



Update on NREL and NTS Testing Activities

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DOE DER Distributed Power Program

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DOE Distributed Power Program

NREL – Lead Laboratory

Interconnection Testing Activities (In-House and Subcontract)

Simulation and Modeling

University of Wisconsin
Orion - University of Massachusetts (Lowell)
Industry Partners - DTE, GE, NiSource

Characterization R&D

NREL - DER Test Facility
EPRI - PEAC
University of Wisconsin

Certification

EPRI-PEAC
Underwriters Laboratories

Field Testing and Validation

Nevada Test Site
Distributed Utility Integration Test - DUA
Industry Partners - GE, NYSERDA, GRI, NRECA,
NiSource, Real Energy, DTE



Purpose of the NREL Distributed Energy Resources Test Facility

- Support DOE Distributed Power Program goals.
- Capitalize on NREL's expertise and expand capabilities in testing renewable and distributed energy systems.
- Continue leadership with industry in standards development and validation for distributed resources (P1547, P1589, ...).
- Support research subcontracts and aid manufacturers of distributed generation equipment through cooperative testing of their systems for baseline comparisons to identify advances in functional performance.
- Coordination of testing at field sites.

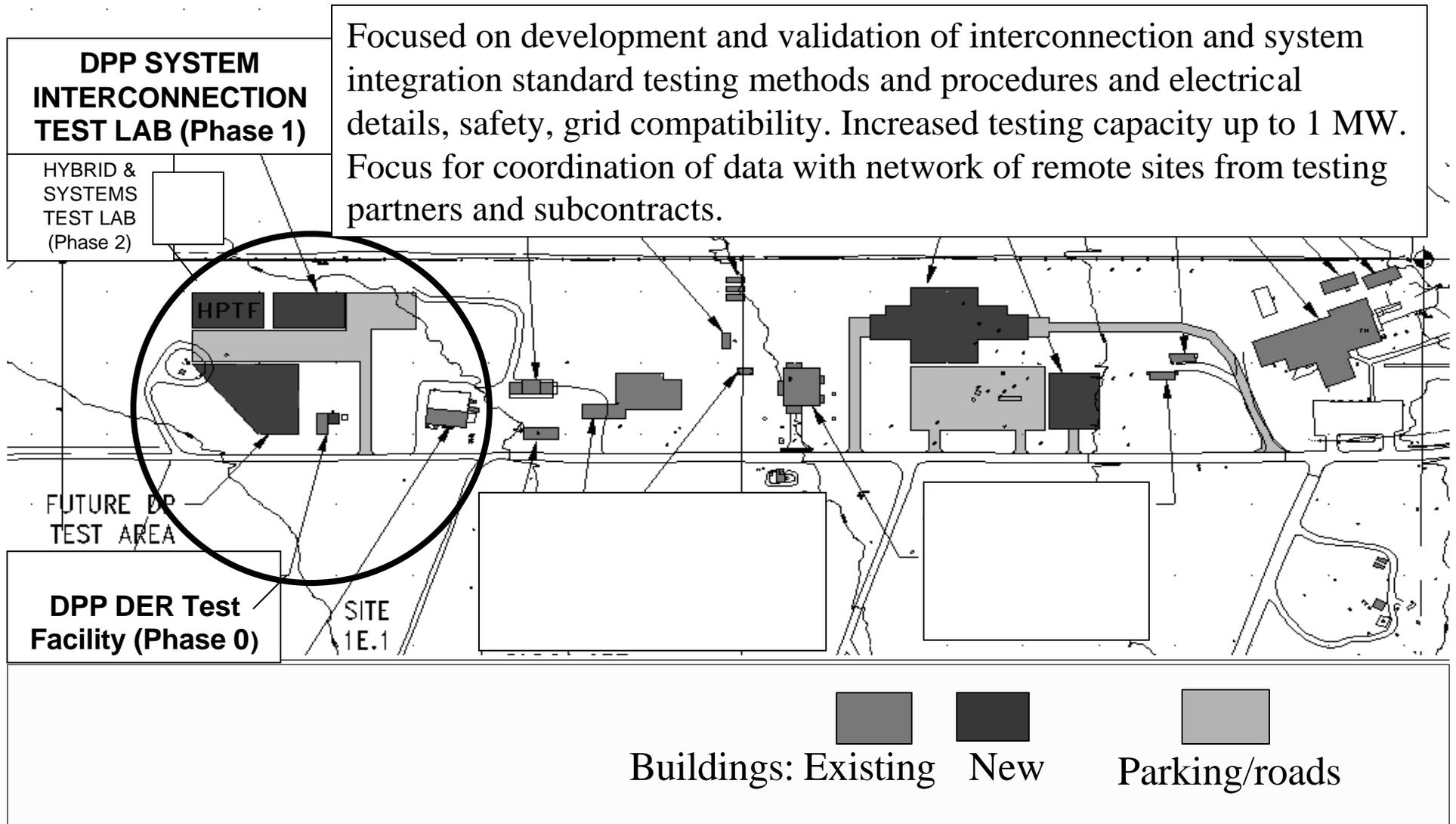


NWTC Site View and Location of HPTB - DERTF



Tour : Thursday 1:20-3pm

Location of Planned Distributed Energy Resources Test Facility at NWTC





Update on NREL DER Test Facility (Phase 0)



- Concrete Pad for DG Testing installed
- Installation of Capstone Turbine completed – initial startup expected October 15



