

Is there no alternative?

It is time energy planning models looked beyond cost-optimal solutions

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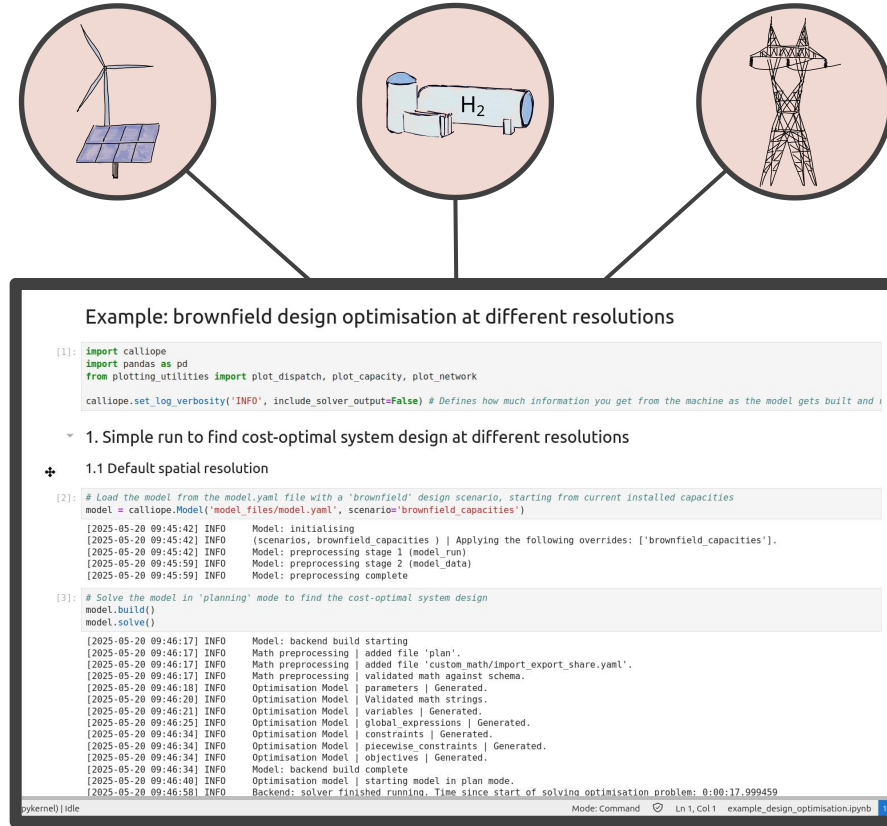


Based on: *Near-optimal energy planning strategies with modeling to generate alternatives to flexibly explore practically desirable options.* Joule, 2025. doi.org/p8b5

Part A.

