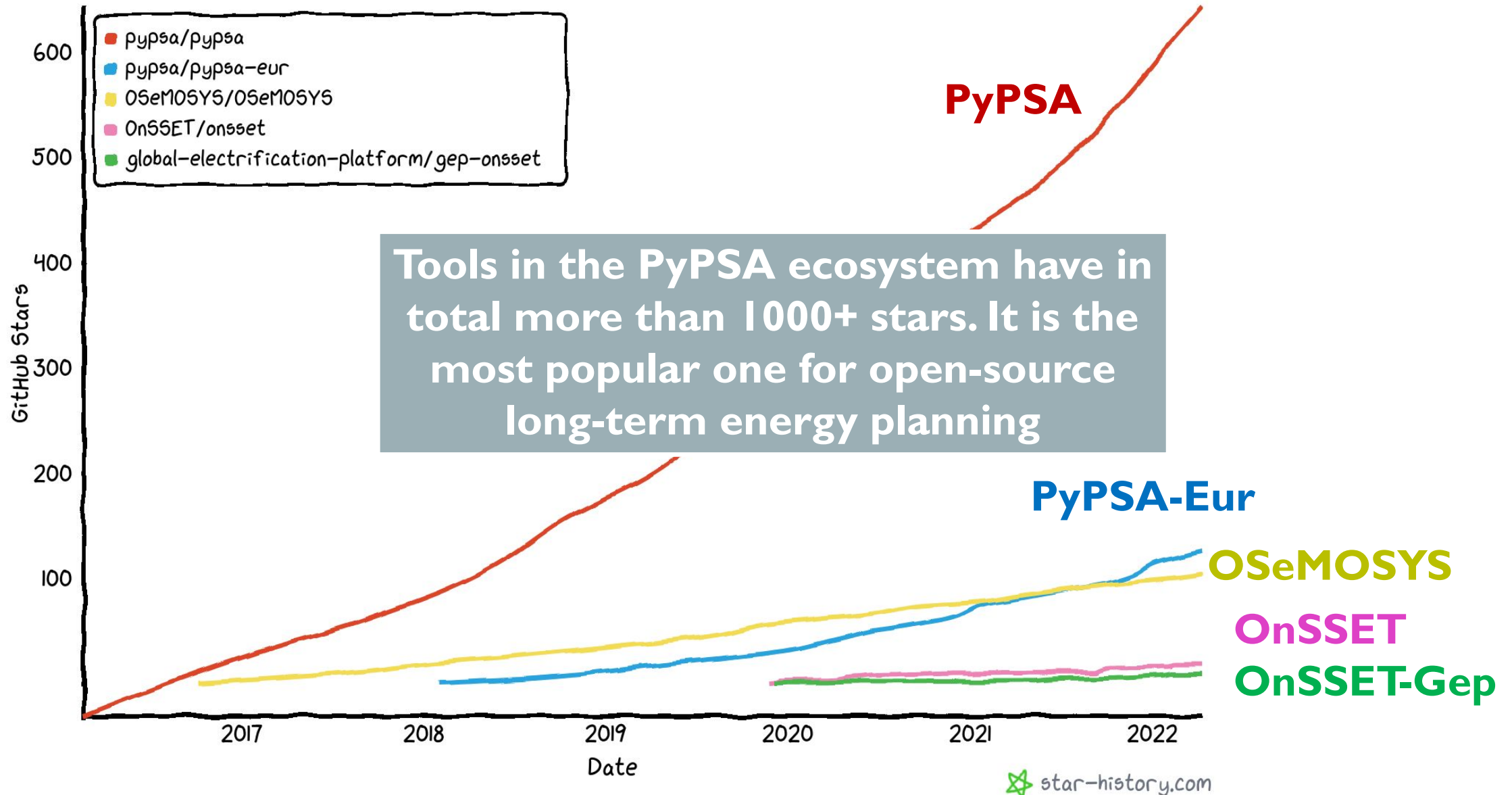
HiGHS-campaign

We organised a campaign, collecting +500k\$, to make the worlds-fastest open-source solver HiGHS ready for large energy planning problems.



