Electrical Energy Storage for Wind Integration Support

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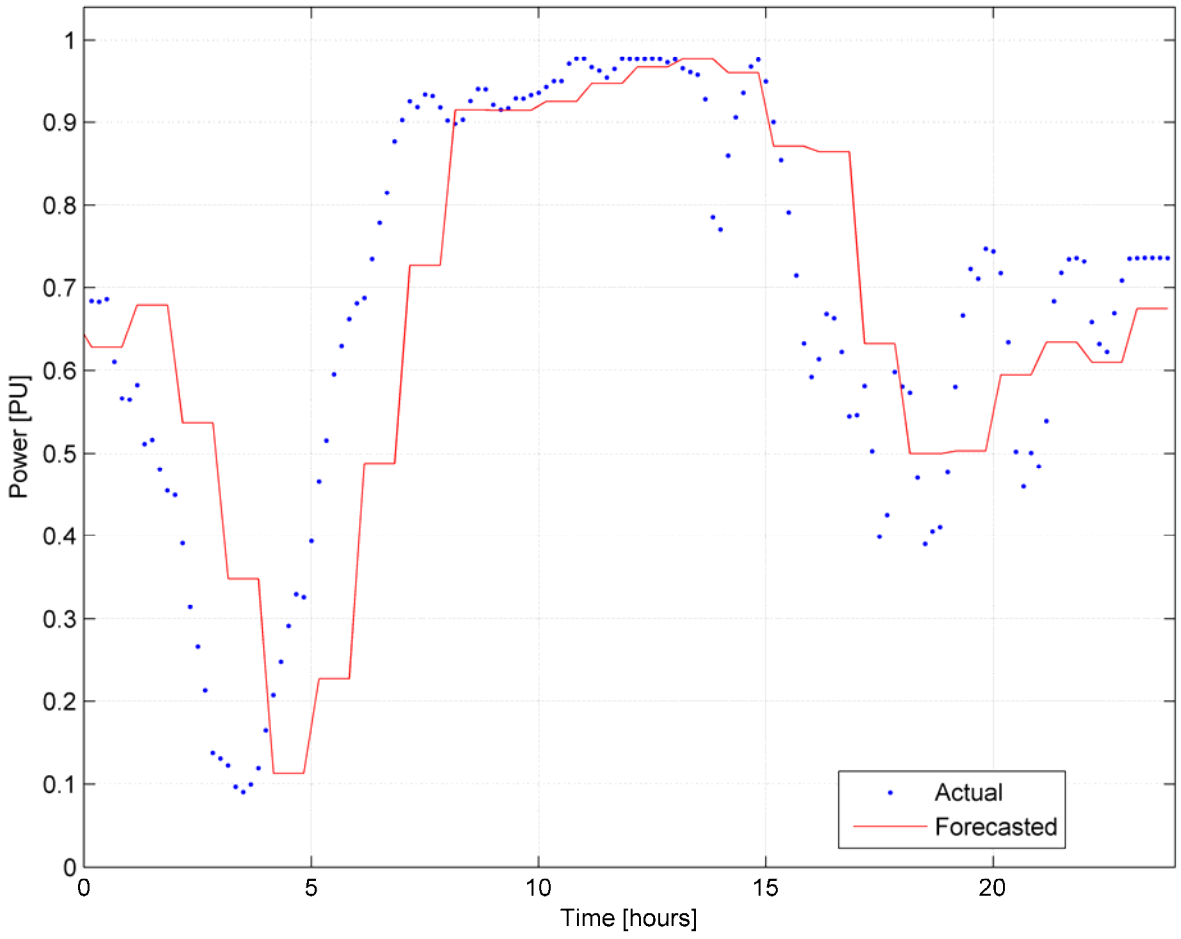
Problem Statement: Forecast *vs*. Produced Power



