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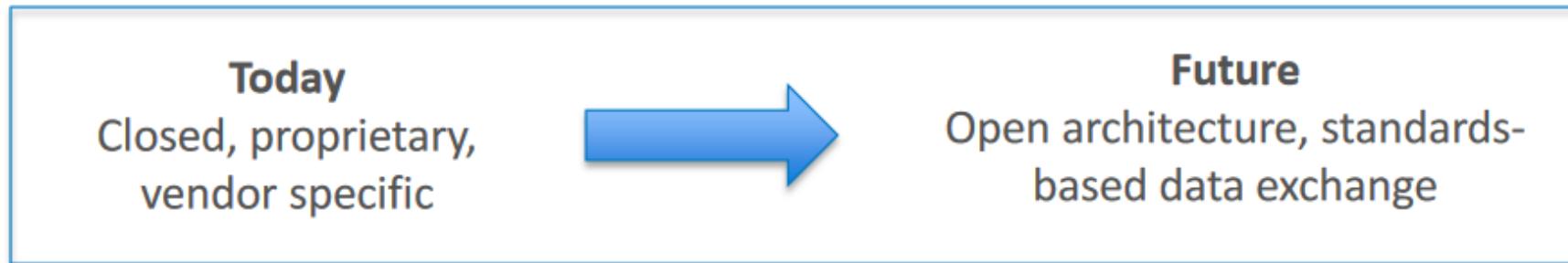
Session : DIGITALIZATION OF UTILITIES, DIGITALIZATION ROADMAPS; DIGITAL TWINS

NREL's Advanced Distribution Management System Test Bed

Presented By

Murali Baggu, Laboratory Program Manager, National Renewable Energy Laboratory

Transform utility electric distribution management systems to enable the integration and management of all assets and functions across the utility enterprise regardless of vendor or technology.



Four program areas:

Platform:

Test bed:

Applications:

Advanced control:

Develop an open-source platform; evaluate advanced applications.

Build a vendor-neutral test bed to evaluate existing and future advanced distribution management system (ADMS) functionalities in a realistic setting.

Develop an initial suite of ADMS applications.

Develop new integrated optimization and control solutions.

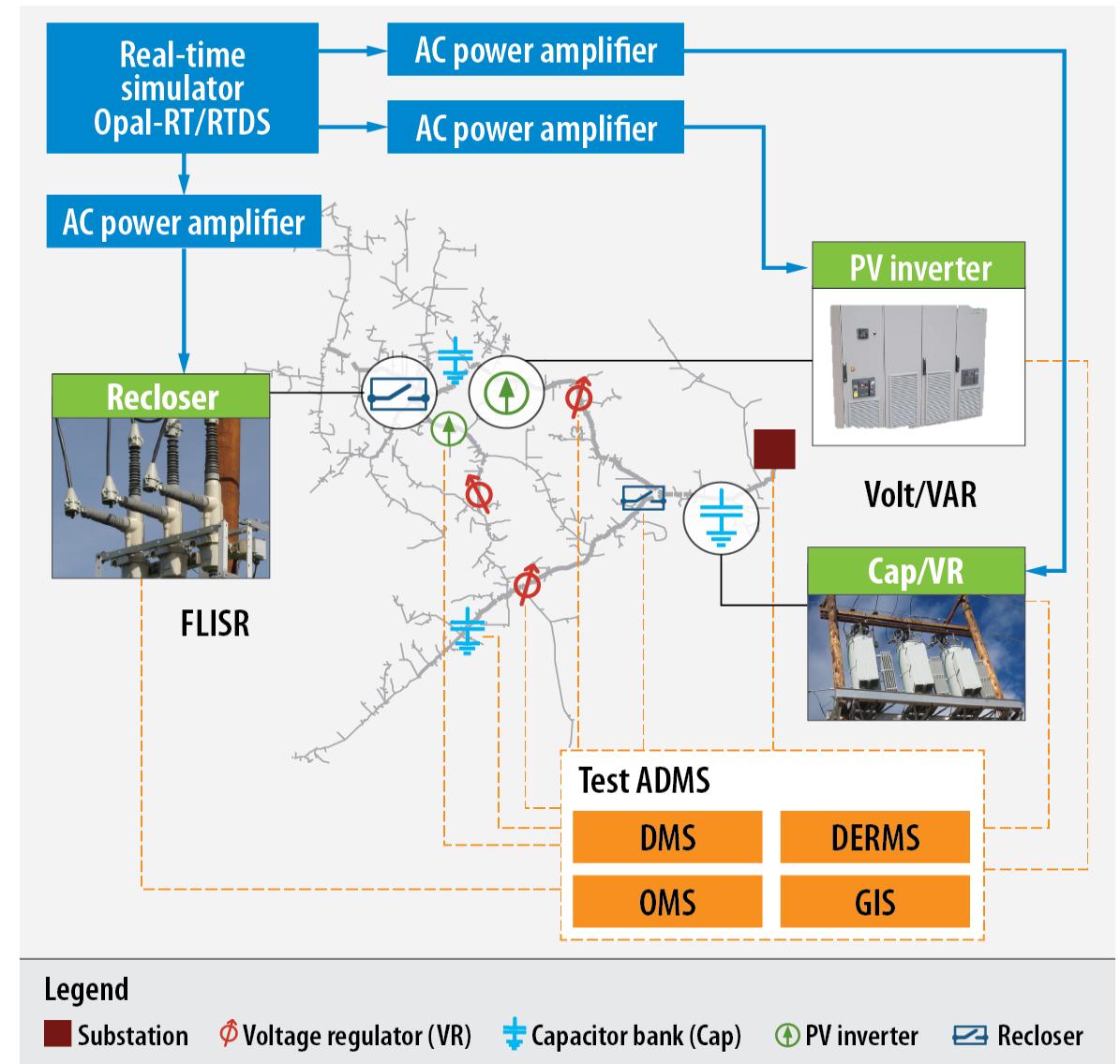
ADMS Test Bed (Digital Twin) Development