What's wrong with conventional cost optimisation

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



The standard. Optimising the system re-design

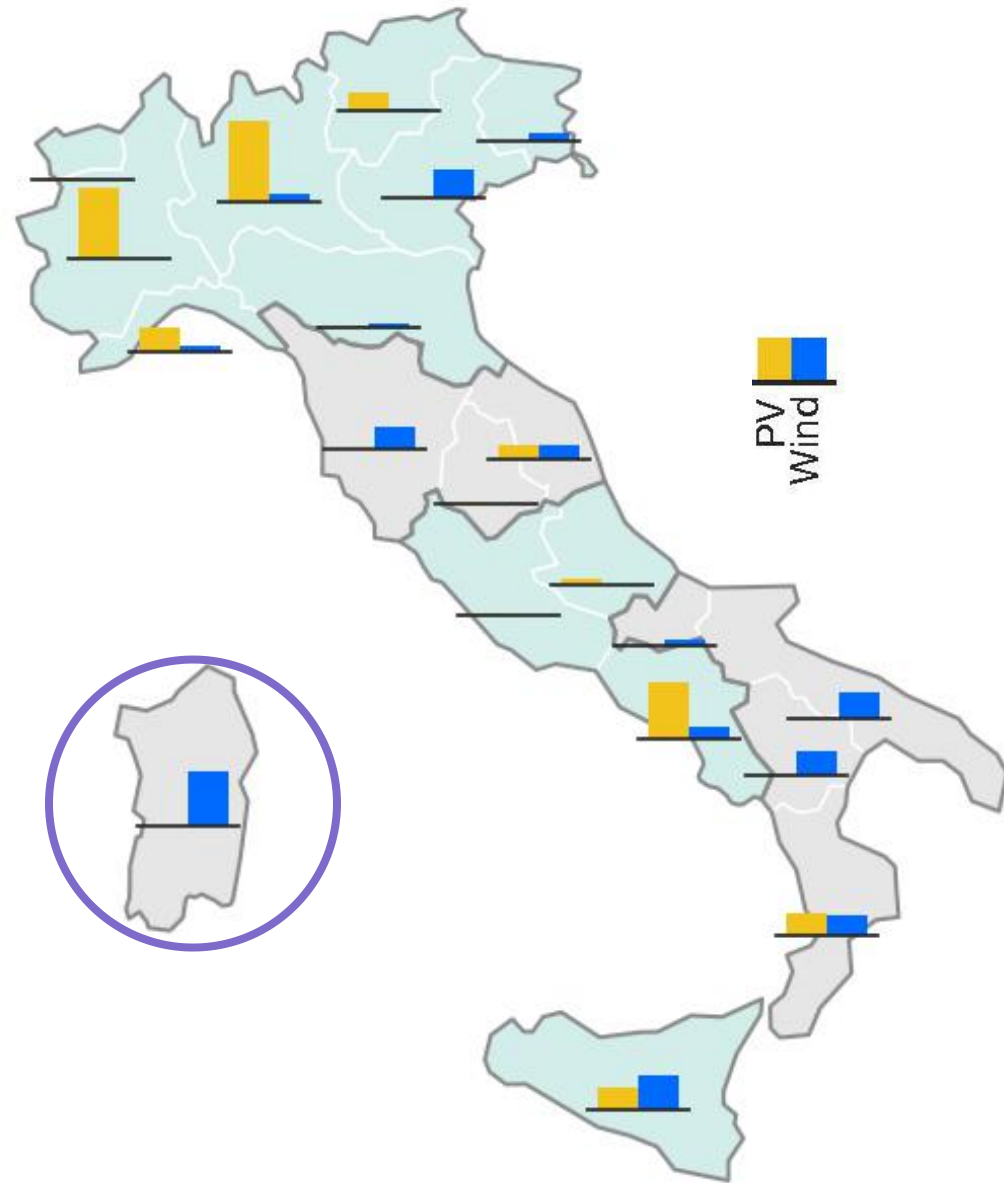
Energy planning models provide quantitative insights on such questions.

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

minimum cost

Cost-optimality.

Is it desirable?

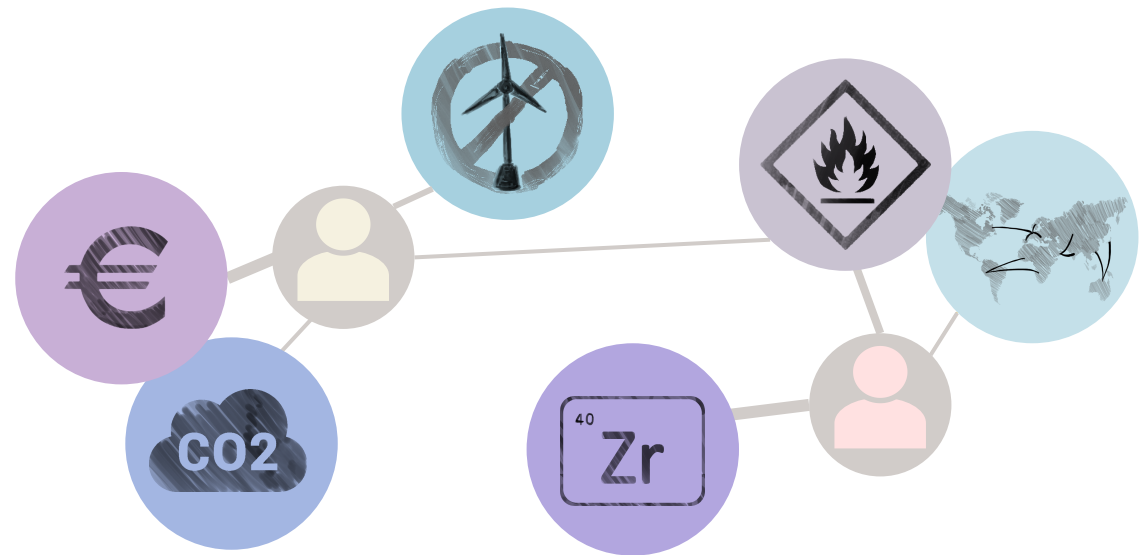


Cost-optimality.

