



Distributed Power Test and Demonstration Plan for Nevada Test Site

Subcontract No. 30605 - 05
Presented by Susan Horgan
Distributed Utility Associates

Principal Investigators: Susan Horgan, Bill Erdman, Chuck
Whitaker, Joe Iannucci

NREL Technical Monitor: Ben Kroposki

Presented at U.S. Department of Energy
Distributed Power Program
Annual Review Meeting
January 29-30, 2002
Arlington, VA



Project Description:

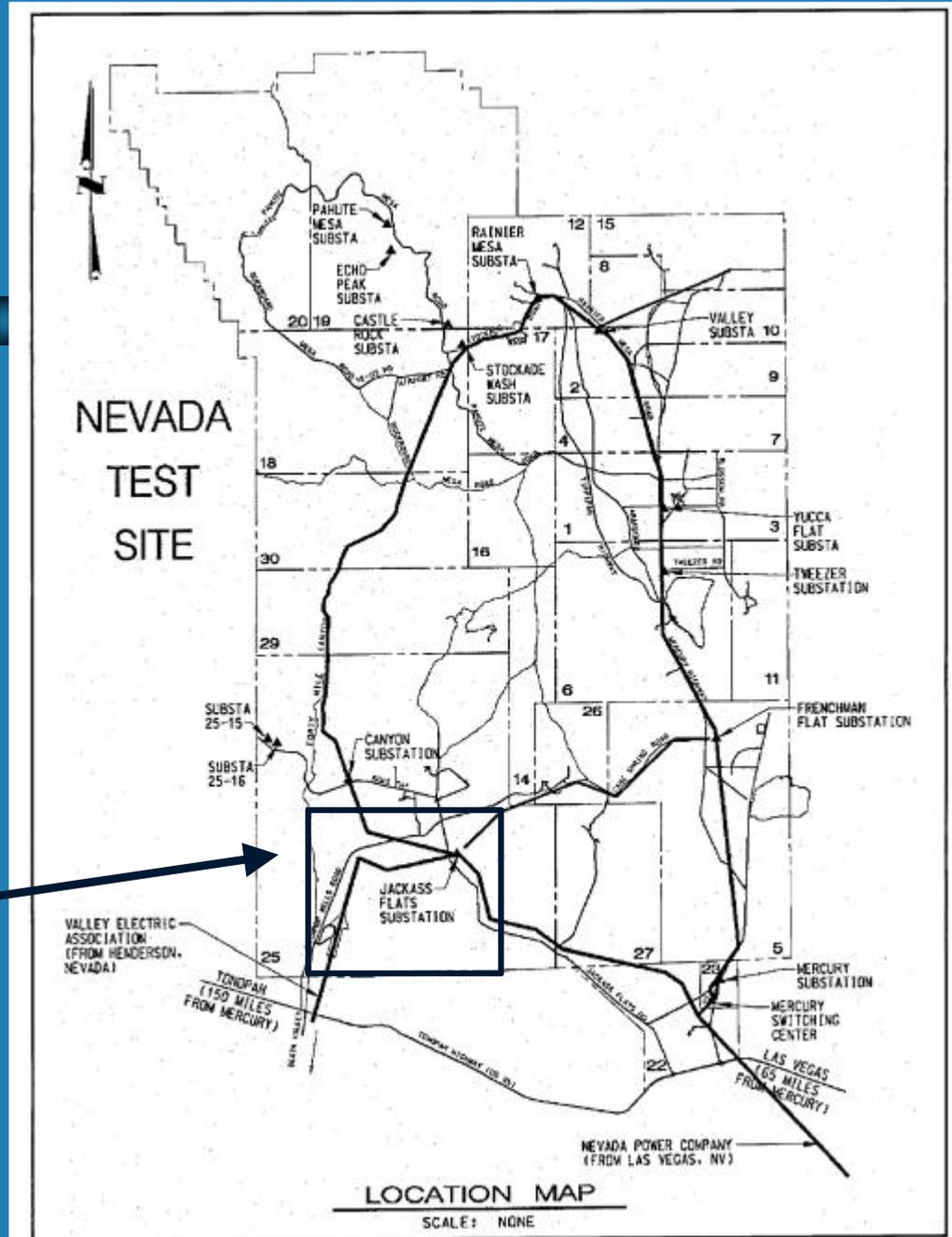
Feasibility study for performing extensive DER electrical system integration testing at NTS

- ✍ Part of DPP field test project at NTS
 - Define role and establish basis for site development
 - Develop and plan specify activities best suited to NTS
 - Identify equipment and upgrades needed to carry out tests
 - Design Mobile Skid for easing DG connections at test site

