Integrating stakeholder preferences in energy system design: the SEEDS project

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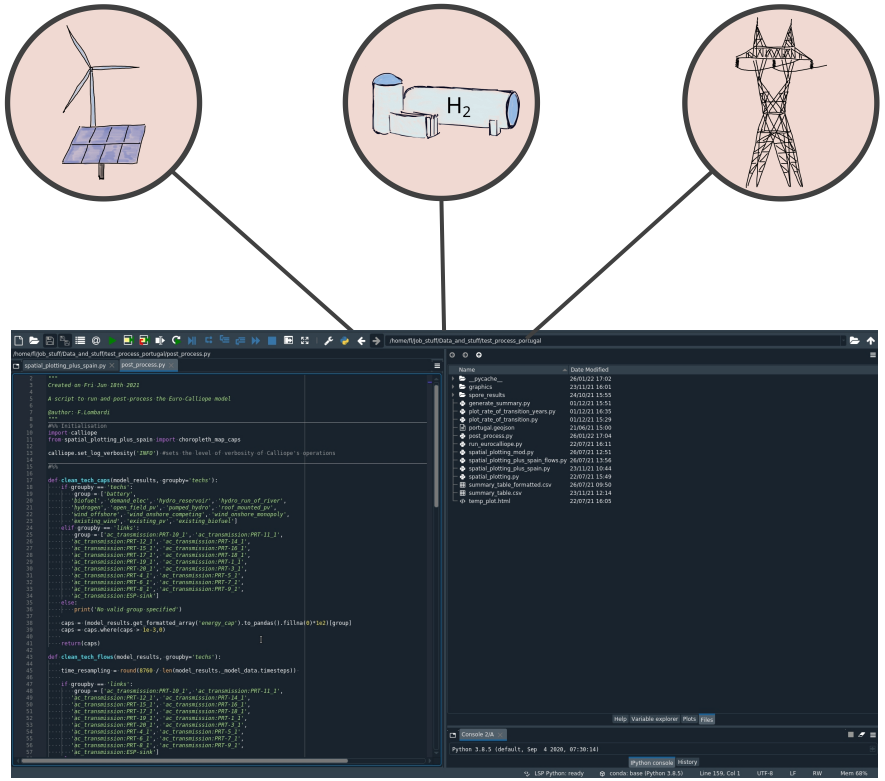
Part A.

What’s wrong with the conventional use of models

The challenge.
Accelerating the energy transition

We must deploy new renewable, transmission and storage capacity.
But **how much**? and **where**?



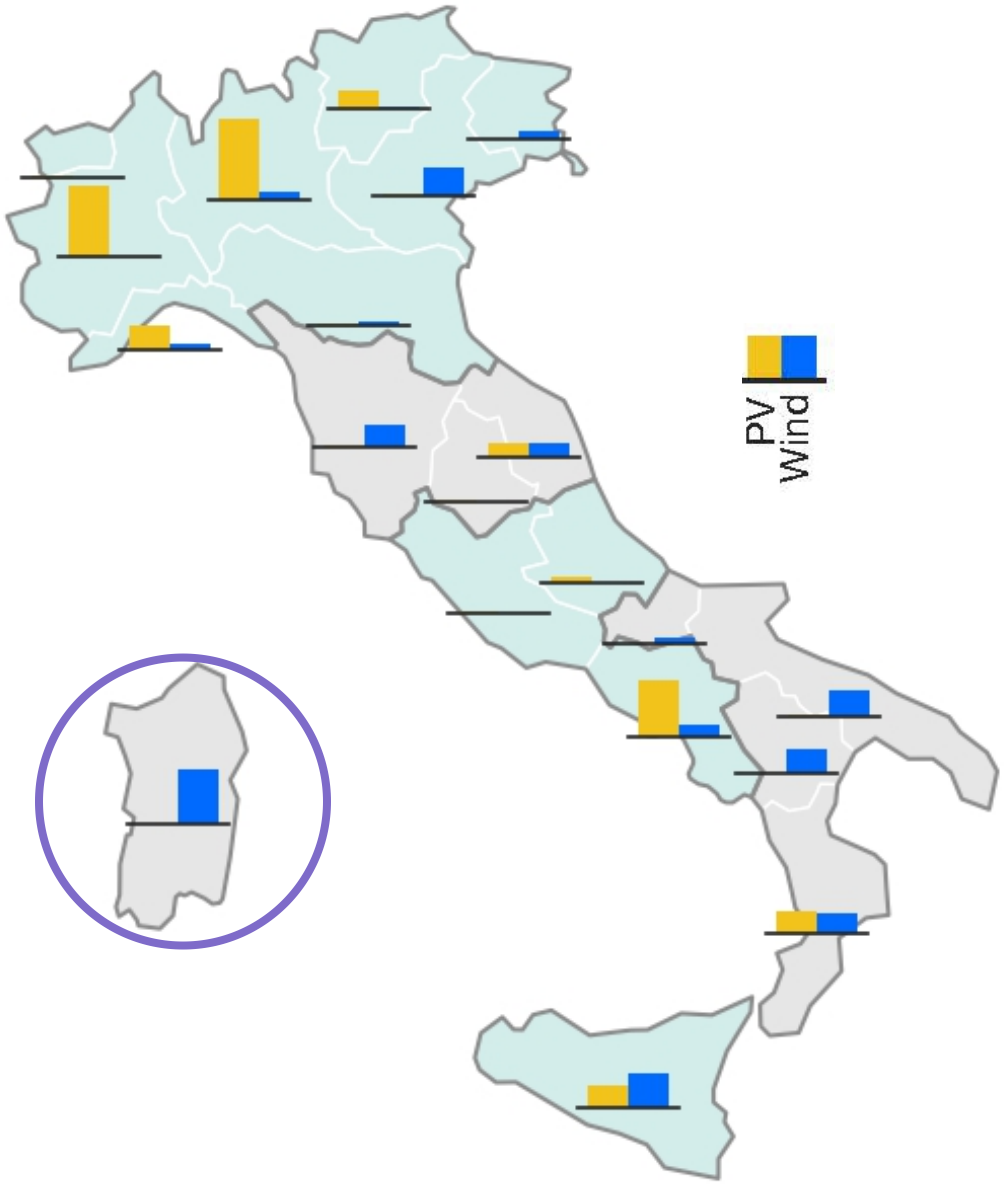
Energy system models provide quantitative insights around such questions.