Public Proposal
Source Code
Category: Campaign
Lead by: pypsa-meets-earth

GitHub stars – indicating the user popularity and adoption



PYPSA-EARTH DESIGN (=PYPSA-EUR DESIGN)

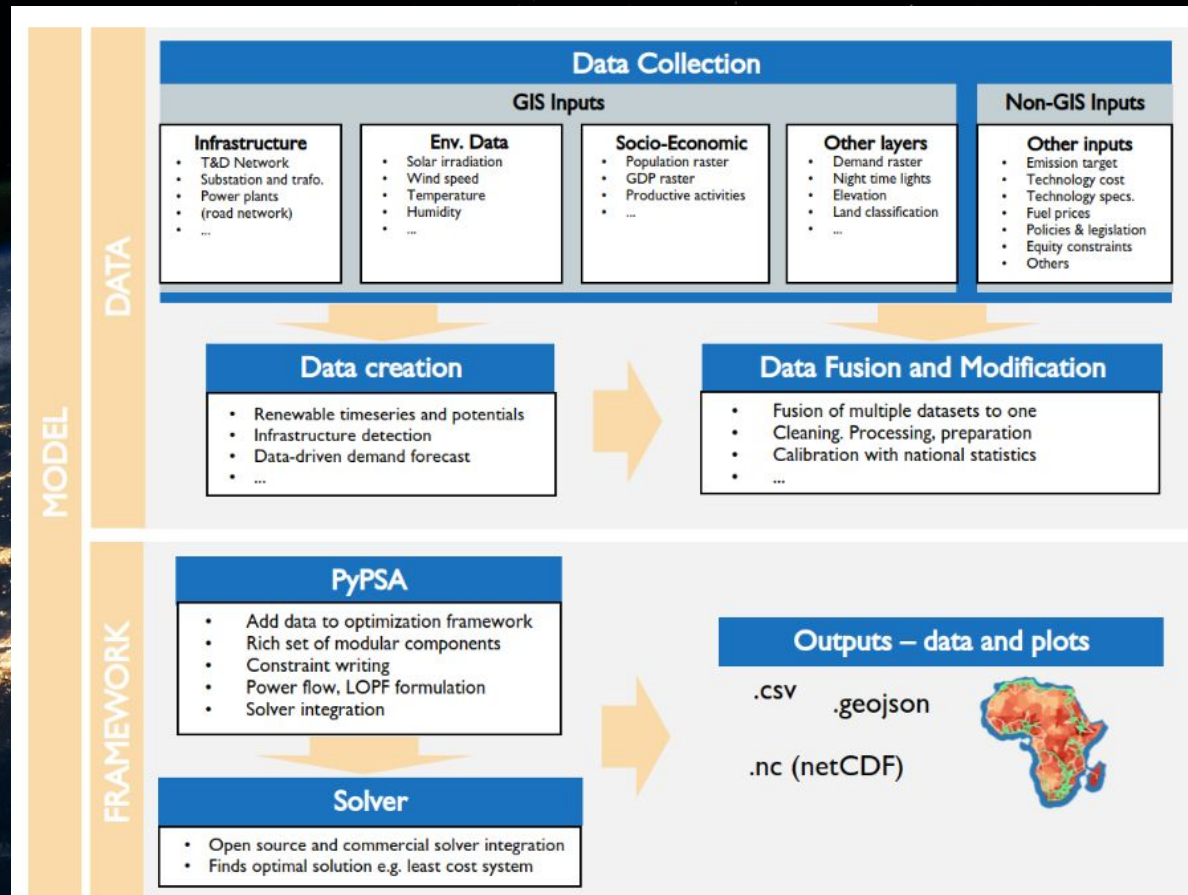
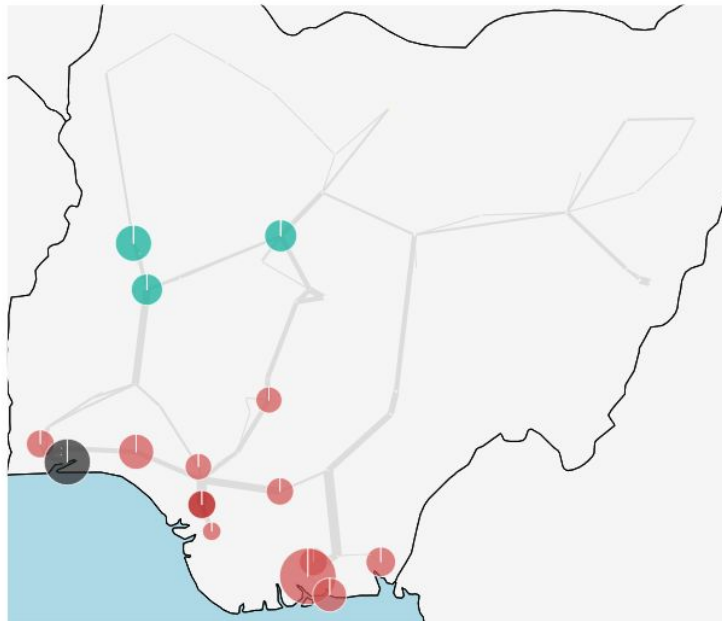


