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Using an Advanced Distribution Management System Test Bed to Evaluate the Impact of Model Quality on Volt/VAR Optimization

Annabelle Pratt

National Renewable Energy Laboratory (NREL)

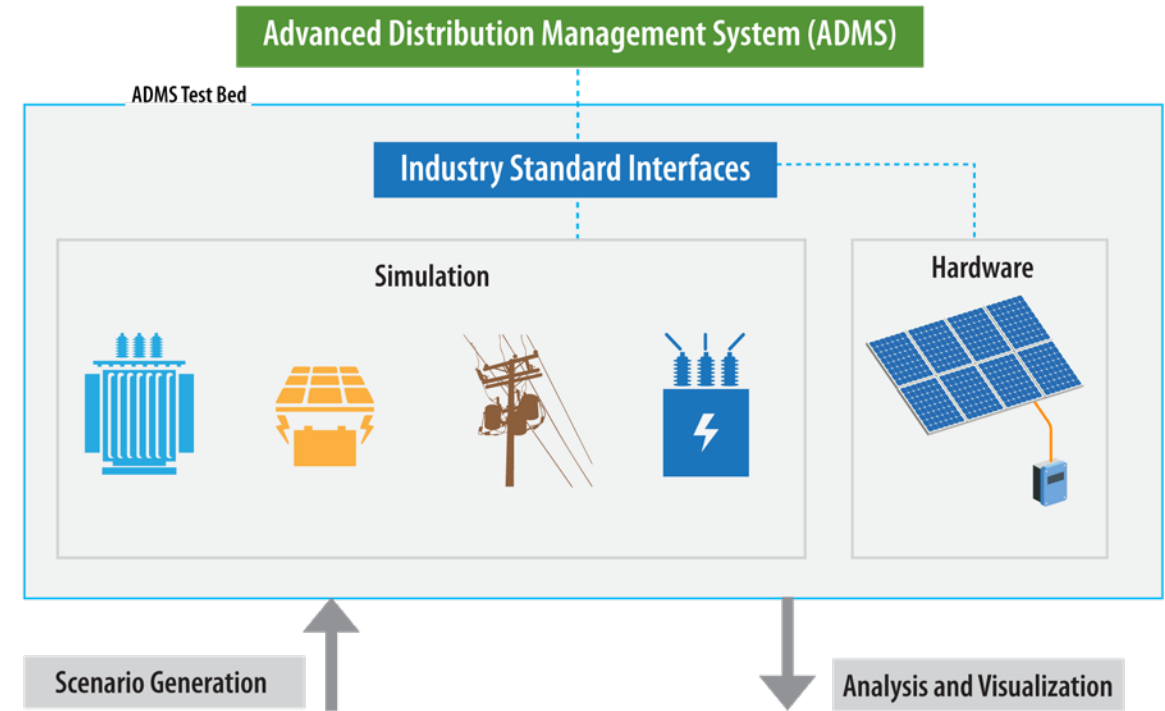
annabelle.pratt@nrel.gov

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Background

- U.S. Department of Energy (DOE), Office of Electricity-sponsored advanced distribution management system (ADMS) test bed at NREL
- Accelerate adoption of ADMS
- Utilities can evaluate applications for their specific system
- This paper presents preliminary results from a Volt/VAR optimization (VVO) use case.



Test Setup

- Simulate Xcel Energy feeder in real time
 - Controller- and power-hardware-in-the-loop.
- Use two different network models in Schneider Electric ADMS
 - Q1: Lowest model quality, no remediation
 - Q4: Highest model quality, full remediation.