How? turning those into a mathematical problem, for which an ‘optimal’ solution can be found

minimum cost

Research gaps.

Is cost-optimal actually desirable?

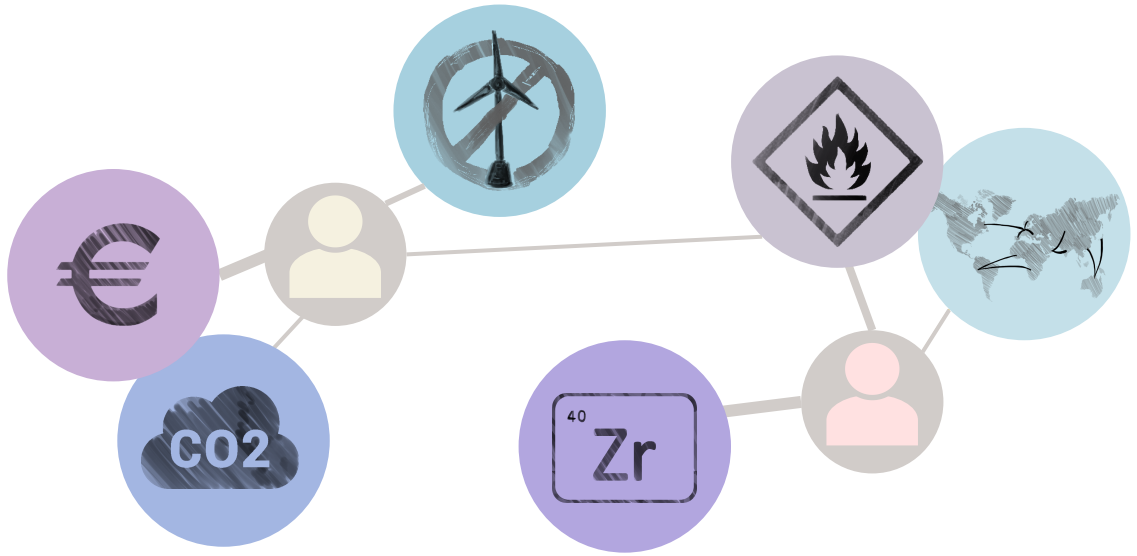


Source: Lombardi, Pickering, Colombo, Pfenninger. *Joule*, 2020. https://doi.org/gg8z6v

Research gaps.
Is cost-optimal actually desirable?

Two generalisable shortcomings:

