

The quantity-quality transition in the value of expanding wind and solar power generation

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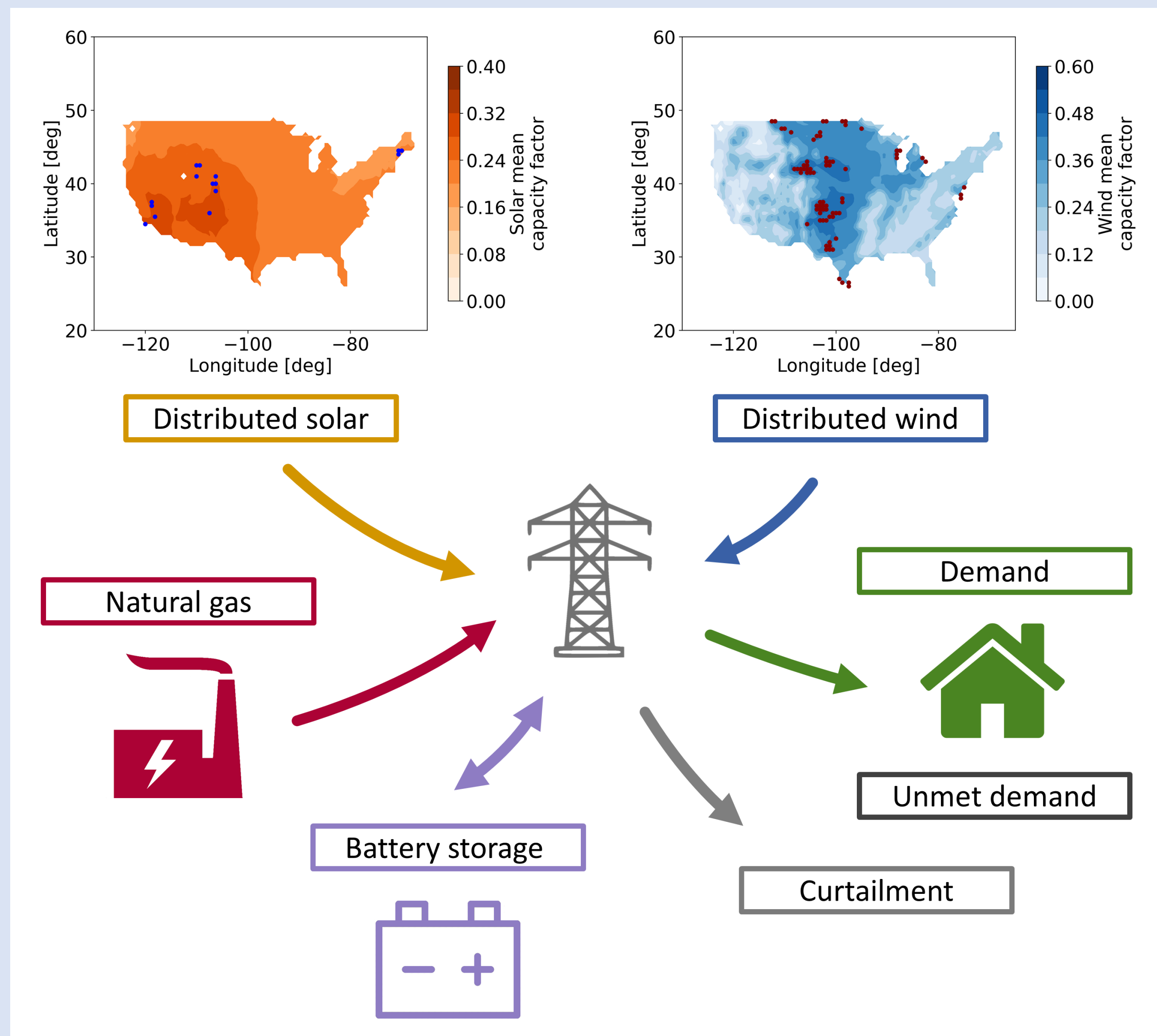
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How to strategically site distributed wind and solar generation while decarbonizing electricity systems?

