Sandia National Laboratories

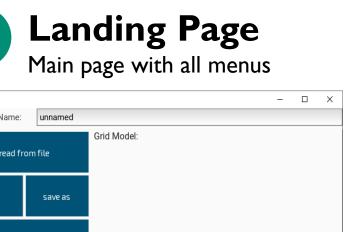


Storage Sizing and Placement Tool in Distribution Grids Will Vining, Ujjwol Tamrakar, John Eddy

Overview

- Identify optimal sizing and placement of Energy Storage assets on a distribution grid, incorporating considerations of:
 - Grid physics
 - Grid reliability
 - Disruptions caused by extreme events
- A HELICS-based co-simulation couples:
 - OpenDSS grid simulation
 - Grid reliability simulation
 - Energy management system simulation

UI Development



ere is no current grid mod

select grid mo



2





SSim						-		Х
Proj	ect Name:	unnamed						
	read from file		Grid Model: C:\Users\jpeddy\Documents\dev\storage-sim	\examples\ieee34_ope	ndss_model\ieee	34Mo	d_PV.d	SS
s	ave	save as		6 22	6 48			
	select grid model select storage configure reliability		puncelus	a 20	6 11			
				6 18 6 615 6 04 6 76	d64 d642	6 60	86 6	840
			a10		682 690 66 2 652r			
	configure metrics				852		28	
	Run		Show Bus Labels 🛛 🗹 Show Storage Option	15 🗹	4 54 4 56			

Select possible busses sourcebus [1, 2, 3] 800	
[1, 2, 3]	
800	
[1, 2, 3]	
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810 [2]	
812 [1, 2, 3]	
Required?	
Edit Control Parameters	
	802 [1, 2, 3] 806 [1, 2, 3] 808 [1, 2, 3] 810 [2] 812 [1, 2, 3] Required?



s storage asset: NewBESS currently Volt-Va

Volt-Var Control Para

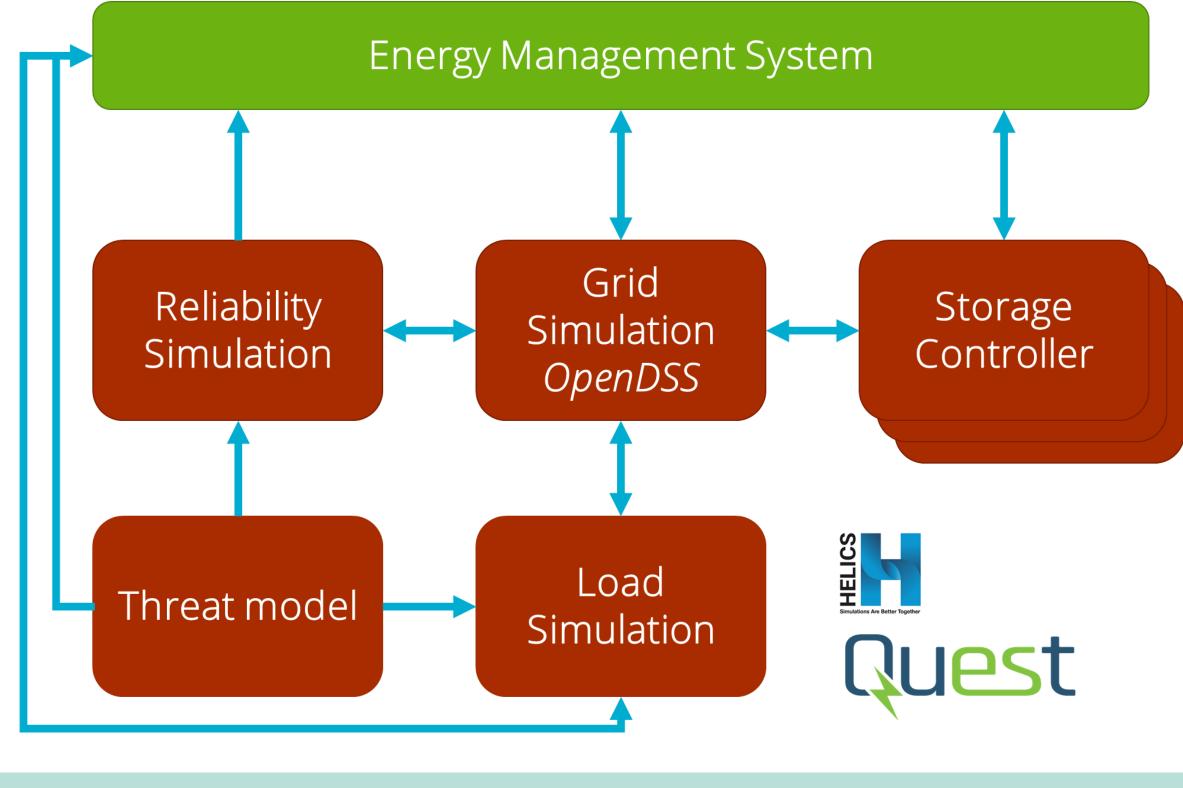
v Bus Labels 🛛 🗹 Show Storage Options 🚽



Voltage Metric for 860 ower Limit=0.975, Uppe. Bus Voltage Metric for 814 ower Limit=0.975, Uppe...



