

# Advanced Distribution Management System (ADMS) Evaluations with Private LTE Communication Networks

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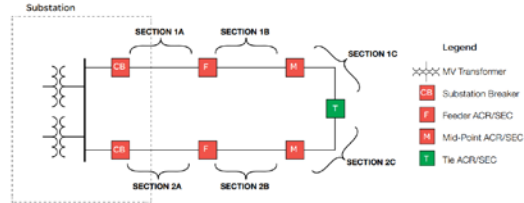
UTC Region 10 Meeting

Las Vegas, Nevada

October 10-11, 2019

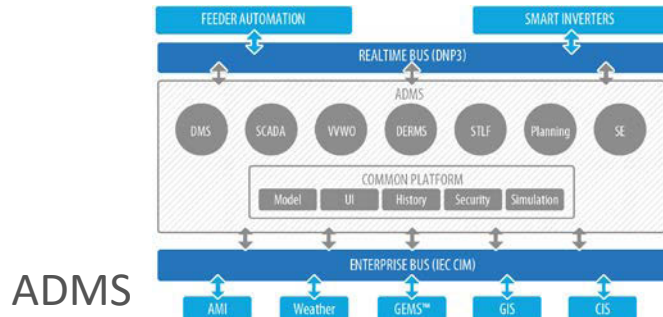
# Grid Modernization Applications

- Communication
- Control/Automation
- Controllable devices
- Reconfigurable
- Reliable/resilient
- ...