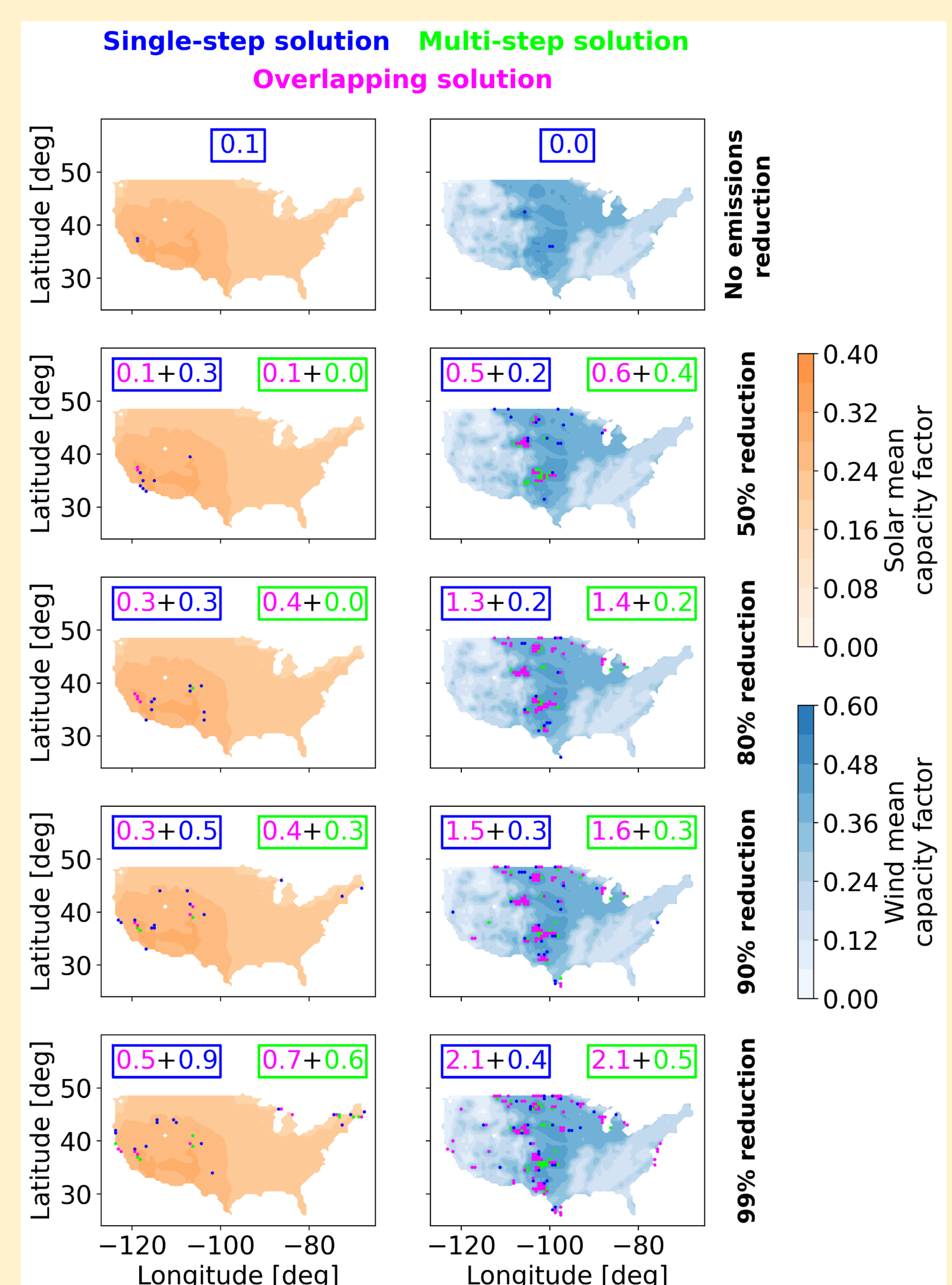