- Expansion of HPTB building is completed
- Electrical and Mechanical modifications for research testing completed

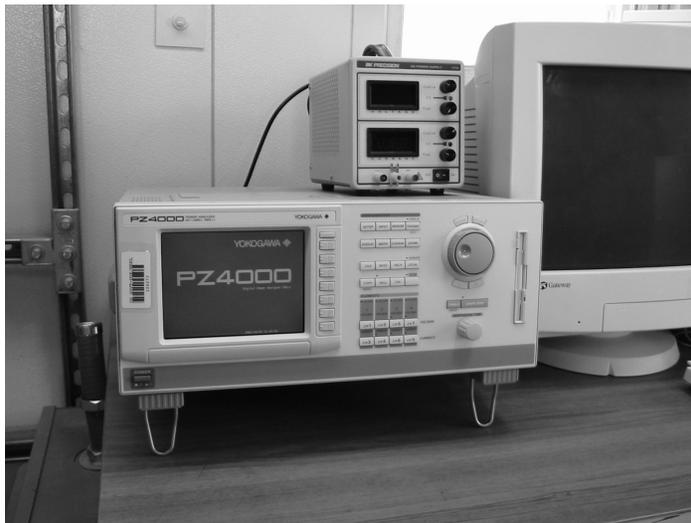




Update on NREL DER Test Facility (Phase 0)



- Have received the all GPP/GPE equipment:
- 200kW Grid Simulator – Simulate utility grid and full control of voltage and frequency to test DG response to grid disturbances
- Yokogawa PZ4000 - Power analyzer – For Data Acquisition and measurement
- KeyTek Surge Tester – Simulate high-voltage lightning strikes on DG equipment





P1547 Standard – Validation Testing

IEEE P1547 Specifications, Requirements and Tests that will be conducted

General (Section 4.1)

Technical Specifications and Requirements	Test Specifications and Requirements	Tests
4.1.1. Voltage Regulation		
4.1.2. Integration with Area EPS Grounding and With Area EPS Ground System Protection	5.3.1	
4.1.3. Synchronization	5.1.1	B.1
4.1.4. DR on Distribution Secondary Grid and Spot Networks		
4.1.5. Inadvertent Energization of the Area EPS		
4.1.6 Monitoring Provisions	5.3.3	
4.1.7 Isolation Device	5.3.2	

Response to Abnormal Conditions (Section 4.2)

4.2.1 Voltage Disturbances	5.1.2	B.2.1, B.2.2
4.2.2 Frequency Disturbances	5.1.2	B.2.3, B.2.4
4.2.3 Reconnection To Area EPS	5.3.4	
4.2.4 Disconnection for Faults		
4.2.5 Loss of Synchronism	5.1.3	

Power Quality (Section 4.3)

4.3.1 Limitation of DC Injection	5.1.4	5.1.4
4.3.2 Limitation of Flicker Induced by the DR	5.4.3	Annex A
4.3.3 Harmonics	5.1.5	B.3
4.3.4 Protection from Electromagnetic Interference	5.1.6	IEEE C37.90.2
4.3.5 Surge Withstand Performance	5.1.7	IEEE C62.45 IEEE C37.90.1