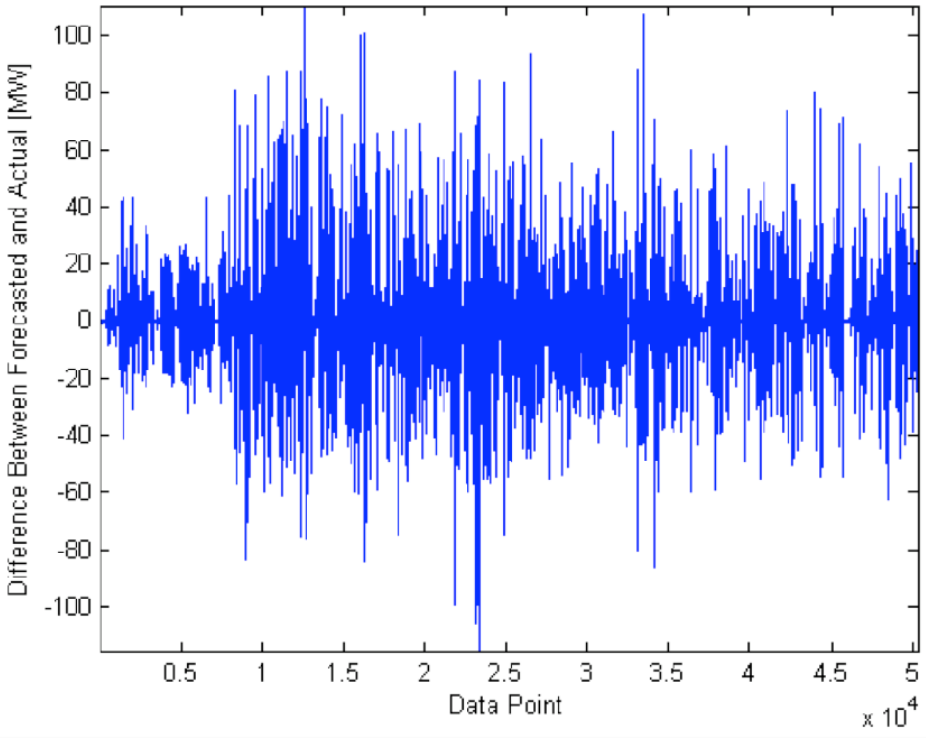
Produced wind power frequently does not match prediction

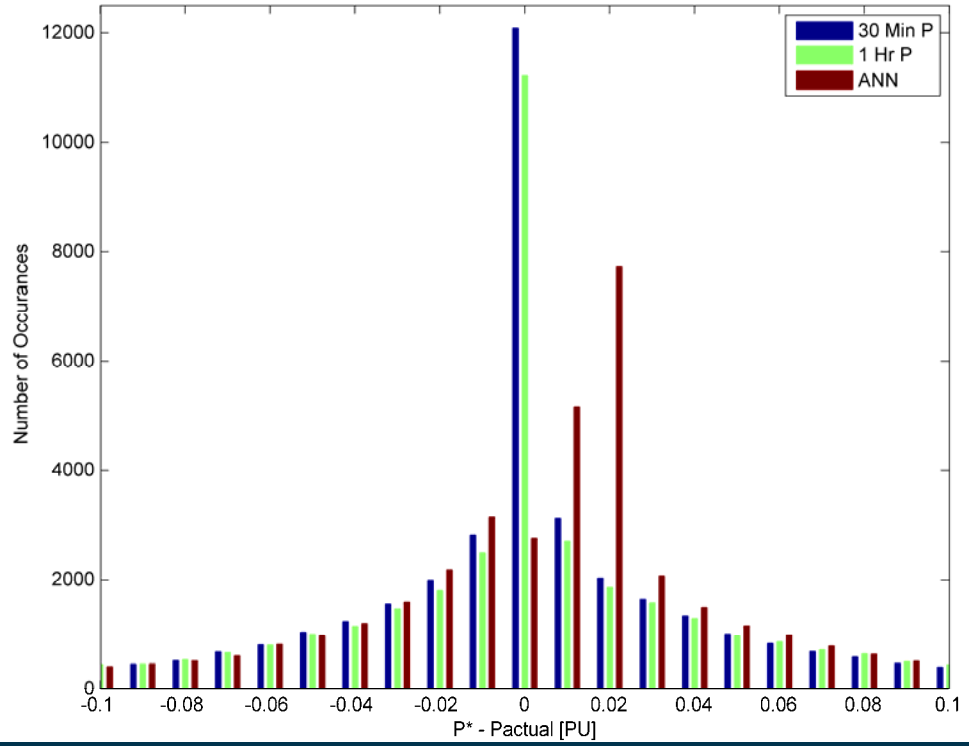
Requires increased spinning reserve by transmission authority and utility, increases integration costs

