Smart Reconfiguration of Idaho Falls Power Distribution Network for Enhanced Quality of Service
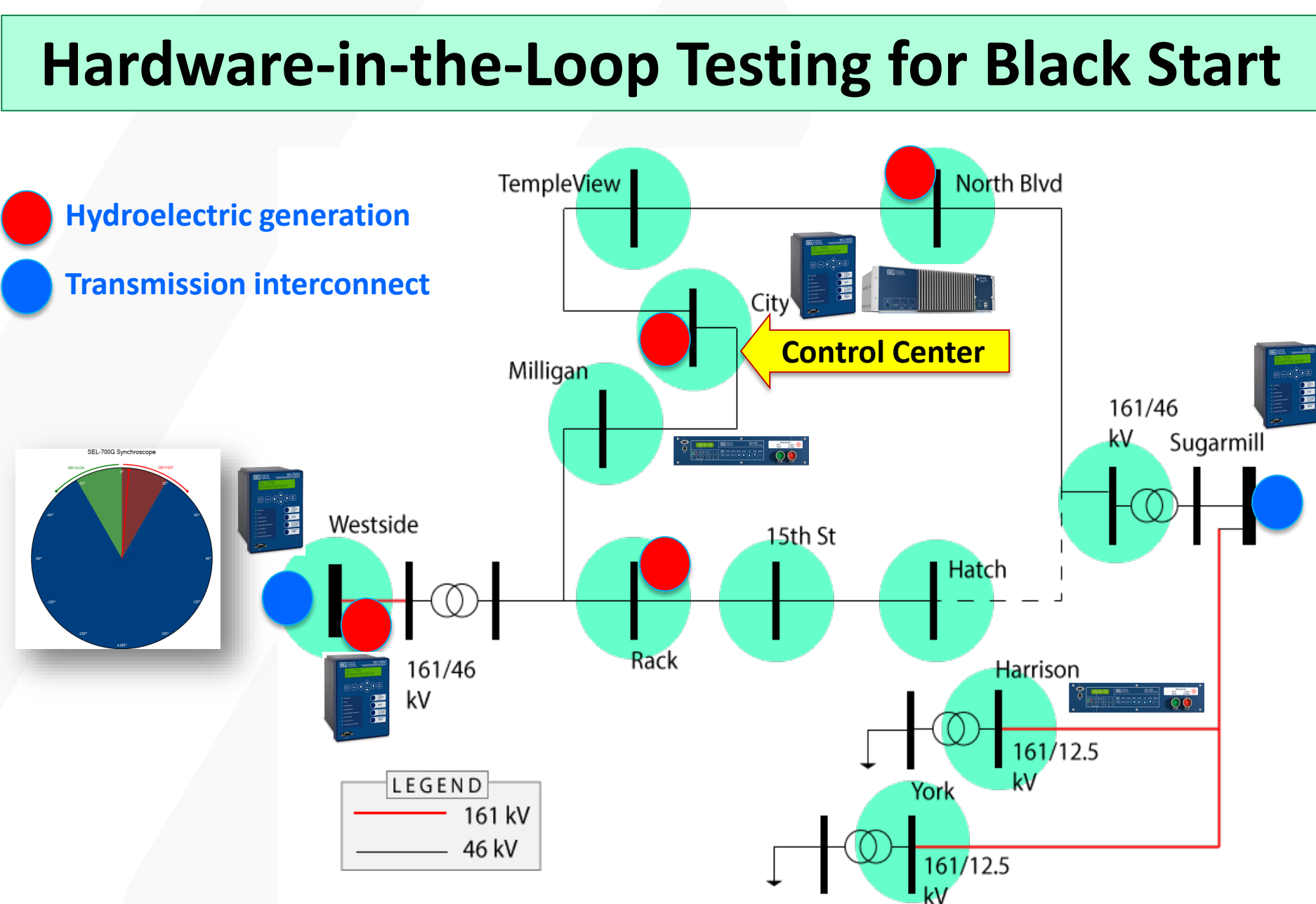