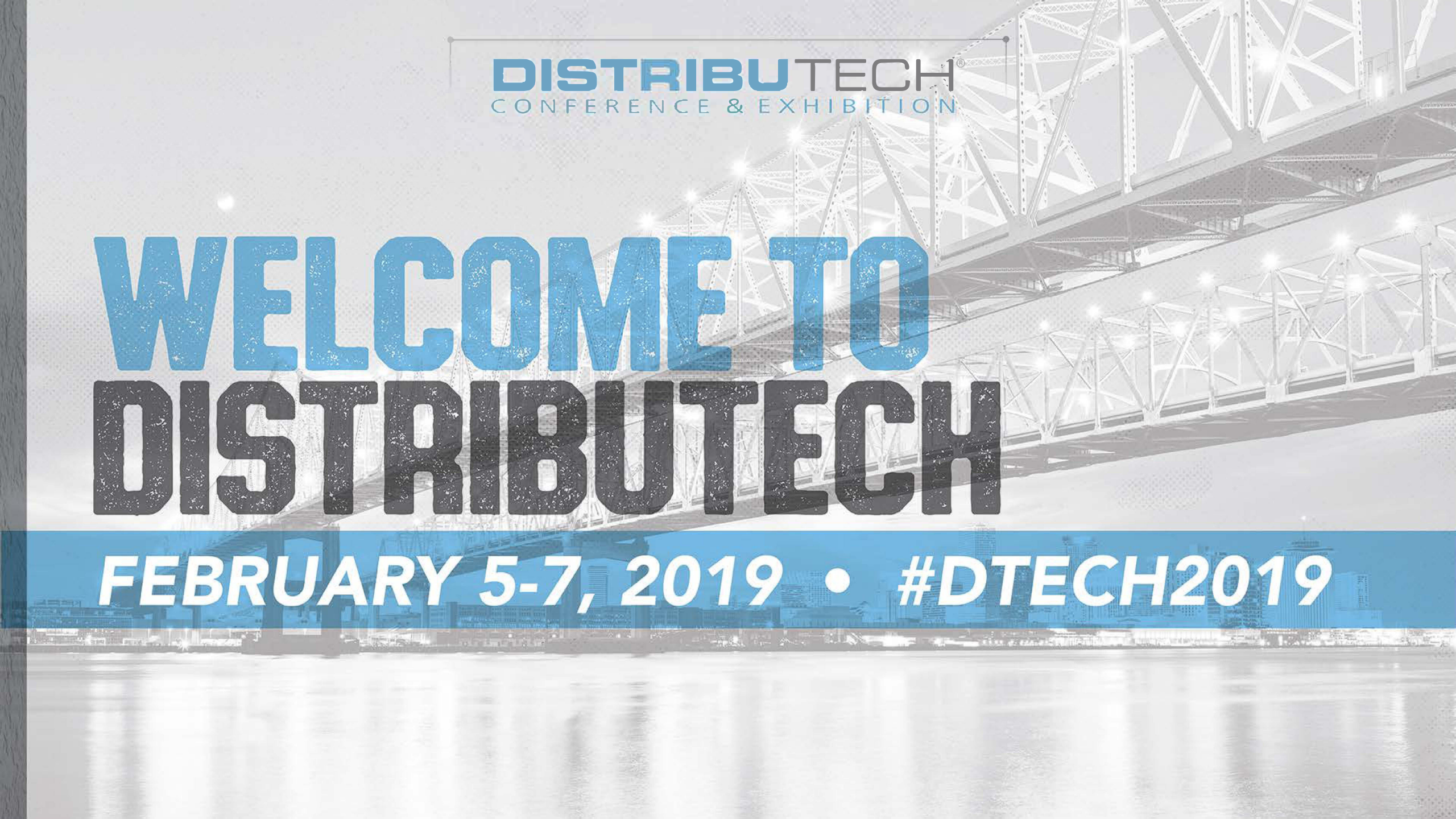

DISTRIBUTECH
CONFERENCE & EXHIBITION
WELCOME TO
DISTRIBUTECH
FEBRUARY 5-7, 2019 • #DTECH2019

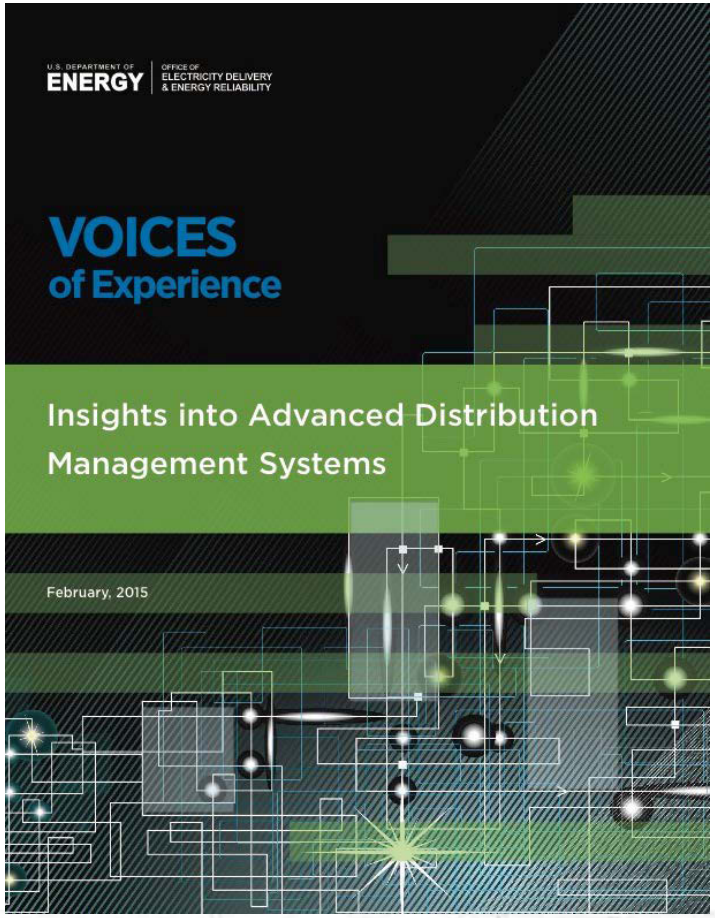
DISTRIBUTECH CONFERENCE & EXHIBITION
FEBRUARY 5-7, 2019 • #DTECH2019

Addressing ADMS Adoption Challenges Using NREL's ADMS Test Bed

Annabelle Pratt, Principal Engineer, National Renewable Energy Laboratory (NREL)
Brian Amundson, Director, Grid Modernization, Xcel Energy
