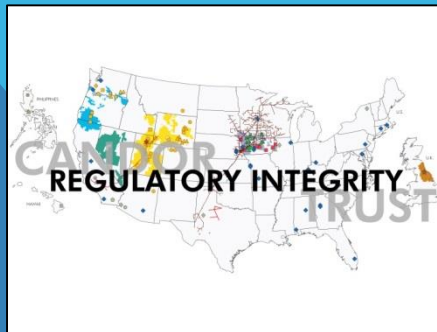




NV Energy Transmission System Planning

New Energy Industry Task Force - By Sachin Verma, PE
JUNE 29, 2016



Topics

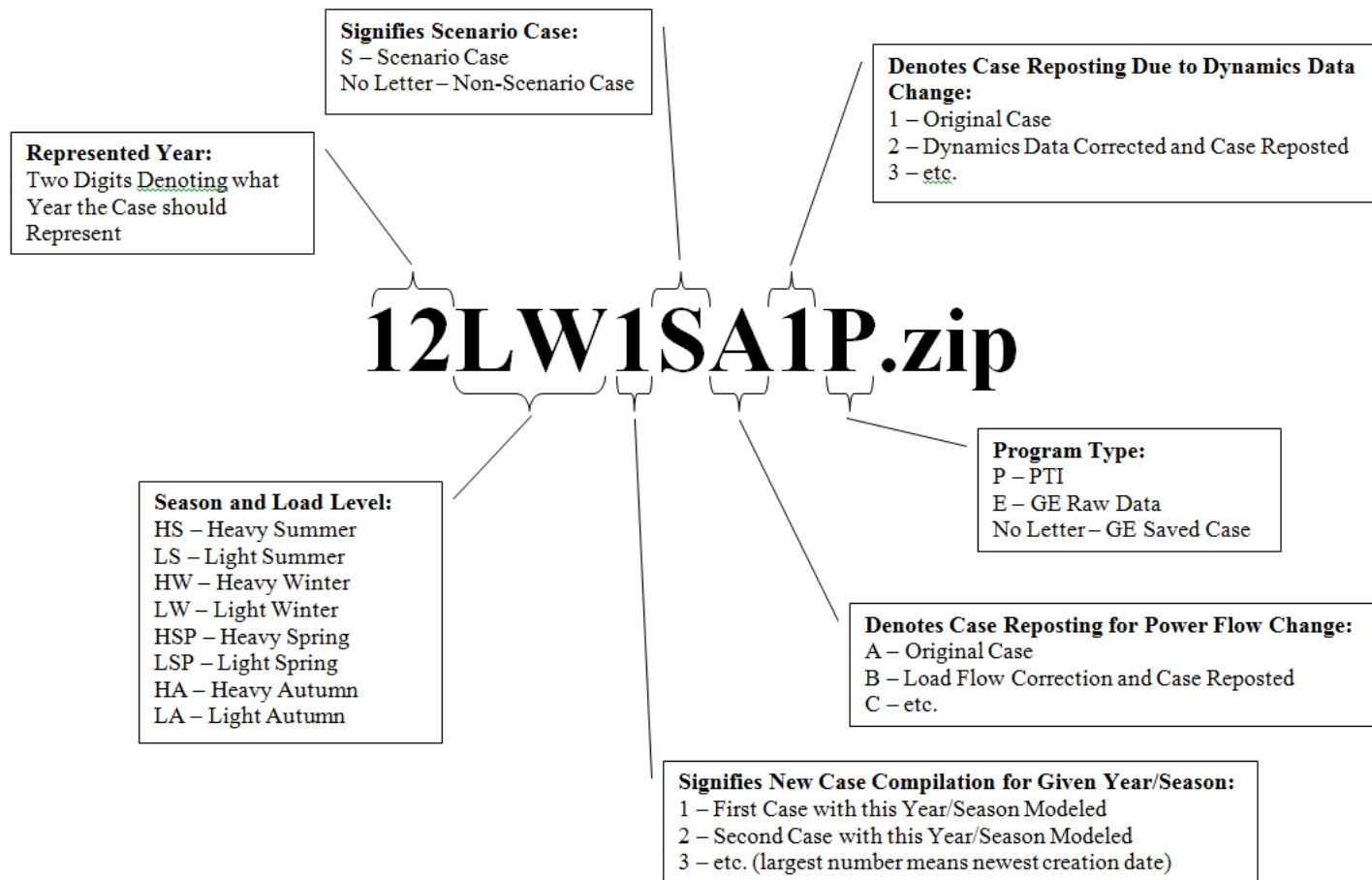
- WECC Base Case Process
- Reliability Analysis
- Load and Generation Analysis
- Regional Planning
- Distributed Generation



