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# PyPSASPICE

## Scenario Planning and Integrated Capacity Expansion

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### Introduction

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# Agenda

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- Goals
  - Key features
  - Studies examples
  - On modeling activities at Agora
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# Goals for **PyPSASPICE**

Scenario **P**lanning and  
Integrated **C**apacity **E**xpansion

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# PyPSA-SPICE has been designed based on our experience of modeling work and collaboration with partners



## Policy relevance

- Deep decarbonization across the energy sector
- Feature development informed by policy questions



## Ownership and modifiability

- Organizations using the framework can fully own both the model and the data
- Permissive license – GPL 2.0
- Easy to make changes, add custom constraints, modify output visualizations, etc.



## Capacity building

- Targeted for organizations looking to build modeling capacity
- Minimal coding knowledge is required
- Starting point to get into PyPSA eco-system



## Custom data

- Work in regions with sparse data availability
- Ease of integrating your custom data
- Ability to align with national energy plans

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# Key features of **PyPSA** **SPICE**

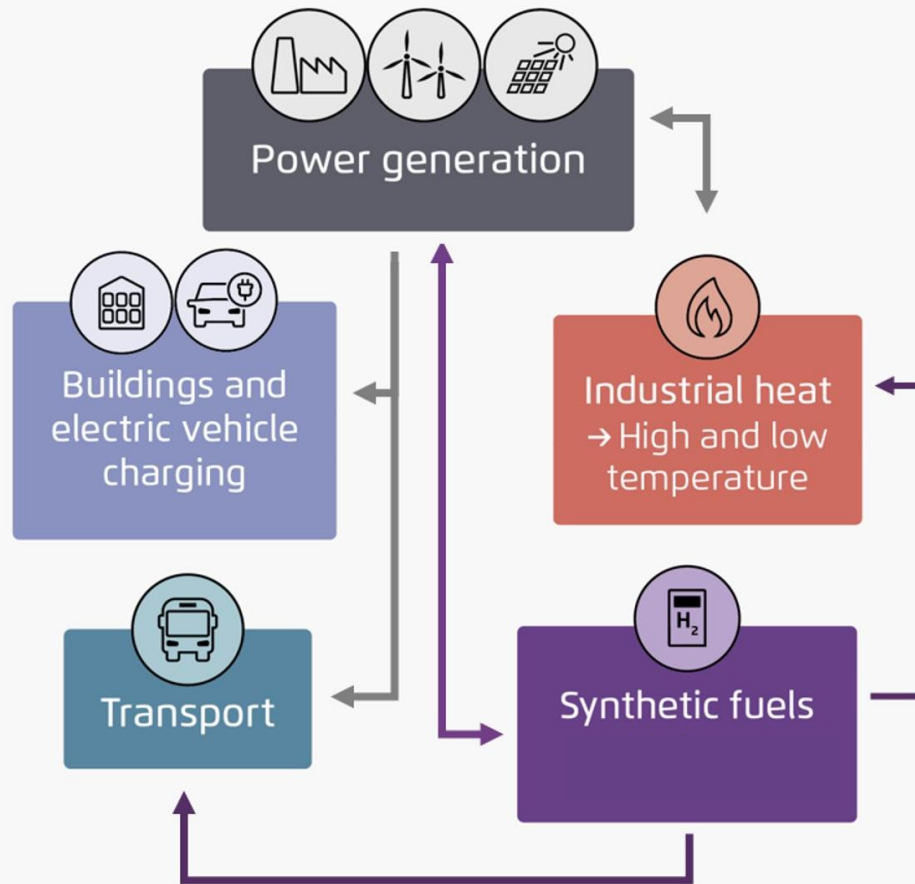
Scenario **P**lanning and  
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# PyPSA-SPICE is multi-sector cost optimization model, with a focus on power sector

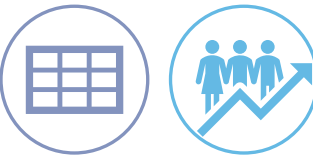


Schematic representation of PyPSA-SPICE

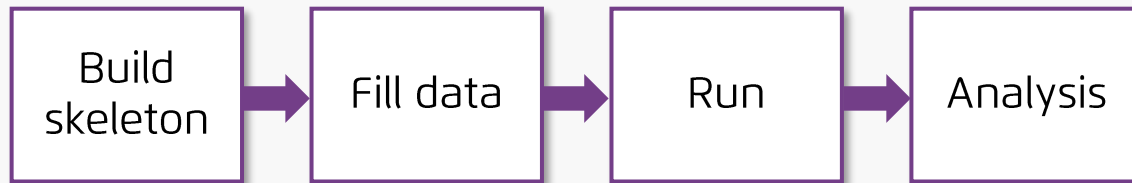


- Assessment of **national** or **regional** mid/ long-term energy **scenarios**
- **Co-optimization** of generation, capacity, and interconnector expansion at hourly resolution
- **Flexible sectoral** coverage: possible to run model with or without industry and transport sector
- Several **pre-defined custom constraints**, including energy independence, reserve margin, must-run constraints on thermal generators, etc.