Santosh Veda, Group Manager, NREL

NREL/PR-5D00-73255

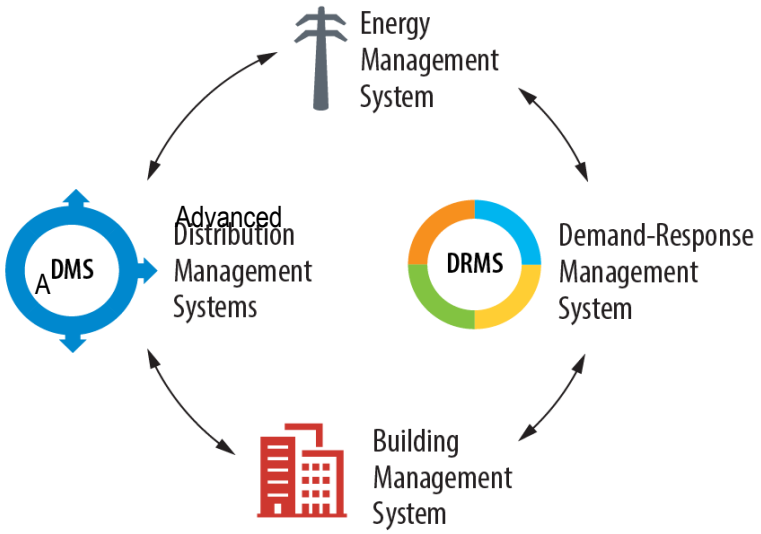
Motivation: why an ADMS test bed?



To accelerate the adoption of advanced distribution management systems (ADMS)

- ADMS are expected to deliver:
  - Increased reliability
  - Improved power quality
  - More renewable energy sources
  - Data security
  - Resilience to natural disasters and other threats.

