MICROGRID KNOWLEDGE

Virtual Conference

Benefits and Challenges of Integrating Energy Storage and Renewable Energy

Agenda

Moderator: Tom Drake, Sr. (Rolls-Royce MTU) Sales Manager

Speakers:

1. Tim Kelley (Russelectric – a Siemens Business) Market Director – Renewable & Storage Solutions
2. Dr. Peter Lilienthal (Homer Energy) CEO & Global Microgrid Lead, UL Renewables
3. Matt Baker (Typhoon HIL) Director Microgrids and Critical Power

Resources:

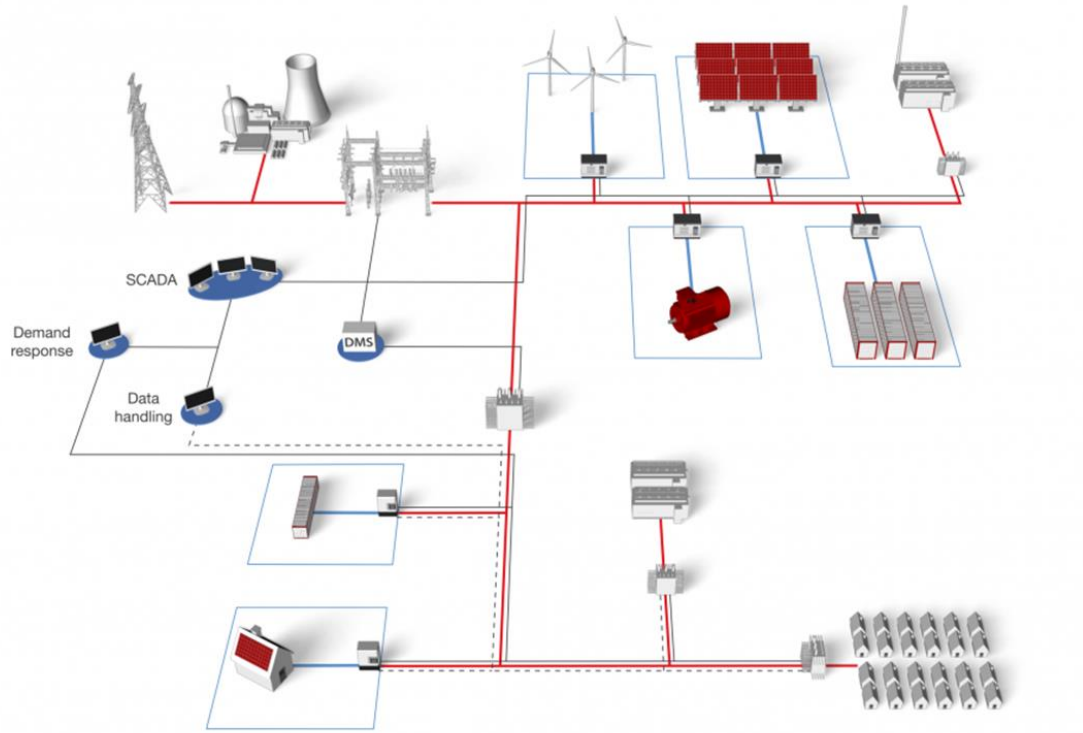
- Speaker Bios
- Ask the Experts: Q&A at End
- Microgrid Resources Library