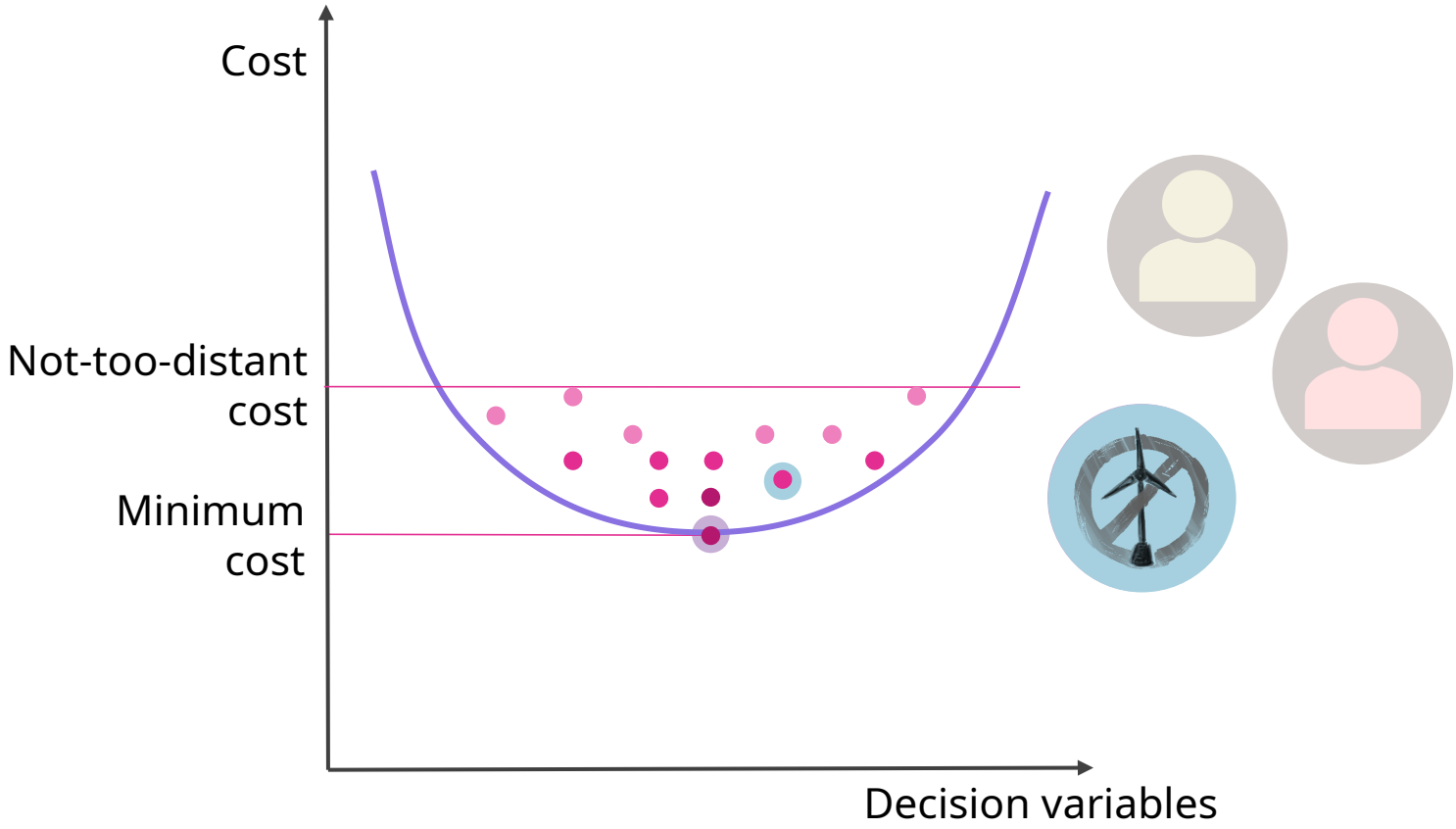
1. Real-world decisions involve much more than economic cost (social acceptance, environmental impact, ...)



Research gaps.
Is cost-optimal actually desirable?

Two generalisable shortcomings:

2. It is silly to fixate on the minimum cost considering the uncertainty surrounding all cost assumptions

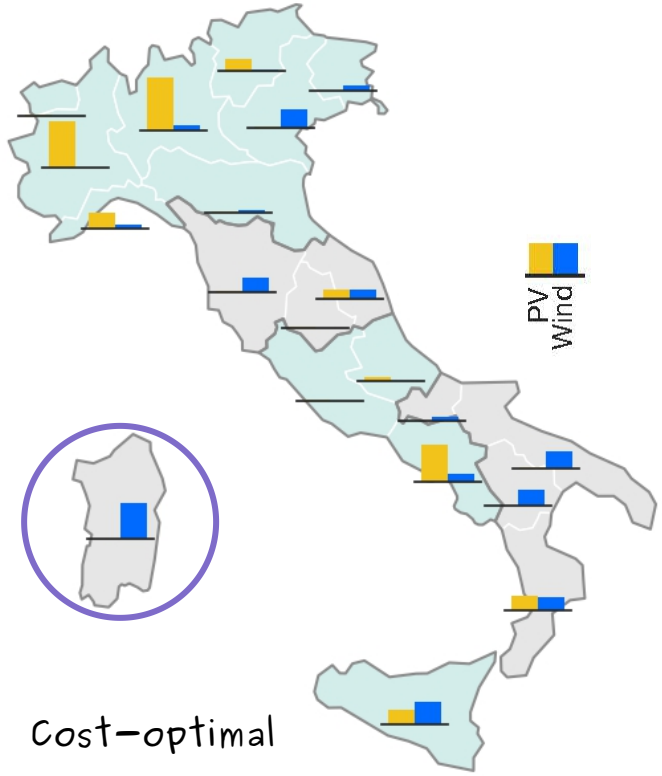


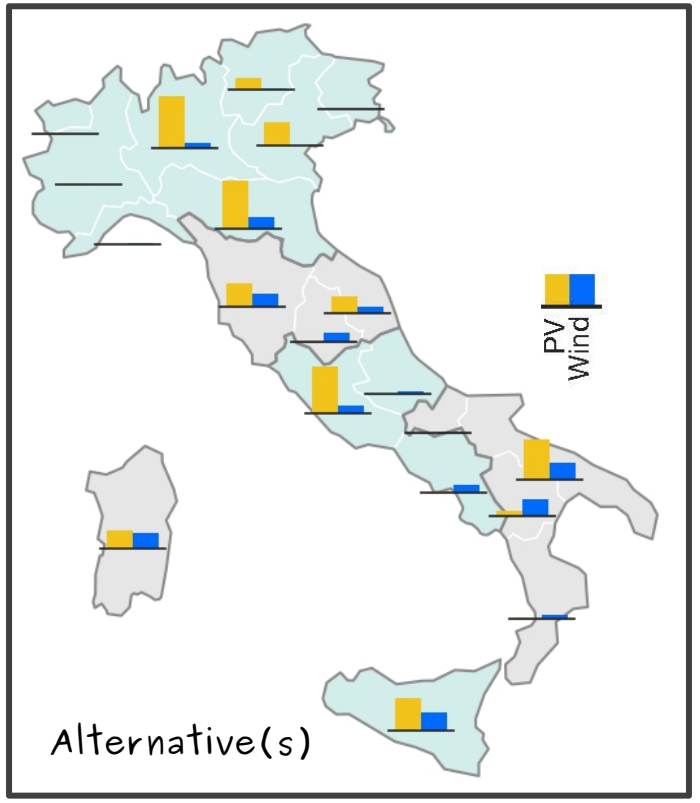
Part B.
Generating alternatives for real-world deliberation

SPORES.

Spatially and technologically distinctive alternatives

An original development of “Modelling to Generate Alternatives” (MGA) designed for **spatial detail**, computational efficiency and **real-world relevance**



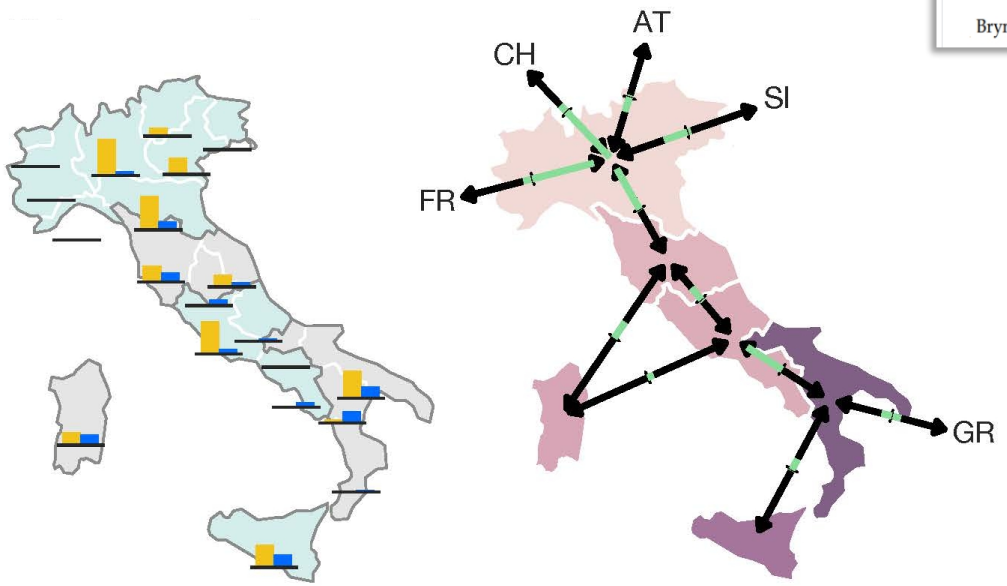


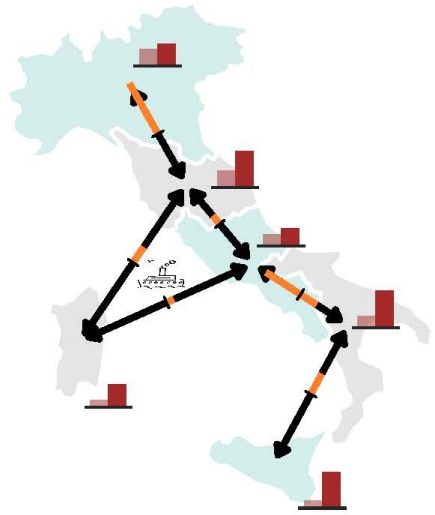
Lombardi, Pickering, Colombo, Pfenninger. *Joule.* 2020. doi.org/gg8z6v