DA

AMI

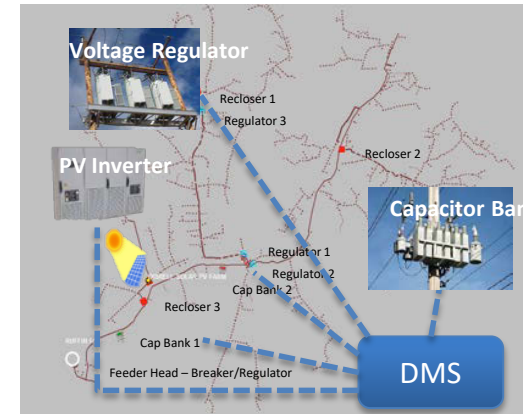


ADMS

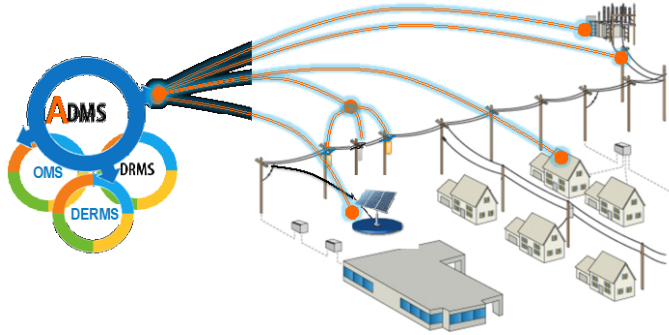
DERMS



CVR

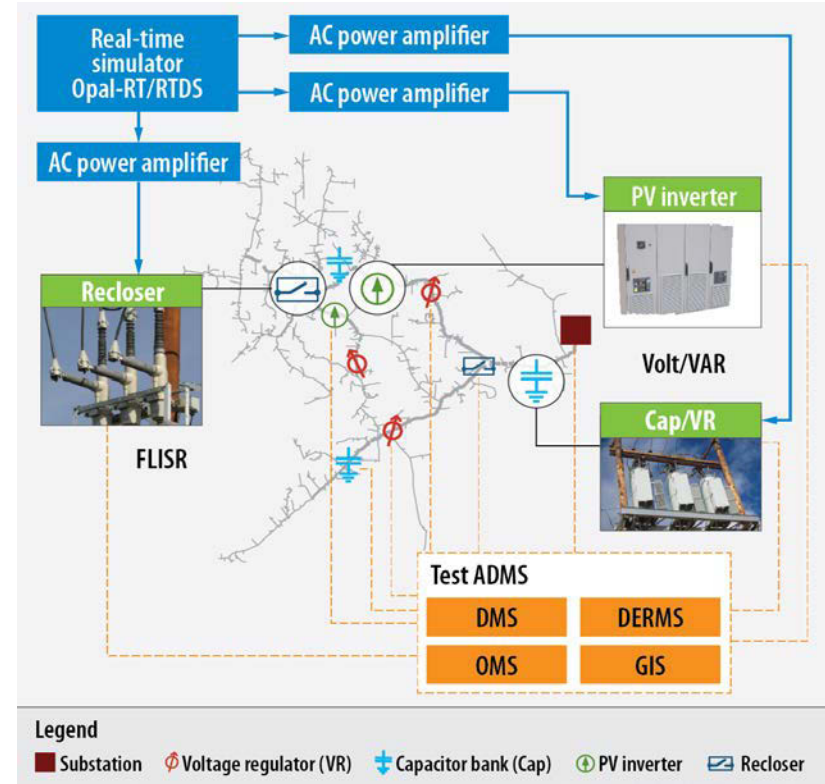


# NREL's ADMS Testbed

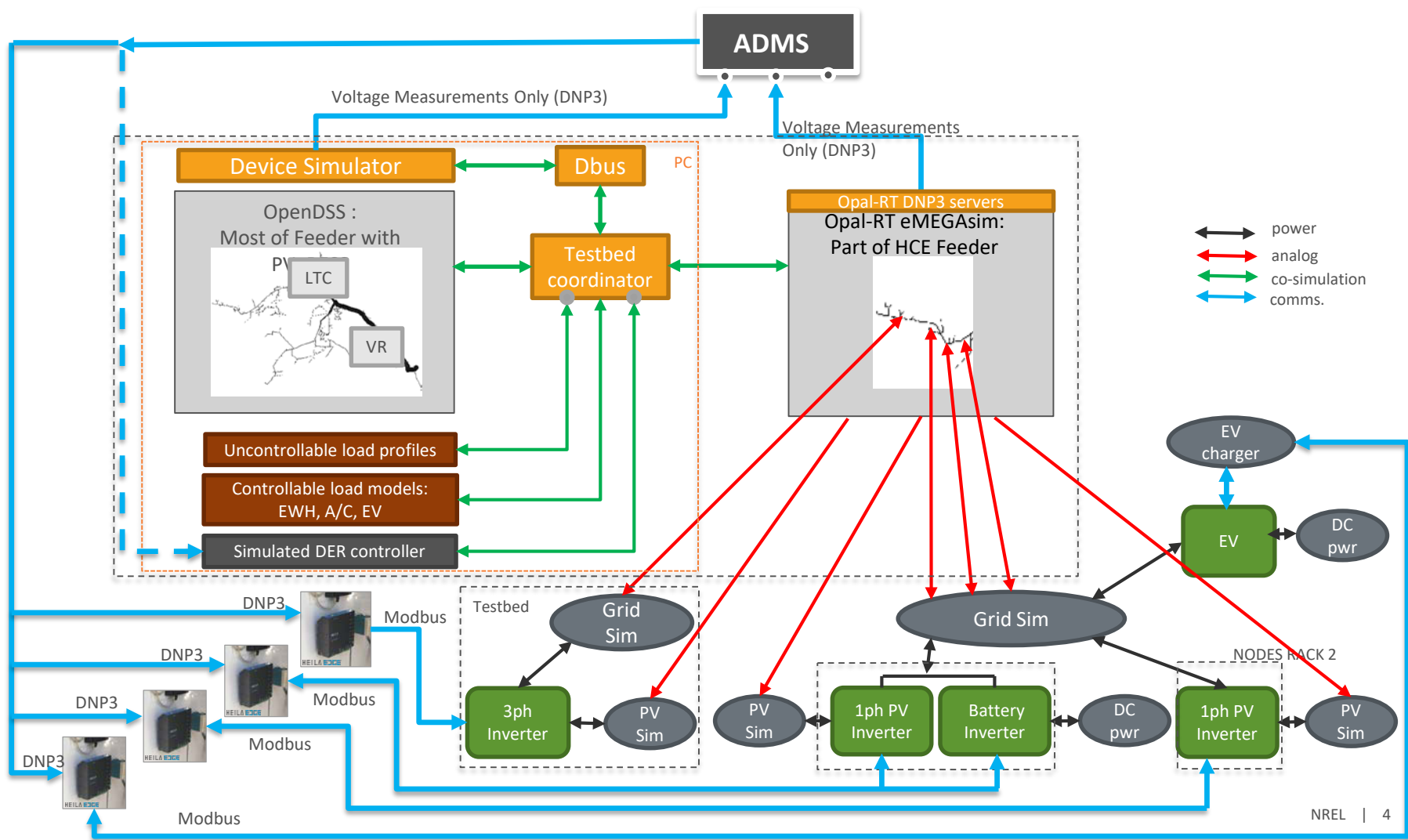