Project description:

- Model key substation service areas of distribution systemsIntegrate distribution system hardware in the Energy Systems Integration Facility (ESIF) for PHIL experimentation.
- Develop an advanced visualization capability for a mock utility distribution system operator's control room.

KEY APPLICATION: Evaluation of ADMS functions

NREL is working with utilities and vendors to evaluate ADMS applications such as VVO, FLISR, OPF, and market participation of distribution assets in a realistic environment developed during this project.

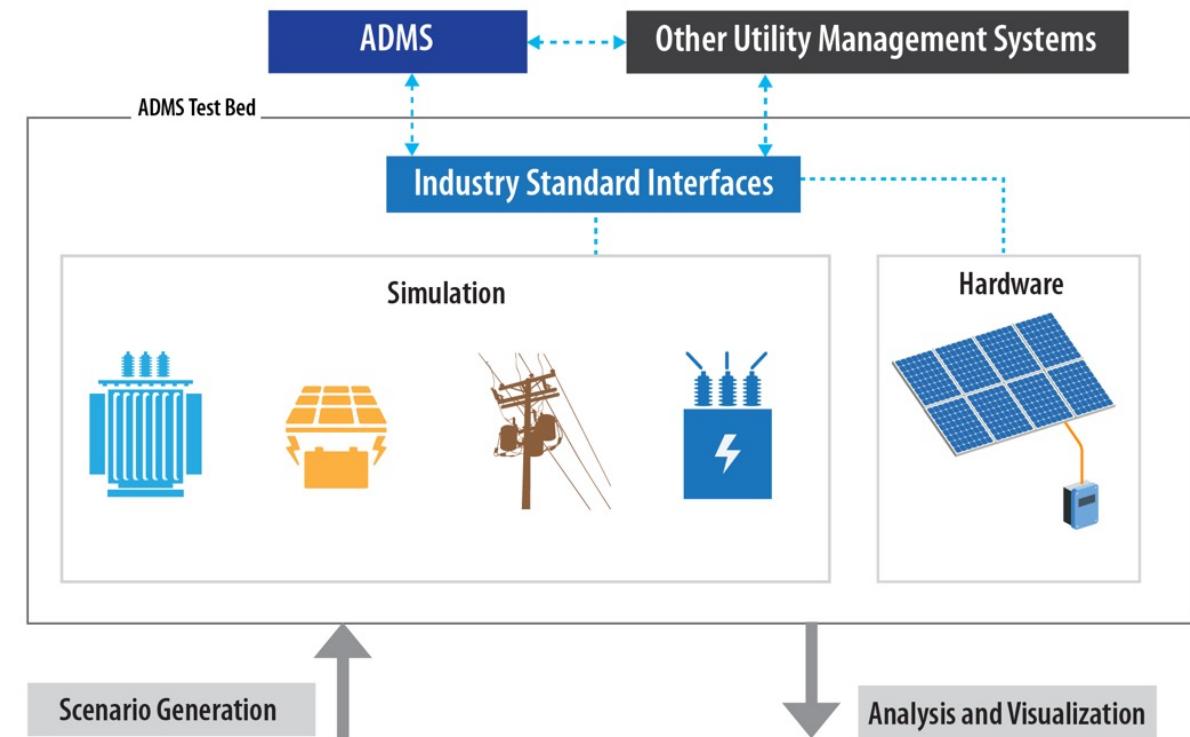


ADMS Test Bed (Digital Twin) Capabilities

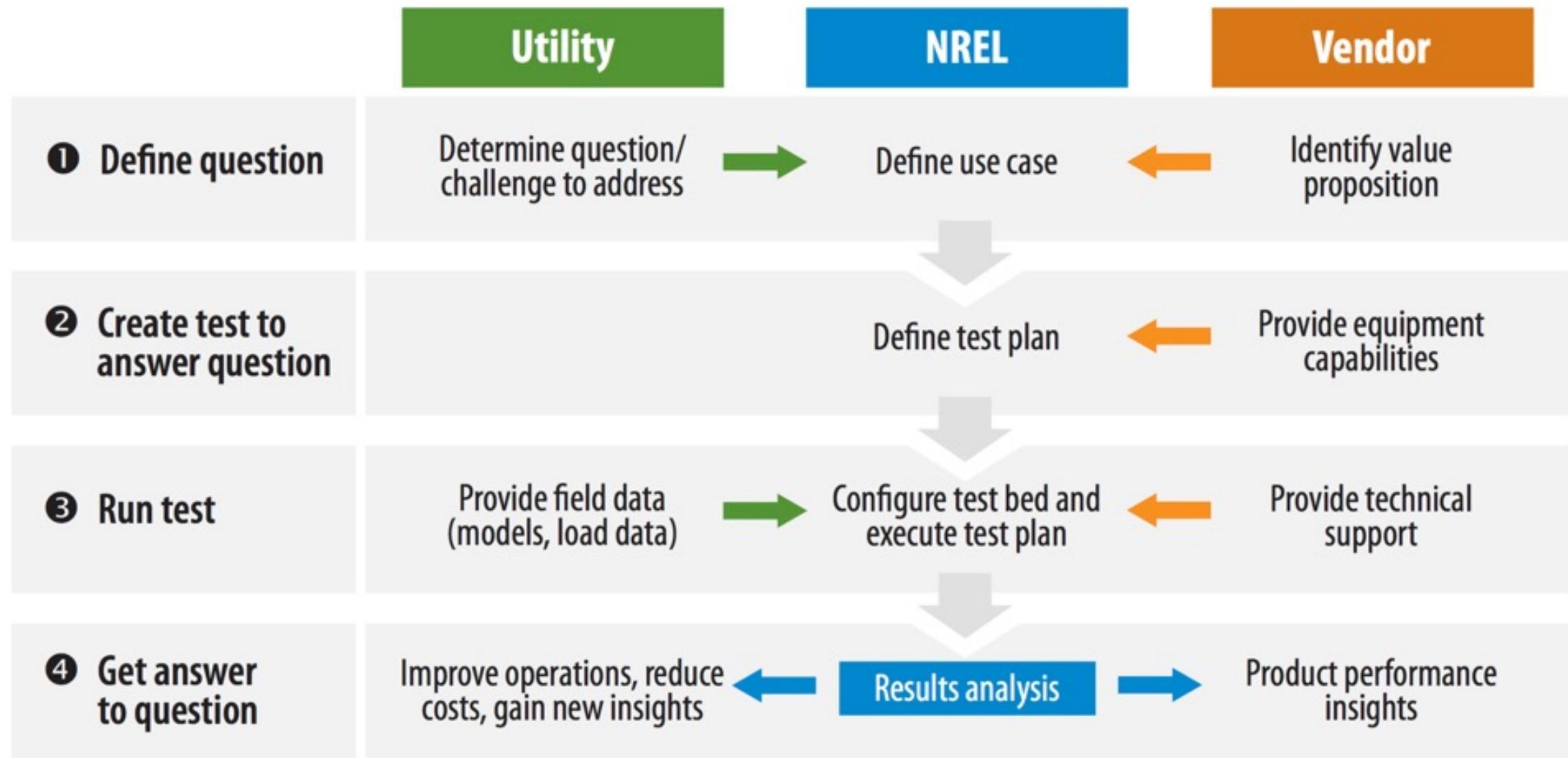


- Hardware integration
- Communications interfaces
- Data collection and visualization

- Multi-timescale co-simulation



ADMS Test Bed Use Case Development



ADMS Test Bed Use Cases

ADMS network model quality impact on VVO

Xcel Energy/Schneider Electric

Peak load management with ADMS and DERMS

Holy Cross Energy/Survalent

AMI-based, data-centric grid operations

SDG&E + GridAPPS-D

FLISR in the presence of DERs

Central Georgia EMC/Survalent

Federated DERMS for high PV system

Southern Company/Oracle + GridAPPS-D

DER controls strategies for T&D grid services

Xcel Energy + GridAPPS-D

Co-optimizing grid operations and facility operations with interoperable ADMS, VPP, microgrids, and grid-edge DERs

Shell + Spirae

Integration of advance grid monitoring and analytics with ADMS FLISR application

Israel Electric Company + EGM

ADMS test bed capabilities used by:

- Non-wires alternatives
- ECO-IDEA
- GO-SOLAR
- SolarExpert
- Resilient Operation of Networked Microgrids (RONM)
 - SDG&E, Cobb EMC
- FAST-DERMS
 - SDG&E, Oracle, EPRI + GridAPPS-D
- PV Integration using a Virtual Airgap (PIVA)
 - GridBright, SDG&E
- REORG
 - Holy Cross Energy, Minsait ACS
- SmartGrid Asset Load Management & Optimized Neighborhood (SALMON)
 - Portland General Electric, OSI