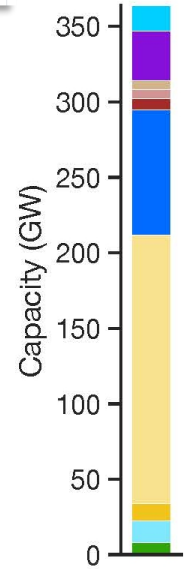
SPORES.

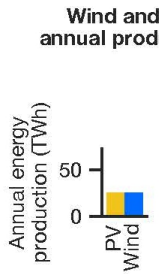
Spatially and technologically distinctive alternatives

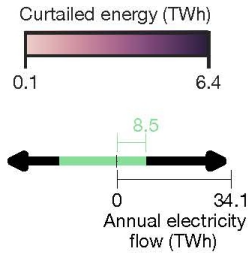
Calliope

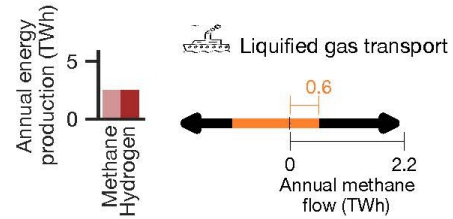


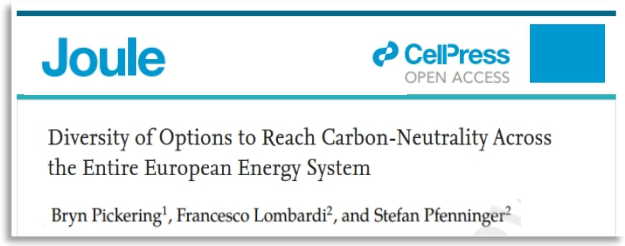












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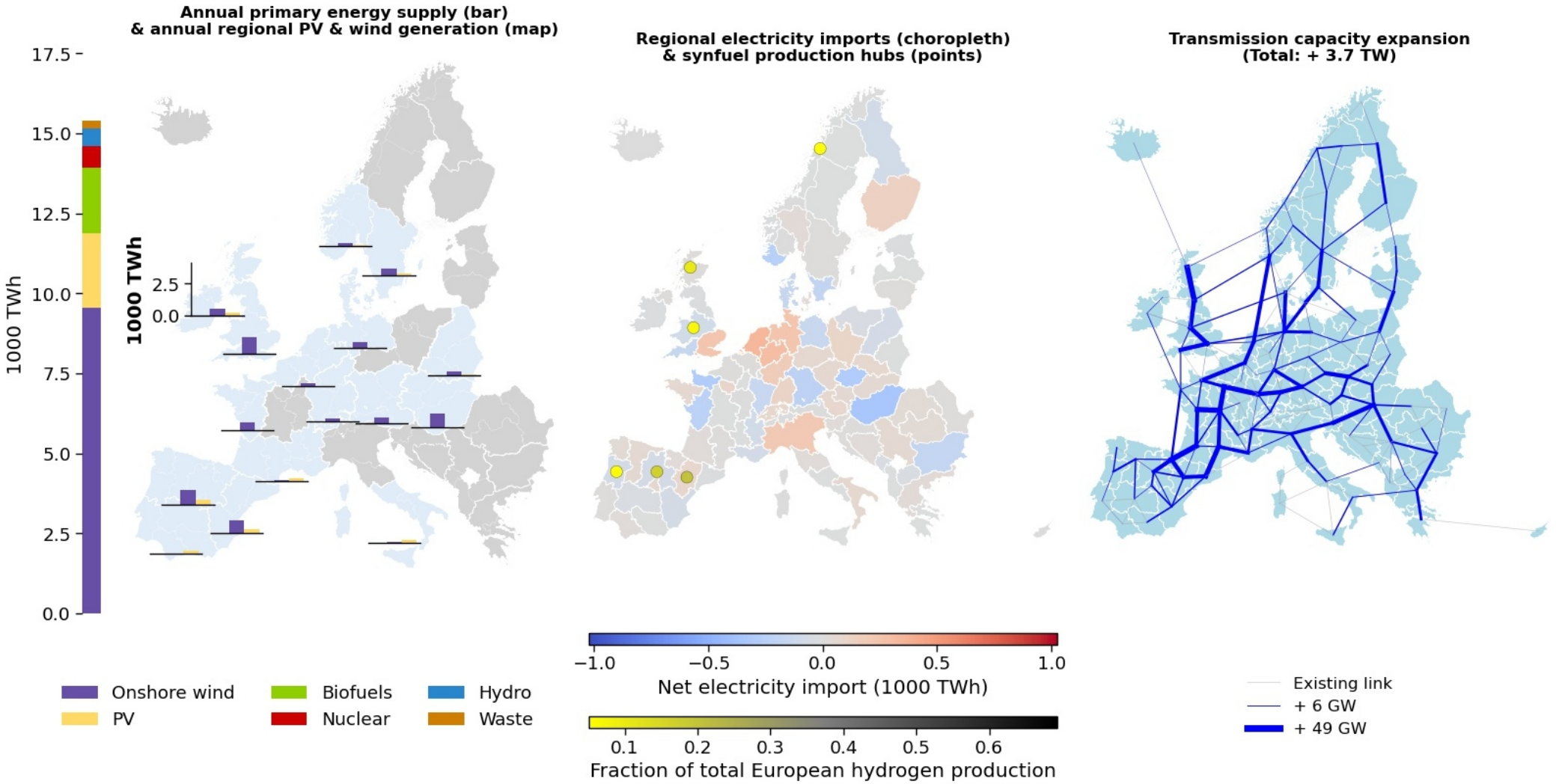
Calliope