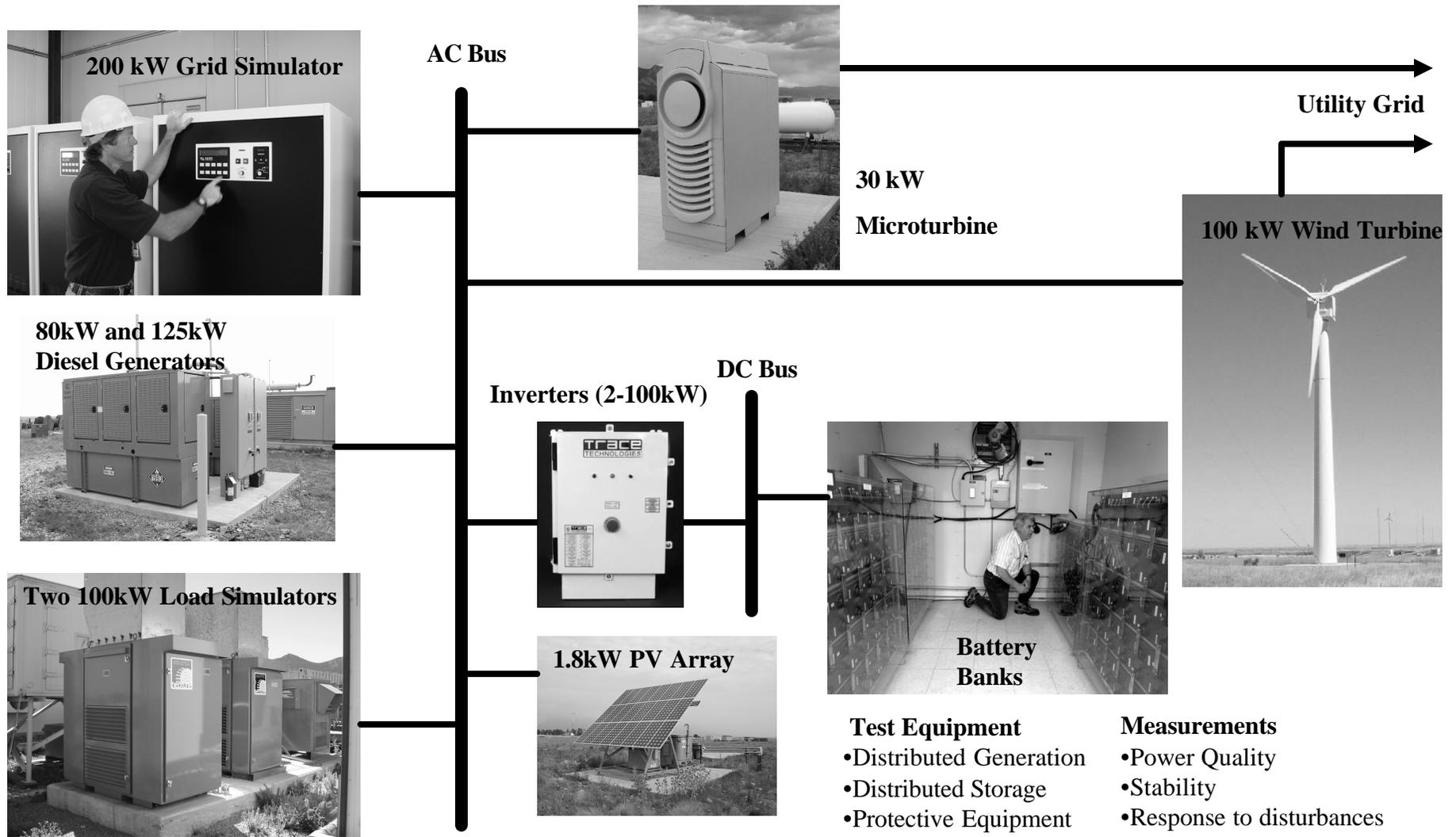
Islanding (Section 4.4)

4.4.1 Unintentional Islanding	5.1.8, 5.4.1, 5.4.2.	B.4
4.4.2 Intentional Islanding		



DER Distributed Power Program NREL Test Facility

Systems Integration Testing



Test Equipment

- Distributed Generation
- Distributed Storage
- Protective Equipment
- Switches
- Electronics
- Communications and Controls

Measurements

- Power Quality
- Stability
- Response to disturbances
- Performance/ Functionality



DPP Testing at Nevada Test Site

NREL Distribute Power Program is conduct exploratory field tests to validate interconnection and commissioning tests included in the IEEE P1547 interconnection standard at the Nevada Test Site. NREL is also developing a long-term testing plan for NTS.