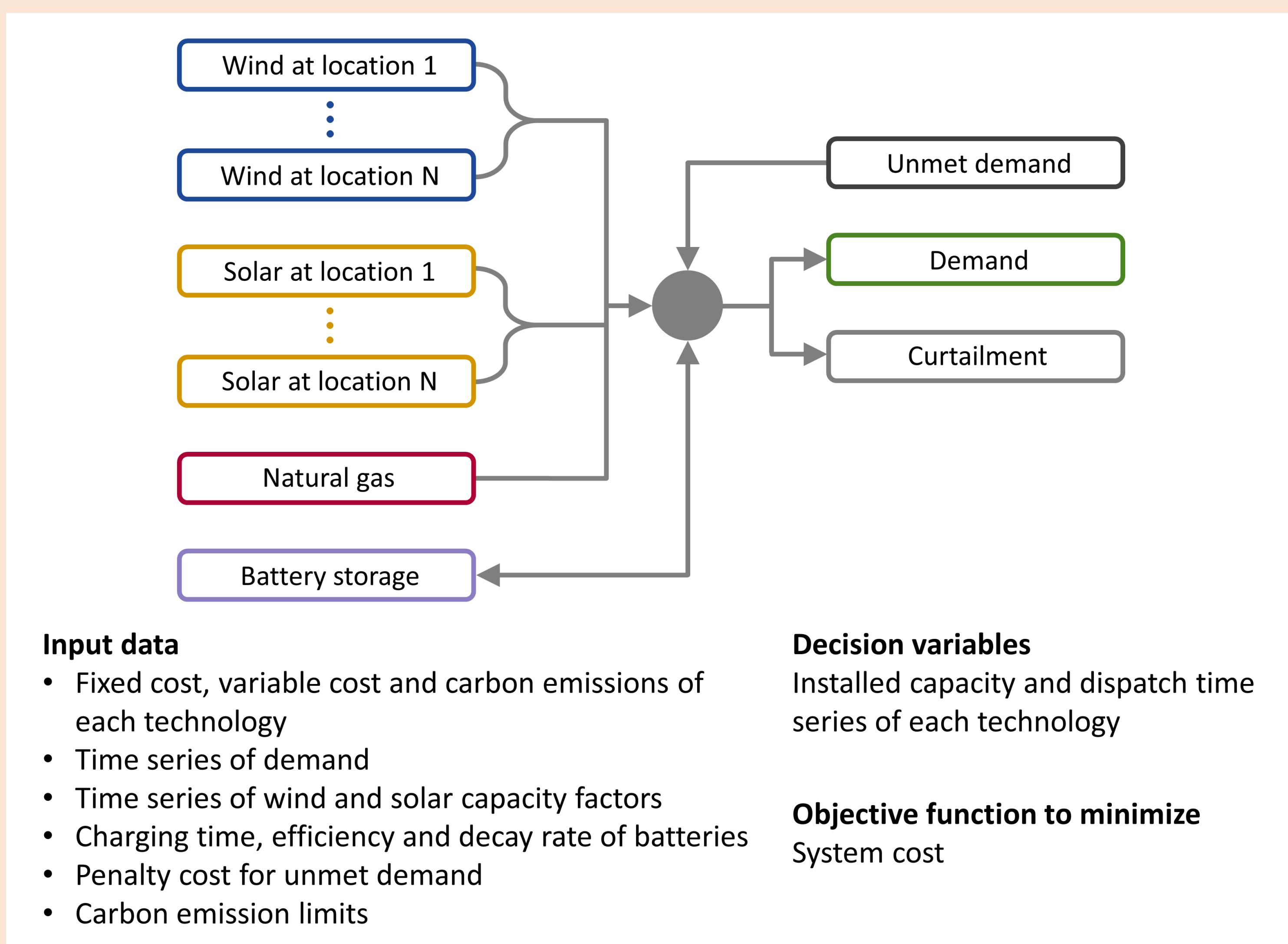
Key takeaways