Figure 1: PyPSA-Earth model design. After providing the configuration parameters and countries of interest, data is collected and processed to be then fed into the PyPSA model framework which enables to perform the desired optimization studies such as least-cost system transition scenarios.

PYPSA-EARTH OUTPUT EXAMPLE

NIGERIA 2020 59 €/MWh

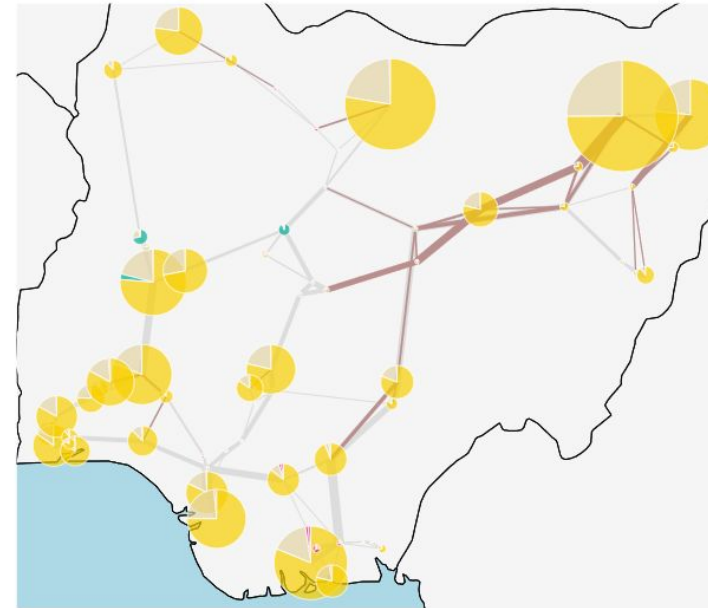


(a)

(b)

Figure 13: Optimization results of Nigeria's (a) 2020 power system. The coloured points represent installed capacities. (b) Shows all network options on a different scale as (a) with the total electricity consumption per node.

NIGERIA 2060 51 €/MWh



(a)

(b)

Figure 14: Optimization result represent Nigeria's (a) 2060 power system. The coloured points represent installed capacities. Light grey and dark grey lines are existing and newly optimized transmission lines, respectively. (b) Shows all network options on a different scale as (a) with the total electricity consumption per node.

How to be part of the team?

GET INFORMED

- gain knowledge -

- Check out publications/papers
- Checkout YouTube/ Google
- GitHub issues & PR's indicate needs

USE TOOLS

- gain experience -

- Apply tools for a small or big study
- Play around with tools

SET GOALS

- mindset to contribute -

- New data interface
- New methods
- New technology
- Performance increase
- Rewrite legacy code
- New validation
- New package

