A cascade-modelling approach for energy systems in developing countries

Carlos A. A. Fernandez Vazquez

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Who are we?

Pablo Jiménez
Multiobjective optimización of energy systems - UCLouvain

Carlos Fernandez
Long-term energy modelling and energy transition - ULiege

Claudia Sanchez
Energy sufficiency and rural electrification - ULiege

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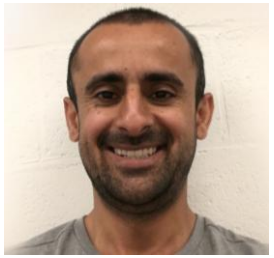
Marco Navia
Dispatch and stability analysis - ULiege



Umair Tareen
Energy sufficiency in integrated energy systems - ULiege

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ISES

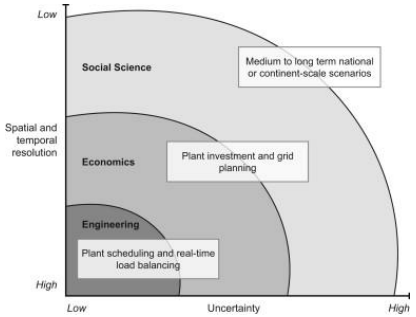
Sylvain Quoilin
Integrated & Sustainable Energy System (ISES) - ULiege

What are we doing?

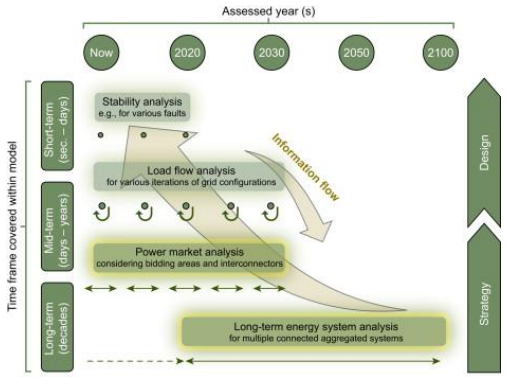
How can energy planning be facilitated for developing countries to tackle the challenge of energy transition?

Complexity

https://www.mech.kuleuven.be/en/tme/research/energy-systems-integration-modeling



https://www.sciencedirect.com/science/article/pii/S1364032114000872



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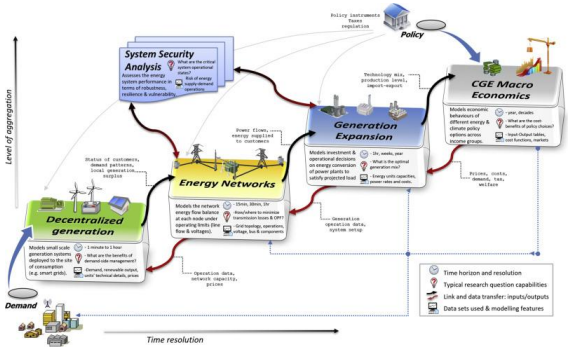

https://www.sciencedirect.com/science/article/pii/S2211467X18300130?via%3Dihub#sec3

Limitations

- There is a **lack of resources** for creating, maintaining, and training personnel in specialized tools
- Energy models are focused on technical aspects, and **social aspects are usually disregarded**
- A sustainable **transition of the energy sector** is a critical and urgent aspect
- As the energy systems evolve, requirements for proper **planning become more complex** and technically demanding

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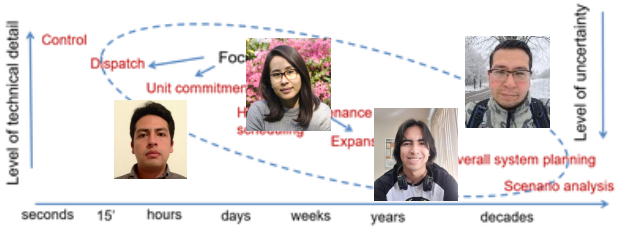

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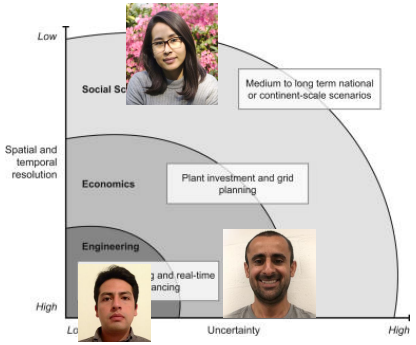