WECC Base Case Process

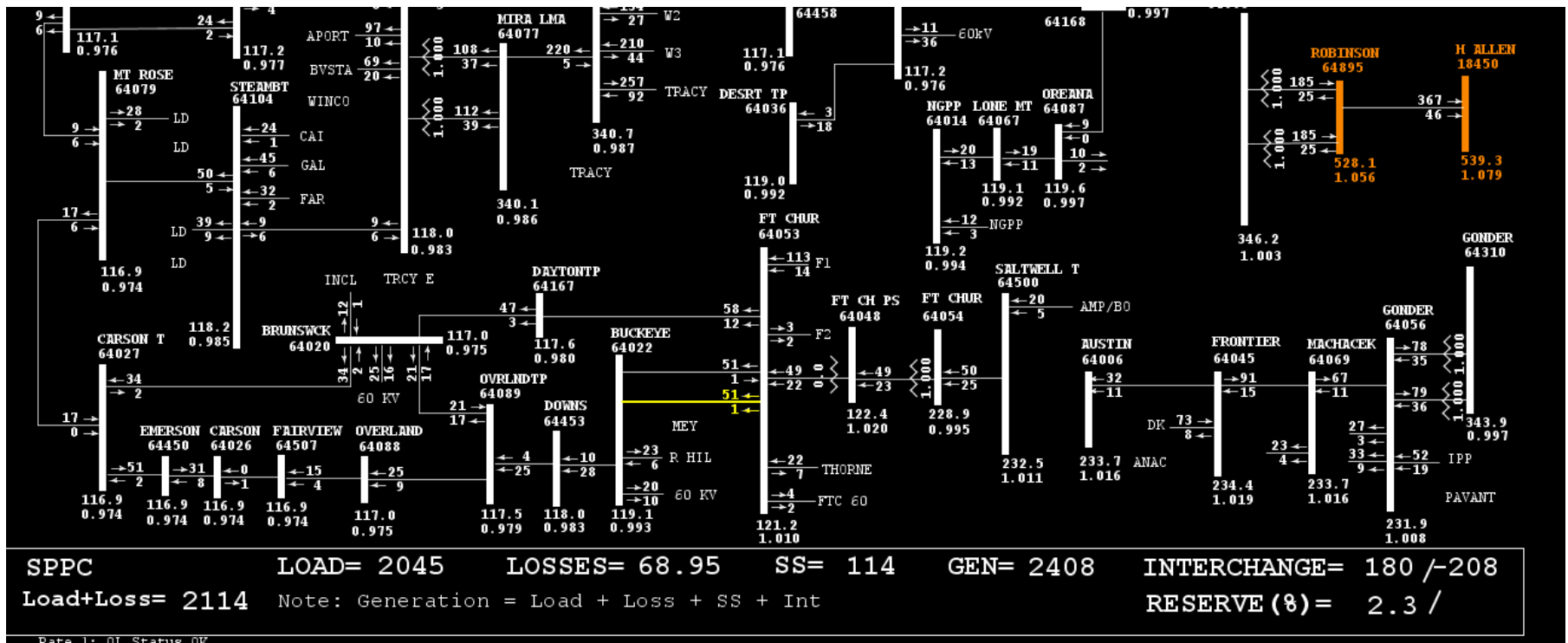
- **Multiple Cases Built Annually**
- **Operation and Scenario Cases**
- **Simulate certain Year, Season and Load**
- **Includes expected in service projects and**