Integrating the Design Process for Successful Microgrid Deployment and Operation

Matt Baker, Typhoon HIL, Director Microgrids and Critical Power

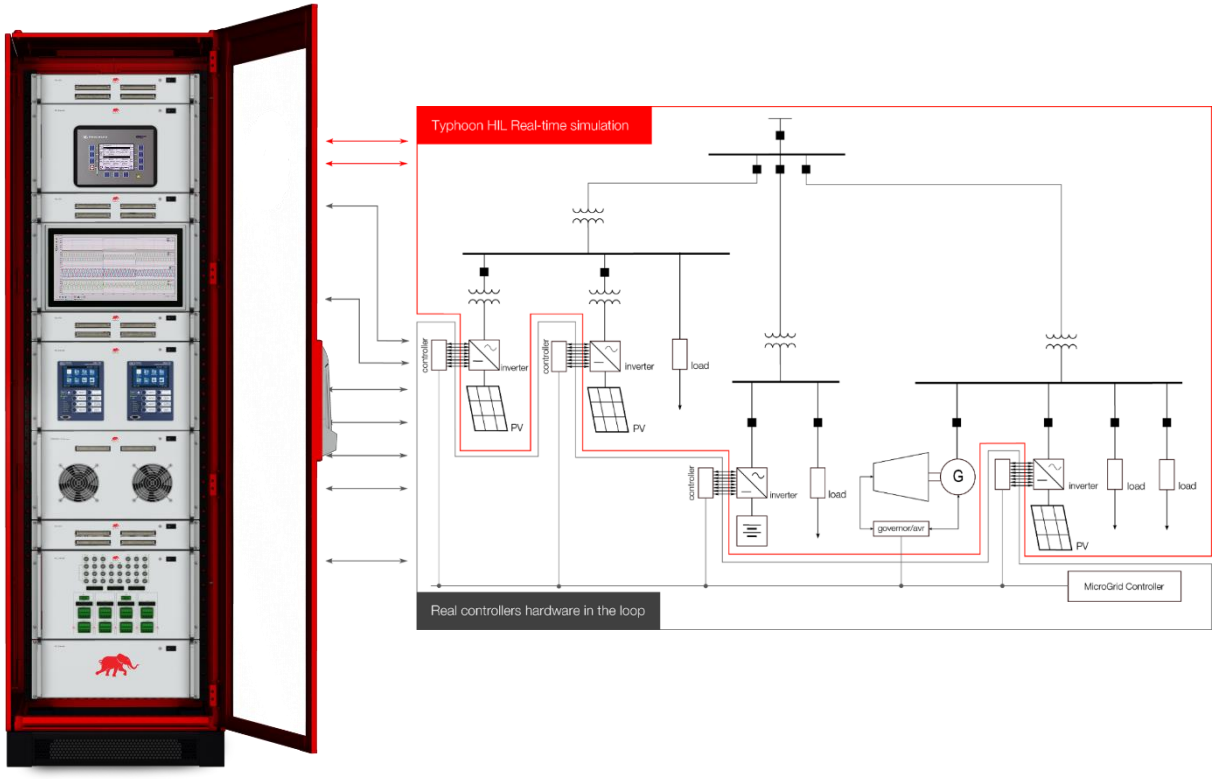
Challenges:

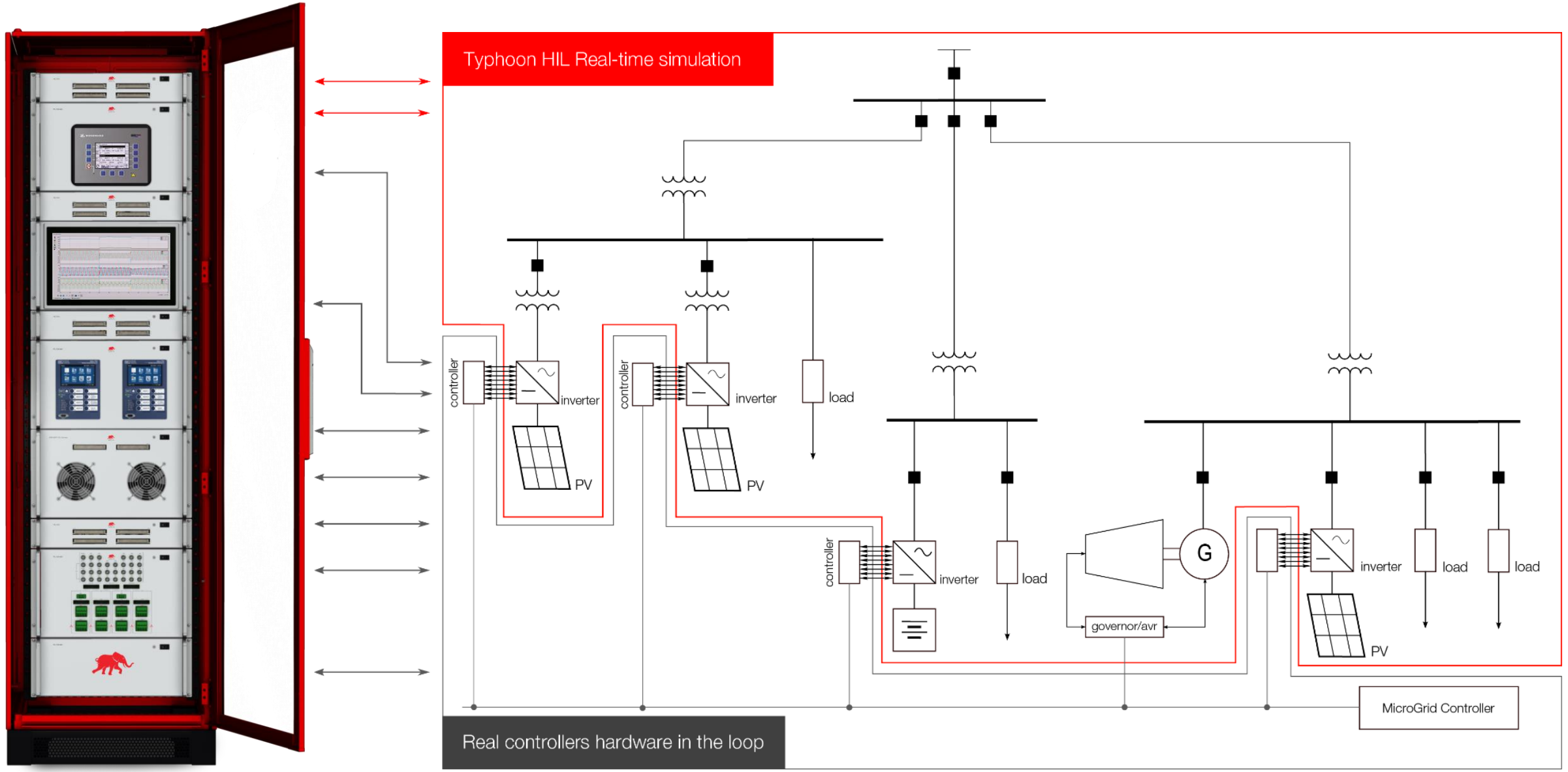
1. Digitalization meets Tesla.
2. Software and testing requirements.
3. Lack of standardization



Solutions

1. Model Based Systems Engineering using Hardware In the Loop for Power Electronics and Controls.
2. Testing and Verification Process.
3. HILCOMPATIBLE components.




Typhoon HIL Real-time simulation
controller
inverter
PV
controller
inverter
PV
load
controller
inverter
load
G
governor/avr
inverter
load
load
PV
MicroGrid Controller
Real controllers hardware in the loop

Results / Recommendations

1. Manufacturers.
2. Integration.
3. Future.

2) Integrating Renewable Energy & Storage

Dr. Peter Lilienthal, CEO of HOMER Energy & Global Microgrid Lead for UL

Challenges:

1. Variety of applications
   - Which side of the meter
2. Variety of value streams
   1. Reliability/resilience
   2. Demand Charge reduction
   3. Multiple ancillary services
   4. Non-wire alternatives
3. Trade-offs
   1. Need for integrated optimization