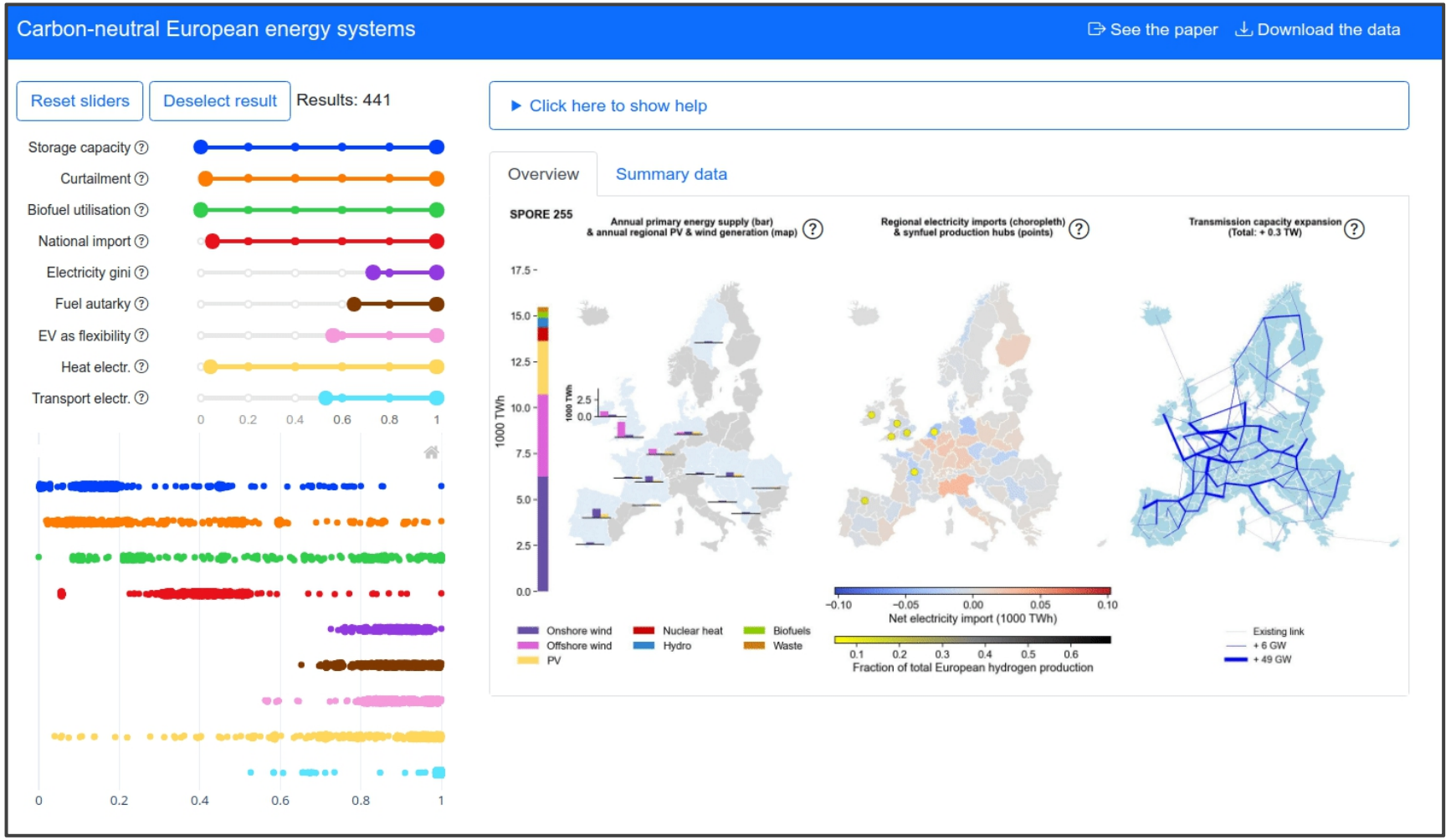
Pickering, Lombardi, Pfenninger. *Joule.* 2022. doi.org/10.1016/j.joule.2022.05.009

Calliope

Try out the results explorer yourself: explore.callio.pe

Interfaces.