Base Case Example



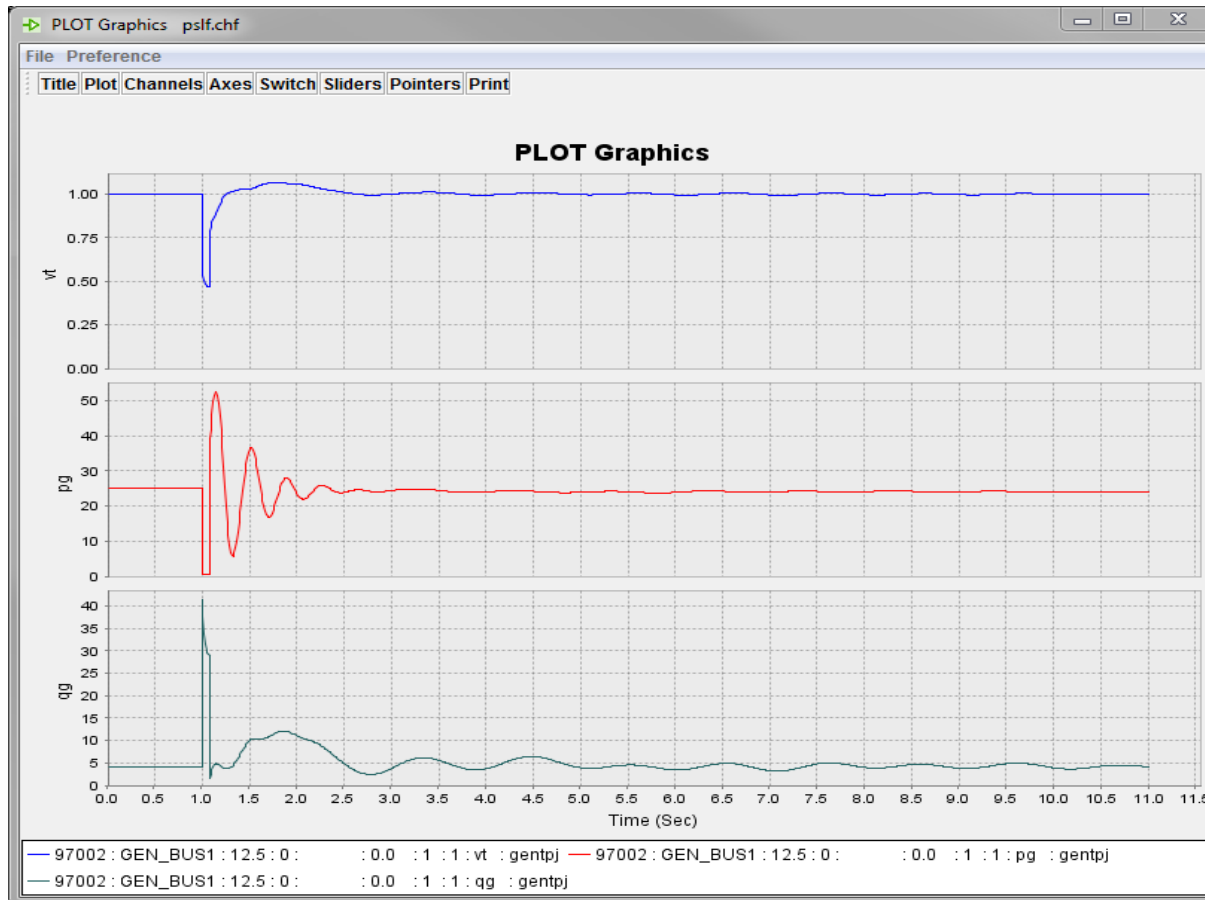
Reliability Analysis

➤ Steady State Contingency Analysis



Reliability Analysis

➤ Transient Contingency Analysis



WECC Criteria

- **N-1 Contingency Criteria**
 - Voltage deviation not to exceed 8%
 - Minimum voltage 90% of nominal
 - No element loaded beyond its rating
 - System must remain stable