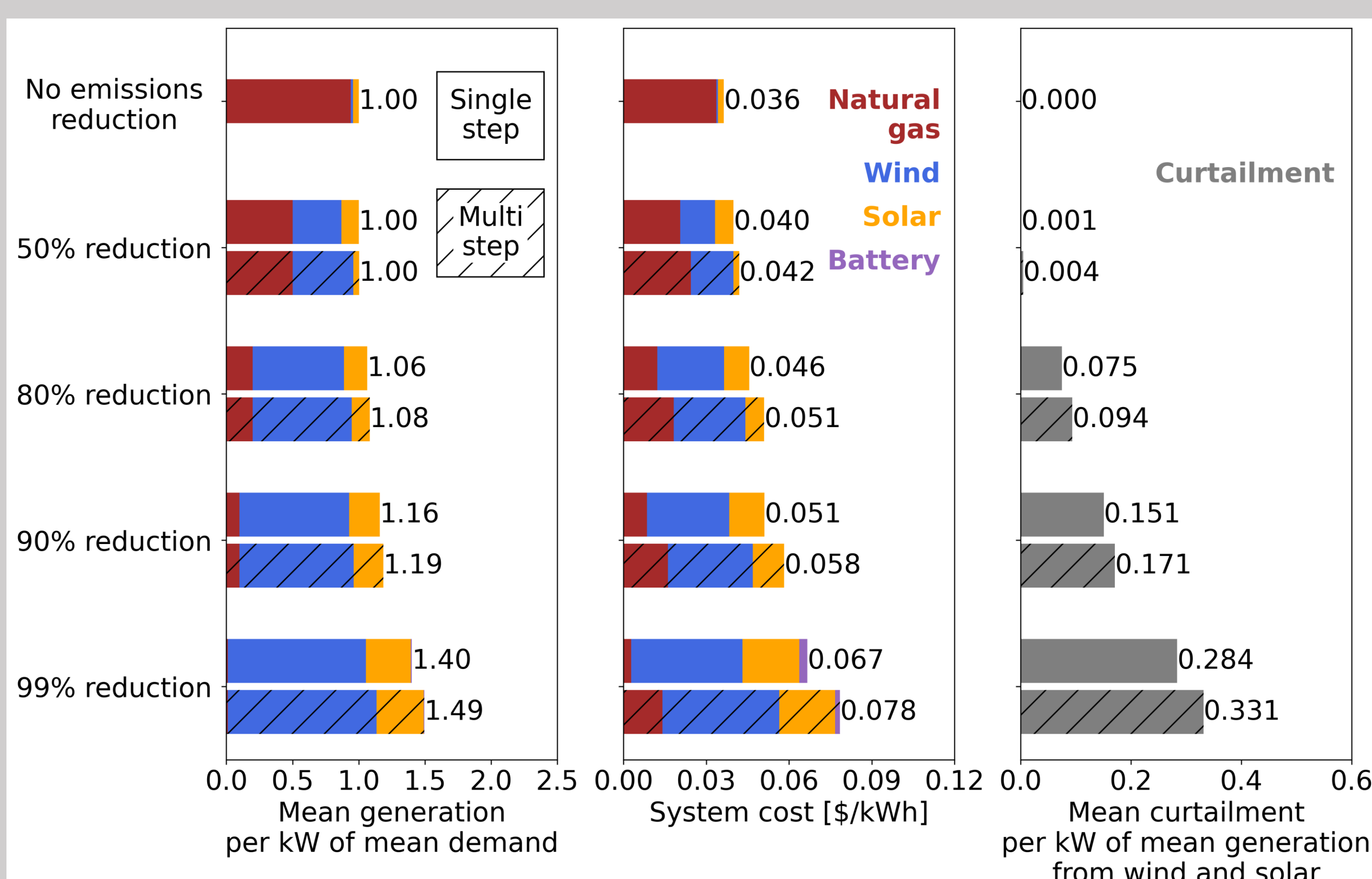
- With weak carbon emission constraints and substantial amounts of flexible electricity sources on the grid, the primary geophysical factor governing the value of wind and solar infrastructure is resource amount – that is, resource *quantity* is paramount.
- With strict carbon emission constraints, the need to meet demand without dispatchable generation will place a higher value on the quality of the wind or solar resource, specifically, its correlation with residual demand – that is, there is increased emphasis on the *quality* of the wind or solar resource.

Illustration of the macro-scale energy model used to understand the optimal siting of wind and solar generation while decarbonizing electricity systems.

Locations of the wind and solar installations selected by our optimizer for the different emissions levels.



Mean generation, system-level cost, and mean curtailment for increasingly strict carbon emissions limits resulting from both multi-step and single-step optimizations.



Mean capacity factors of wind and solar installations versus the correlation between the capacity factor time series and the residual demand.

