Real-time simulation: Changing the game for de-risking microgrids

Kati Sidwall

Technical Marketing Lead,
RTDS Technologies

RTDS Technologies

How do we validate that devices will operate as expected (and to grid code / standards) before they are installed?

How confident are we that multiple devices in the grid are interoperable through a variety of operating scenarios?

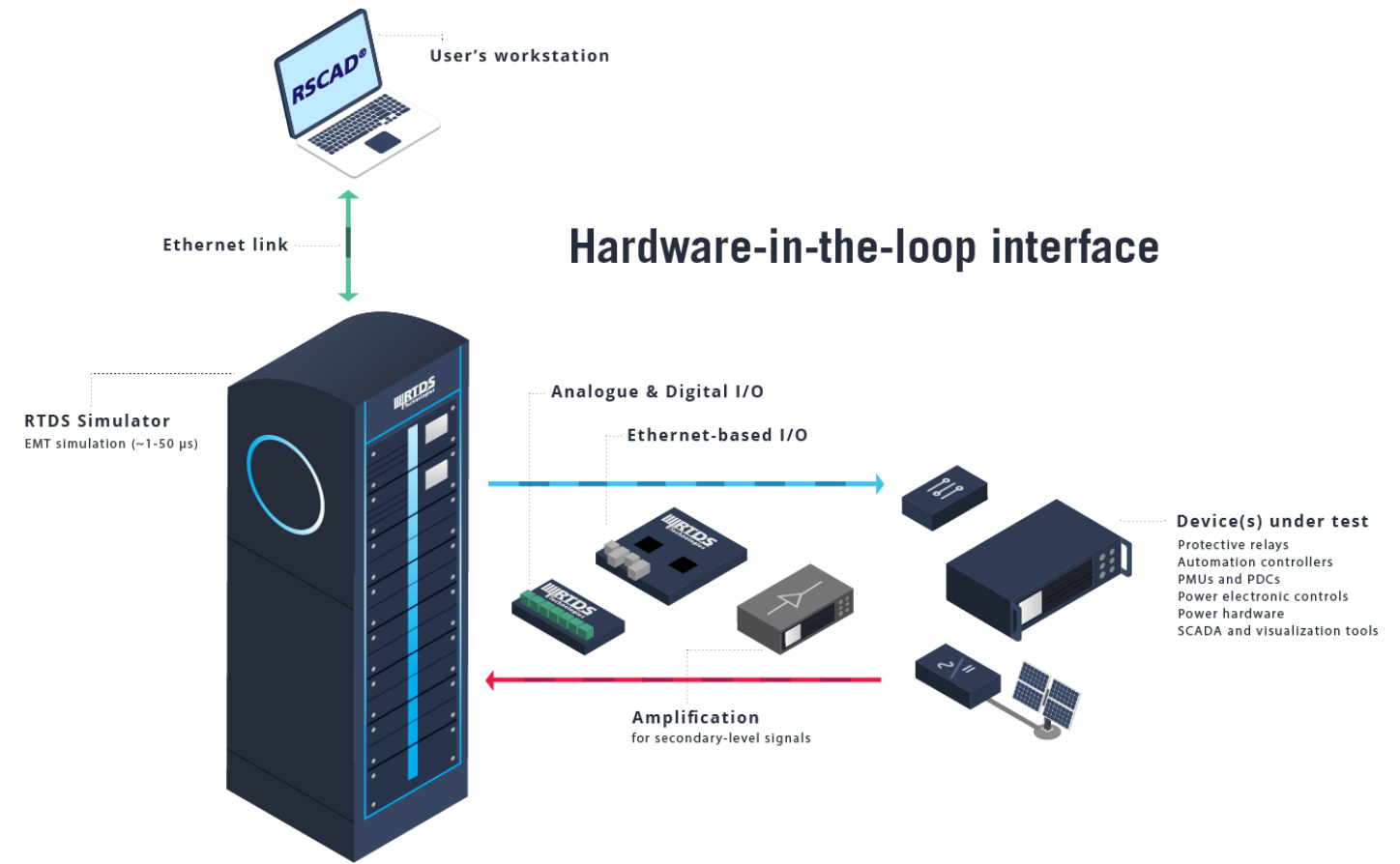**How wide a range of system conditions are we modelling and testing for?**

How detailed is our system representation when we model and test?