## Actual ADMS Deployment:

- Tools to model large scale distribution systems for evaluating ADMS applications
- Integrate distribution system hardware for power hardware-in-the-loop (PHIL) experimentation
- Develop advanced visualization capability

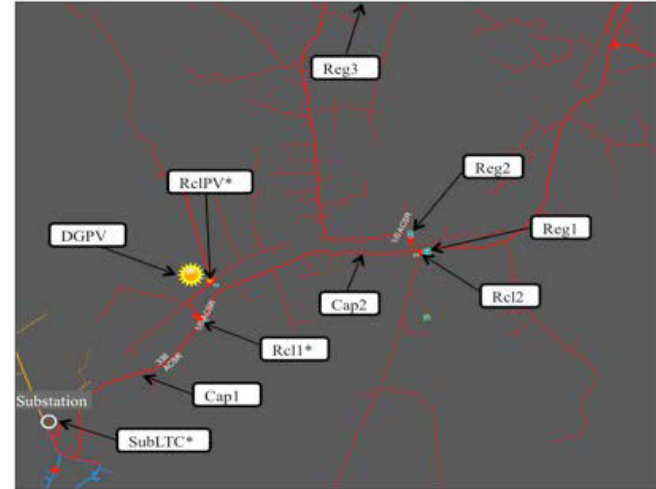


dual variables (P & Q)



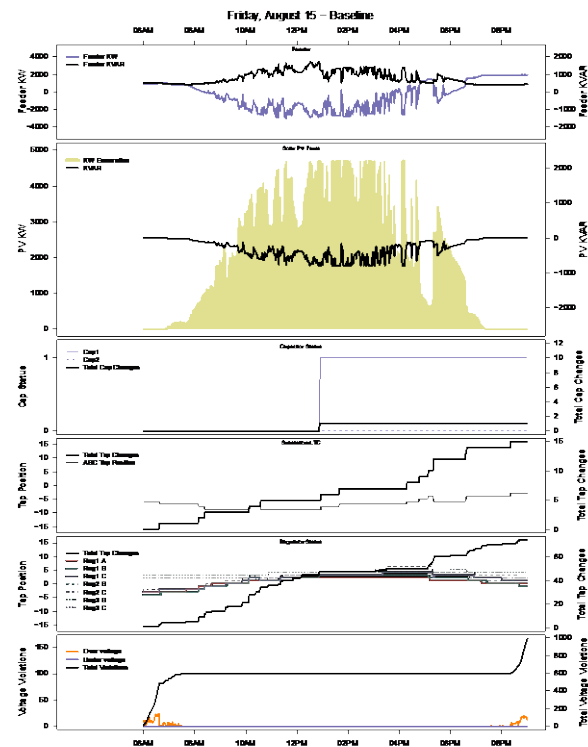
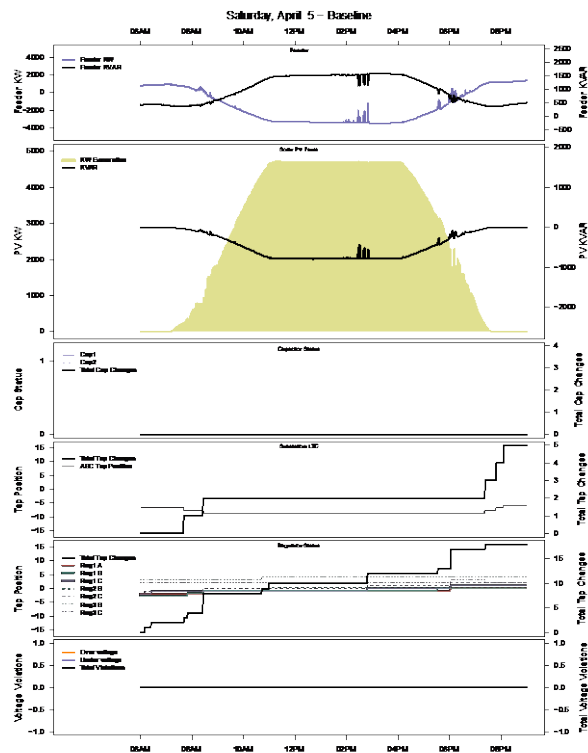
# Case Study System Characteristics