USE CASE: FLISR in the Presence of DERs

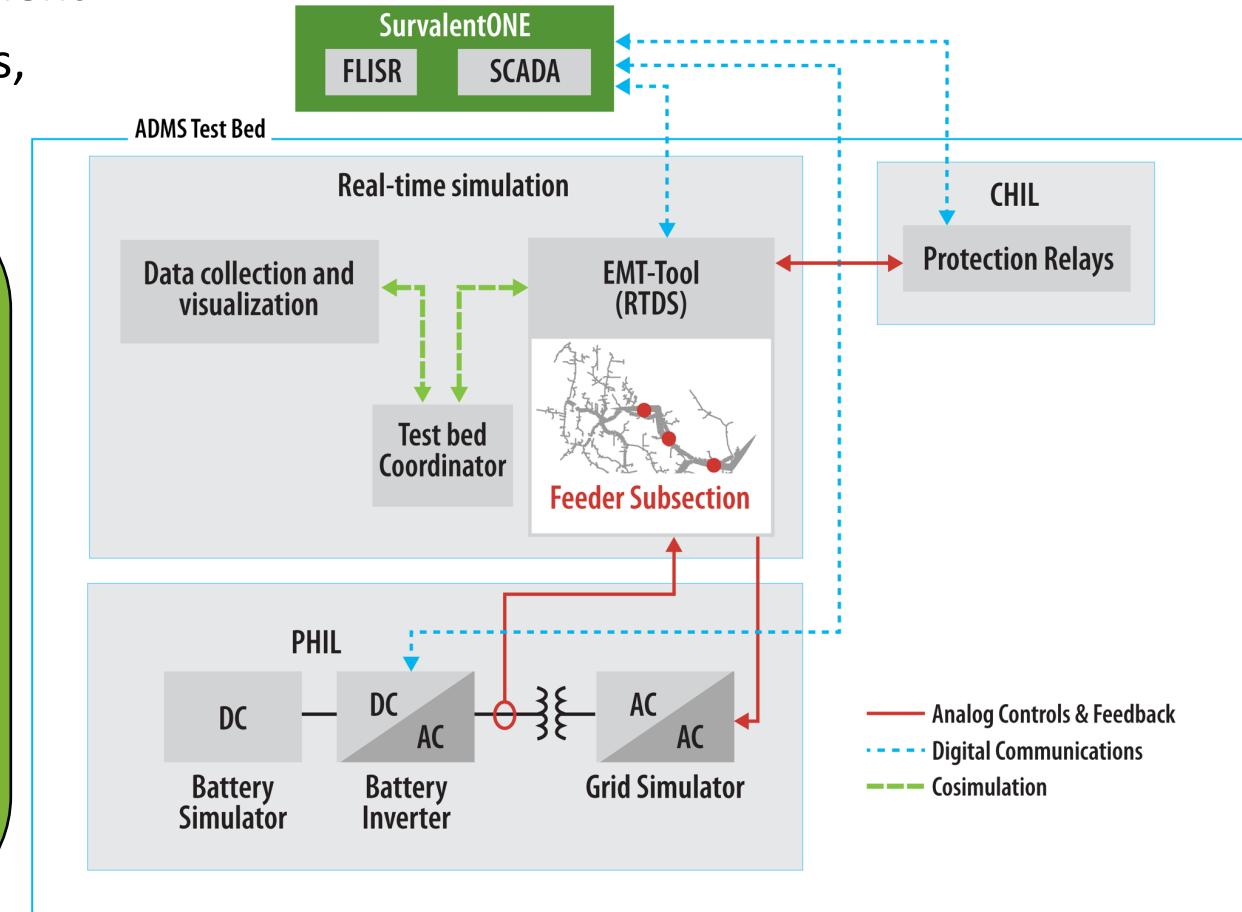
Objective: Evaluate the performance of a commercially available ADMS fault location, isolation, and service restoration (FLISR) application in the presence of DERs.

Partners: Utility: Central Georgia EMC, ADMS: Survalent

Evaluate the impact of: DER locations Fault locations, DER trip settings.