Q1: What are best energy storage options (widely applicable)

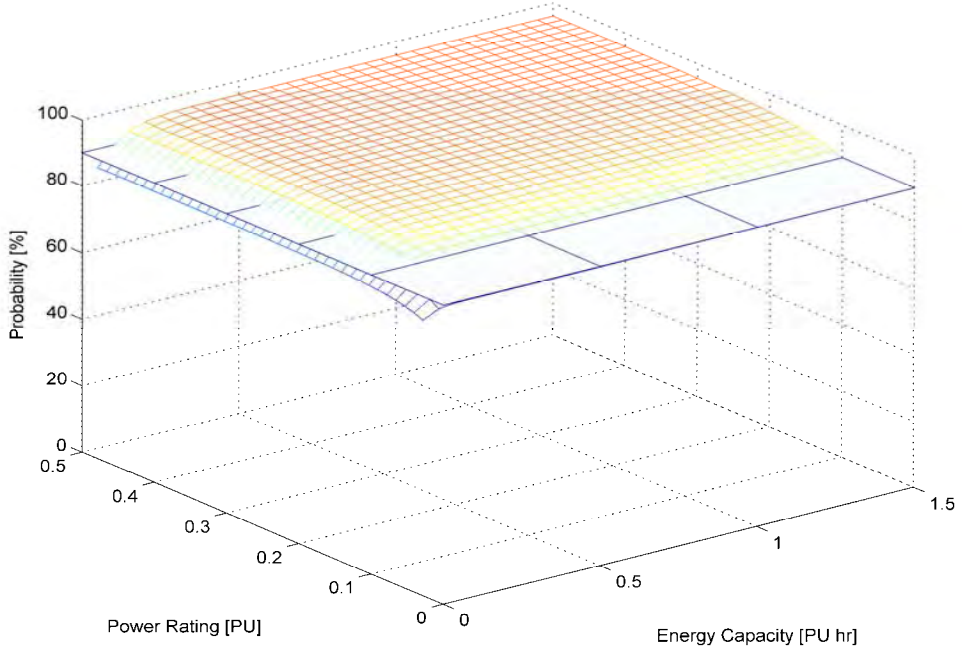
Q2: What size of Energy Storage is most beneficial?

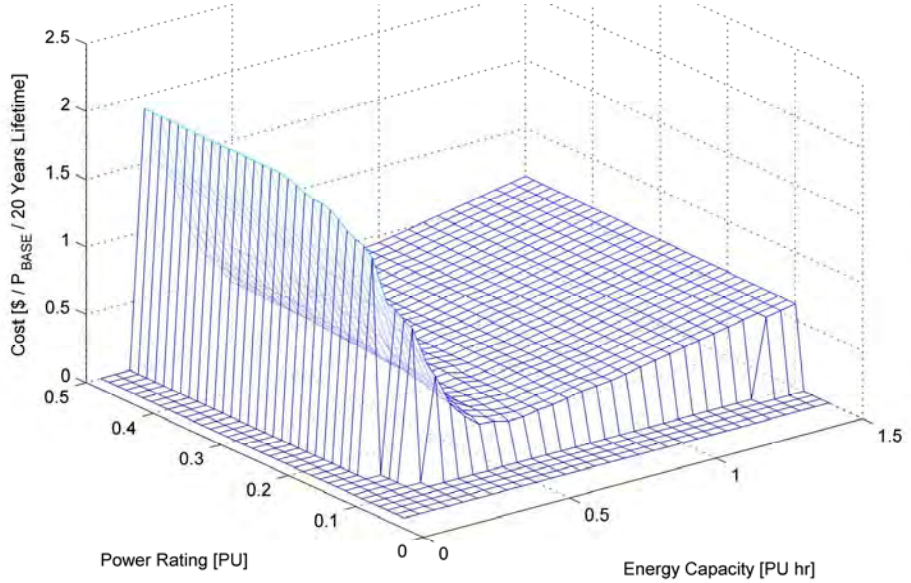
How Often Does Energy Storage Need to Be Used