Generalisable shortcomings

Two issues when applied to energy transition planning:

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

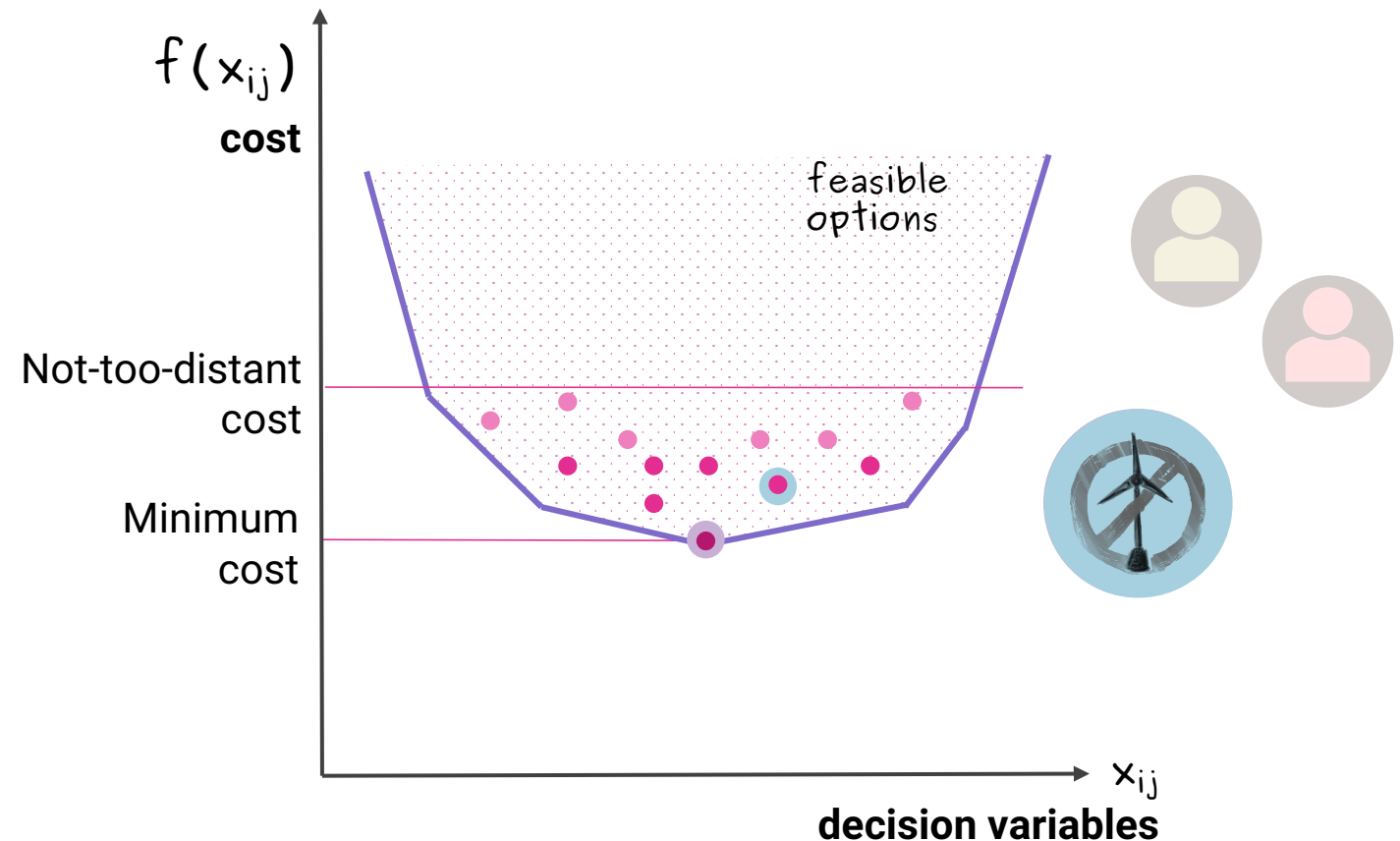


Cost-optimality.

Generalisable shortcomings

Two issues when applied to energy transition planning:

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

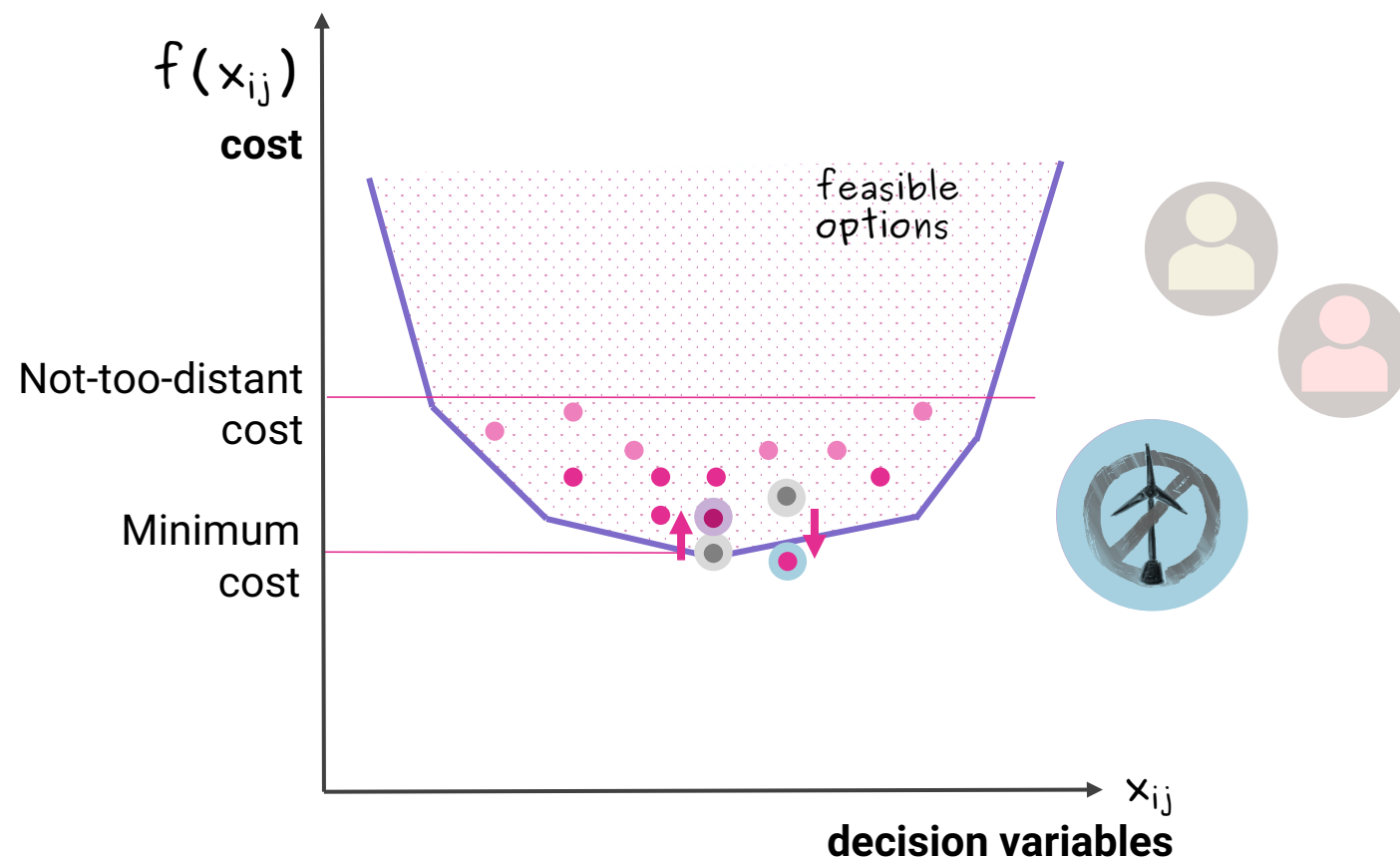


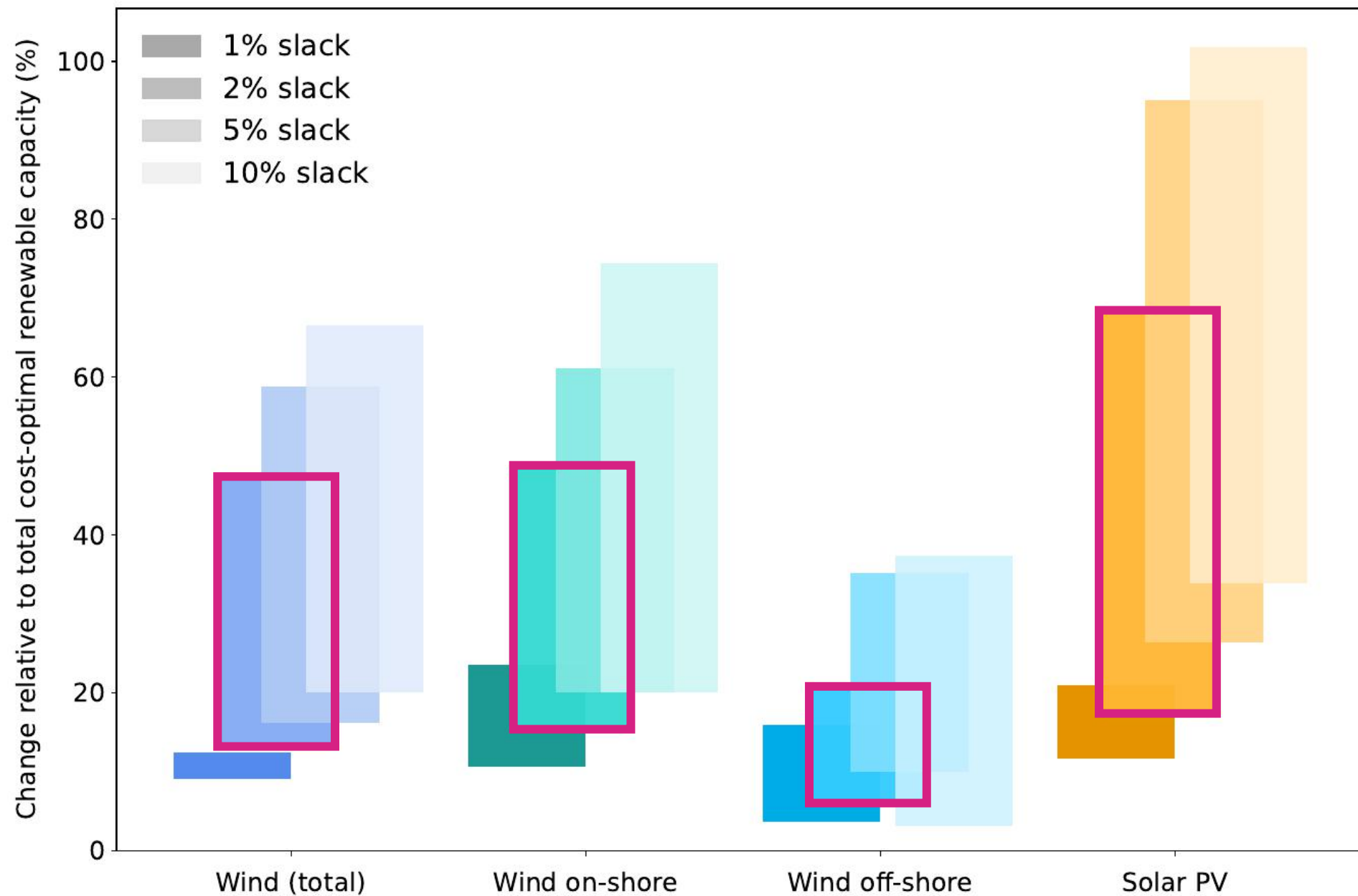
Cost-optimality.

