Is an 'optimal' solution desirable in practice?
Decision support for renewables deployment through Spatially Explicit Practically Optimal Alternatives

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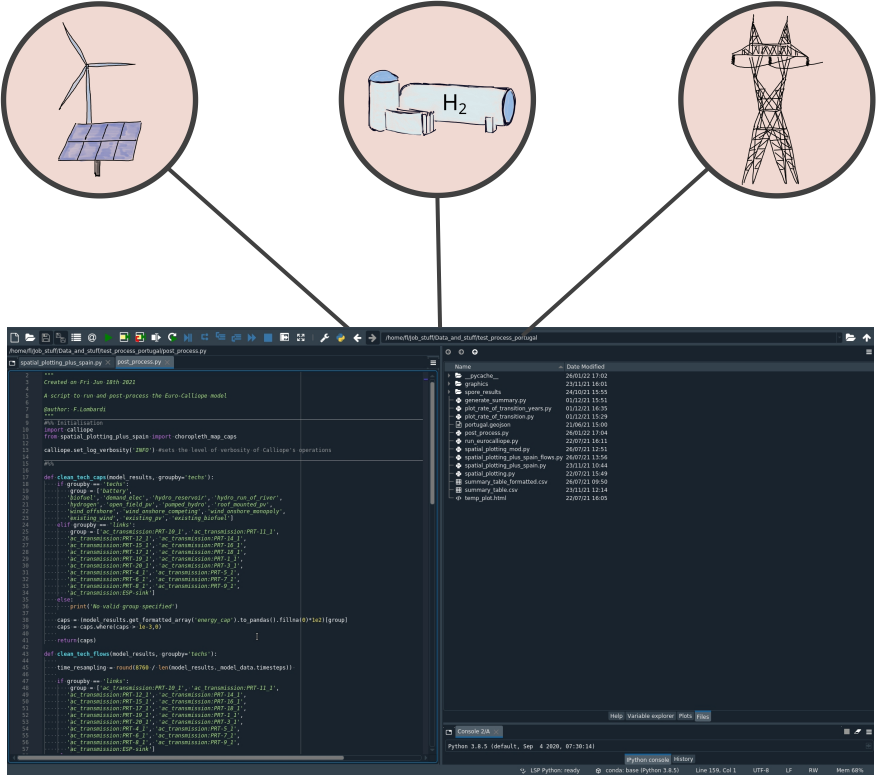Energy and Industry section

TUDelft

Part A.
On why 'optimal' does not equate 'desirable'