Nevada Test Site

Distributed Power Test and Demonstration Plan

Area 25



NTS Area 25

- ✍ The site was identified as a potential test facility with existing assets:
 - Unused, minimally restricted 2.5 MVA substation and overhead distribution line
 - Local connected building load
 - Indoor facilities for office, communication and data acquisition
 - Large inventory of miscellaneous DG hardware including Diesel gensets, load banks, distribution level switchgear
- ✍ Test site could be used to support ambitious distribution system testing
- ✍ Potential comprehensive test facility, flexible configuration, distribution voltage and real world feeder test facility

Test Facility - Attributes

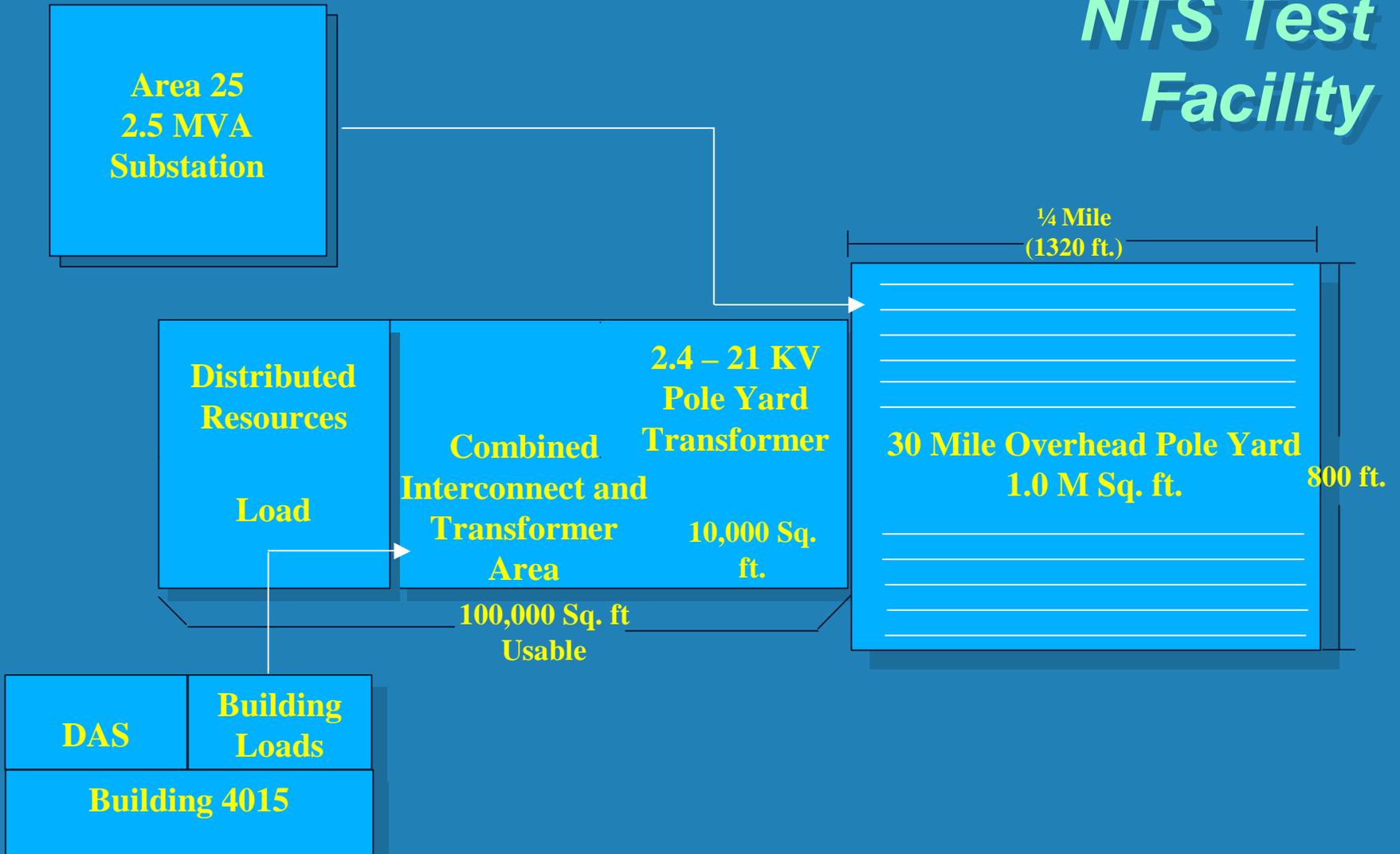
- ✍ Balances need for isolation and controlled testing environment with real distribution configurations
- ✍ Co-location of distributed resources and loads
- ✍ Real world distribution system pole yard with 30 miles of feeder
- ✍ Distribution field can be easily configured:
 - variable length feeder 0-30 miles
 - voltage 2.4 to 21kV
 - variable load and DR placement
 - as a network system
- ✍ Makes use of NTS material and personnel
- ✍ Flexible DAS for monitoring DR and loads