Generalisable shortcomings

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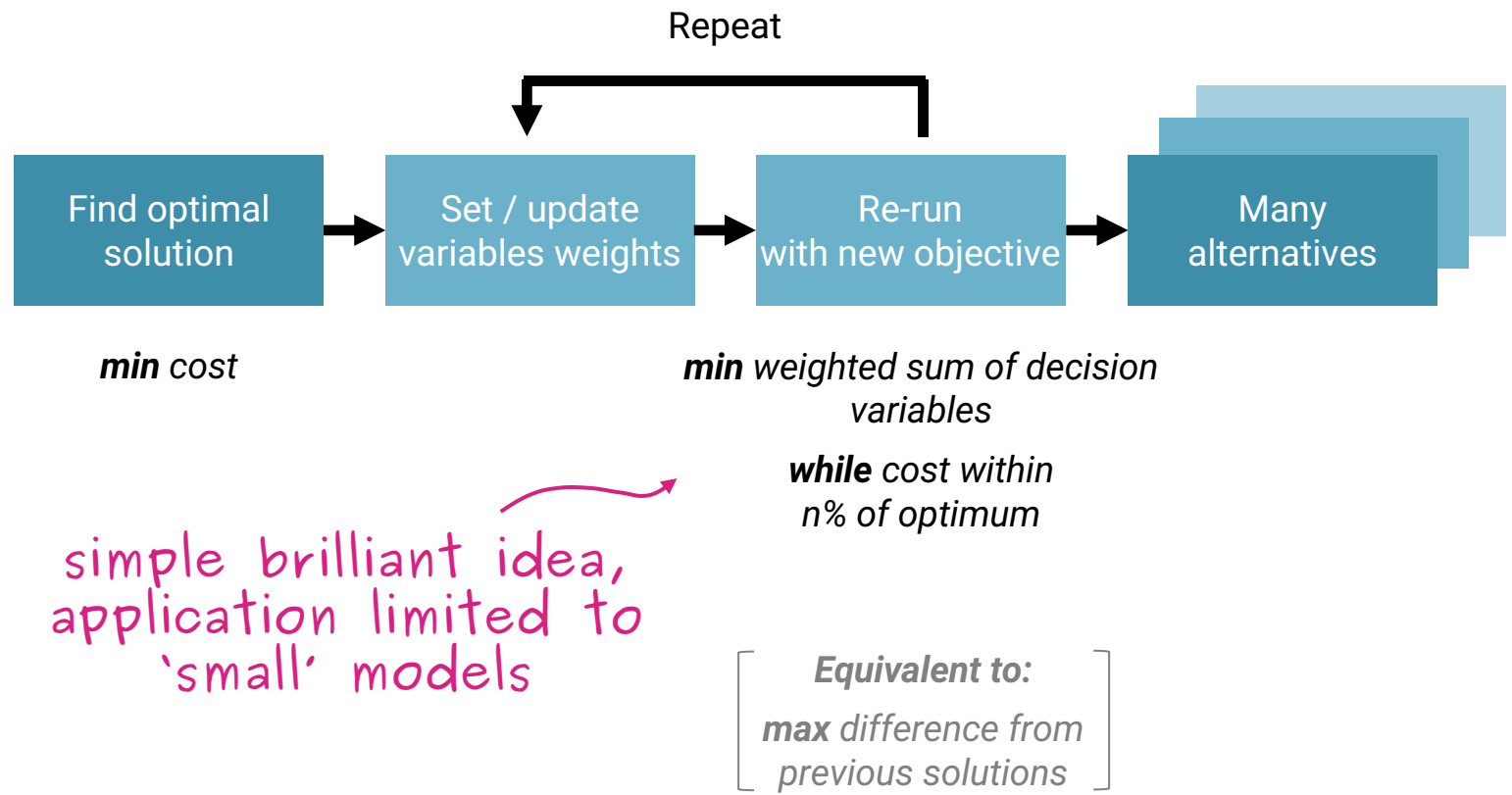




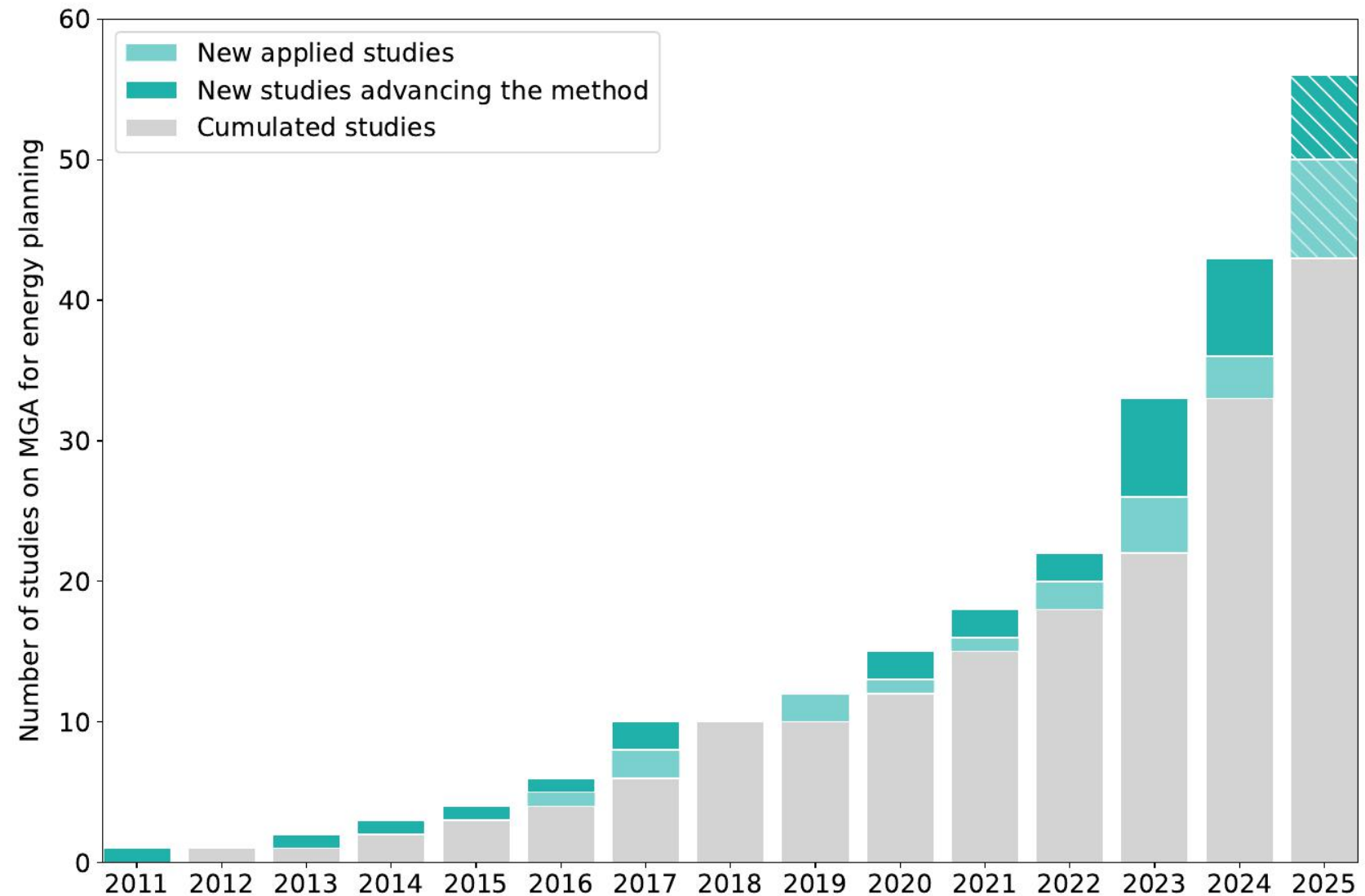
Part B.