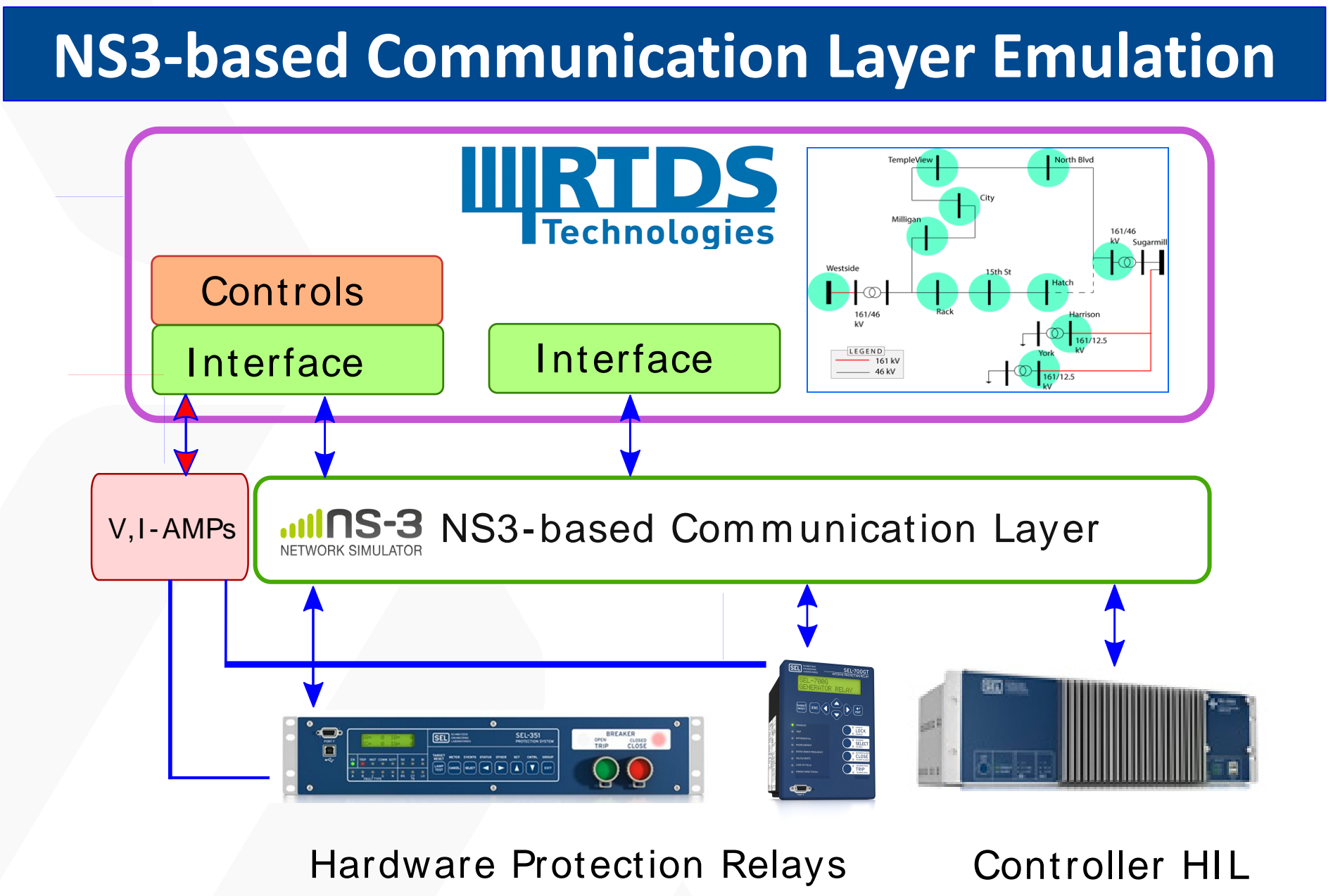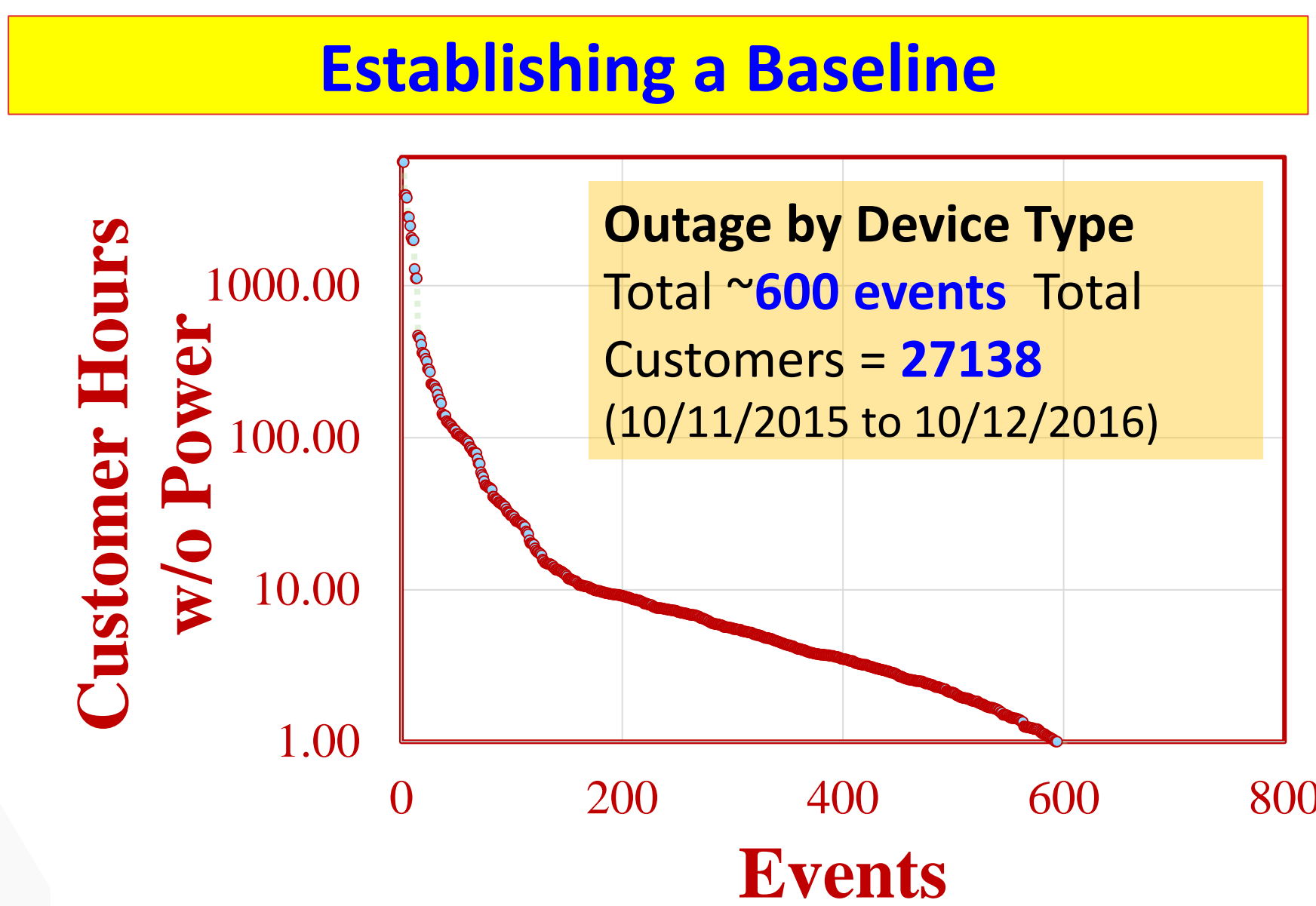