Solutions

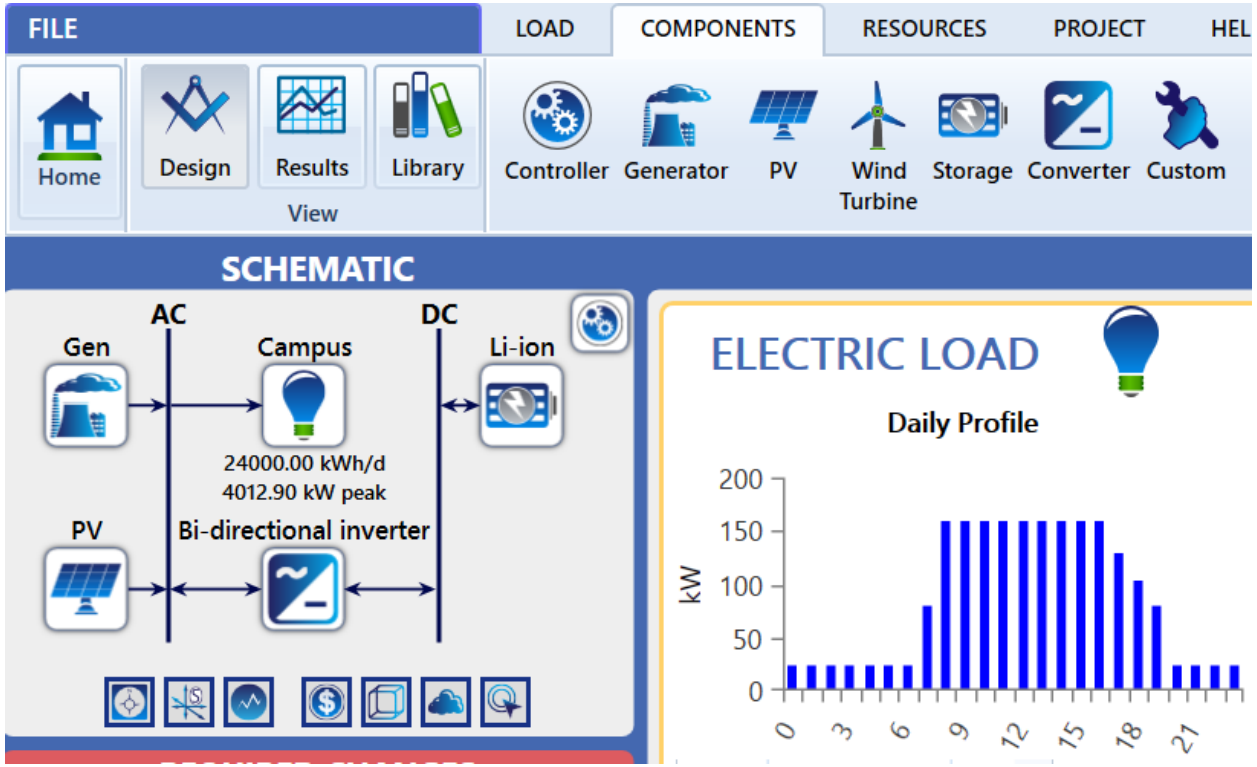
1. HOMER Pro: Microgrids, especially stand-alone systems

2. HOMER Grid: Peak shaving, resilience, export restrictions

3. HOMER FTM: For front-of-the-meter projects
   - Under development

Recommendations

1. Understand objectives
    1. Profit / Cost
    2. Reliability
    3. Environmental Benefits
2. Evaluate trade-offs
3. Iterative design process