Motivation: why an ADMS test bed?

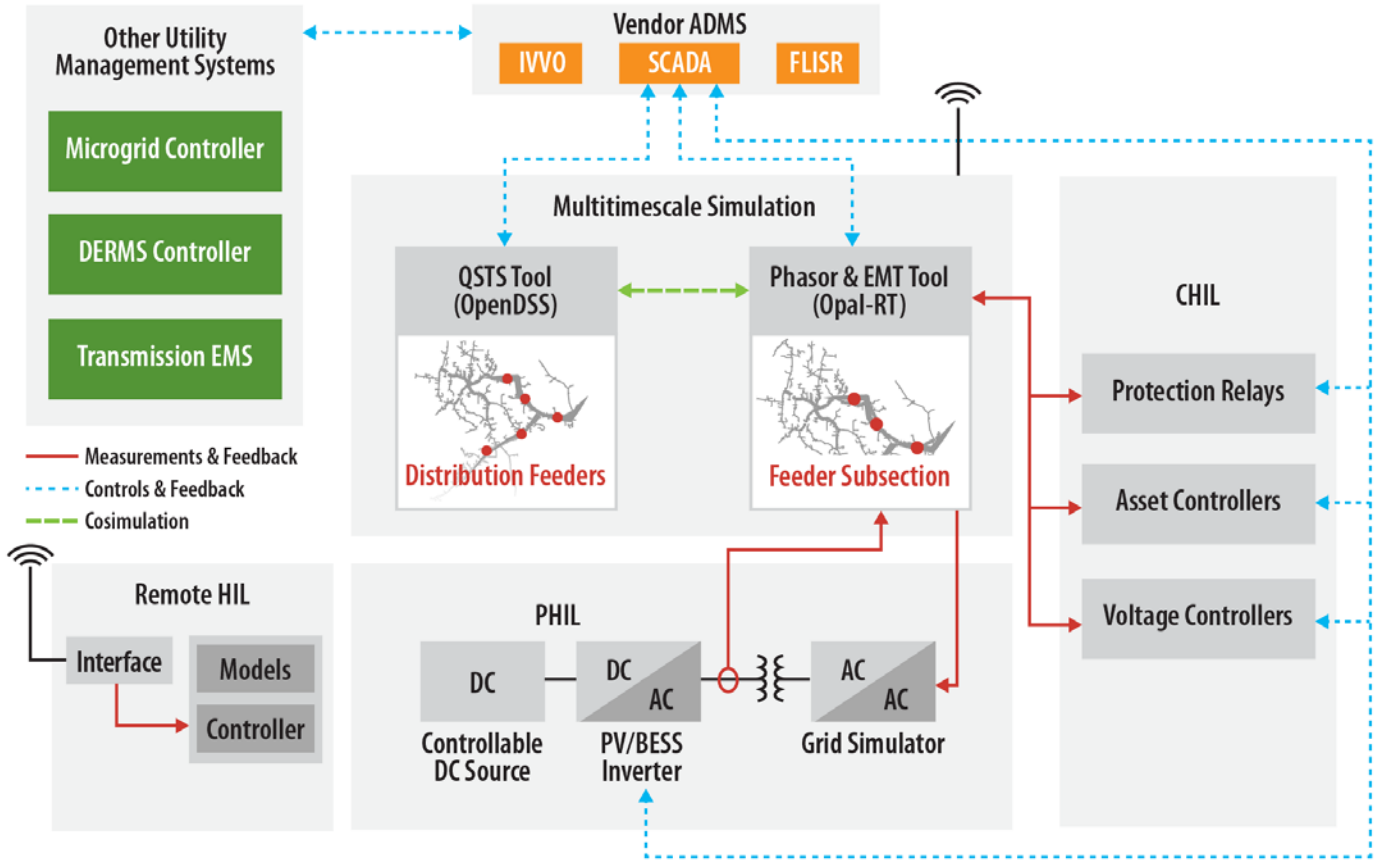


ADMS deployment requires:

- Significant investment
- Solid business case
- Well-understood benefits.

What is the ADMS test bed?

Realistic laboratory test environment with standard interfaces



What questions can the test bed address?