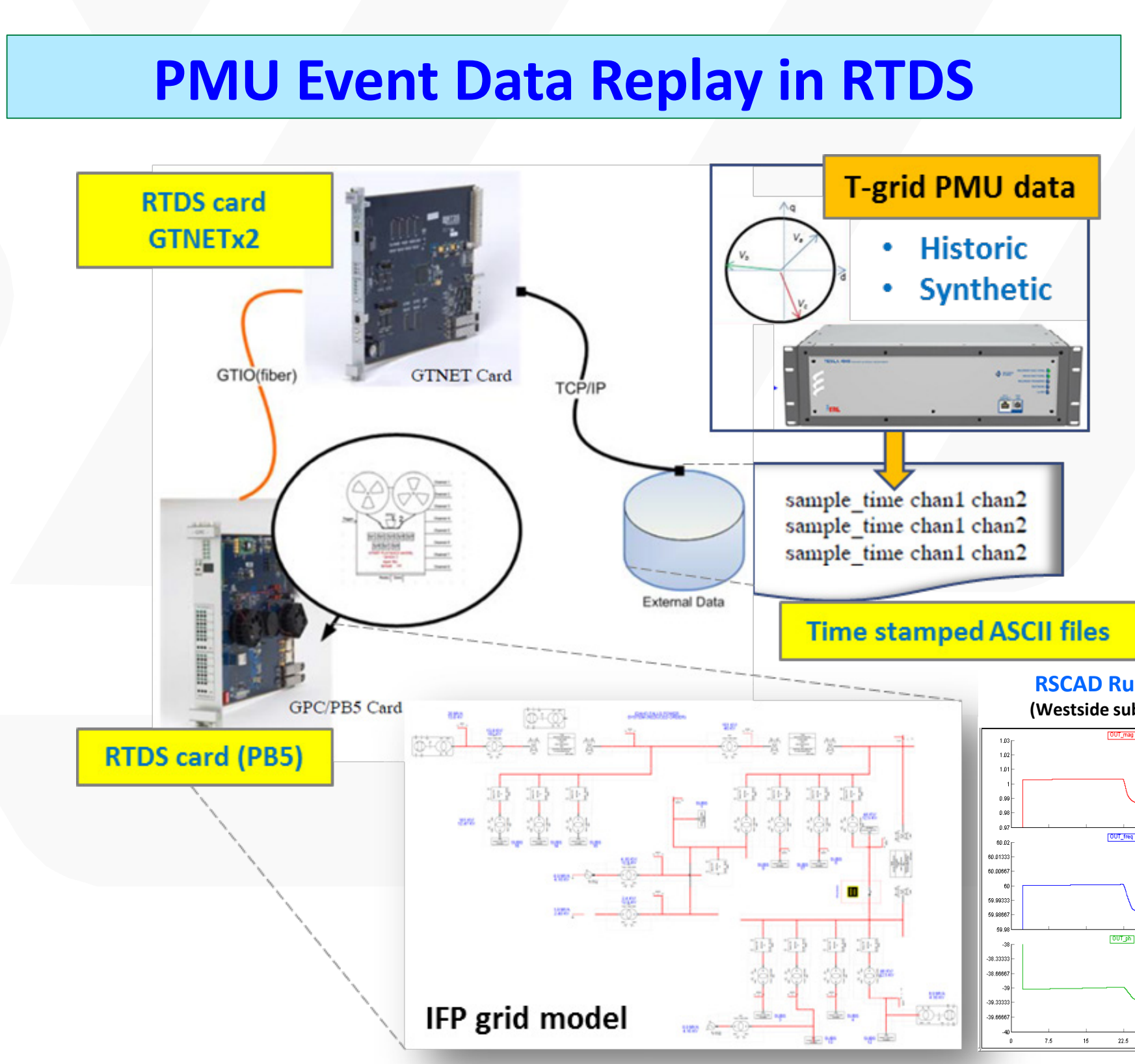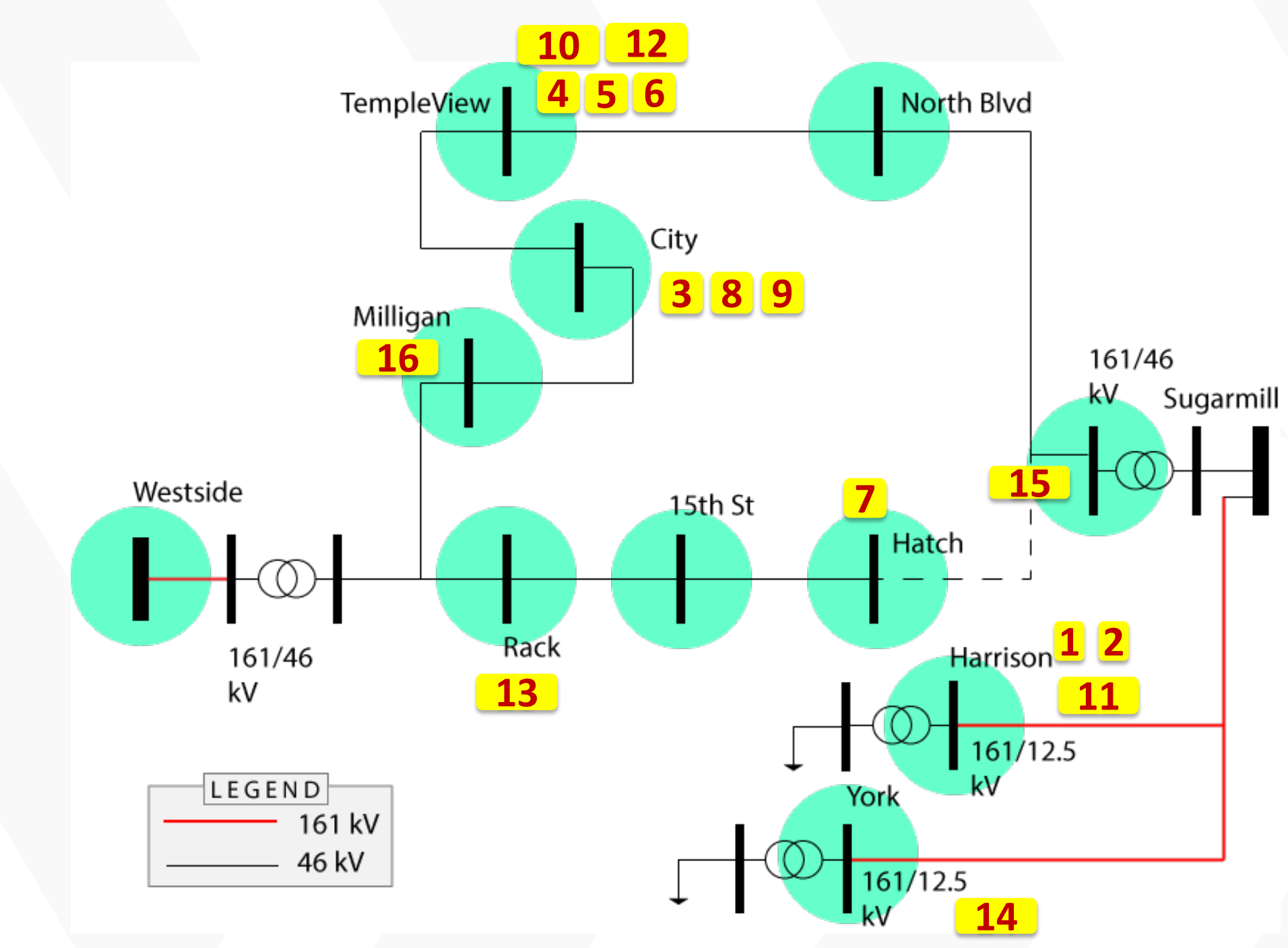