Assessment of Valley Region – Considering the Availability of the Frontera Facility

ERCOT System Planning and Operations

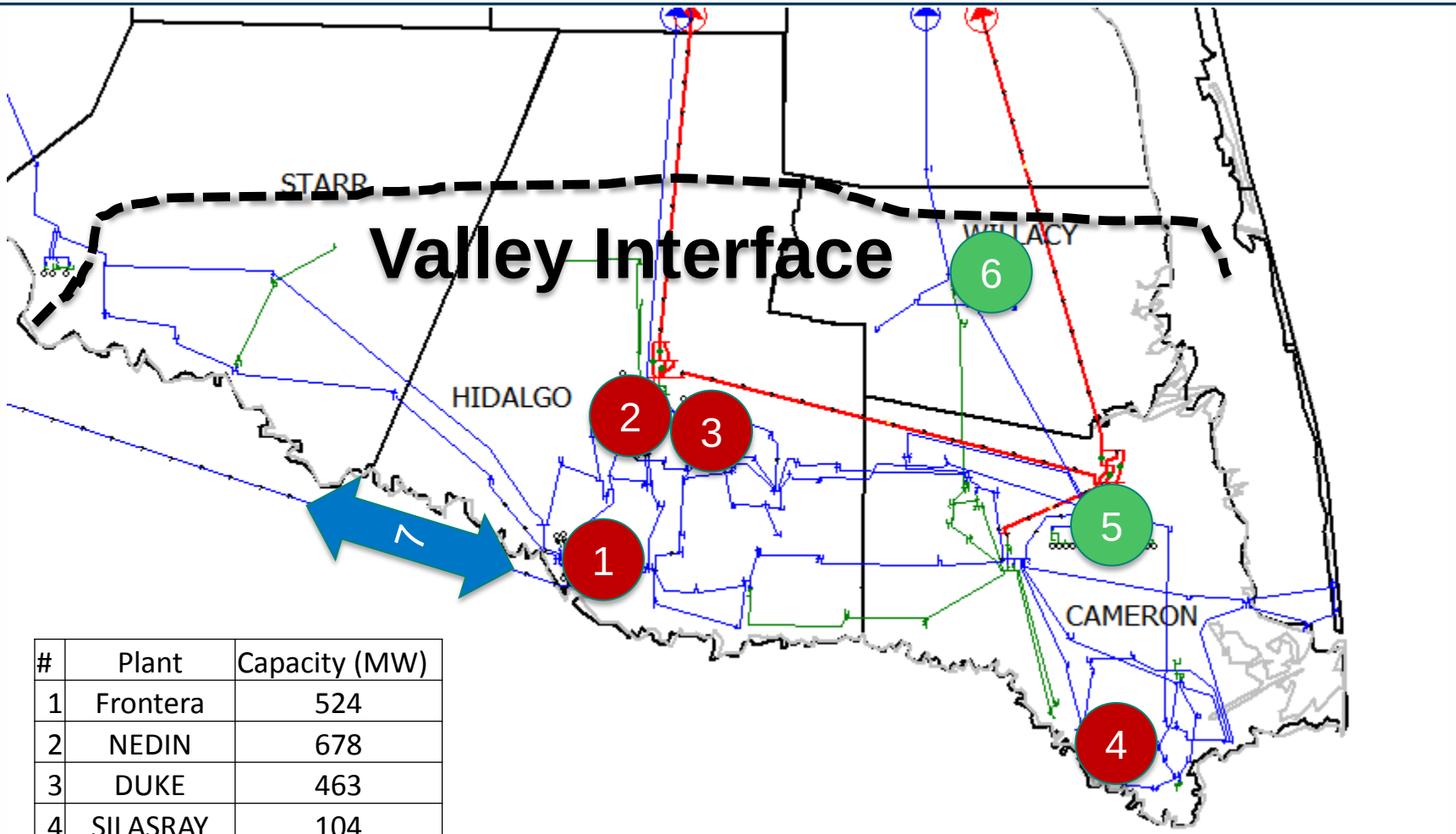
October 21, 2014

ERCOT Regional Planning Group Meeting

Outlines

- Valley Overview: 2014, 2015, and 2016
- Frontera Facility Availability
- This presentation does not include the assessment beyond 2016.