REACH OUT

- understand how to do that -

- Write us on Discord
- Write a comment on GitHub
- Join “open” meetings

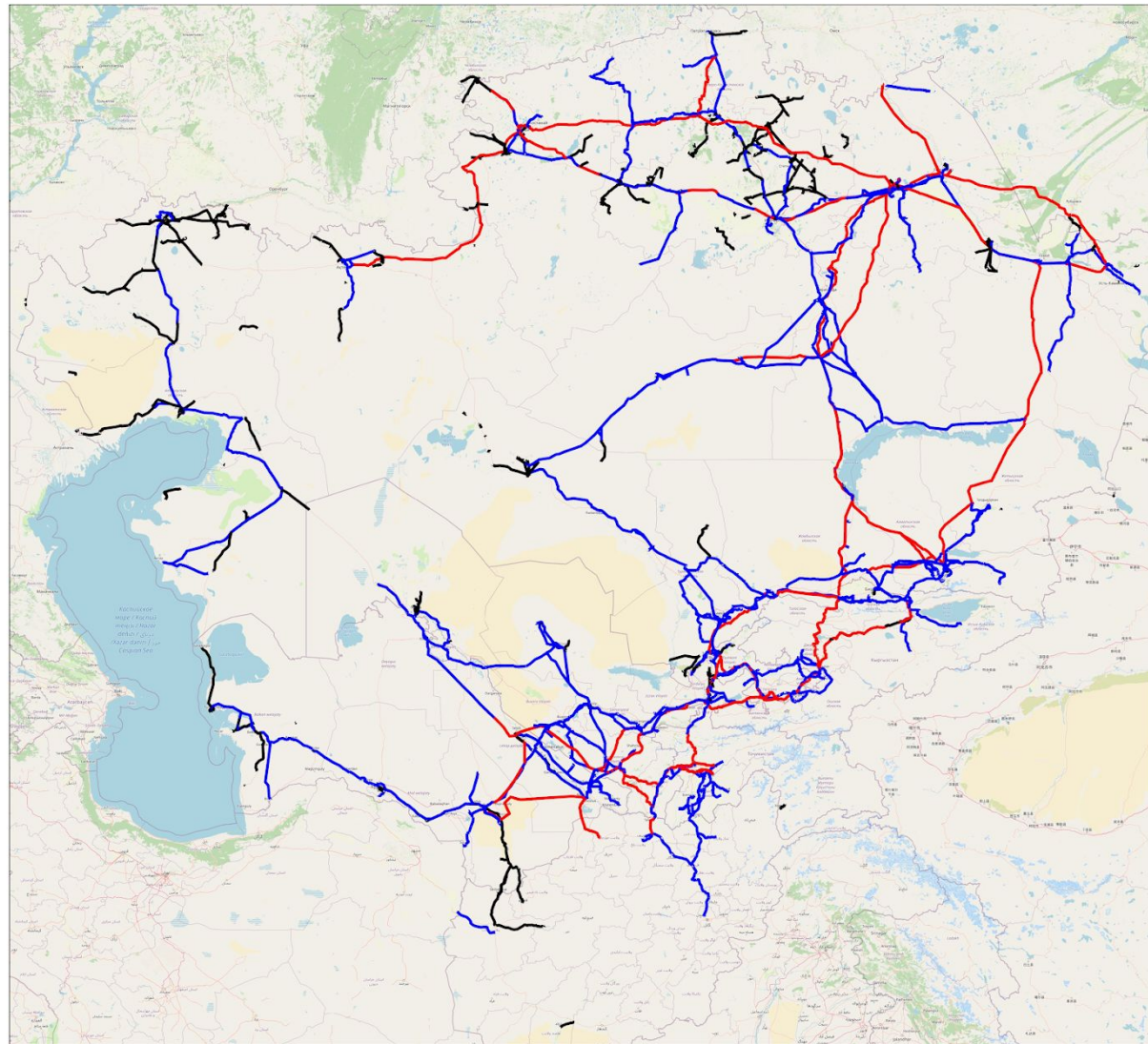
PYPSA-EARTH: MAKING THE ENERGY TRANSITION GLOBAL

Central Asia

- Energy supply&energy efficiency is associated with the region development
- Water-energy nexus is critical
- Energy mix is heavily based on fossil fuels
- Excellent renewable resources (wind, solar, hydro)
- National energy transition plans
- Increasing perception towards renewable power