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

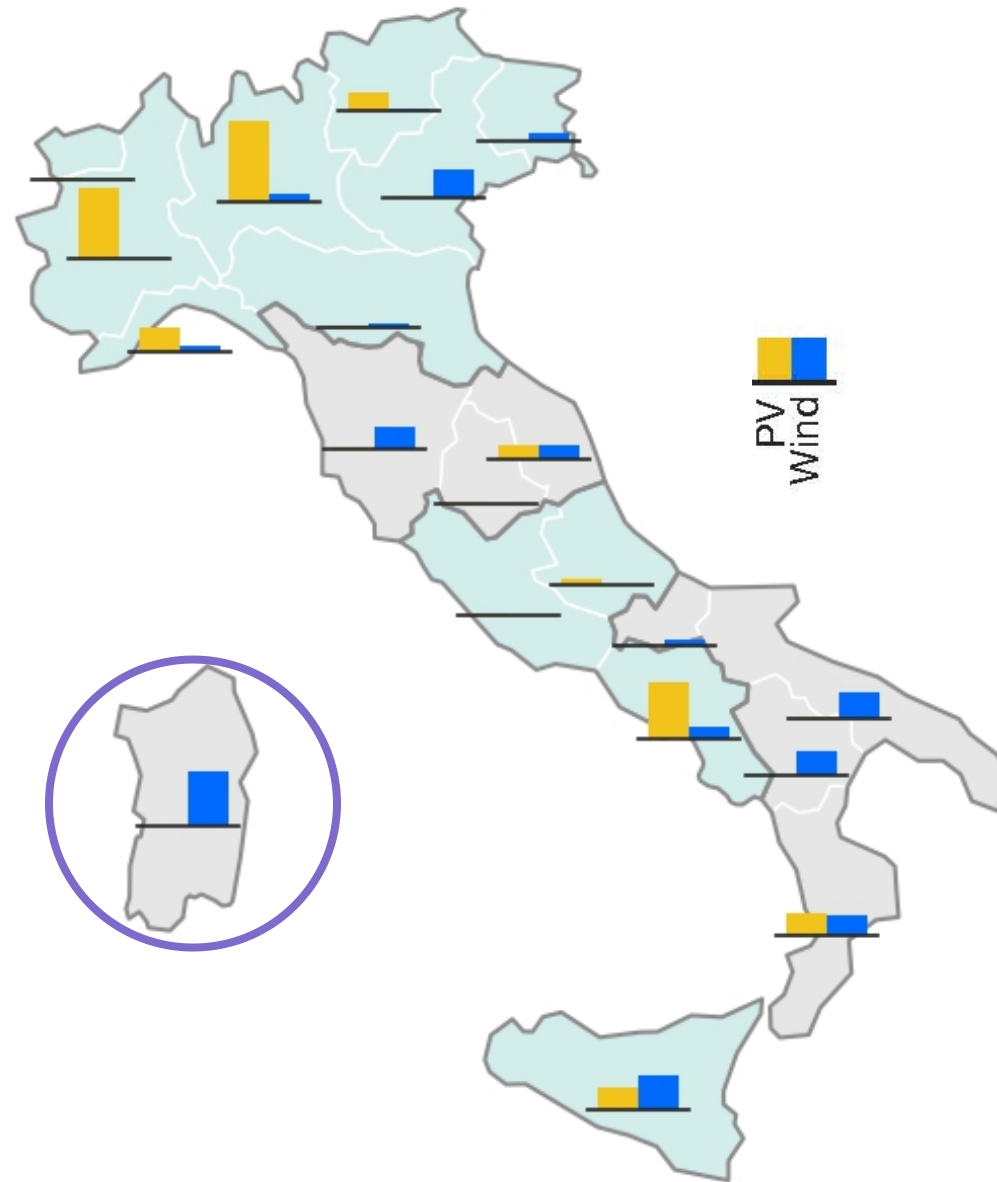# The challenge.
Accelerating the
energy transition

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

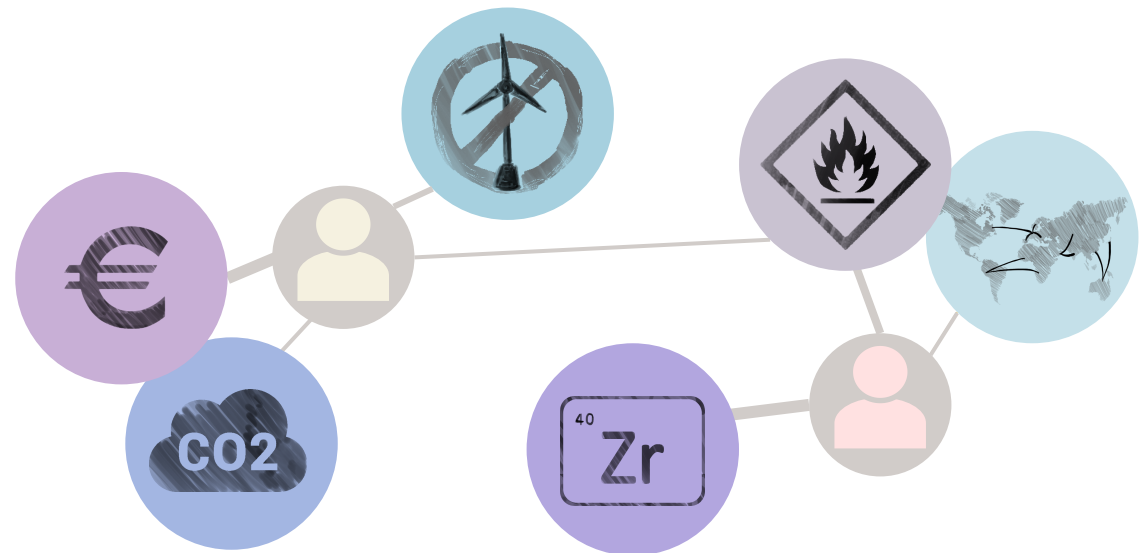# Research gaps.
Is cost-optimal actually desirable?