An example for EuroSPORES

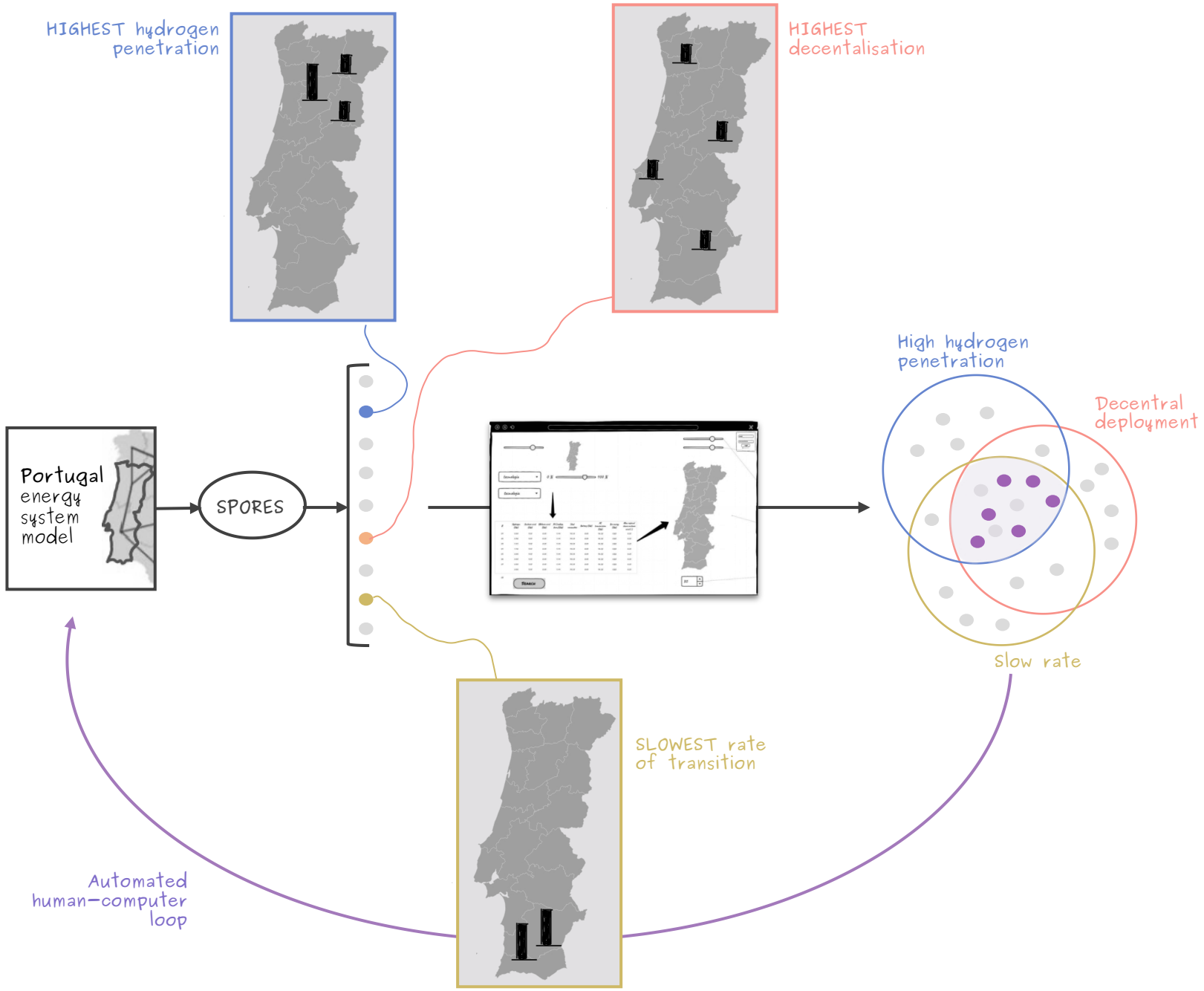


Pickering, Lombardi, Pfenninger. *Joule*. 2022. [doi.org/jbd7](doi.org/jbd7)

Part C.
From theory to practice: the SEEDS pilot study

Humans in the loop.