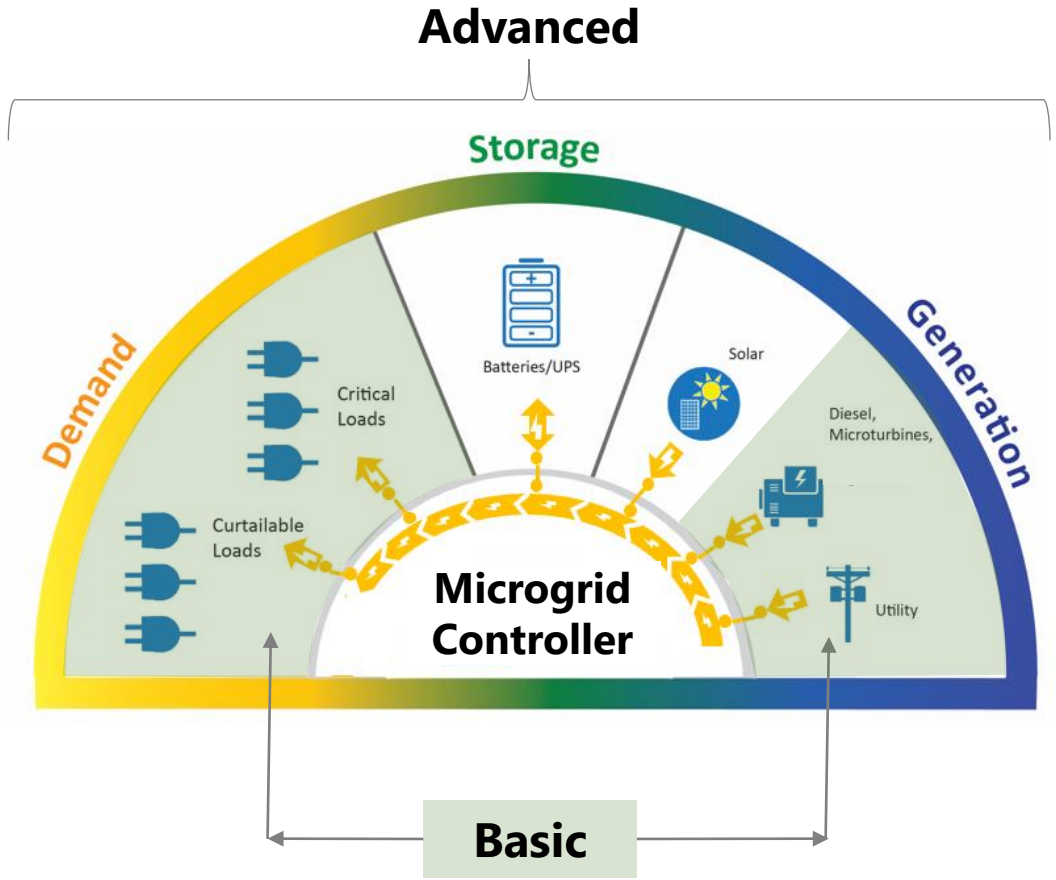


Basic to Advanced Microgrid

Adding Storage (and PV) to Generator-Based Emergency Back-up System

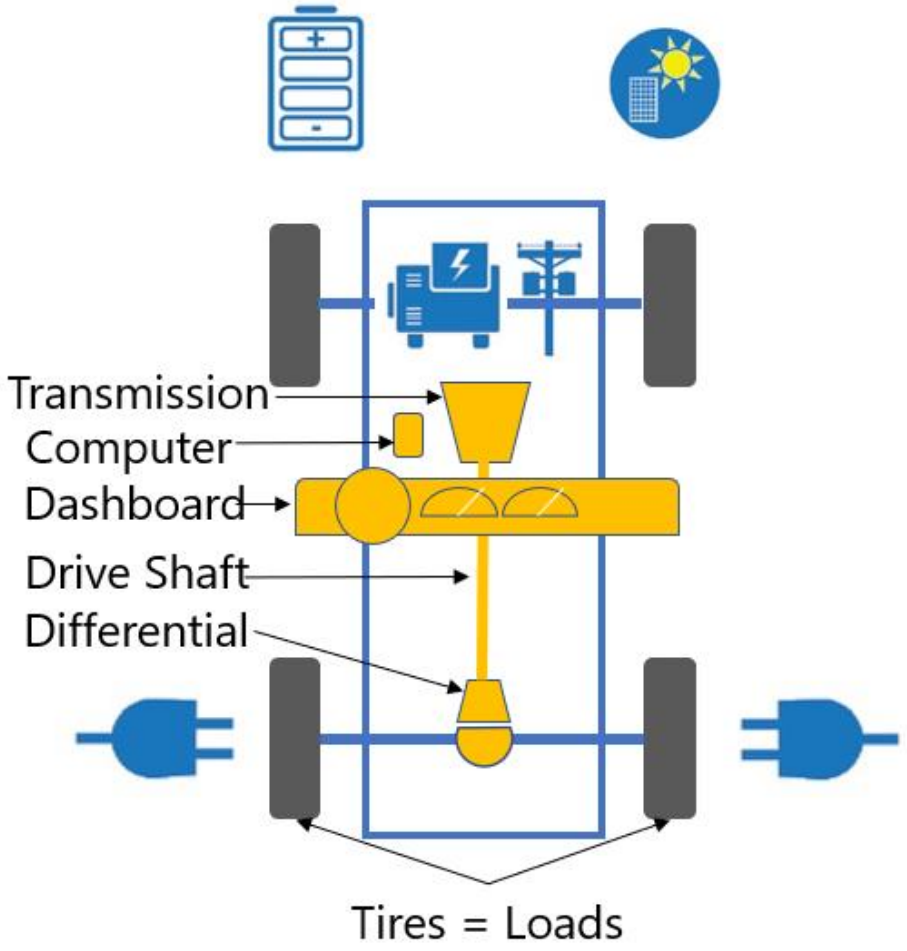
Tim Kelley, Russelectric, Market Director – Renewable & Storage Solutions

	Basic	Advanced
Generation		
Utility	✓	✓
Reciprocating Engine(s)	✓	✓
Storage		✓
PV		?
Other		?
Benefits		
Resilience – Back-up Power During Outage	✓	✓