Storage controller simulations



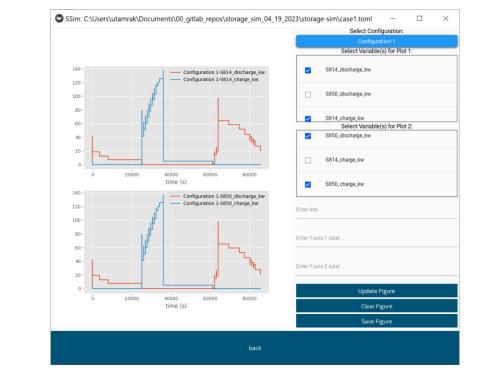


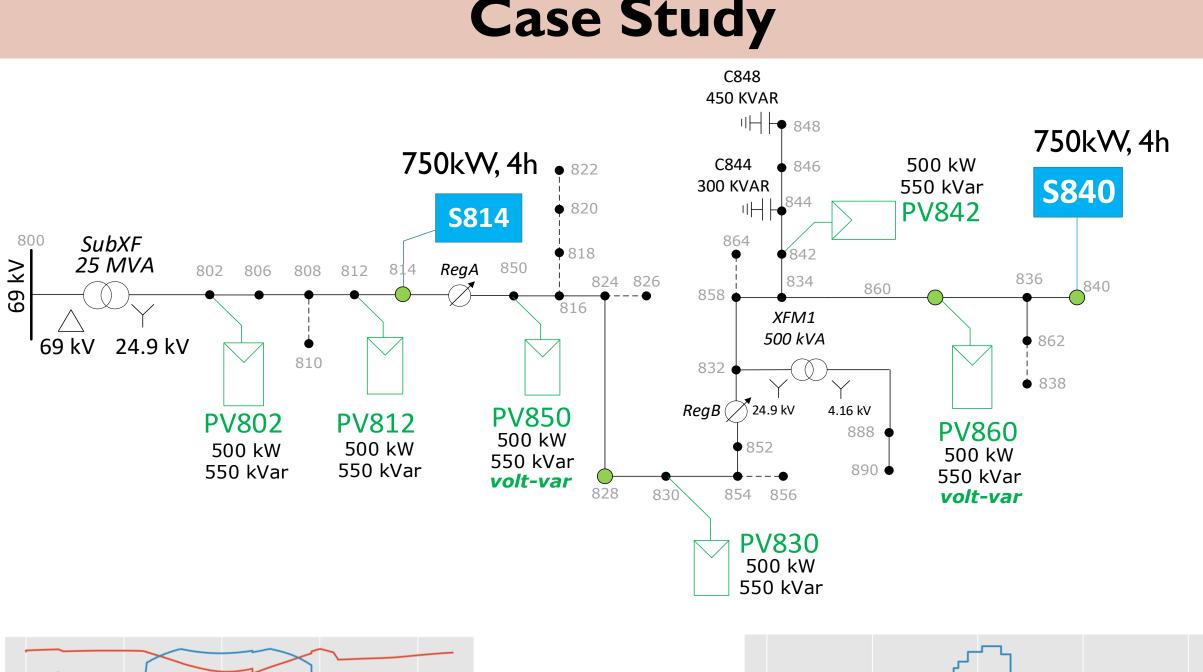


set voltage targets by ome other metric value

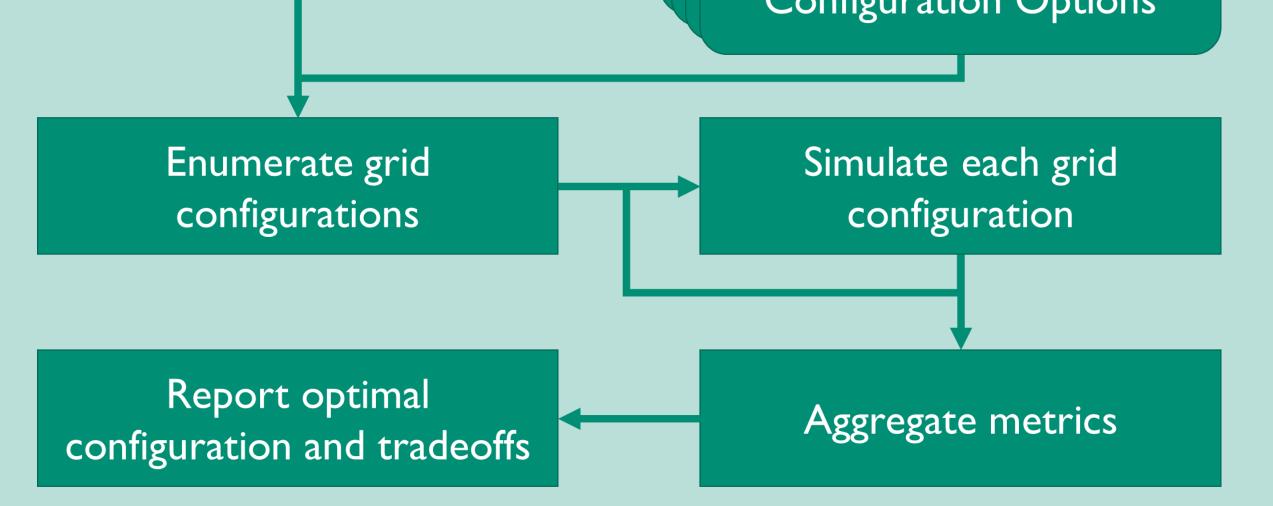


Results and Visualization

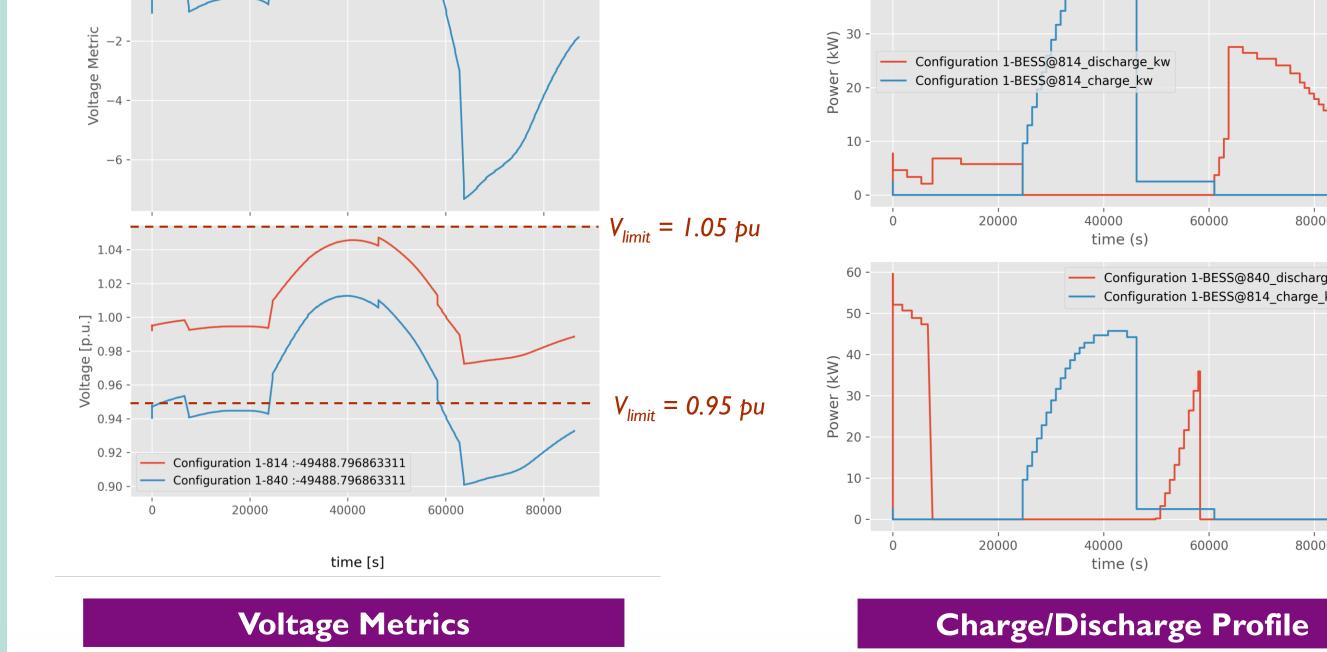




Case Study



- Metrics are captured and aggregated across the grid to quantify the impact of each storage configuration
- Metrics are normalized in such a way that different quantities of interest can be compared directly.



Metric for voltage quality at busses 814 and 840 in the feeder above. The metric values become increasingly negative as the limits on

voltage are exceeded.

Future Work

- The simulator will be distributed as an open source component of Sandia's QuESt tool.
 - Simulate threats to the grid such as extreme weather.
 - Develop capability to add PV assets from within the simulator.
 - Model different energy storage technologies.



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This work was supported by the U.S. Department of Energy Office of Electricity Energy Storage program under the guidance of **Dr. Imre Gyuk**.