(Next-generation) Modelling to Generate Alternatives

Modelling to Generate Alternatives.



Modelling to Generate Alternatives.

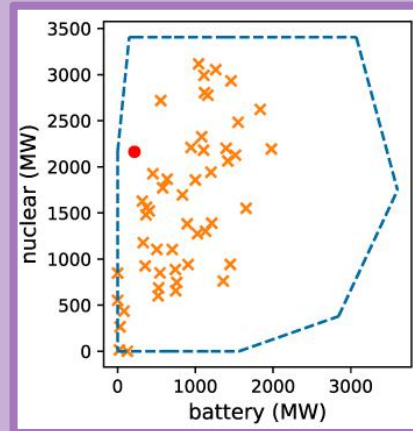


Next-gen MGA.

(selected illustrative examples)

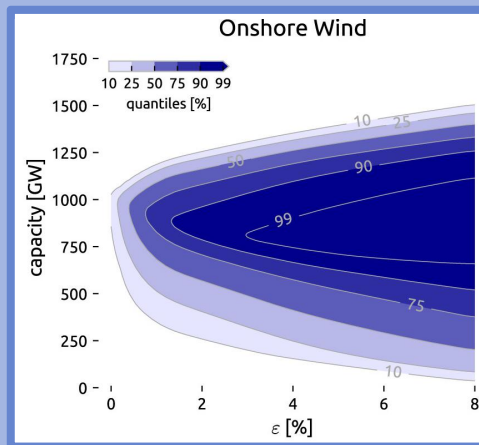
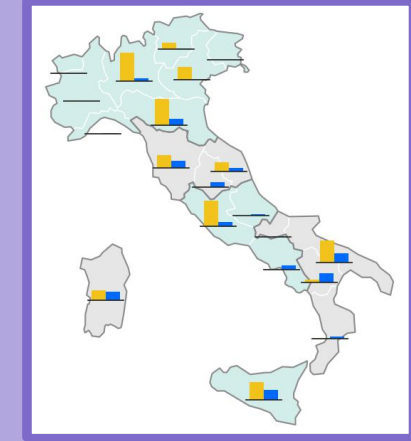
Lau, Patankar, Jenkins. *Env. Res.: Energy*, 2025. doi.org/p8nk

More efficient and robust computation



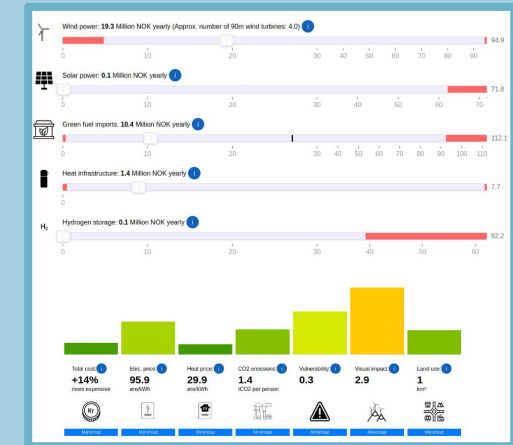
Lombardi, Pickering, Pfenninger. *App. En.*, 2023. doi.org/j457