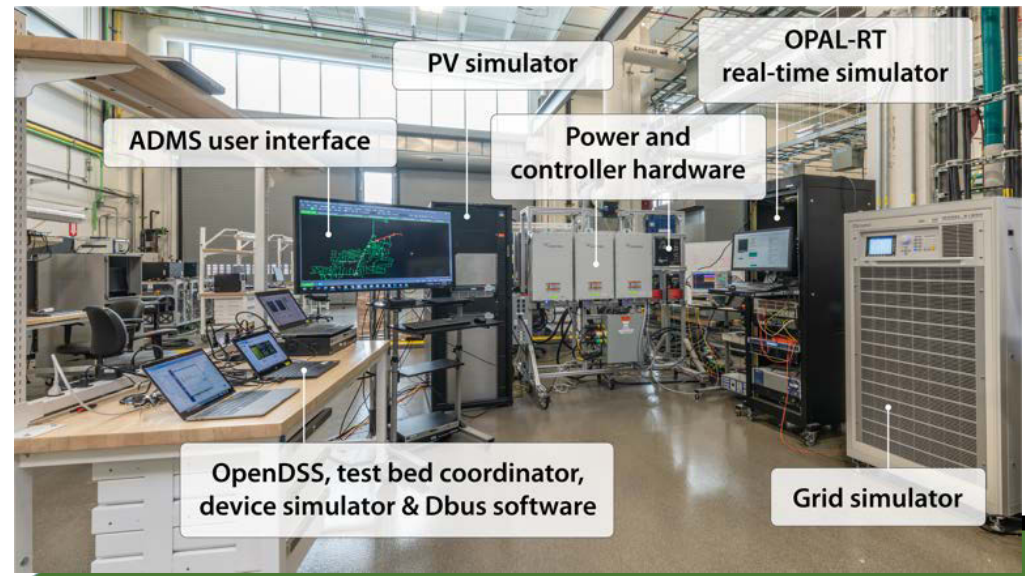
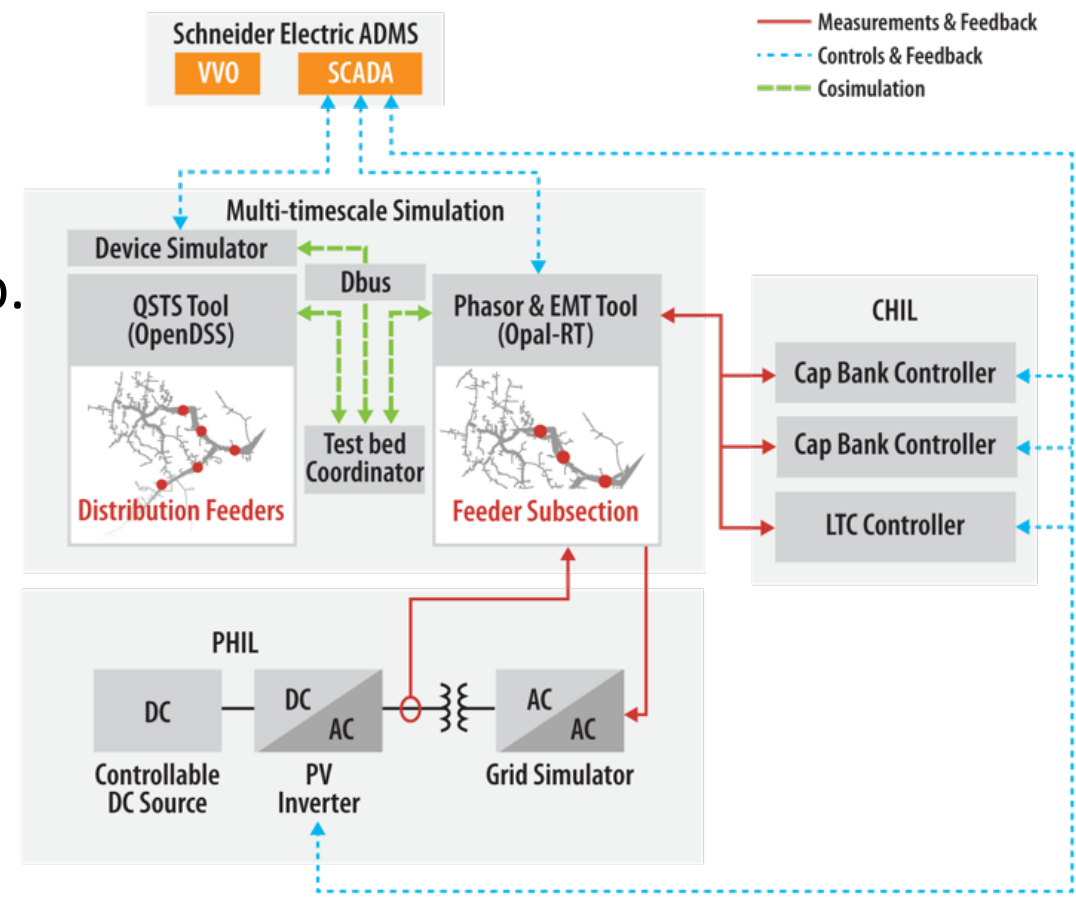
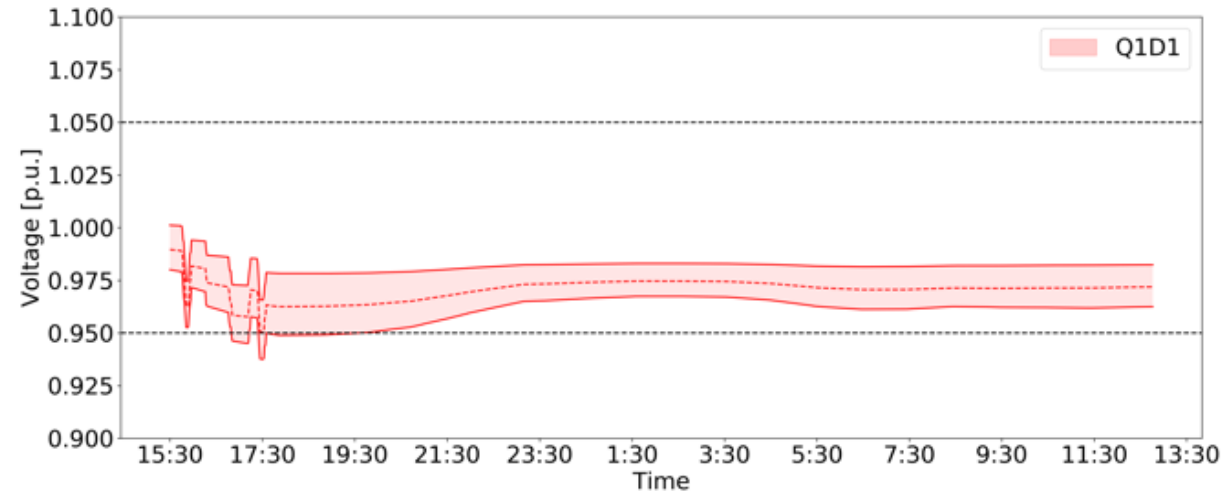
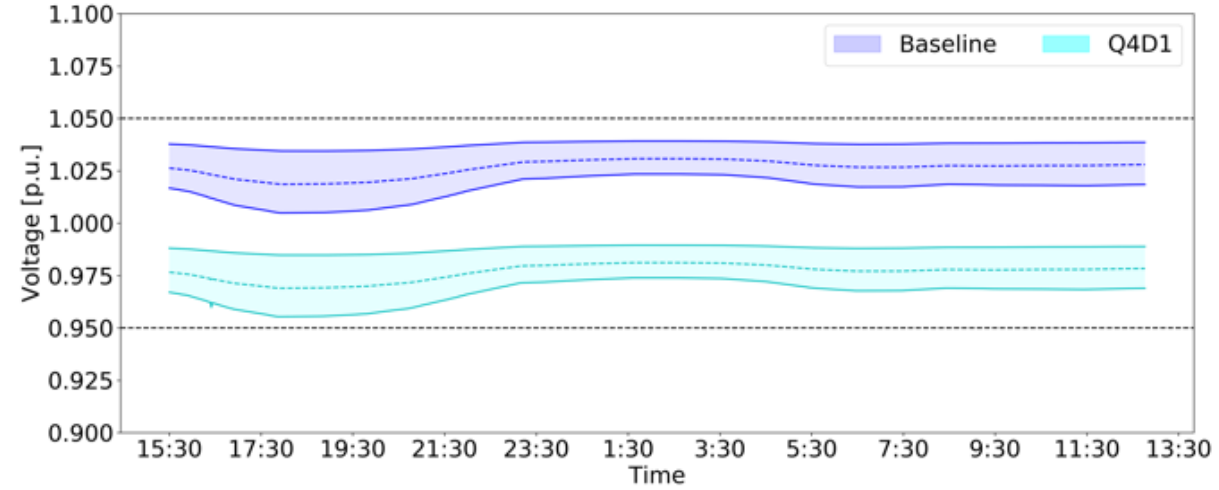


Photo by NREL

Results

- D1 indicates only feeder-head data available to ADMS
- Higher model quality (Q4) achieves the highest possible energy savings while avoiding voltage exceedances.

	Number of LTC Tap Changes	Energy Savings (%)	Number of Voltage Exceedances
Baseline	0	N/A	0
Q1/D1	16	6.4	784
Q4/D1	0	5.3	0



Maximum, minimum and mean of end-of-line voltages for baseline, Q4/D1 and Q1/D1

Conclusions/Recommendations

- Evaluating existing and future ADMS applications in a realistic laboratory setting will allow utilities a cost-effective way to obtain insights and accelerate ADMS deployment.
- An ADMS test bed has been developed at NREL with funding from DOE that can be used by utilities, vendors, and researchers.
- We presented initial results from the ADMS test bed that evaluates the impact of ADMS network model quality on the performance of VVO.
 - With only feeder-head data, the more accurate model achieves the highest possible energy savings while avoiding voltage exceedances.

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