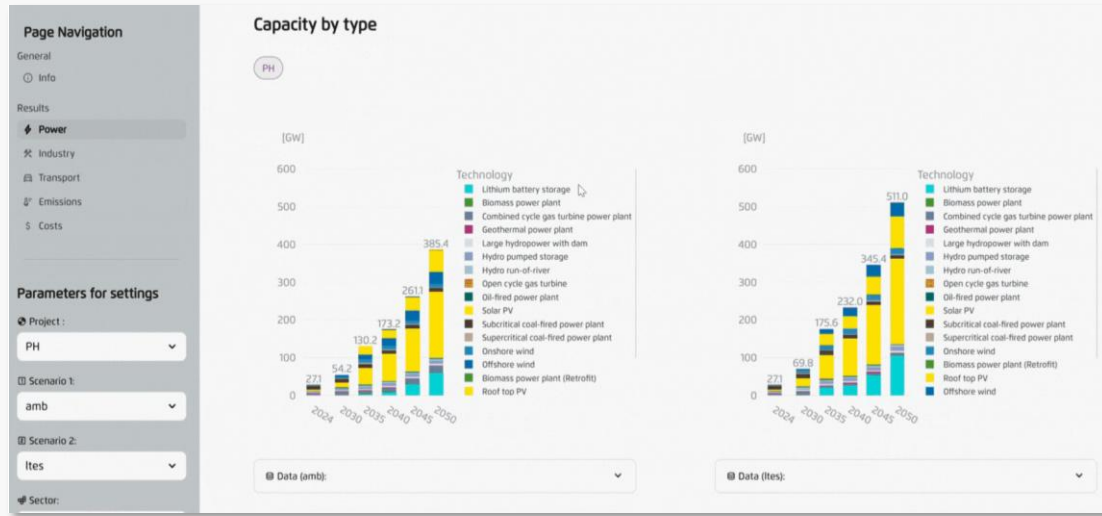
# PyPSA-SPICE workflow focuses on ease of use, capacity building and feeding custom data



## Workflow of building and running models



## Visualization tool for analysis



- Straightforward creation of models for **new countries or regions** using user-defined parameters
- Easy integration of **custom data** into the model
- Easy definition of **new technologies** and parameters
- A **visual tool** for easy visualization of model outputs
- Extensive [documentation](#)

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Studies using **PyPSASPICE**

Scenario **P**lanning and  
Integrated **C**apacity **E**xpansion

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# A range of studies, with partners, have already used PyPSA-SPICE framework



Nov 2022

**Towards a collective vision for Thai energy transition: National long-term scenarios and socio-economic implications**



To be published

**ENVISIONING 2050 : Long-Term Energy Scenarios for an Inclusive and Data-driven Energy Transition**



July 2024

**Navigating through Thailand's PDP towards carbon neutrality**



August 2023

**Alignment between Vietnam's PDP8 and JETP commitments**



May 2025

**Kazakhstan's power system 2035: options for development**

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On modeling activities at Agora...

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# PyPSA-SPICE is just one tool. We collaborate with partners on diverse modeling frameworks to fit project needs and foster an open-source modeling ecosystem.



Nov 2025

## Coordinated grids planning could save Europe 560 billion euros by 2050



To be Published

## A Guide to PtX modeling and Allocation in Long Term Energy Planning



Supported by:  
 Federal Ministry for Economic Affairs and Climate Action  
on the basis of a decision by the German Bundestag



Implemented by  
 giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH



To be published

## Efficient integration of wind and solar power in the Philippines



Training

## Various targeted and specific research question models



# Open-source modeling is close to **the inflection point**. With a little support, it can become mainstream!

Stylized technology adoption curve



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# Thanks

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<https://agoenergy.github.io/pypsa-spice/>



<https://github.com/agoenergy/pypsa-spice>



<https://github.com/agoenergy/pypsa-spice/discussions>

Let's make open-source modeling mainstream!