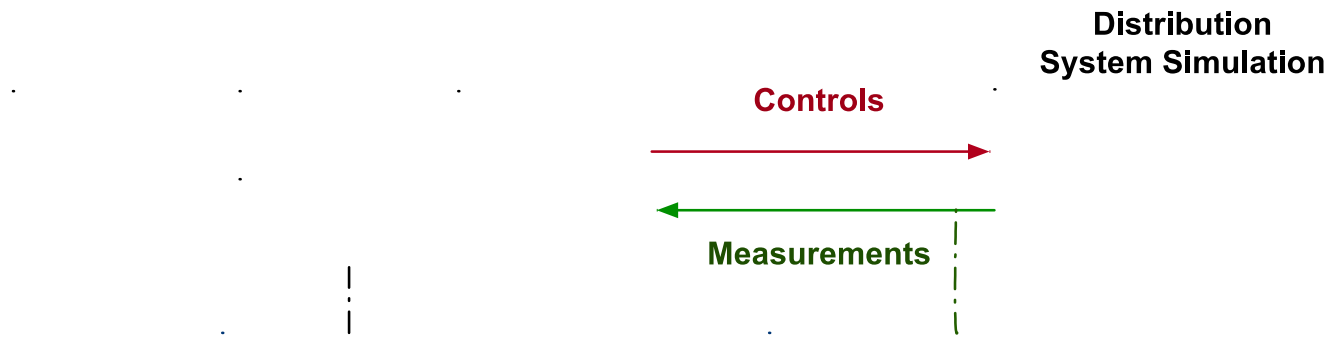
- What is the impact of improved forecasting?
- How much peak load management can be achieved?
- Does a distributed energy resource management system significantly improve load management performance?
- How do grid-edge technologies impact ADMS performance?

Xcel Energy ADMS test bed use case

- Xcel Energy is deploying ADMS across its footprint of approx. 3,000 feeders
- Data needed: impedance, connectivity, real-time, and load profiles
- How accurate does the ADMS model need to be?
- Can additional sensors offset model accuracy?
- Is there a “sweet spot” of sensor deployment v. model improvement?

Model improvement use case

Evaluate the performance of the ADMS volt/volt-ampere reactive optimization application for different levels of data remediation and different levels of measurement density.



Model improvement use case

Model quality levels:

- Q1: Base-level geographic information system (GIS) data
- Q2: Field verification at select locations. Confirm step transformer attributes, and collect capacitor, regulator, and recloser attributes
- Q3: Tap-phase verifications.
- Q4: Field-confirming each primary pole line by circuit to obtain distribution transformer attributes, phasing, and using Xcel Energy GIS data.

Measurement density levels:

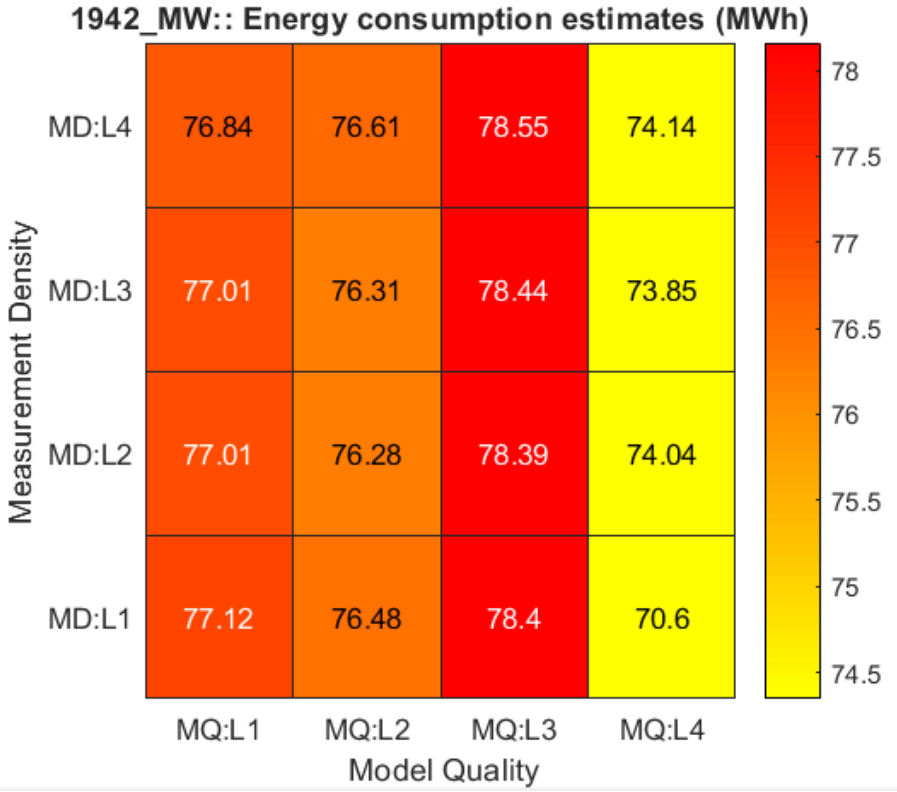
- D1: Feeder-head measurements
- D2: D1 + voltage regulators, capacitor banks, reclosers, and 1 tail-end voltage sensor (advanced metering infrastructure [AMI] sensor) per feeder
- D3: D2 + a total of 10 AMI sensors per feeder
- D4: D2 + a total of 20 AMI sensors per feeder.