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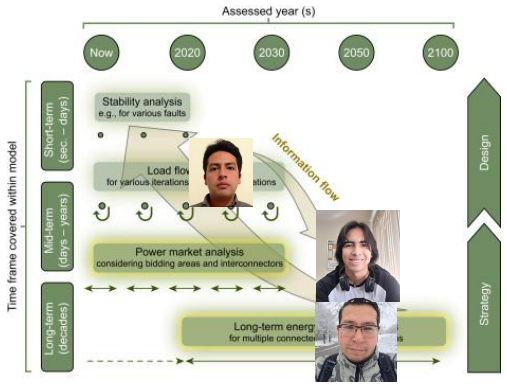

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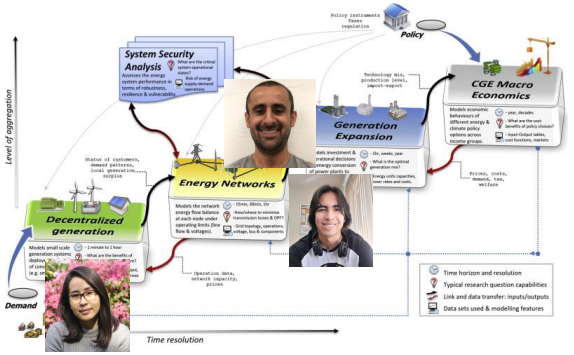

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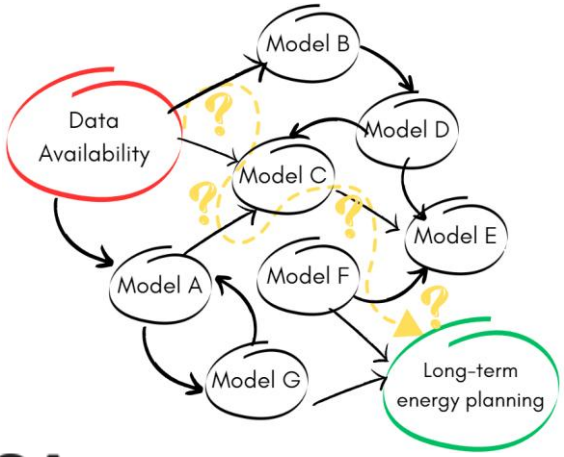
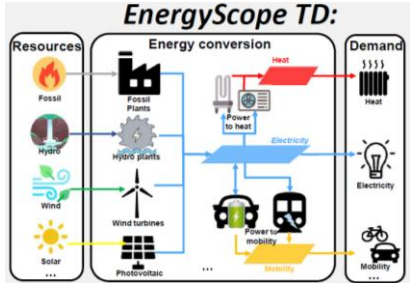
The cascade approach

- Each tool has its strong points and limitations
- There are always overlaps between models
- Outputs and inputs among tools can be complementary





EnergyScope - Bolivia

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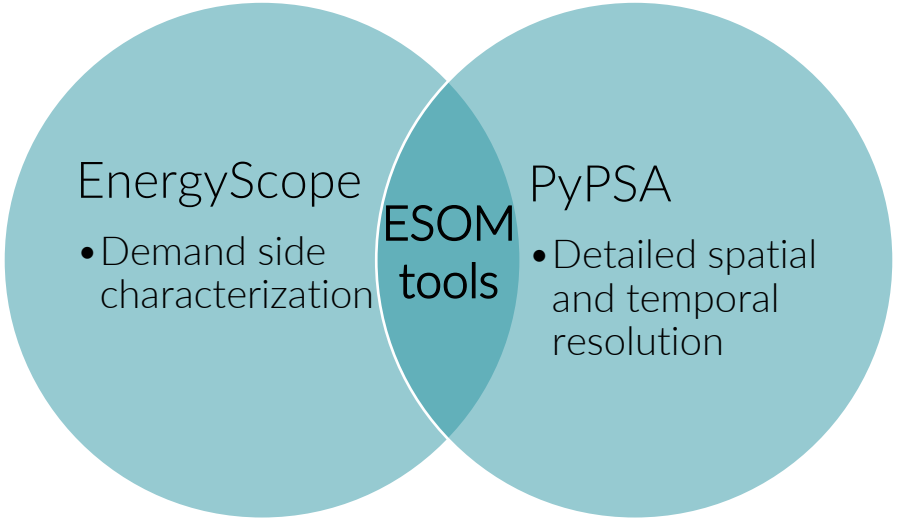

PyPSA meets Earth

PyPSA-BO

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The cascade approach

Energy demand characterization

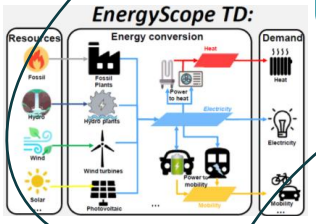
- Systematization of end-use energy demands