Knowledge gap: energy modelling is rare, open energy modelling is extreme rare

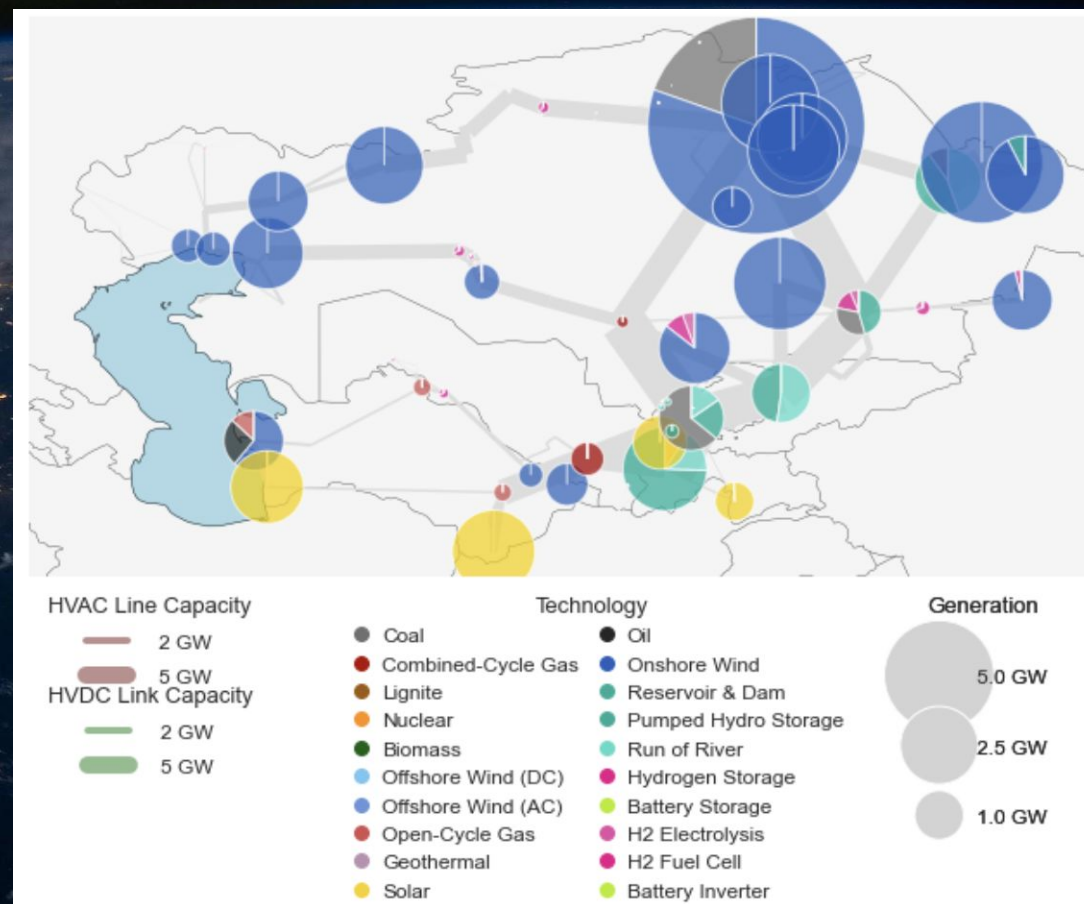
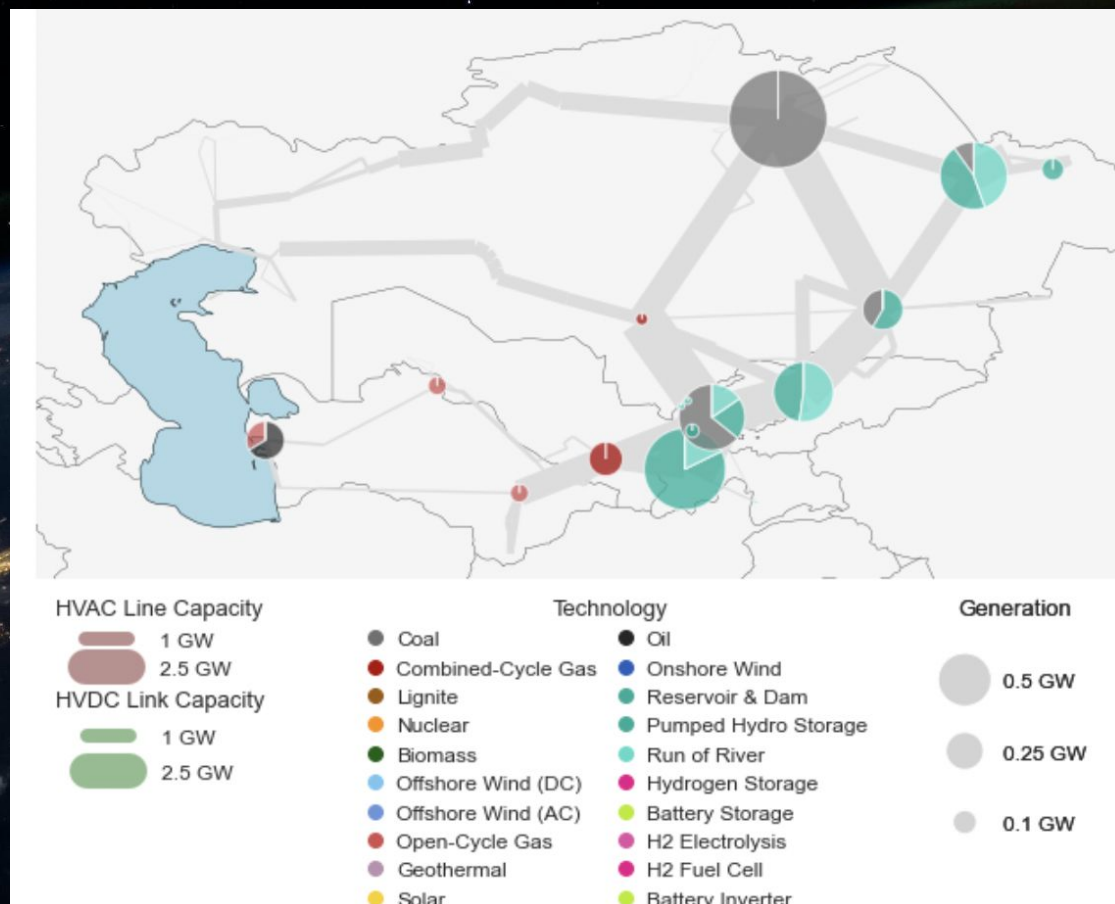
PYPSA-EARTH: MAKING THE ENERGY TRANSITION GLOBAL