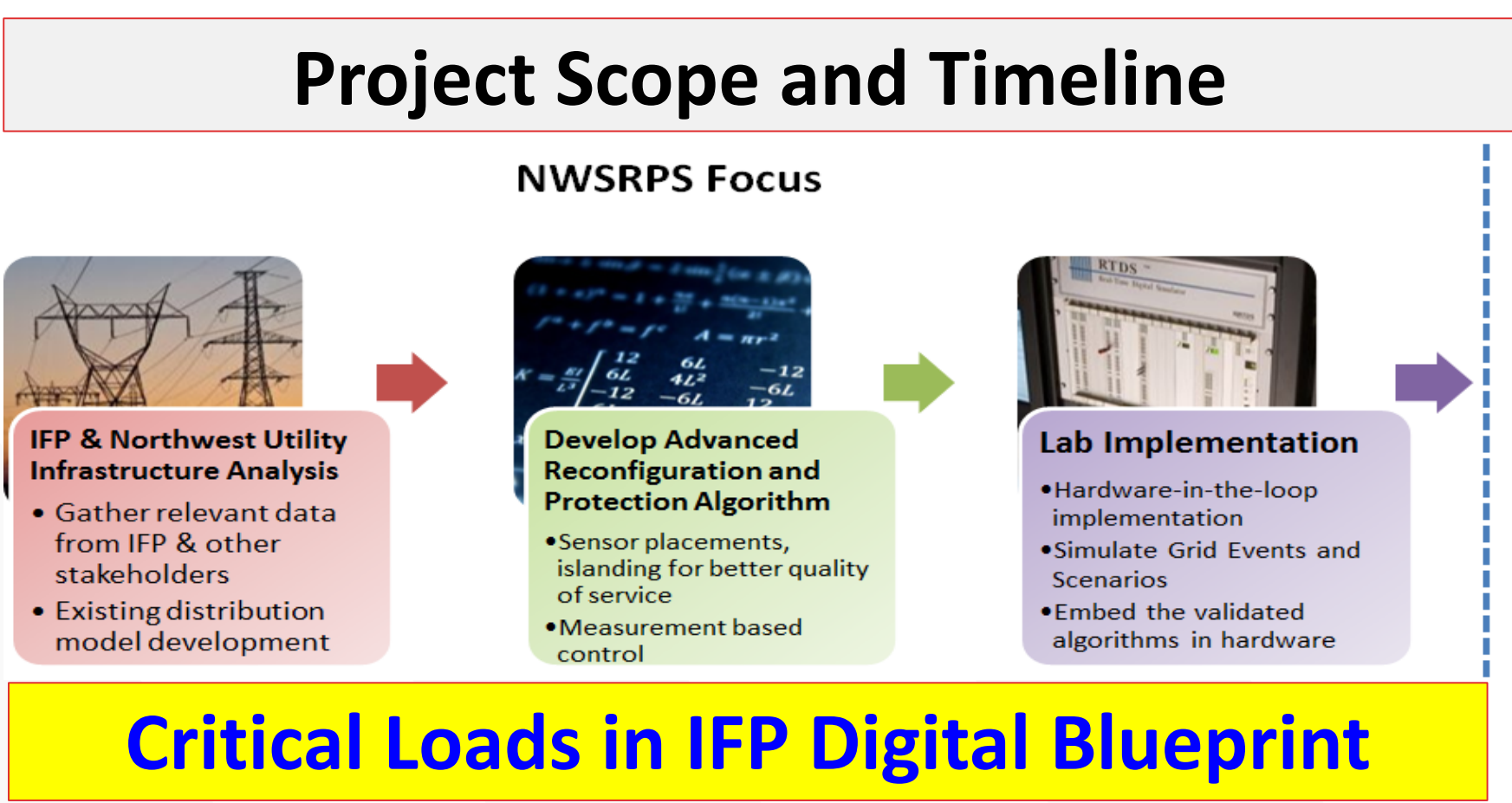
Project Description