The near-term testing that will be conducted includes:

Over Voltage, Under Voltage, Over Frequency, Under Frequency, Trip Test, Harmonics, DC Current Injection, Unintentional Islanding, Synchronization

Plans are to test 2 different types of DG:

1. Static Inverter (PV Inverter 5kW)
3. Synchronous generator (100kW diesel gensets w/parallel package).



Update on Nevada Test Site DPP Testing

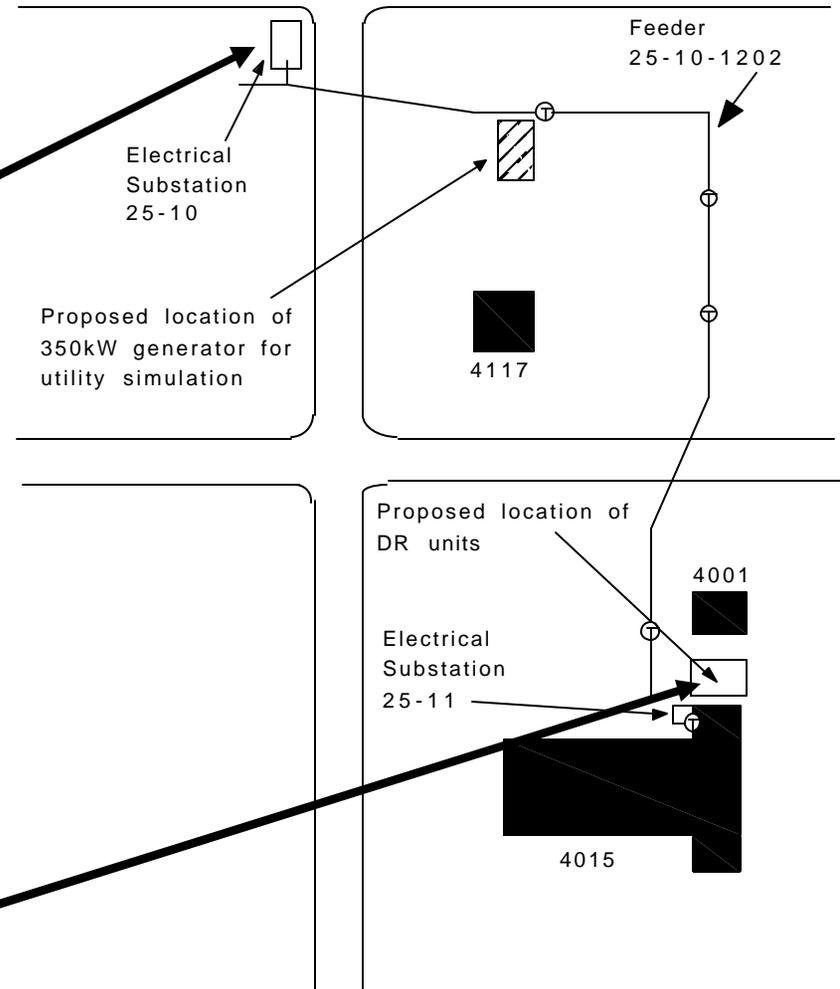
- Completed Initial Test Plan
- Coordination Meeting (May 23-24) with NREL, DOE/NV, Bechtel/NV, DUA on test plan and site development
- Toured NTS with Bechtel/NV and ASCO on 10/19/01 – Installation of required electrical modification are on schedule
- NREL completing portable DAS for measurements
- Testing scheduled for October – November 2001