Fundamental Considerations that Drive the Facility Design

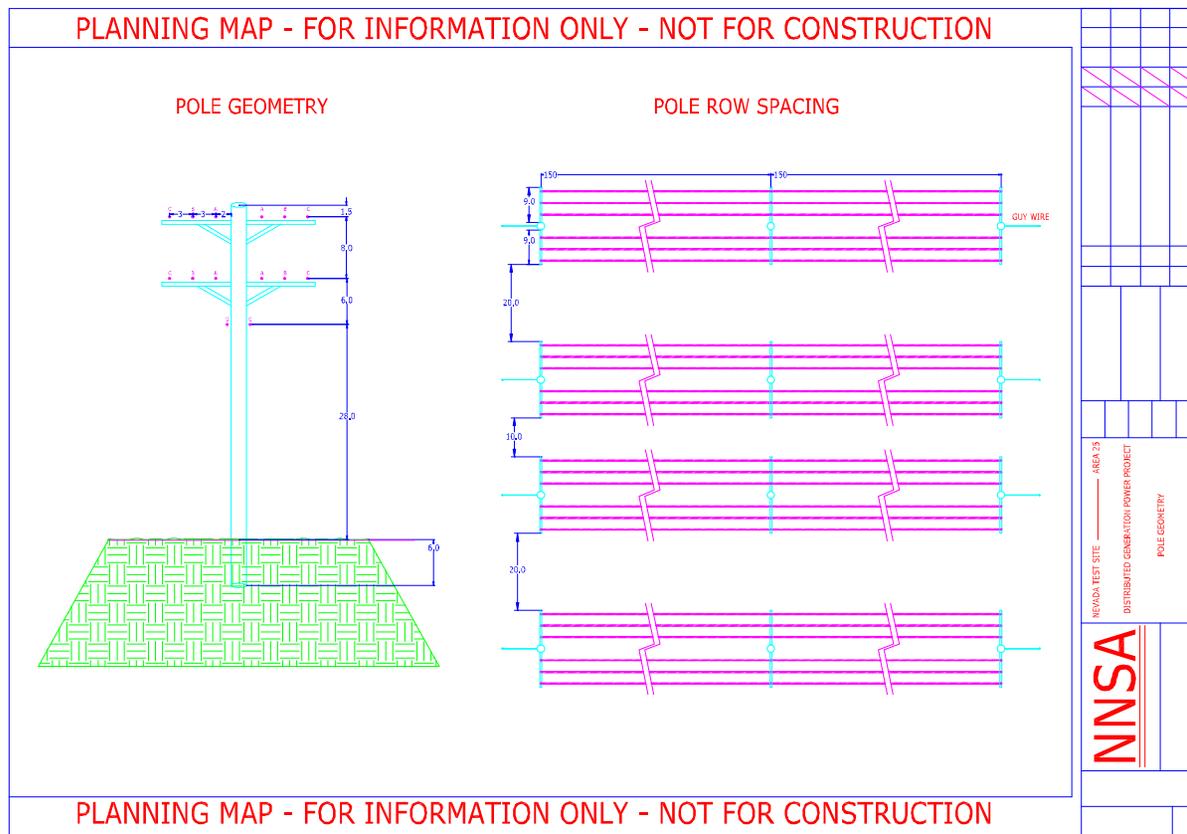
- ✍ Testing at distribution voltages vs. low voltages
Clearly some tests can adequately be performed at low voltage – but some cannot
(How do low voltage results scale or apply to distribution voltages?)
- ✍ Real World (distributed parameter) feeder vs lumped parameter approximation of short, medium, and long feeder
- ✍ Deep penetration of distribution system
- ✍ NTS design provides flexibility and variability

Conclusion: The proposed real world feeder and voltage levels eliminate the nagging questions and add certainty in the test results

