



## Engineering our Way to the Future:

Microgrids, Digitalization and Automation

## Agenda

**Moderator:** David Smith (Burns Engineering) Director of Energy Services

#### **Speakers:**

- Alexandra Schwertner (Rockwell Automation)
   Advanced Energy Business Development
   Manager
- 2. Scott Manson (Schweitzer Engineering Laboratories) Technology Director
- 3. Kati Sidwall (RTDS Technologies Inc.) Simulation Specialist

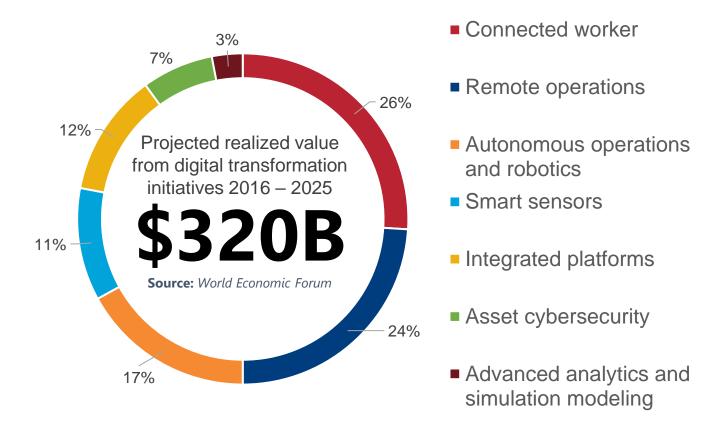
#### **Resources:**

- Speaker Bios
- Ask the Experts:
   Q&A at End
- Microgrid Resources Library



## Solving the data disconnect

Allie Schwertner, Rockwell Automation, Advanced Energy Business Development Manager



#### **LESS THAN 1%**

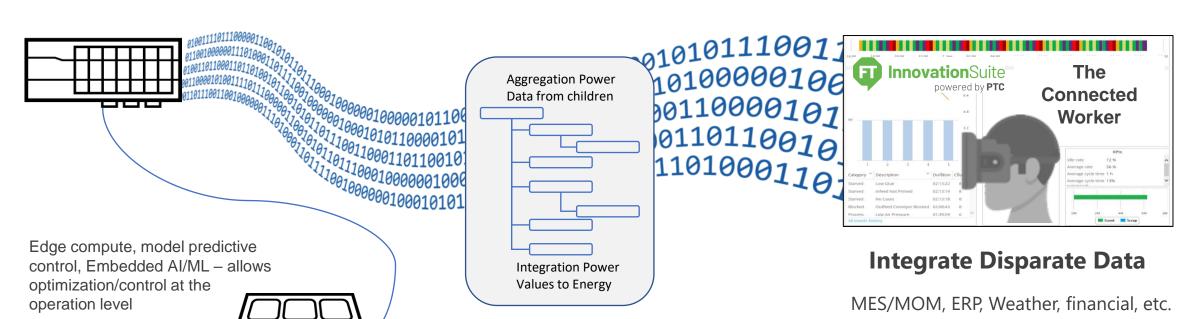
of data is currently used.

Source: McKinsey - The Internet of Things: Mapping the Value Beyond the Hype

## **Optimizing Systems of Systems through IIoT**

Smart Energy Objects **Standardized Information Data Models** 

IIoT Platform



Connected devices x + 1



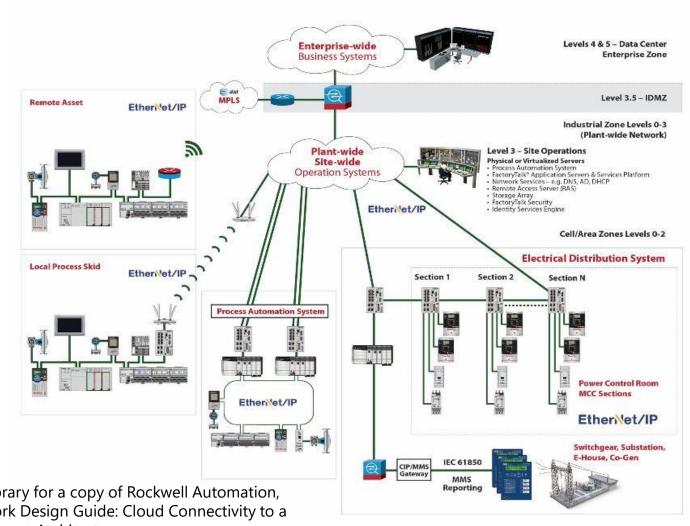






### **Resilient IT/OT Network Architectures**

- Protect the integrity and availability of data from sensor to cloud
- Authentication, authorization and accounting
- Tested and validated architectures