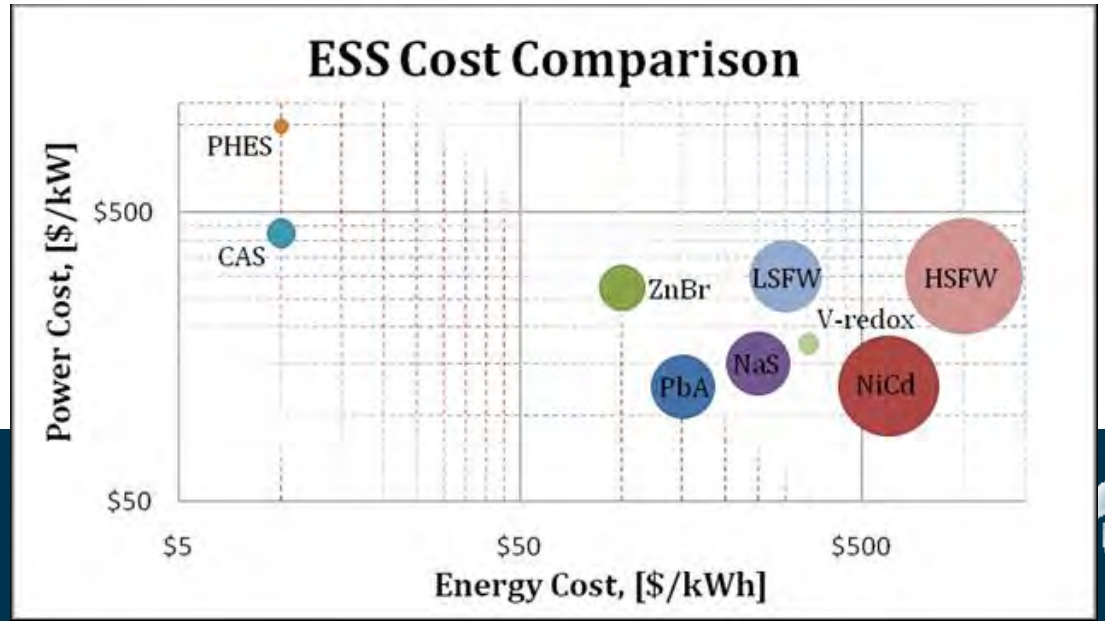




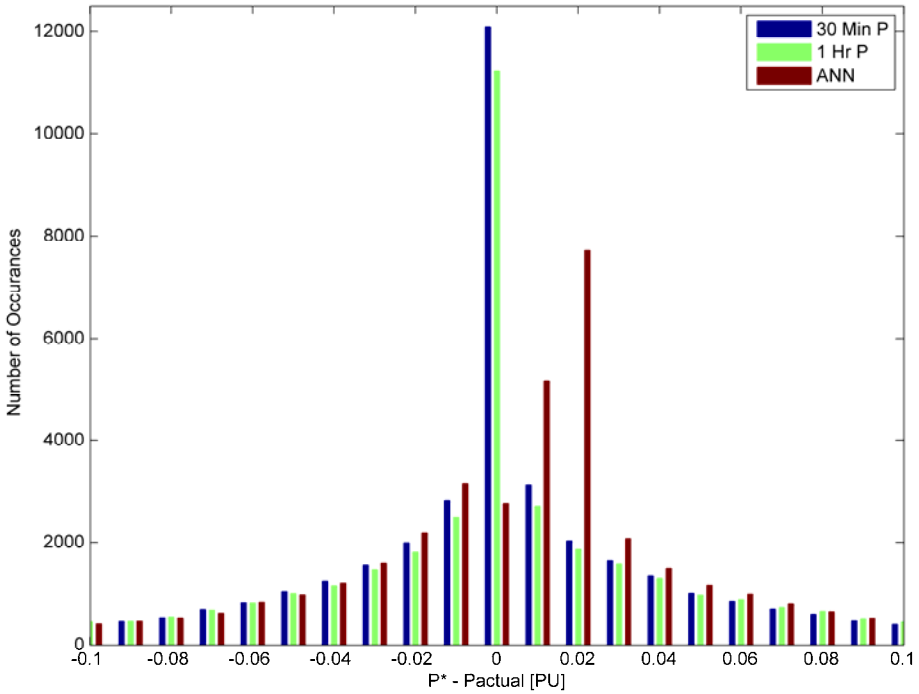
Energy Storage – 30 min persistence

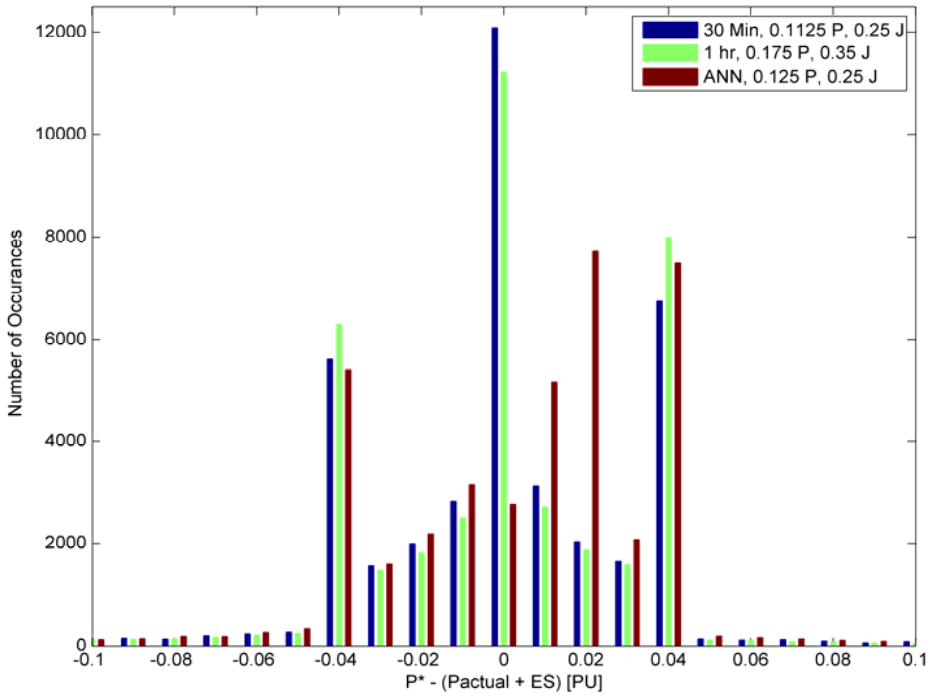






Energy Storage Effect on System



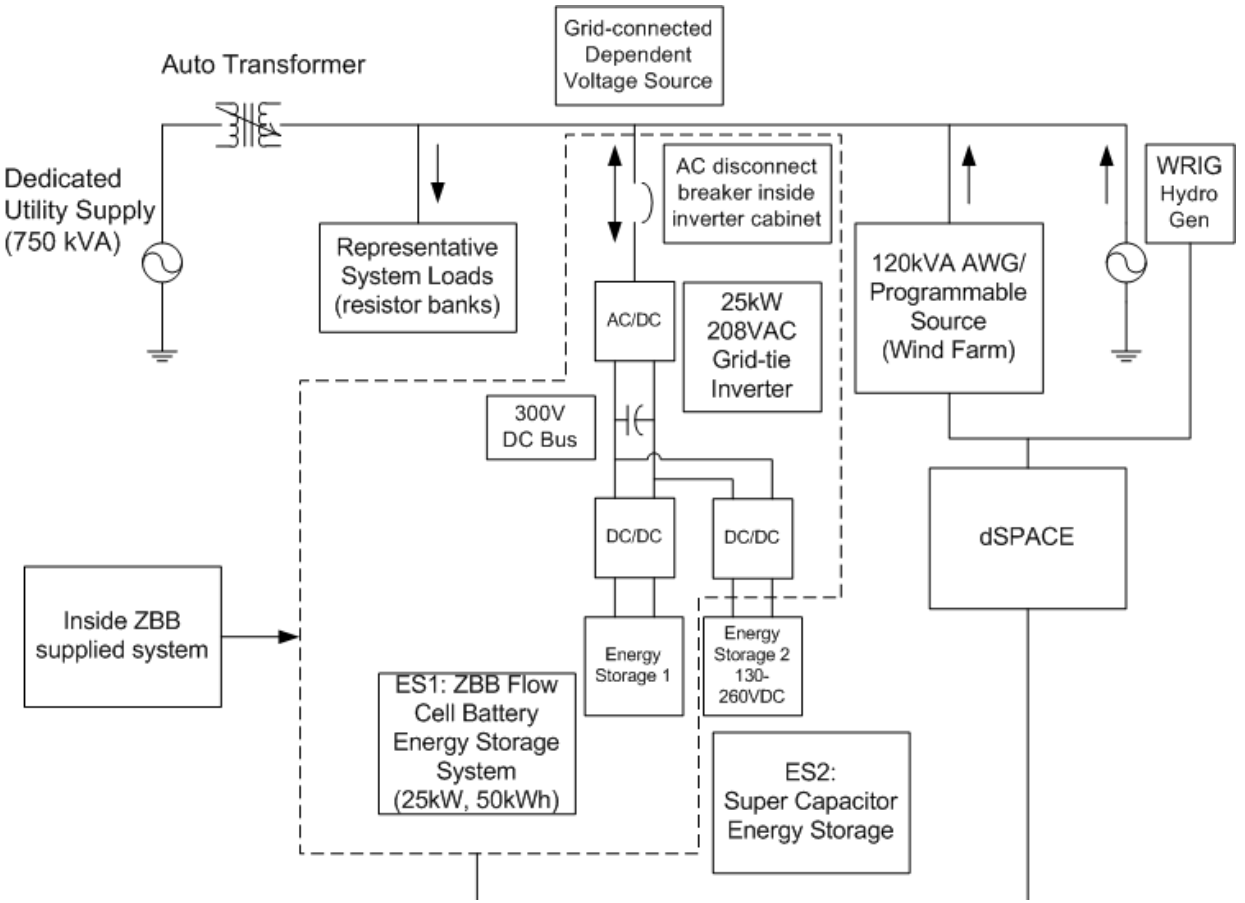


	Power	Energy	$/Power
1hr	0.1500	0.8000	0.3366
30min	0.1125	0.4500	0.2031
30 min ANN	0.1125	0.5500	0.2336

The Lab Micro-Grid

To verify these values experimentally, lab micro-grid under construction at OSU-WESRF

Will be complete and operational end of 9/09



Conclusions and Future Plans

Improving forecasting is simplest and most cost effective method of improving performance

Energy capacity has a bigger impact than power rating

Flywheel and Flow Battery ES most universal solutions

Pumped hydro (and regular hydro) for long term energy storage if topologically feasible

Phase II of project proposal submitted to BPA/BEST/CLPUD/OSU

Using developed lab micro-grid evaluate:

- Control algorithm that best enables power management
- Lifetime effects on Zn/Br battery in this application
- Load leveling through in-home ES systems?

Acknowledgements

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