Model improvement use case

Summary of findings:

- Long feeders show difference in performance for varying measurement density
- Rural feeders show greater improvement with increasing levels of model quality
- Higher measurement density results in fewer violations.

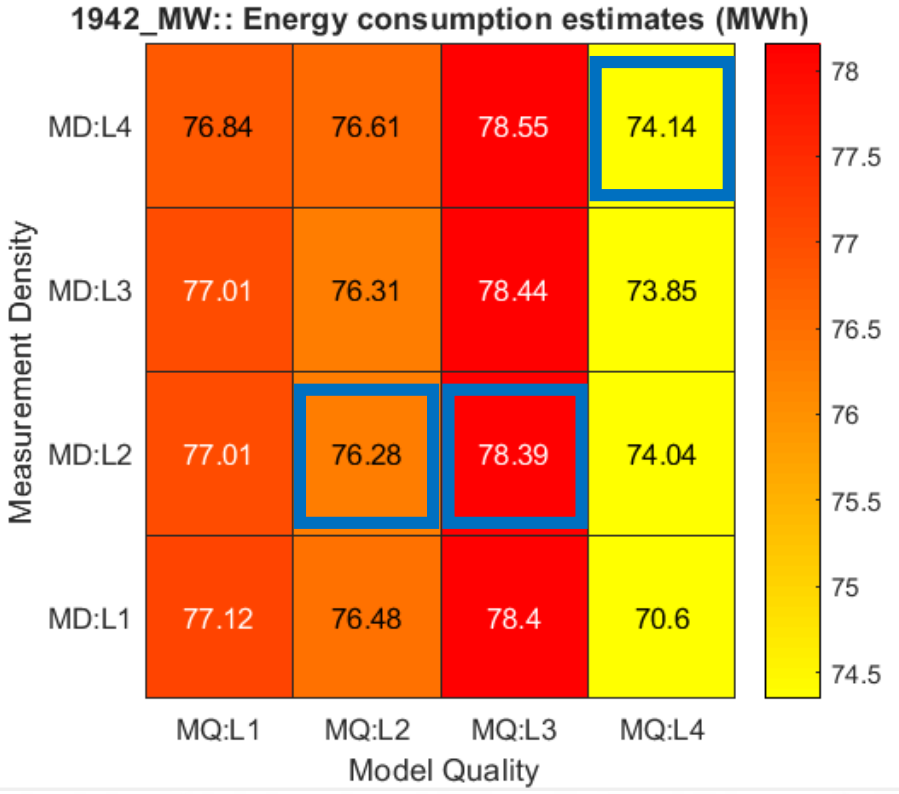
Semirural feeder



Next step: ADMS test bed evaluation

- Select two to three test cases.
- Simulate in real time using the test bed.