- **N-1-1 and N-2 Contingency**
 - System must remain stable
 - No Cascading or Voltage Collapse

Reliability Studies

- **NERC Compliance standard TPL-001-4 was approved on January 1, 2016 and replaced all of the existing NERC Compliance TPL standards**
- **NV Energy conducts an annual assessment of the system reliability pursuant NERC transmission planning, facilities and protection standards.**
- **Studies performed by NV Energy include steady state and transient contingency analysis as well as short circuit analysis.**

2016 NERC Compliance Study Plan

TPL-001-4 requires certain scenarios to be studied along with sensitivity analysis for each.

- **An off peak 1-5 year case is required**
 - A 2017 Light Winter scenario has been chosen and the sensitivity analysis will simulate heavy generation in the NV Energy Balancing area during light load.
- **A peak 1-2 year case is required**
 - A 2018 Heavy Summer scenario has been chosen and the sensitivity analysis will re-evaluate must run generation requirements in Carson City area.
- **A peak 5 year case is required**
 - A 2021 Heavy Summer scenario has been chosen and the sensitivity analysis will evaluate system performance with each WECC path stressed in the incoming and outgoing directions.

Software

- **PSLF – Positive Sequence Load Flow (GE)**
- **PSSE – Power Systems Simulator Engineering (Siemens)**
- **PowerWorld Simulator**
- **TARA – Transmission Adequacy & Reliability Assessment**
- **Aspen – Short Circuit Analysis**

Load Additiona Analysis

- **Analyze the addition of load addition requests and system load growth**
- **Review voltage, equipment loading, stability and frequency**
- **State Jurisdictional process associated with with NV Energy Rule 9 and Integrated Resource Planning**

Generation Addition Analysis

- Analyze the addition of load addition requests and system load growth
- Review voltage, equipment loading, stability and frequency
- FERC Jurisdictional process governed by NVE Open Access Tariff (“OATT”).
- > 20 MW LGIA (Large Generator Interconnection Agreement)
- < 20 MW SGIA Small Generator Interconnection Agreement

Generation Addition Analysis

- **System Impact Study & Facilities Study provide requirements to connect only**
- **Network Upgrades for Transmission Interconnections are securitized by customer and repaid by NVE.**
- **Transmission Service Request (“TSR”) required to move energy to another utility or Designated Network Resource Request (“DNR”) required to serve NV Energy load.**

Regional Planning

- **FERC Order 890 passed in 2007 Requires coordinated, open and transparent regional transmission planning processes to address undue discrimination**
 - SSPG – Sierra Sub-Regional Planning Group (Northern Nevada)
 - SWAT – Southwest Area Transmission – (Southern Nevada)