Define a transition scenario

- NetZero emissions by 2050 in Bolivia

Estimate electrical demand growth expectations

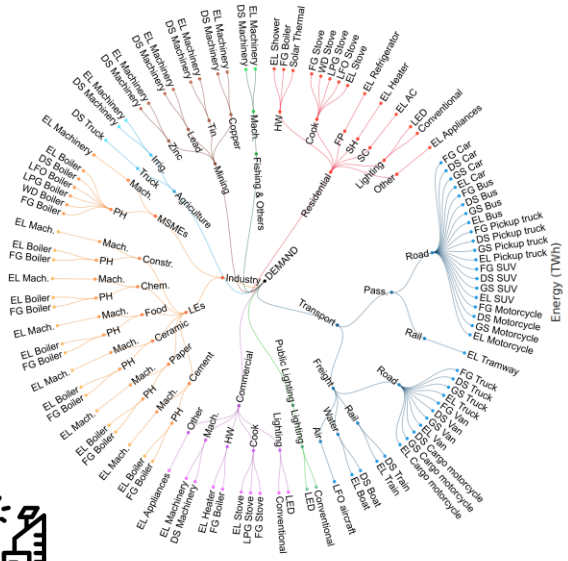
- Development pathways in EnergyScope - Bolivia

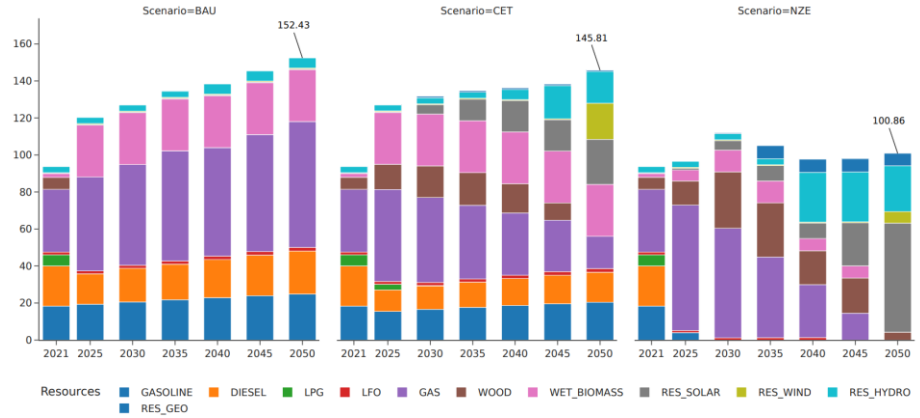


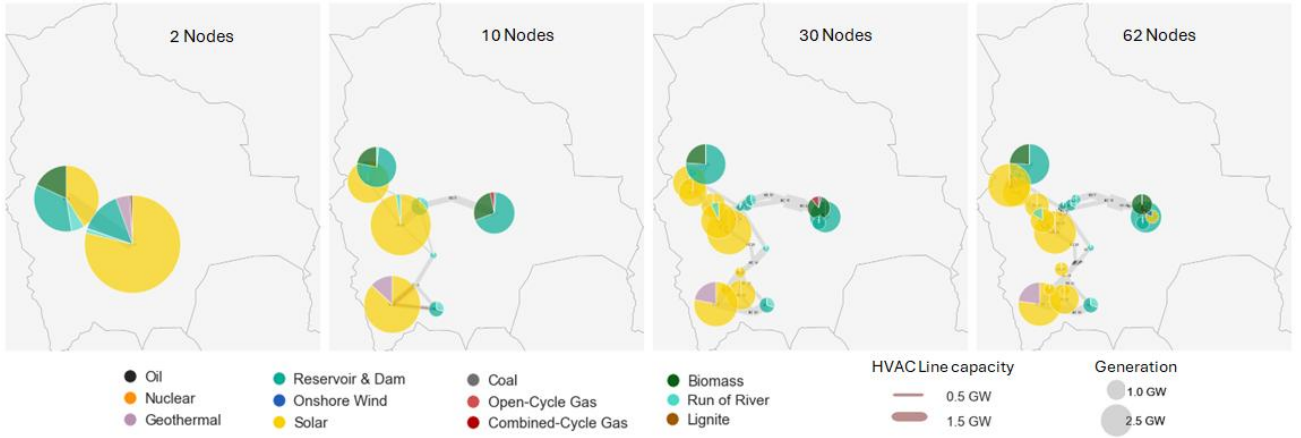
Characterization of the future electric system

- Brownfield expansions for the electrical system with PyPSA-BO

PyPSA meets Earth







Thanks for your attention!

¿Questions?

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