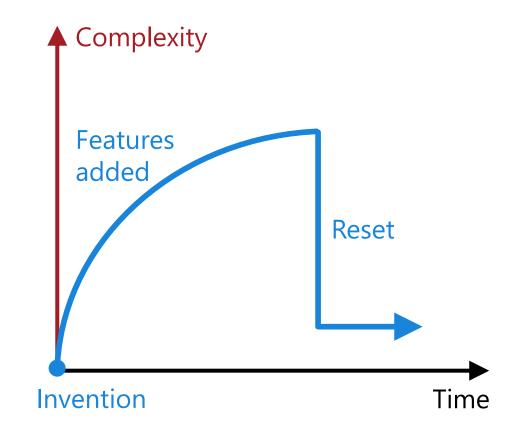
Check out the resource library for a copy of Rockwell Automation, Cisco and Panduit's network Design Guide: Cloud Connectivity to a Converged Plantwide Ethernet Architecture

# Resetting Complexity in Microgrid Controls and Protection

Scott Manson, SEL, Technology Director

#### **Challenges:**

- 1. Complexity of microgrid controls has increased over time
- 2. Complexity negatively affects cost and reliability





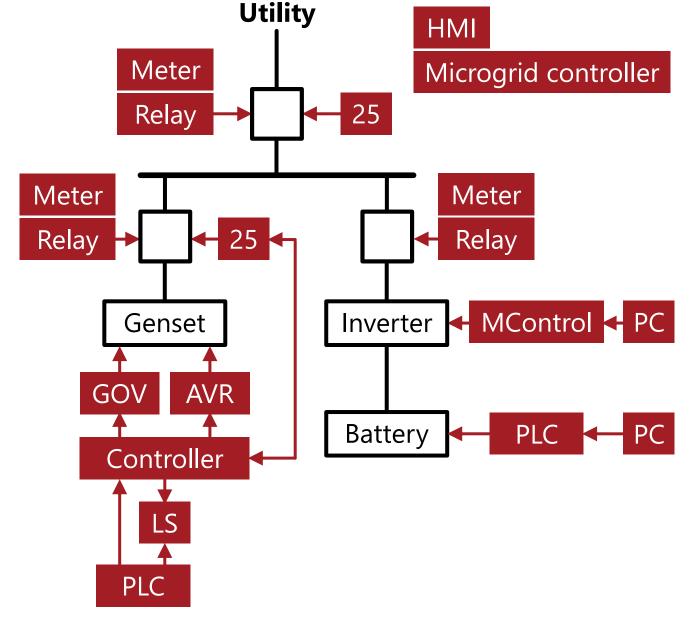
### Solutions

#### Conventional solution

Advanced relay solution

Self-configuring communications

No tuning controls

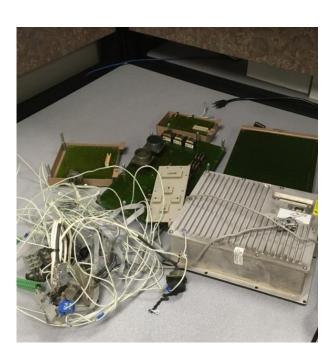




## Results / Recommendations

#### 1. Reducing part count improves reliability





60 kW genset



Streamlined solution



# De-risking microgrids of the future with hardware-in-the-loop testing

Kati Sidwall, RTDS Technologies Inc.

CONTEXT: The need for high-fidelity testing tools to anticipate vulnerabilities in protection and control (P&C) as microgrids become more complex and intelligent.