Valley Overview - 2014



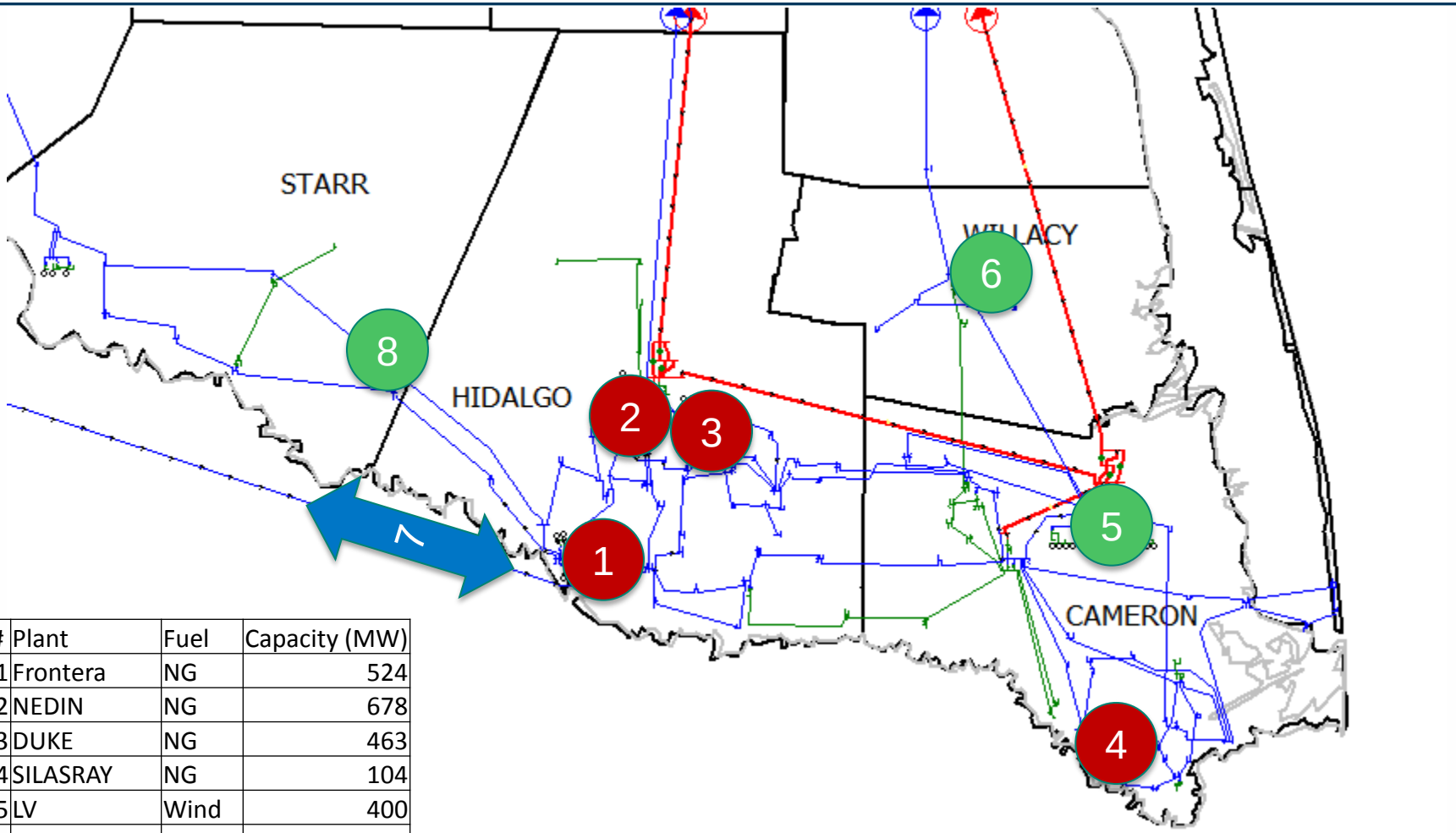
#	Plant	Capacity (MW)
1	Frontera	524
2	NEDIN	678
3	DUKE	463
4	SILASRAY	104
5	LV	400
6	REDFISH	200
7	RD-DC	300