Research gaps.
Is cost-optimal actually desirable?

Two generalisable shortcomings:

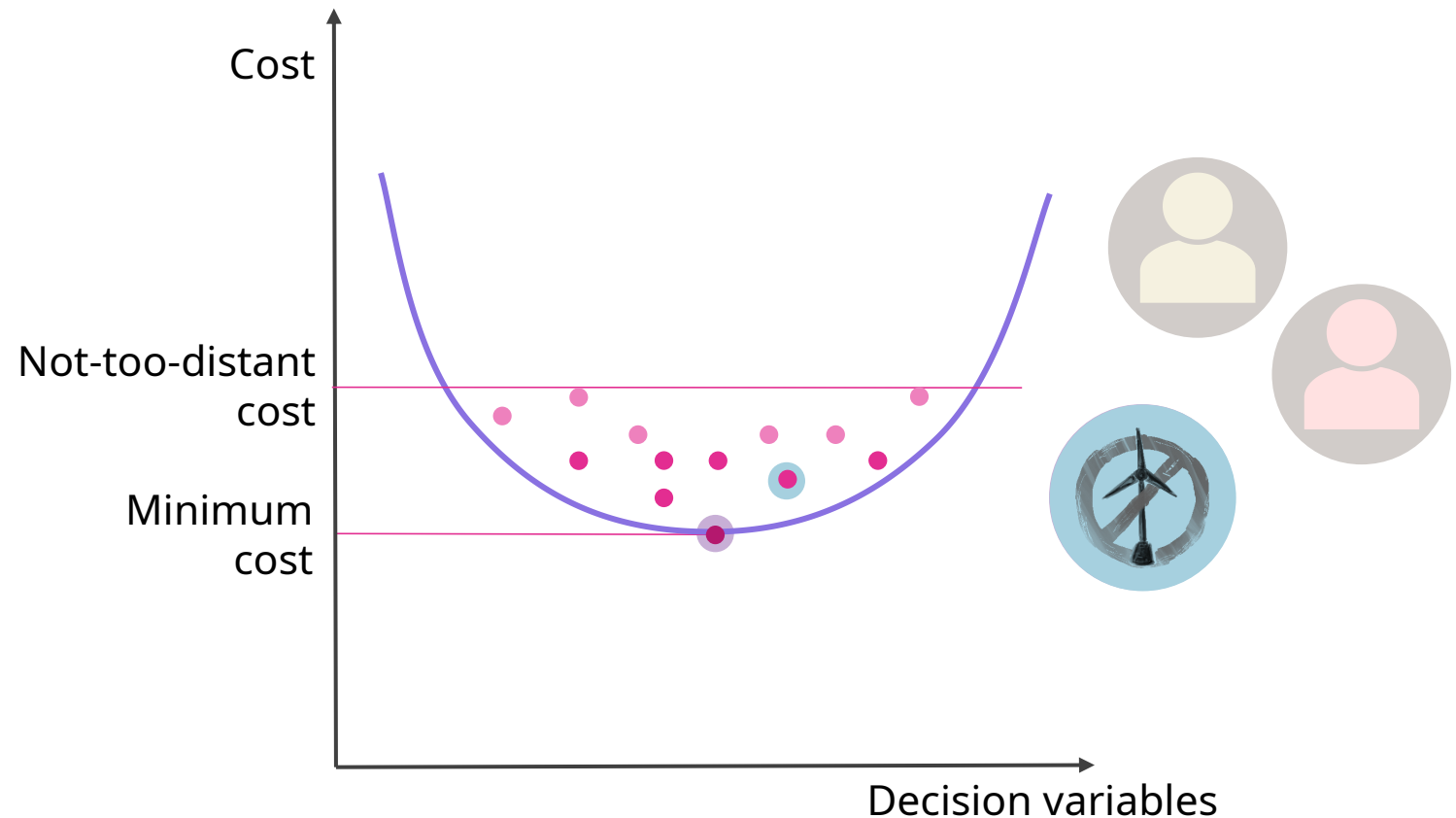1. Real-world decisions involve much more than economic cost (social acceptance, environmental impact, ...)