#### **Challenges:**

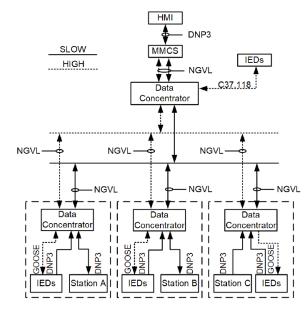
- Traditional modelling / testing tools (RMS modelling / open-loop testing)
  can be blind to issues in modern microgrids [1]
- 2. Testing facilities for today's P&C require high-speed communication-based I/O in addition to traditional analogue/digital signals
- 3. Need for accurate modelling of DERs and their converters



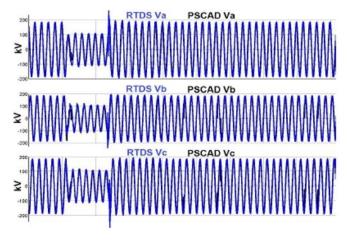
Real-time simulator

### Solutions

- Electromagnetic transient (EMT) models have improved performance in converter-rich networks; real-time simulators allow for comprehensive hardware-in-the-loop testing of microgrid equipment connected to the simulation
- 2. MODBUS, DNP3, IEC 60870-5-104, IEC 61850, PMU data, TCP/UDP have been successfully implemented for HIL testing
- Validated, highly detailed modelling library developed over decades (e.g. machines, loads, renewables, high frequency switching converters)



Microgrid communication network [2]



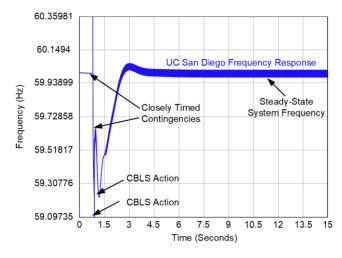
EMT model (validation of results) [3]



Speaker: Kati Sidwall, RTDS Technologies Inc.

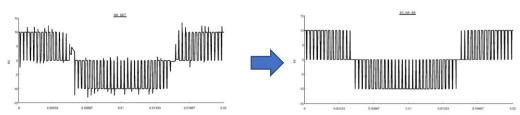
## Results / Recommendations

- Include HIL testing in the validation process for microgrid projects where gaps in P&C interoperability can pose a significant reliability/stability risk
- Slow- and fast-acting communication protocols implemented in the HIL testbed allow for primary, secondary, and tertiary control devices to be tested together



HIL test results for microgrid controller [2]

 Continue to develop models to improve test accuracy and reflect industry trends (e.g. higher converter switching frequencies)



Improved switching algorithm for power electronics

#### References:



[1] B. Badrzadeh, Z. Emin, February 2020. The need for enhanced power system modelling techniques and simulation tools. CIGRE ELECTRA No. 308. [2] Dillot, John; Upreti, Ashish; Nayak, Bharath; Ravikumar, Krishnanjan Gubba, 2018. Microgrid Control System Protects University Campus From Grid Blackouts. 45th Annual Western Protective Relay Conference.

[3] M. Davies, October 2019. Preparing for the Future Power System – Now. Presentation, RTDS
#

#MicrogridVirtual

Speaker: Kati Sidwall, RTDS Technologies Inc.





## Ask the Experts: Q&A Session

Type your questions in to the Q&A box

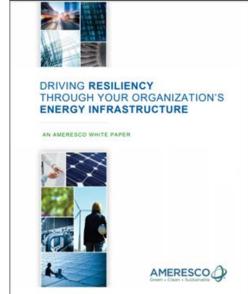
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# Microgrid Knowledge Virtual Conference Resource Library

Recommended Resources

Microgrid Resource Library
Visit ThinkMicrogrid.com

Network with the MGK Community on LinkedIn



Real-Time Simulation of a Microgrid Control System using MODBUS Communication

Sachethe Kanyawawan, Dinesh Rangena Gurusinghe\*, and Dison S. Ouellette REDS Technologies Inc., Winnipeg, Canada ("Corresponding author: dinesh@stds.com)

ETRACT

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Keywords - Microgrids, Distributed Energy Resources (DER), Islanding, Modbus Communication

#### INTRODUCTION

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## Microgrid 2020 LIVE Conference – Nov. 18-20

Philadelphia, PA

**Plenary Session -** Microgrids Have Leapt 'the Chasm.' What's on the Other Side?

- Plus 90 Speakers in 30+
   Sessions on best practices
- 35 Exhibitors
- Networking opportunities







## Thank You!

Hope to see you in Philadelphia on Nov 18-20 for Microgrid 2020