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Introduction

- Holistic Energy Resource Optimization Network (HERON) is a software that optimizes the capacities and dispatch of components for maximum economic outcome. The economic outcome of interest is the Net Present Value (NPV). HERON conducts this optimization on a two-level setup with capacity and dispatch handled separately.
- The focus of this project is developing an alternative workflow, which handles this optimization on a single level. For cases with cooperative dispatch, the single and two-level solutions are equivalent. Furthermore, a single level solution may be more efficient in certain cases.

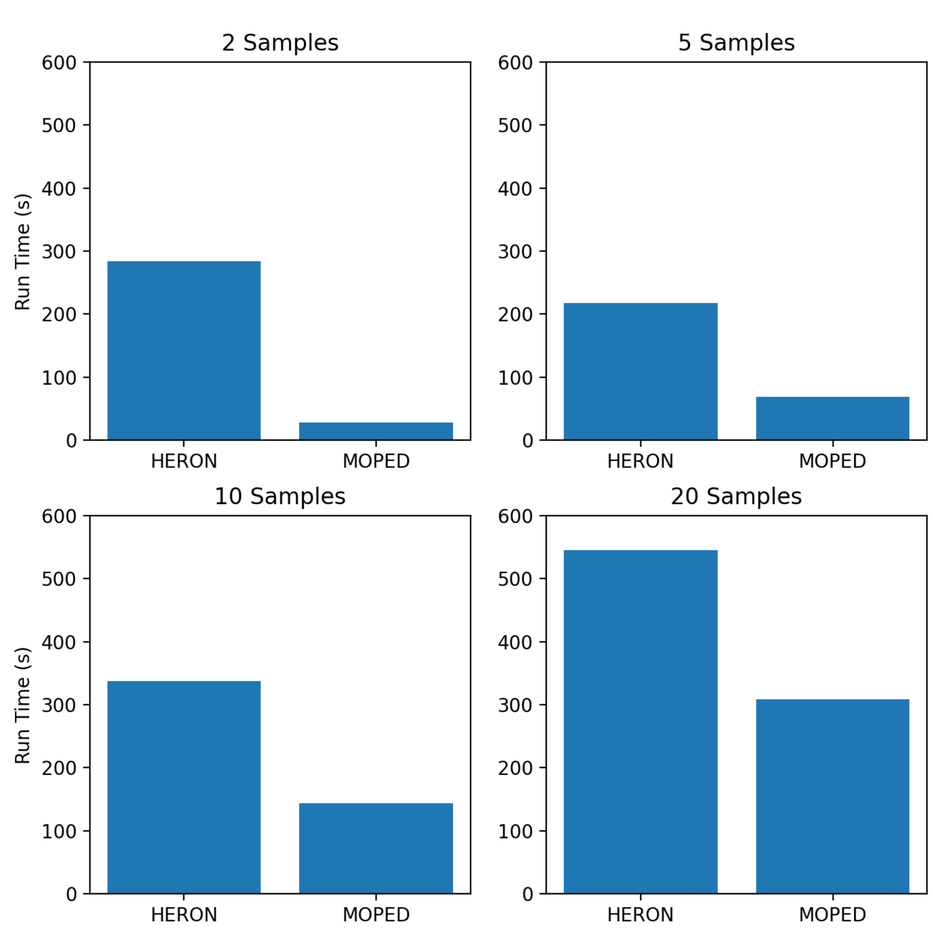
Methods

- The alternative workflow, Monolithic Optimizer for Probabilistic Economic Dispatch (MOPED), reads the same input file to build the single level optimization problem.
- In contrast to the standard HERON workflow, MOPED develops an algebraic expression for the NPV as a function of the component capacities and dispatch.

$$\max_{C,D} NPV(C, D)$$
$$s.t.\ \ C_{lower} \leq C \leq C_{upper}$$
$$0 \leq D \leq C$$
$$\sum Produced = \sum Demanded$$

- To compare the workflows, a simple use case is run with both workflows.
- The number of samples or realizations of the synthetic history varies between runs. The comparison focusses on net run time and final NPV results.

Results



Number of Samples	HERON NPV Results ($)	MOPED NPV Results ($)	NPV Difference (%)
2	8713000000.000	8632000000.000	0.90
5	8707000000.000	8633000000.000	0.85
10	8695000000.000	8633000000.000	0.70
20	8698000000.000	8633000000.000	0.75

Conclusion

- Run times reflect efficiency of single level optimization
- Both approaches converge to similar results
- MOPED is scheduled to expand its capabilities to handle more inputs that HERON currently accepts.
- Considering multiplicity for clustered evaluation could significantly reduce MOPED run time, while maintaining an accurate NPV expression.

References

https://github.com/idaholab/HERON
https://github.com/idaholab/raven
https://github.com/idaholab/TEAL