Feeder Characteristics	
Substation primary/secondary voltage (kV LL)	44/13.5
Substation transformer (MVA/%X)	10/6.84
Feeder head gang-operated regulators, set of three (kVA/%X)	250/6.25 (each)
Feeder head X/R	4.25
P(Est. Native) <sub>annual avg</sub> (MW)	1.71
P(Est. Native) <sub>peak</sub> (MW and date)	5.26 (Jan. 30, 2014)
P(Measured) <sub>annual avg</sub> (MW)	0.678
P(Measured) <sub>min</sub> (MW)	-3.72
Capacitor Banks (number/total kVAR)	2/900
Line Regulator groups	1x3-phase, 2x2-phase
PV Plant Characteristics	
Commission date	March 2013
Plant rating (MW <sub>DC</sub> /MW <sub>AC</sub> )	6.4/4.8
PV recloser X/R	1.82
Distance to substation (overhead line miles)	1.75

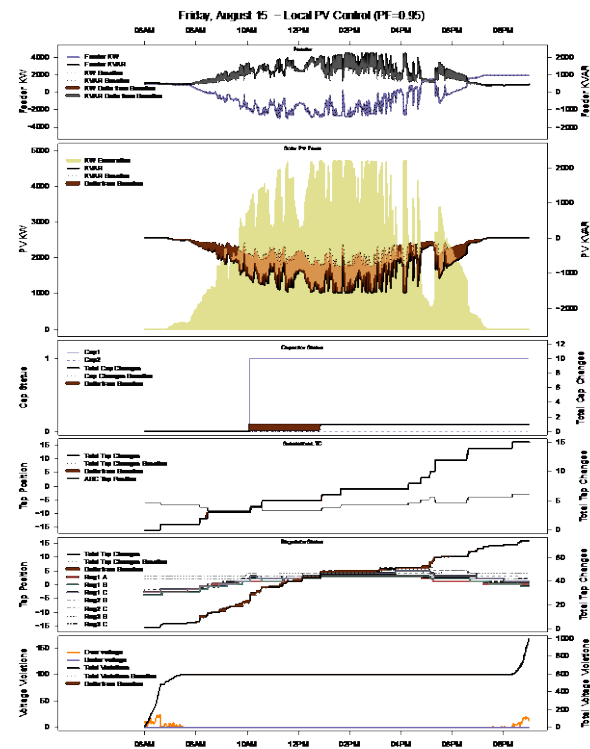
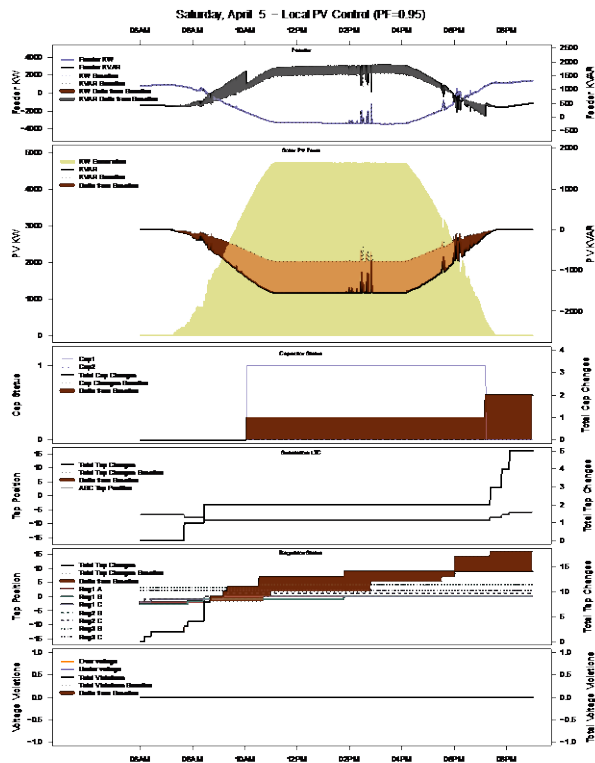