Feeder 25-1202 at Area 25 of Nevada Test Site

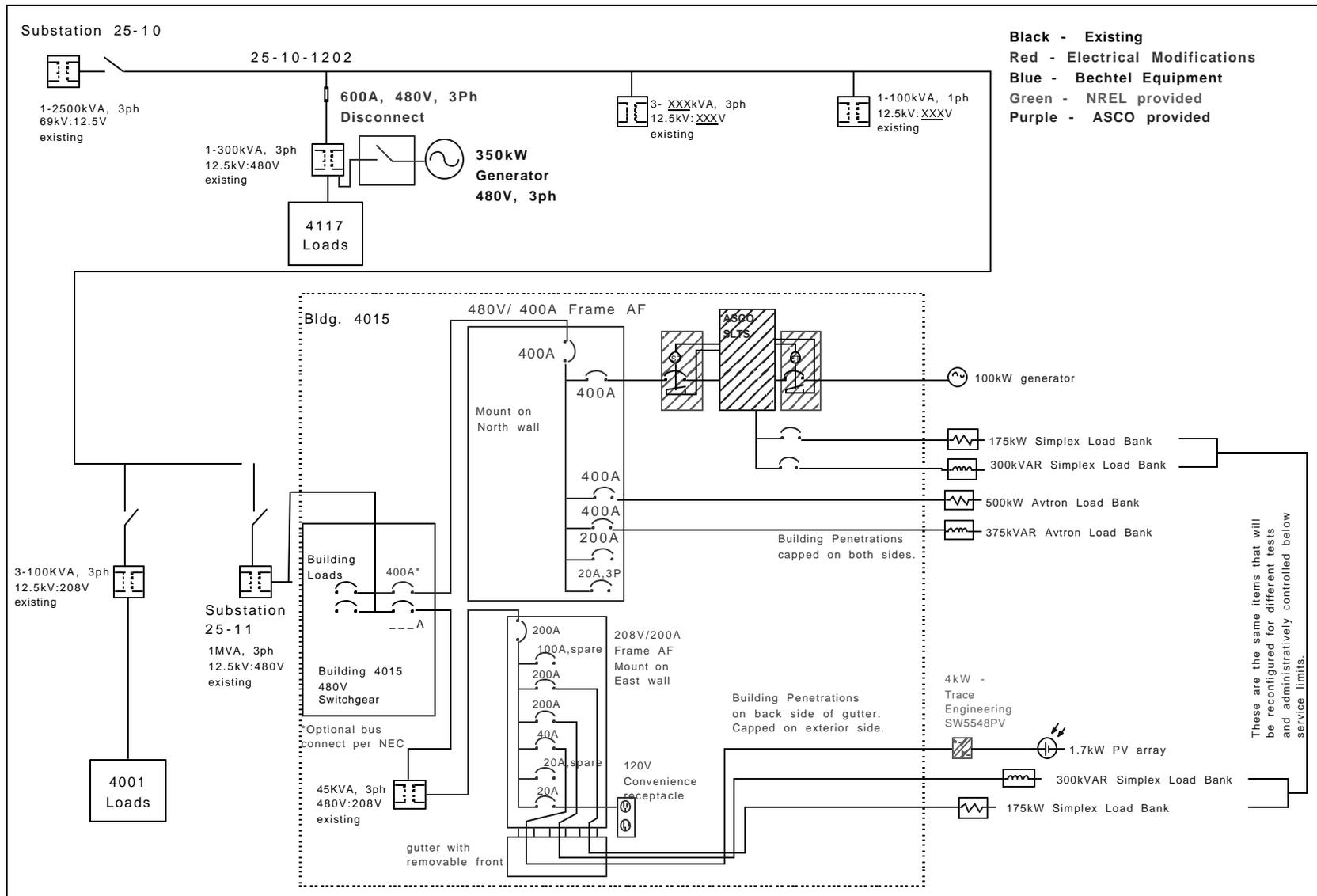


DPP Testing at Nevada Test Site





DPP Testing at Nevada Test Site – Electrical One-Line



Revision History				Drawing Title		Page	Rev.#	Date	Scale	Drawn	 National Renewable Energy Laboratory
No.	Date	Item	Name	Electrical One-Line of Feeder 25-10-1202 with Test Equipment				8.28.01	none	BDK	
01				Drawing No. BDK- NTS-006		File Name: NTS_online_6					