Two generalisable shortcomings:

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

Research gaps.
Is cost-optimal actually desirable?

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**
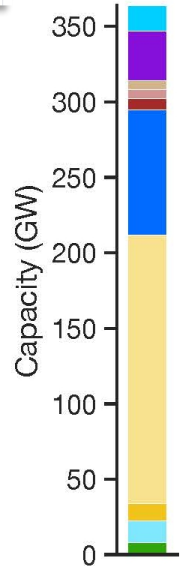

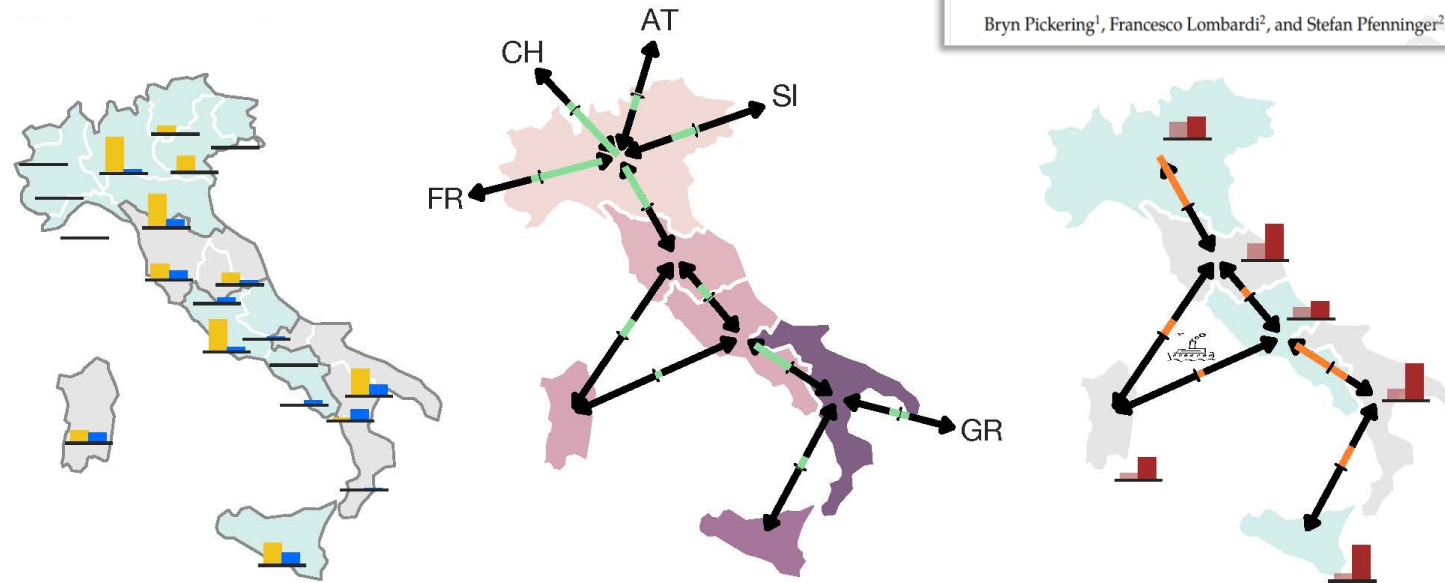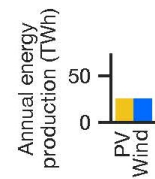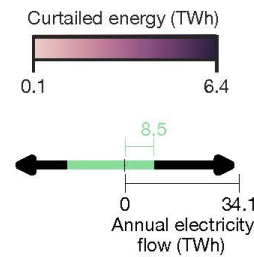Cost-optimal

Alternative(s)

SPORES.
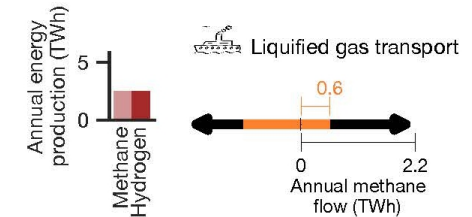Spatially and technologically distinctive alternatives