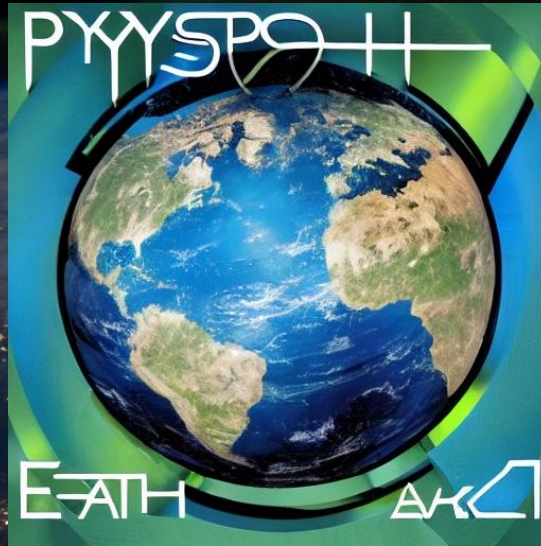
Validation of GEGIS demand model for Kazakhstan



PYPSA-EARTH: MAKING THE ENERGY TRANSITION GLOBAL



YOU CAN CHANGE THE WORLD!



21.10.2022,

**Ekaterina Fedotova (Central Asia lead PyPSA-Earth),
Maximilian Parzen (Co-director PyPSA-Earth)**