- Cap1: A 450-kVAR (150 kVAR per phase) VAR-controlled capacitor with temperature override. Cap2: A three-phase 450-kVAR capacitor (always disconnected unless controlled otherwise by IVVC)
- Reg1: A set of three single-phase 167-kVA regulators with a voltage target of 123
- Reg2: A set of two single-phase 114-kVA regulators on phase B and phase C with a voltage target of 123 V;
- Reg3: A second set of two single-phase 76.2-kVA regulators on phase B and phase C with a voltage target of 124 V;

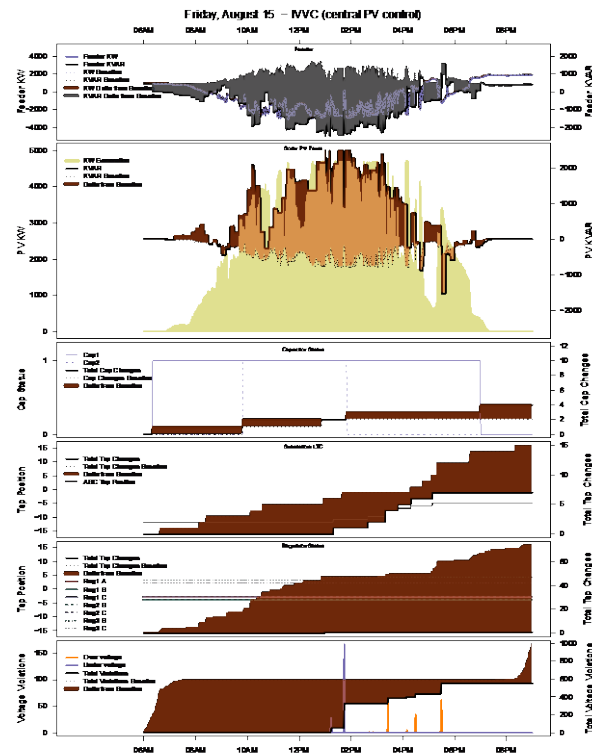
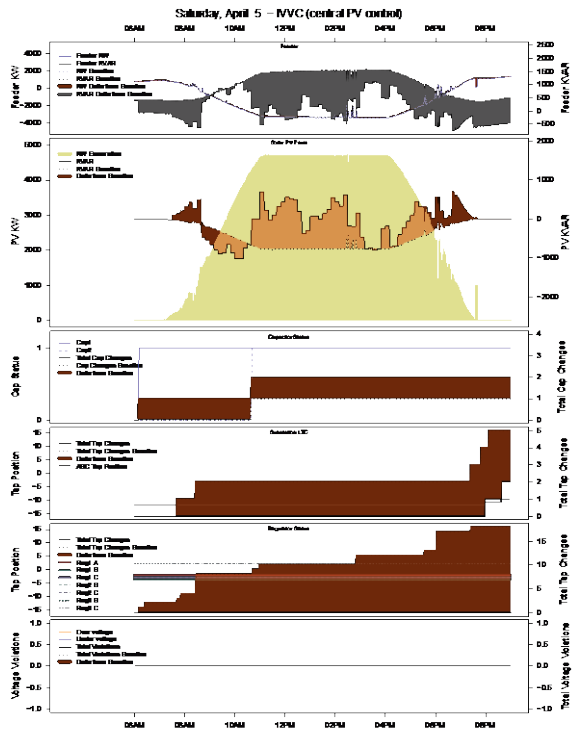
# Baseline Results (No Control)