Tailored search for spatial aspects



Integration with parametric uncertainty

Neumann, Brown. *iScience*, 2023. doi.org/g27qjq



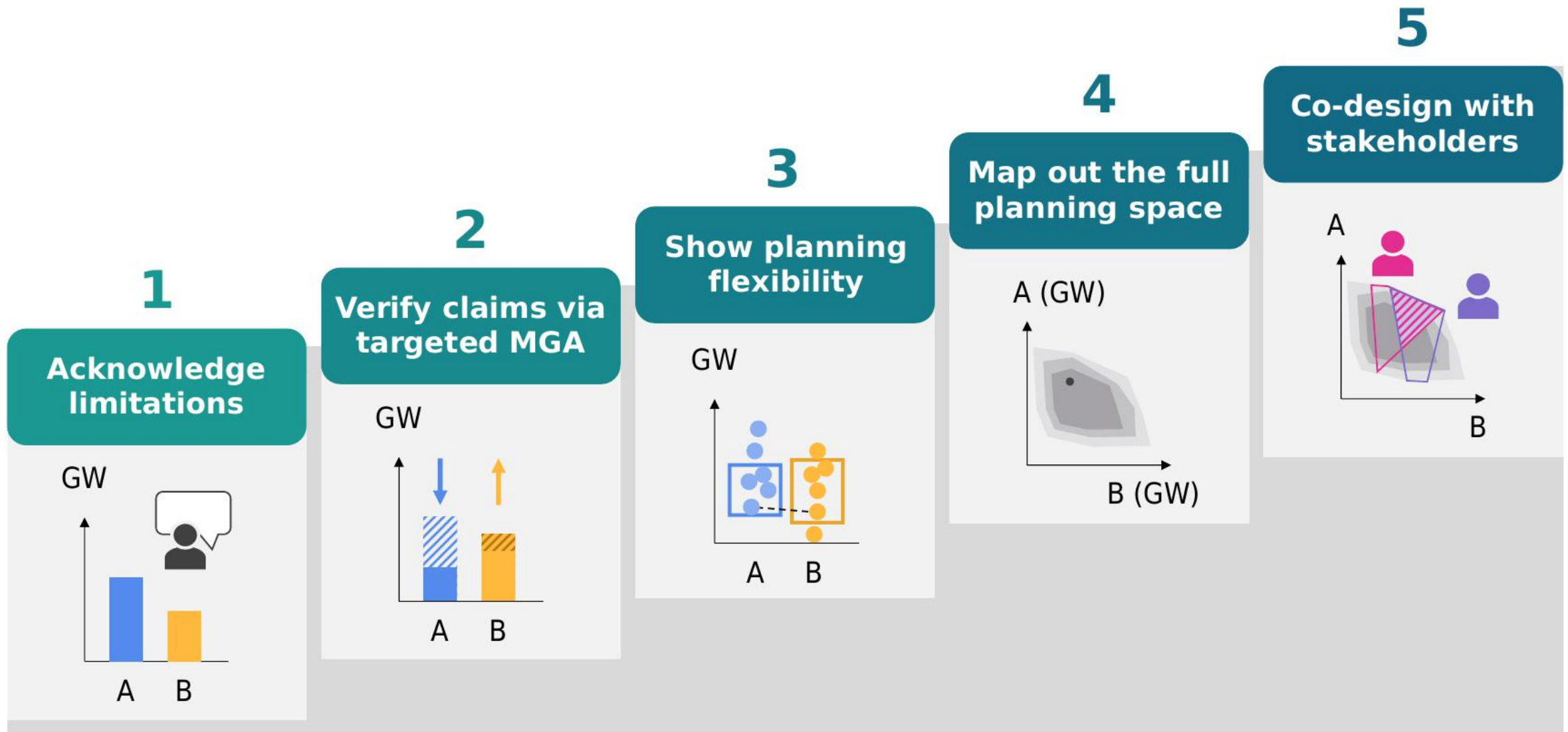
Intuitive and practically applicable outputs

Vågerö, van Greevenbroek, Grochowicz, Roithner. *arXiv*, 2025. doi.org/p8nm

Part C.

Integrate MGA in your analysis in five flexible levels

An MGA integration ladder.



Cost-optimal planning provides a false sense of exactness

Next-gen MGA enables technically-robust and socially-viable plans

Tailored MGA checks on key insights are simple but very helpful