Regional Planning

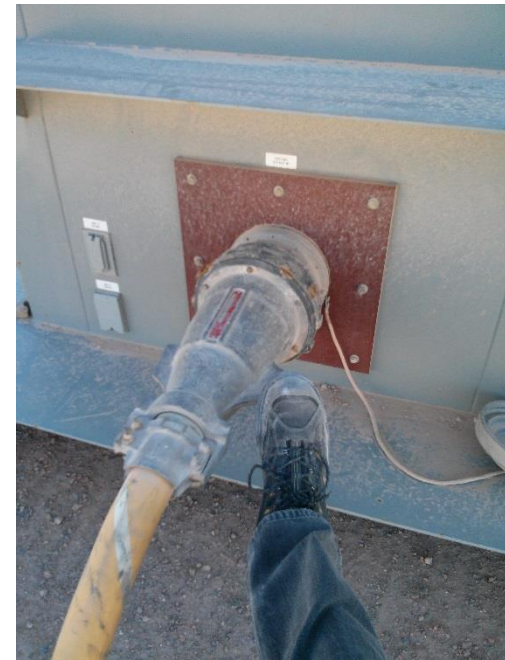
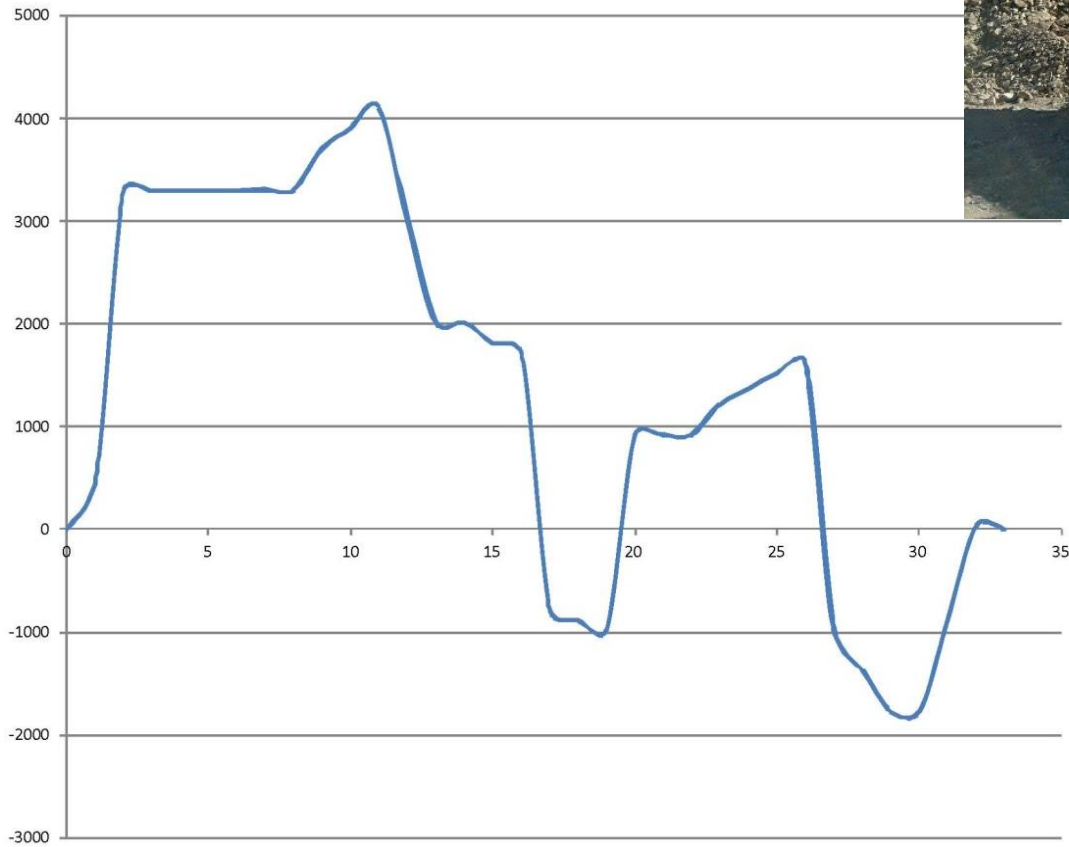
- **FERC Order 1000 passed in 2011**
 - Requires transmission planning at the regional level to consider and evaluate possible transmission alternatives and produce a regional transmission plan.
 - Requires the cost of transmission solutions chosen to meet regional transmission needs to be allocated fairly to beneficiaries.
 - WestConnect Participation

Distributed Generation

- **Met with several Battery Storage manufacturers**
- **Gathered details on capability of products**
 - Reactive Capability & Voltage Control
 - Availability Time and Duration
 - Capacity and expandability

Distributed Generation

- Evaluating Options
- Mining Shovels:



Distributed Generation

- **Local Voltage Support**
- **Peak Load Shaving**
- **Motor Starting**

Alternatives to energy storage and batteries include Static VAR Devices, additional distribution, transmission and transformers.

QUESTIONS?