Reduce Engine Wear & Tear		✓
Diversify / Extend Fuel During Outage		✓
Reduce Energy Costs		✓
Reduce Carbon		✓
Improve Power Quality		✓



Adding Storage (and PV) to Generator-Based Emergency Back-up System

Controller Upgrades



Adding Storage (and PV) to Generator-Based Emergency Back-up System

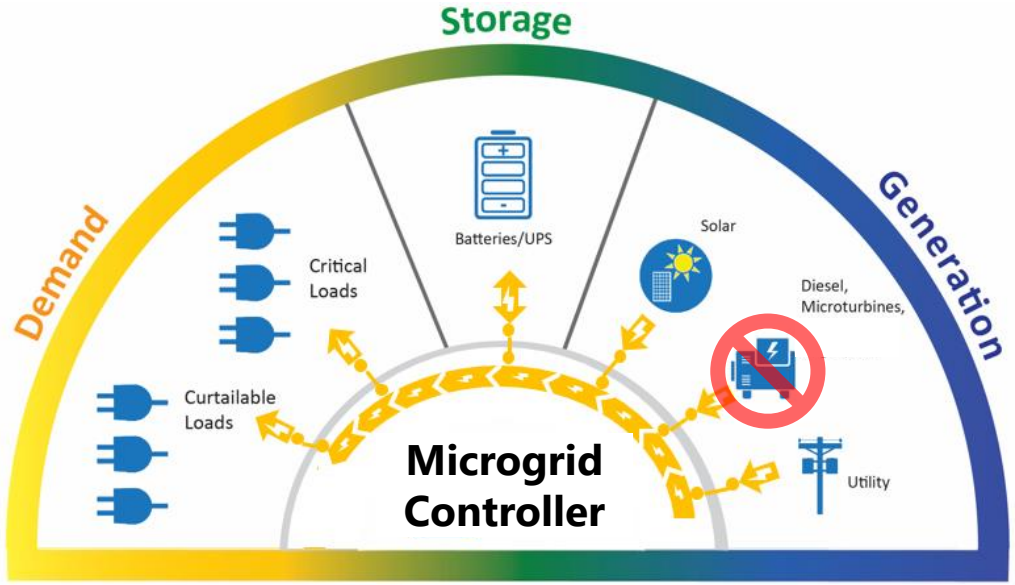
Non-Emergency Condition – Grid Operating / Generator(s) Off