Calliope
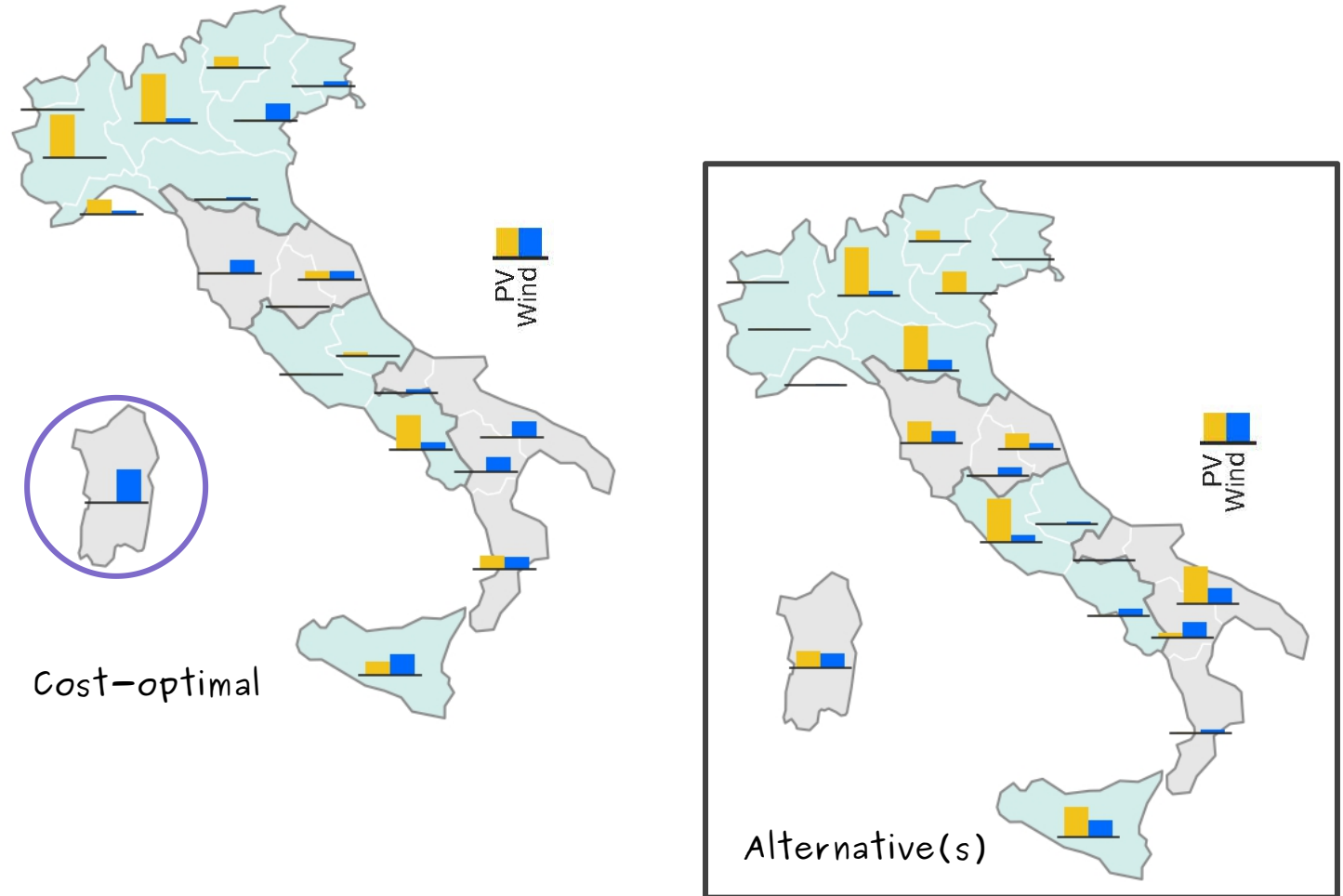
Wind and PV annual production

Electricity curtailment and energy flow along transmission lines

Methane and Hydrogen production and methane flow along transmission lines

Installed capacity