Elements of a NTS Test Facility



Overhead Line Pole and Yard Geometries



Interconnect Area

240 Interconnect Points

30-3 Phase Interconnect Nodes, 8 DR/Loads each

Feeder Configurations

1-30 Mile Single

30-1 Mile Parallel

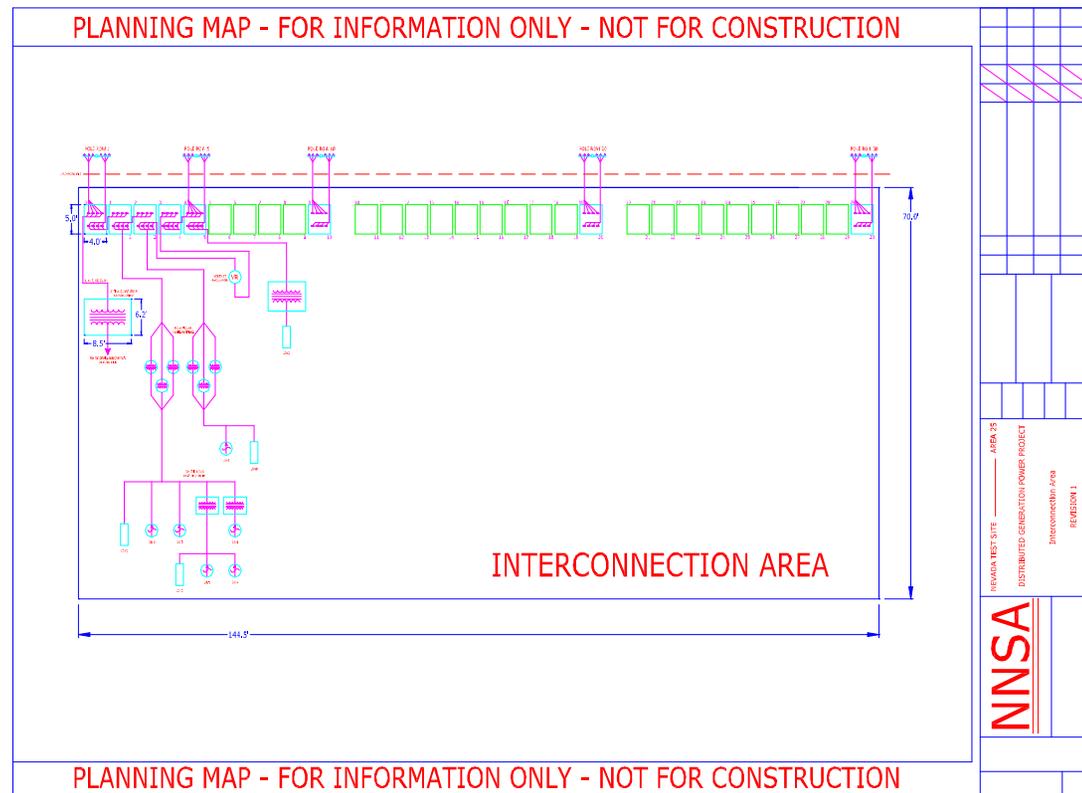
Operating Voltage

2.4 kV to 21kV, 4 wire

Fault Staging locations

150ft or 1 Mile increments

10 MVA – Total Capacity



NTS Bill of Material Summary

Feeder Yard and Interconnect Area

Item	Quantity	Description
1	280	45 ft., class 4 pole
2	1120	9 ft cross/alley arm
3	90 miles	397 MCM AAC conductor
4	15 miles	Ground conductor
5	2592	Post insulator /clamp
6	140	Ground Insulator

Item	Quantity	Description
7	64	Dead end guy wire
8	768	Dead end insulator
9	128	End pole crossarm
10	64	Turnaround crossarm
11	8	NEMA 3R termination
12	2 miles	Underground conductor

NTS Facility Cost Estimates

Completed Cost Estimates for the following:

- ✍ Overhead Pole Yard Materials and Construction – using Standard Utility Pricing based on two California utility data bases.
- ✍ Interconnect Area Materials - Switchgear quotation from 2 Suppliers, surface preparation and underground cable installation excluded.
- ✍ High Speed Data Acquisition System Infrastructure - National Instrument Based System

Design of Mobile Test Skid

- ✍ Develop detailed electrical and mechanical specs for a standard mobile skid including:
 - DG unit
 - Electrical quick-connection apparatus
 - Integrated fuel storage
 - Industry partners to participate in characterization and field testing of DG

Nevada Test Site Summary

- ✍ NTS long-term Test Plan in draft. This work can support DOE DPP testing goals. (1547 and beyond)
- ✍ NTS offers unique opportunity to develop a large-scale distributed power test facility
- ✍ NTS facility could support large number of testing options including functional, long and short term, and even abnormal condition testing.