Storage – Cost Reduction Engine

- ✓ Peak Demand Reduction
- ✓ TOU Energy Cost Arbitrage
- ✓ Power Quality Improvement*
- ✓ Wholesale Market Transactions (FERC 841)

PV

- ✓ Low Cost Energy
- ✓ Investment Tax Credit Applies to Storage $



** Dependent on storage system capabilities.*

Adding Storage (and PV) to Generator-Based Emergency Back-up System

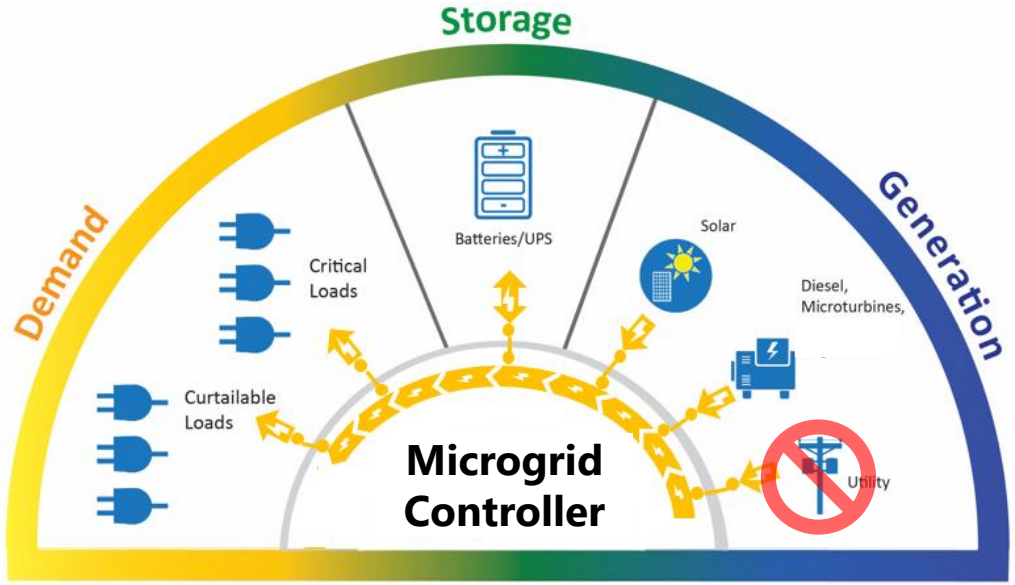
Emergency Condition – Grid Outage / Generator(s) On

Storage

- ✓ "Seamless Transfer"*
- ✓ Reduce Fuel Use
- ✓ Efficient Generator Deployment
  - If Storage < Loads
    - ✓ Use Storage to Smooth Load = Efficient Generator Use
  - If Storage >= Loads
    - ✓ Use Generator to Charge Battery, Then Shut Down

PV

- ✓ Fuel Diversification
  - ✓ Unlimited, But Intermittent "Fuel"
  - ✓ Extends Consumption of Onsite Fuel Storage



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Ask the Experts: Q&A Session

Type your questions in to the Q&A box

#MicrogridVirtual

Microgrid Knowledge Virtual Conference Resource Library

Recommended Resources

Microgrid Resource Library

- Visit ThinkMicrogrid.com

Network with the MGK Community on LinkedIn

Save the Date: Microgrid 2020

In Person Conference – Nov. 18-20 - Philadelphia, PA

Finance Session: *The Role of Renewable Biofuels in a Low Carbon, Resilient Economy*

- Plus 90 speakers in 30+ sessions on best practices
- 35 exhibitors
- Networking opportunities

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Thank You!

Next Session: *Evolution of the Remote Microgrid @ 2 PM Eastern*

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