HIL testing with a real-time simulator

Test protection, control, and power devices in a closed loop with a simulated network

- Test multiple devices (and entire schemes) at once

- Much more detailed system representation than open-loop test systems provide (e.g. modelling power electronics)

- Test continues after the action of the protection/control device, showing dynamic response of the system

User's workstation

Ethernet link

Hardware-in-the-loop interface

RTDS Simulator
EMT simulation (~1-50 μs)

Analogue & Digital I/O

Ethernet-based I/O

Amplification
for secondary-level signals

Device(s) under test
Protective relays
Automation controllers
PMUs and PDCs
Power electronic controls
Power hardware
SCADA and visualization tools

ComEd Grid Integration and Technology (GrIT) Lab RT-HIL Facility

Commissioned in 2018 | Located at Maywood, Illinois

Major project areas:
- HIL testing and validation of emerging technologies such as microgrid controller, DER management system, distribution state estimation
- Protection and relay testing
- Cybersecurity projects

Several Microgrid projects in Collaboration with Department of Energy (DOE), National Science Foundation (NSF), Universities, and National Laboratories

RTDS is the heart of RT-HIL test setup

Source: ComEd

Bronzeville Community Microgrid

- 7 MW aggregate load, serving approximately 1,000 residences, businesses and public institutions
- Powered by DERs –

    750 Kw solar PV (owned by Chicago Housing Authority)
    500 kW/2MWh battery energy storage (owned by ComEd),
    4.8 MW controllable generation (owned by Enchanted Rock)

- Can cluster with IIT Campus Microgrid – one of the most advanced urban microgrid clusters in the USA
- **Microgrid master controller is being tested in the ComEd Grid Integration and Technology Lab**
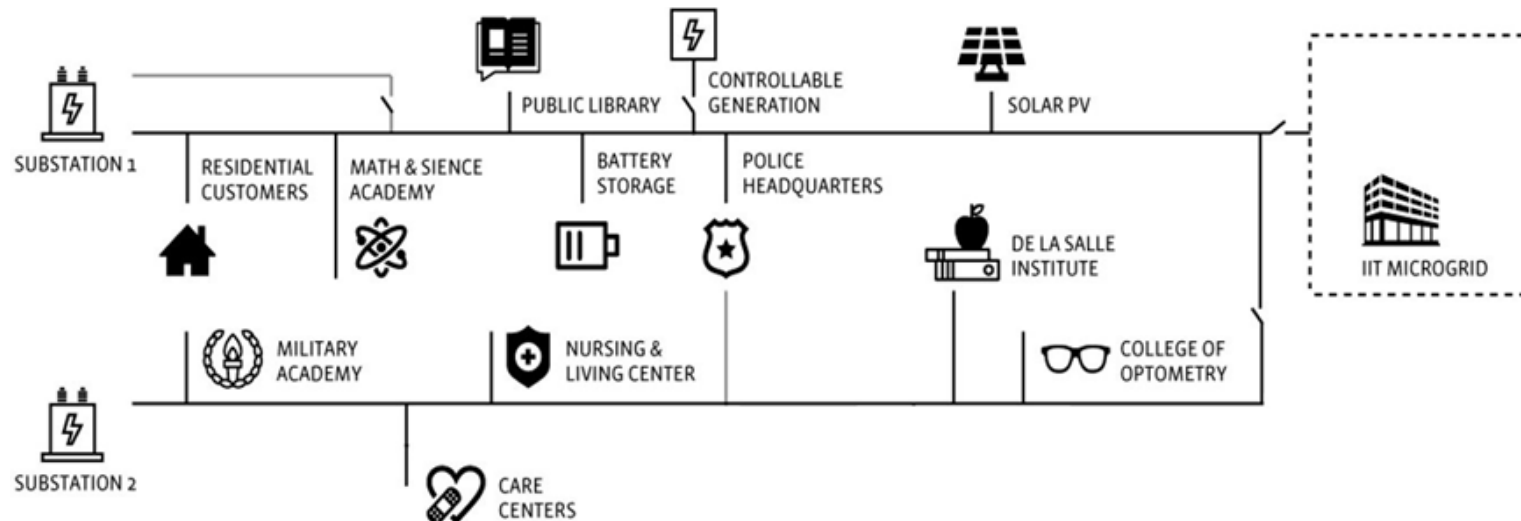
Source: ComEd