# Baseline Results (Autonomous Control)

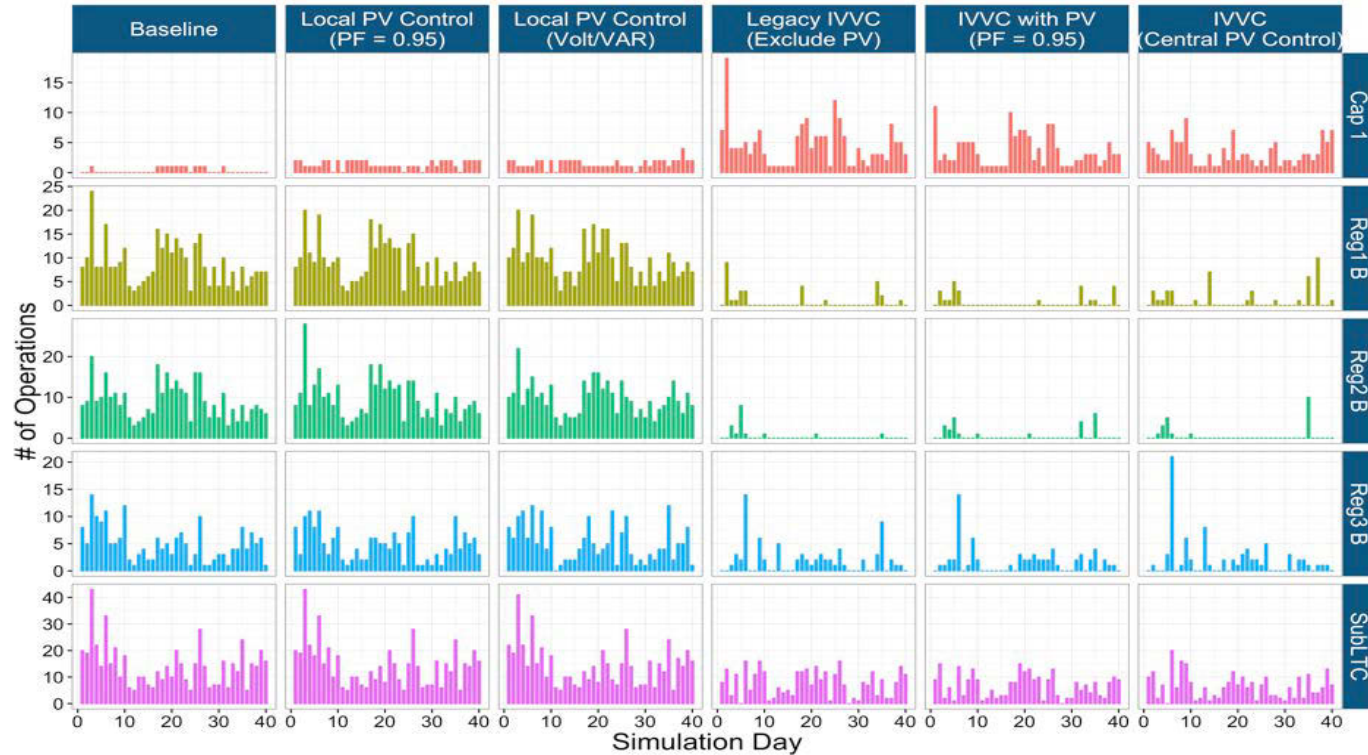


# Baseline Results (Full ADMS – IVVC)

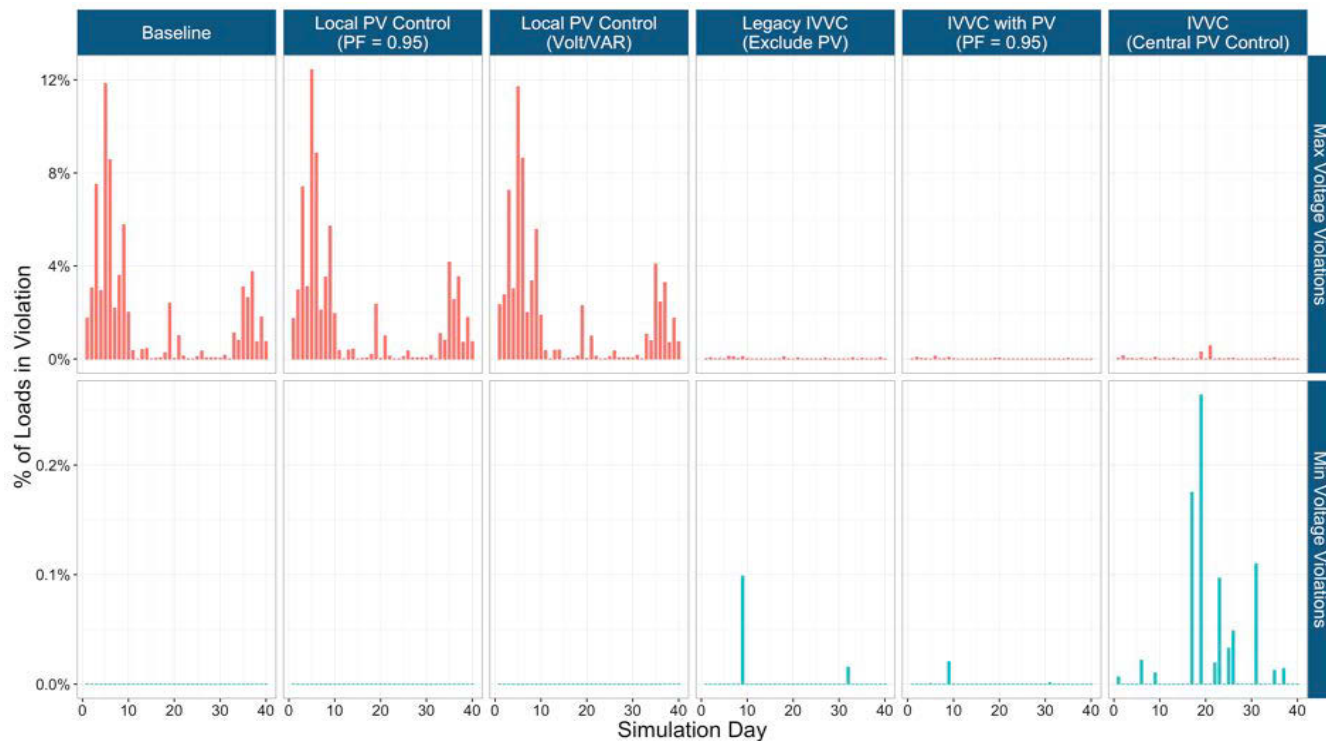


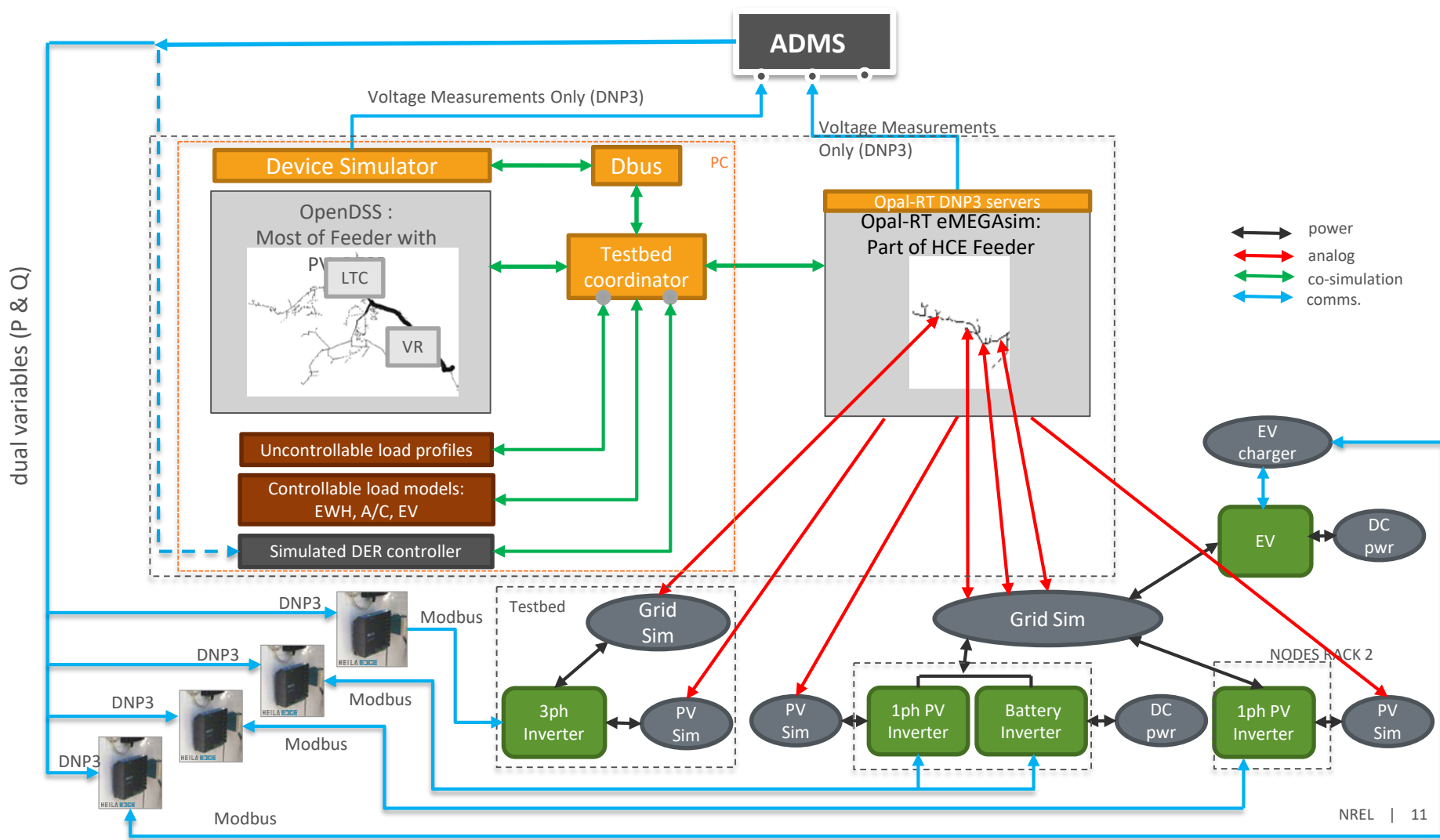


# Case Study Summary for Voltage Regulation Equipment



# Case Study Summary for Voltage Performance





# Thank you for your attention

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