- Pumped hydro
- Battery
- Gas turbine
- Methanation
- Electrolysis
- Offshore wind
- Onshore wind
- Rooftop PV
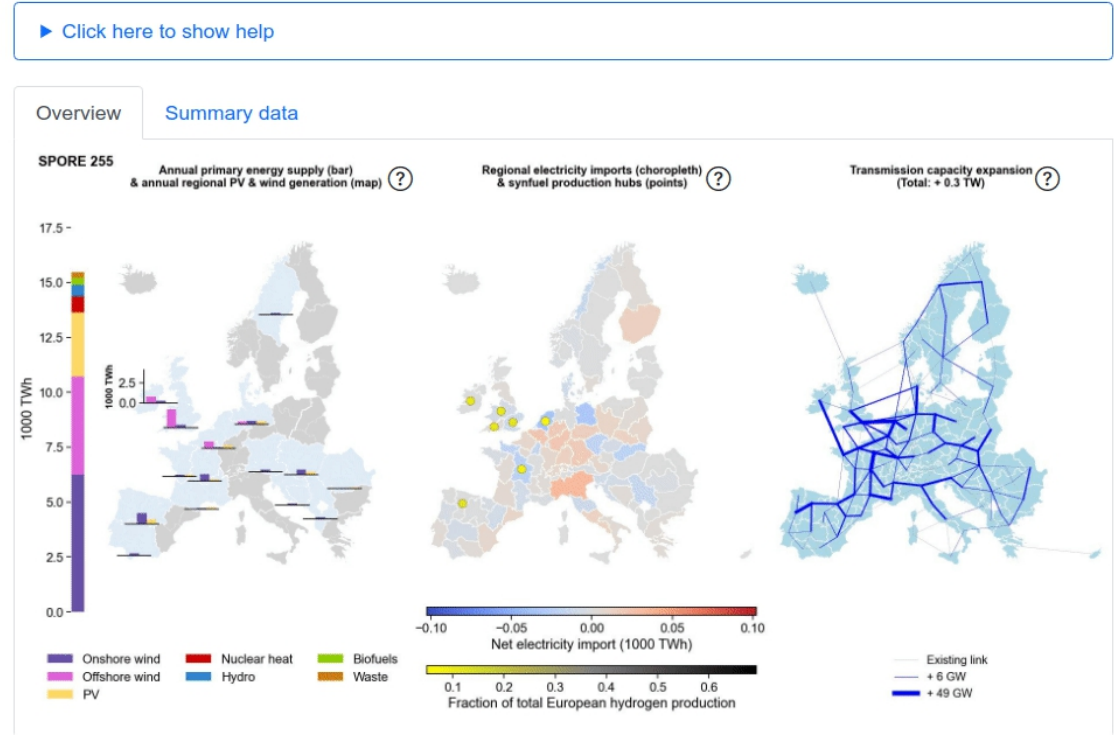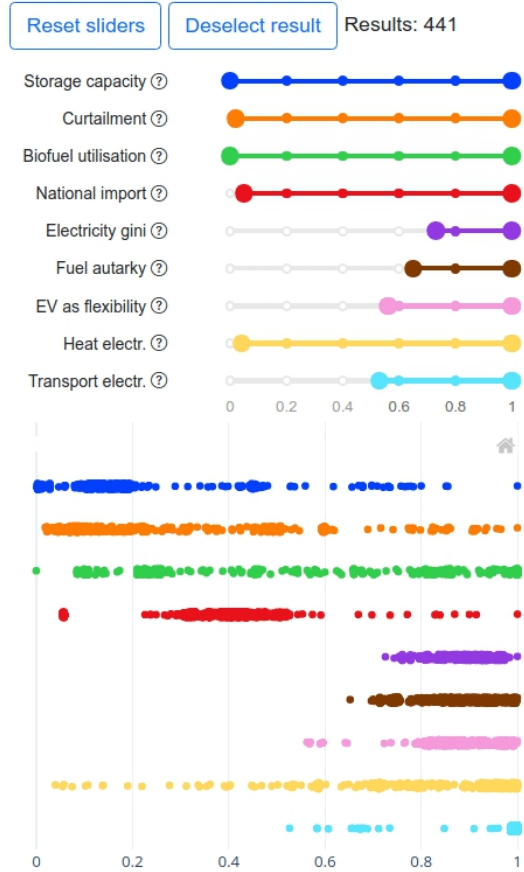- Farm-scale PV
- Hydro
- Bioenergy