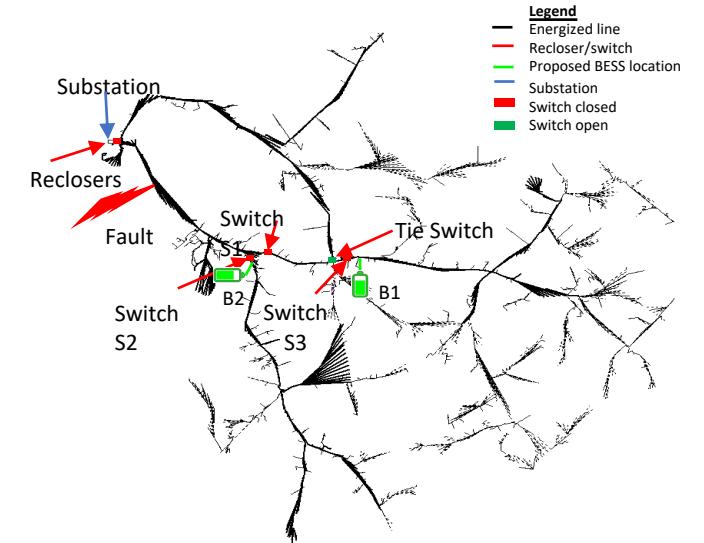
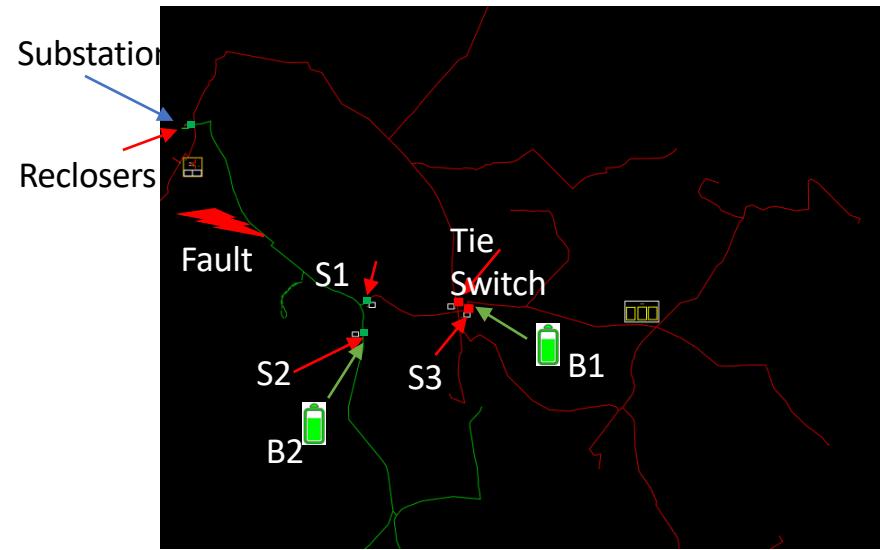
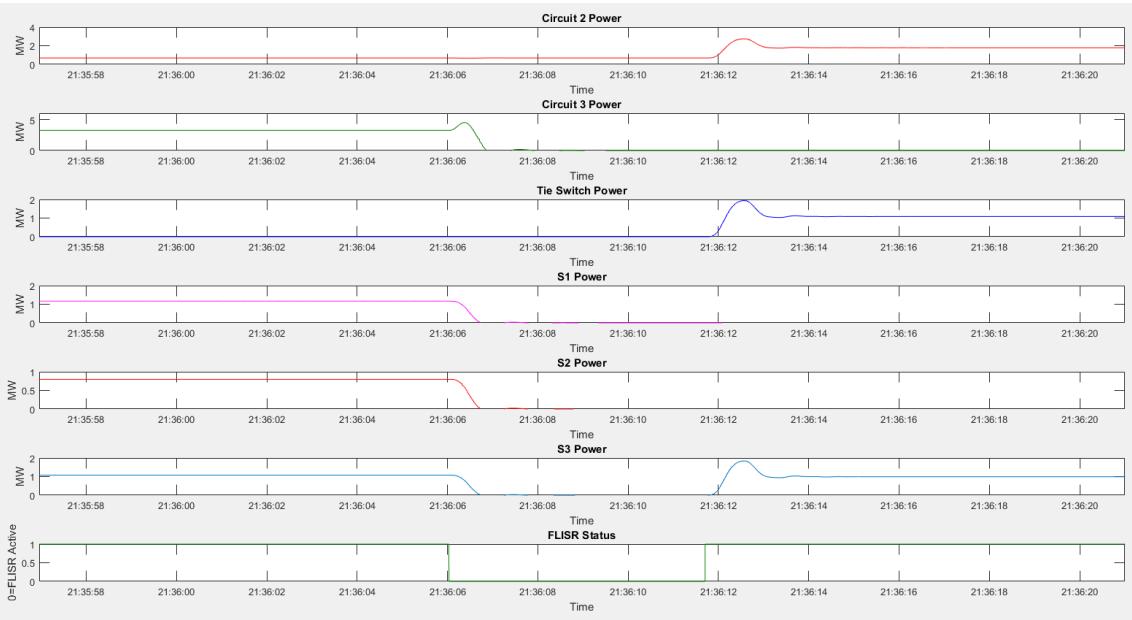
FLISR is an advanced application that assists distribution electric utility operators during a fault or disturbance to:

- Automatically locate the impacted area.
- Isolate the portion of the feeder by operating upstream and downstream controllable switches to reduce the number of affected customers.
- Transfer portion(s) of the feeder load to adjacent feeders that have the capacity to support the load and reestablish service to a portion of the affected customers in a matter of seconds.



Takeaways

- The use case evaluated the performance of a FLISR application in a distribution feeder with GFM DERs and how FLISR could use these DERs to reduce the number of impacted customers.
- Results of this use case provide the electric utility industry with insights into DER capabilities to improve system resilience and potential improvements to FLISR applications.



THANK YOU

*For discussions/suggestions/queries email: isuw@isuw.in
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- Annabelle Pratt, “NREL’s Advanced Distribution Management System Test Bed”, NREL/PR-5D00-84415,

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