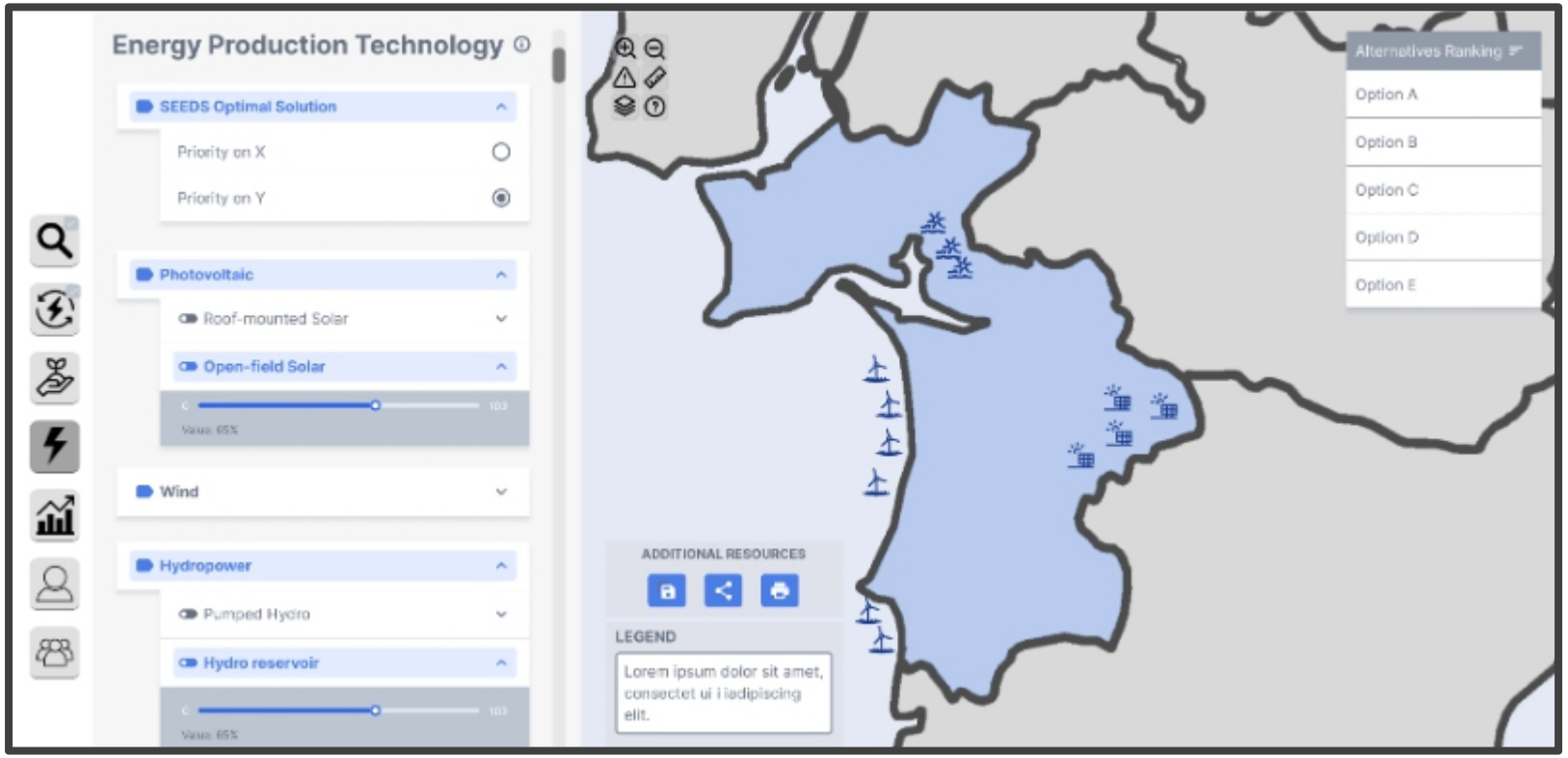
Training the algorithm to stakeholder needs



Lombardi, Pickering, Pfenninger. *SEEDS-project deliverable 1.3*. 2022. seeds-project.org

SEEDS.
How is
it going?

Interface under development, stakeholder engagement end of this year



Courtesy of Tallin University, partner in the SEEDS project

Thank you.
Questions?

1. Cost-optimality is not necessarily viable, let alone desirable, in practice. Modellers should provide **alternatives**

2. Flexibility of choice - particularly about spatial deployment - is **very likely** in any scenario, leaving **room for stakeholder discussion**

3. Yet, only a finite number of alternatives can be generated, which calls for **stakeholder integration in the computational workflow**

4. User-friendly **interfaces** might help balancing a wider decision space with calls for **understandability**

Additional material about SPORES and ongoing projects is available at www.flombardi.org

And for Calliope: callio.pe

Thanks to: Stefan Pfenninger, Bryn Pickering; partners of the SEEDS project as listed in seeds-project.org/about/