Hardware-in-the-loop test setup
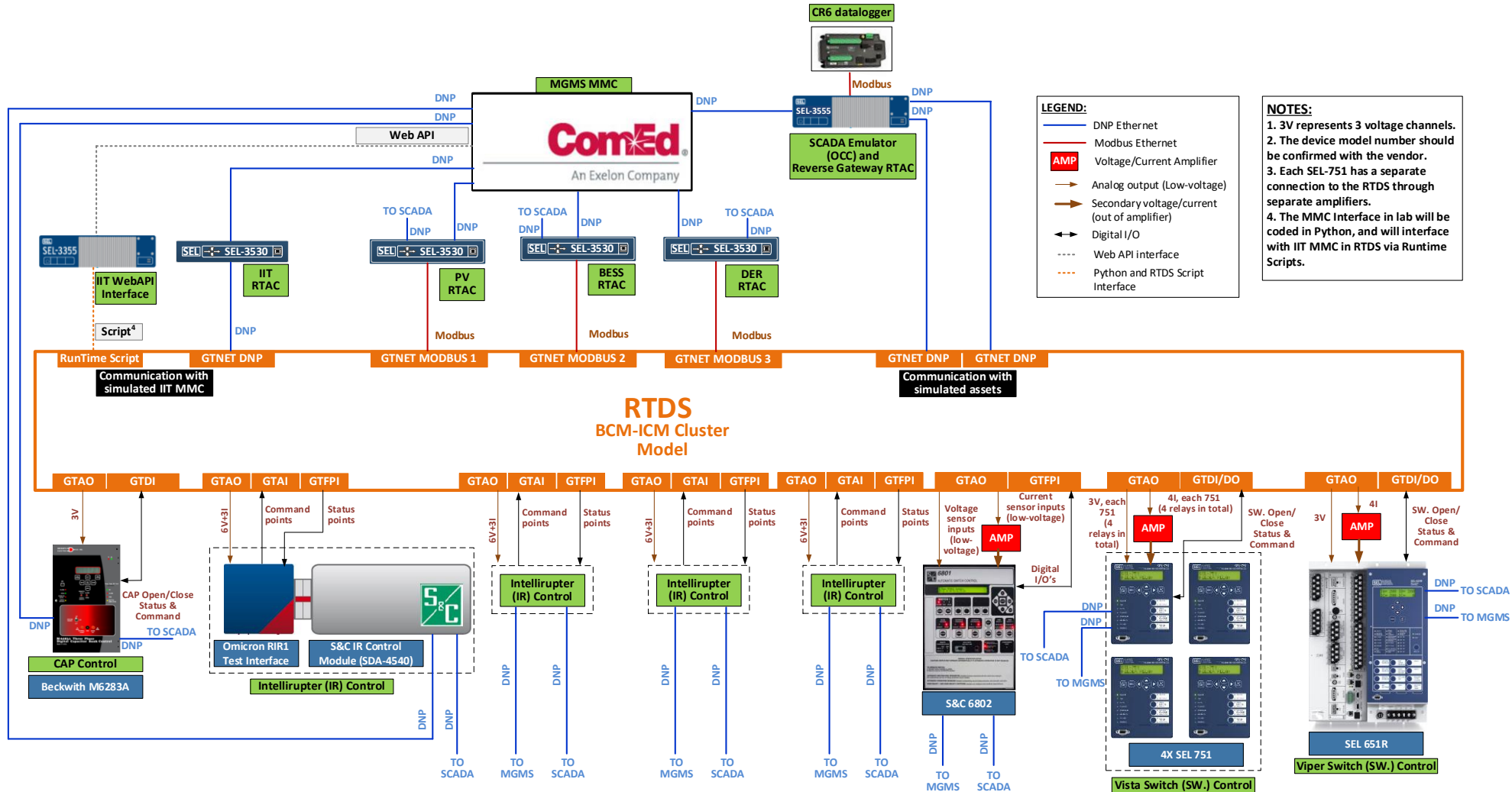
Source: ComEd

Other DER and microgrid applications

- DER integration studies
  - Black box control model integration

- Impacts/interactions of DERs with existing automation

- Grid-forming control testing

- Inverter testing (power hardware in the loop – PHIL)

- PPC testing

… and more

Thank you!

Questions?
**Visit our booth
or email kati@rtds.com**

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