Semirural feeder



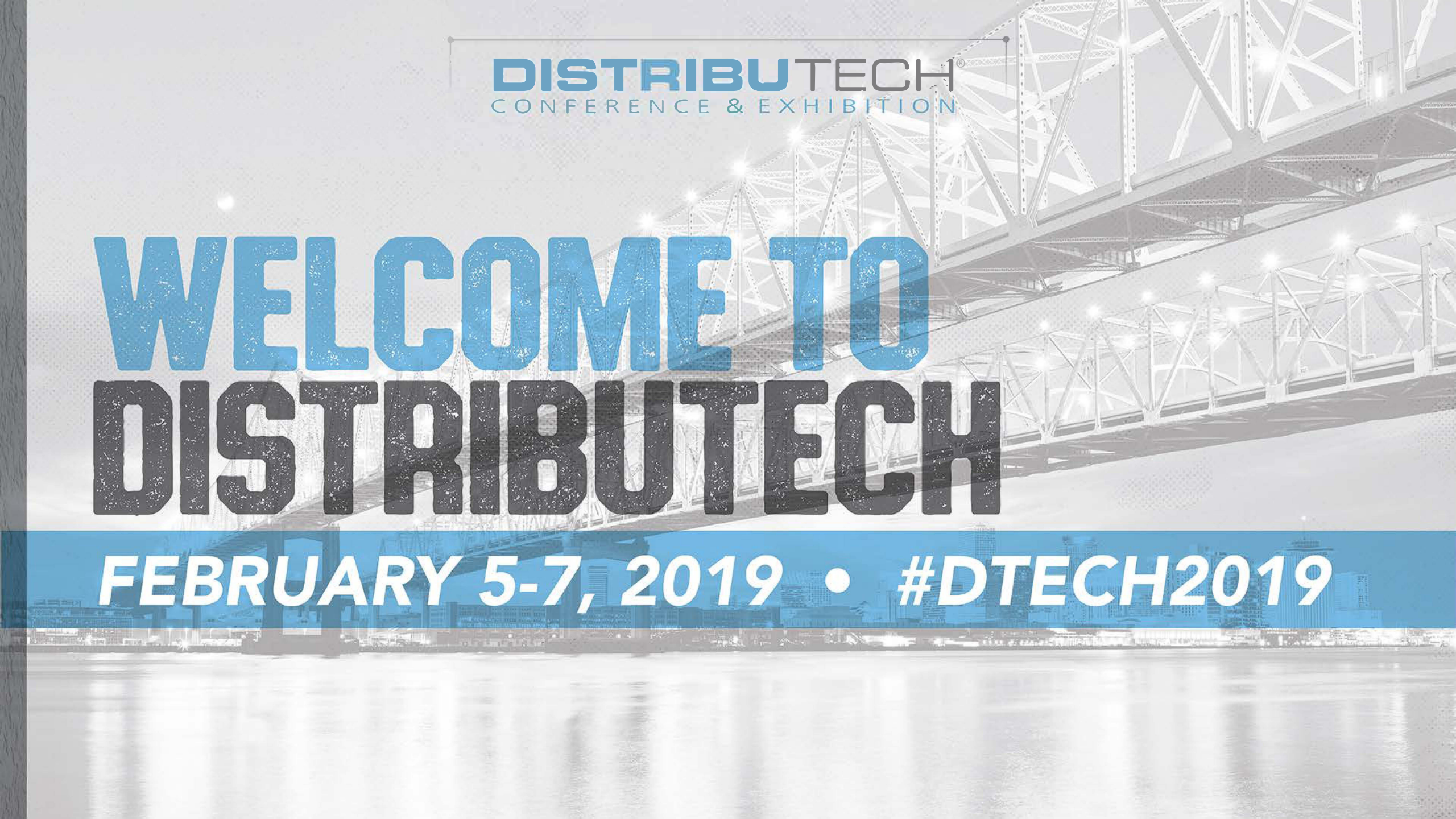
Thank You

Annabelle Pratt
annabelle.pratt@nrel.gov

Advanced Grid Research
OFFICE OF ELECTRICITY
US DEPARTMENT OF ENERGY

NREL
Transforming ENERGY

Xcel Energy℠


DISTRIBUTECH
CONFERENCE & EXHIBITION
WELCOME TO
DISTRIBUTECH
FEBRUARY 5-7, 2019 • #DTECH2019