Calliope   Try out the results explorer yourself: explore.callio.pe
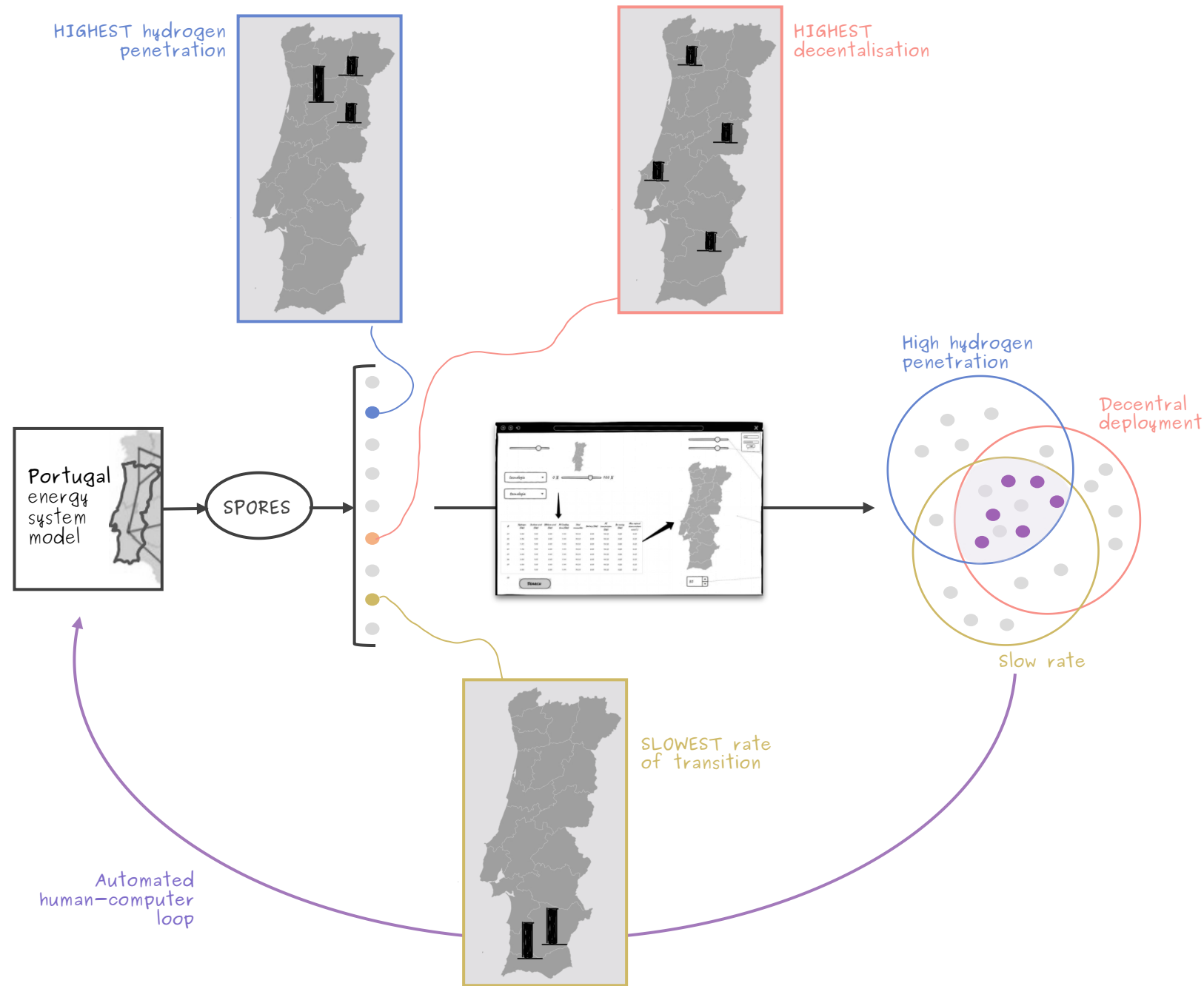
Interfaces.
A first example for EuroSPORES

Part C.
From theory to practice: interfaces and more

Humans in the loop.
Training the algorithm to stakeholder needs

Thank you.
Questions?

🐦 @FrLomb

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**