► Develop methods for keeping as much of the system operating as possible during **system events** at **transmission or distribution level**

► **Provide a generalized roadmap**, including **best practices based on the regional case for IFP**, which the utilities and power system operators across the United States can use

► Show **effectiveness** of the implemented **smart reconfiguration schemes** in **comparison to state-of-the-art**

Expected Outcomes

► Baseline for the IFP grid via a digital blueprint

► Improved reliability and resiliency of IFP grid by serving critical loads during outages

► Smart reconfiguration and protection schemes for islanding and resynchronization using advanced measurements for a regional distribution grid

► A generalized roadmap for using a digital blueprint approach for developing and implementing advanced reconfiguration and protection methodologies in distribution grids

Significant Milestones	Date
Digital Blueprint	Sep. 2017
HIL with one relay (700G)	Dec. 2017
Evaluation of PMU data from dynamic simulations	Dec. 2017
Transmission fault scenarios / events	Dec. 2017, Ongoing
Black start demo with one hydro-generator and HIL	Mar. 2017
Reconfiguration algorithm	Dec 2017
Include dynamics in reconfiguration algorithm	Ongoing
Tech Transfer / Regional Collaboration	
- SunValley Institute, Blaine County, ID	Feb. 2017
- Richland Energy Services, Richland, WA	Mar. 2017

Project Scope and Timeline

NWSRPS Focus

IFP & Northwest Utility Infrastructure Analysis
• Gather relevant data from IFP & other stakeholders
• Existing distribution model development

Develop Advanced Reconfiguration and Protection Algorithm
• Sensor placements, islanding for better quality of service
• Measurement based control

Lab Implementation
• Hardware-in-the-loop implementation
• Simulate Grid Events and Scenarios
• Embed the validated algorithms in hardware

Future Work [IFP Lead, INL Support]
Future Idaho Falls Power hardware deployment

Critical Loads in IFP Digital Blueprint

PMU Event Data Replay in RTDS

Establishing a Baseline

Outage by Device Type
Total ~**600 events** Total Customers = **27138**
(10/11/2015 to 10/12/2016)

NS3-based Communication Layer Emulation

Hardware Protection Relays   Controller HIL

Hardware-in-the-Loop Testing for Black Start

● Hydroelectric generation
● Transmission interconnect

Progress to Date

● Real-time **digital blueprint** of Idaho Falls Power distribution grid network for **baseline**

● **Critical load** priorities and locations identified in IFP digital blueprint

● **PMU event data** synthesized using realistic scenarios

● **Black start** of one City Bulb hydro-generator with **HIL**

● **NS3-based** communication layer for **co-simulations**

● Established **cross-project contributions** and interest from **regional** utilities for future projects