1769 Gas

600 Wind

300 DC-Tie

Valley Overview - 2015



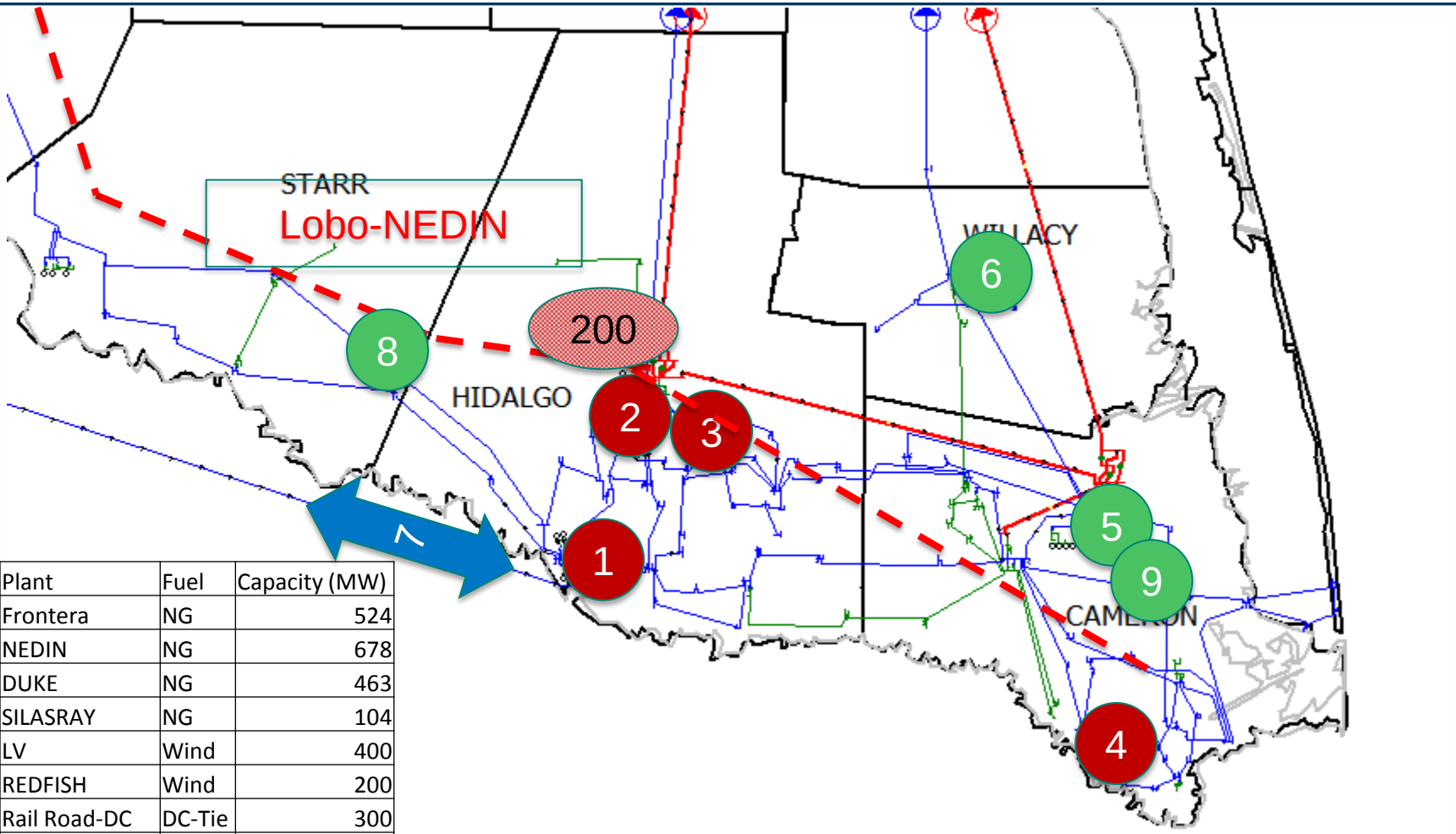
#	Plant	Fuel	Capacity (MW)
1	Frontera	NG	524
2	NEDIN	NG	678
3	DUKE	NG	463
4	SILASRAY	NG	104
5	LV	Wind	400
6	REDFISH	Wind	200
7	Rail Road-DC	DC-Tie	300
8	LV III	Wind	200

1769 Gas

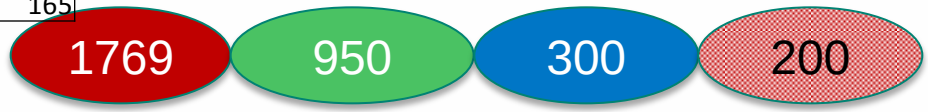
800 Wind

300 DC-Tie

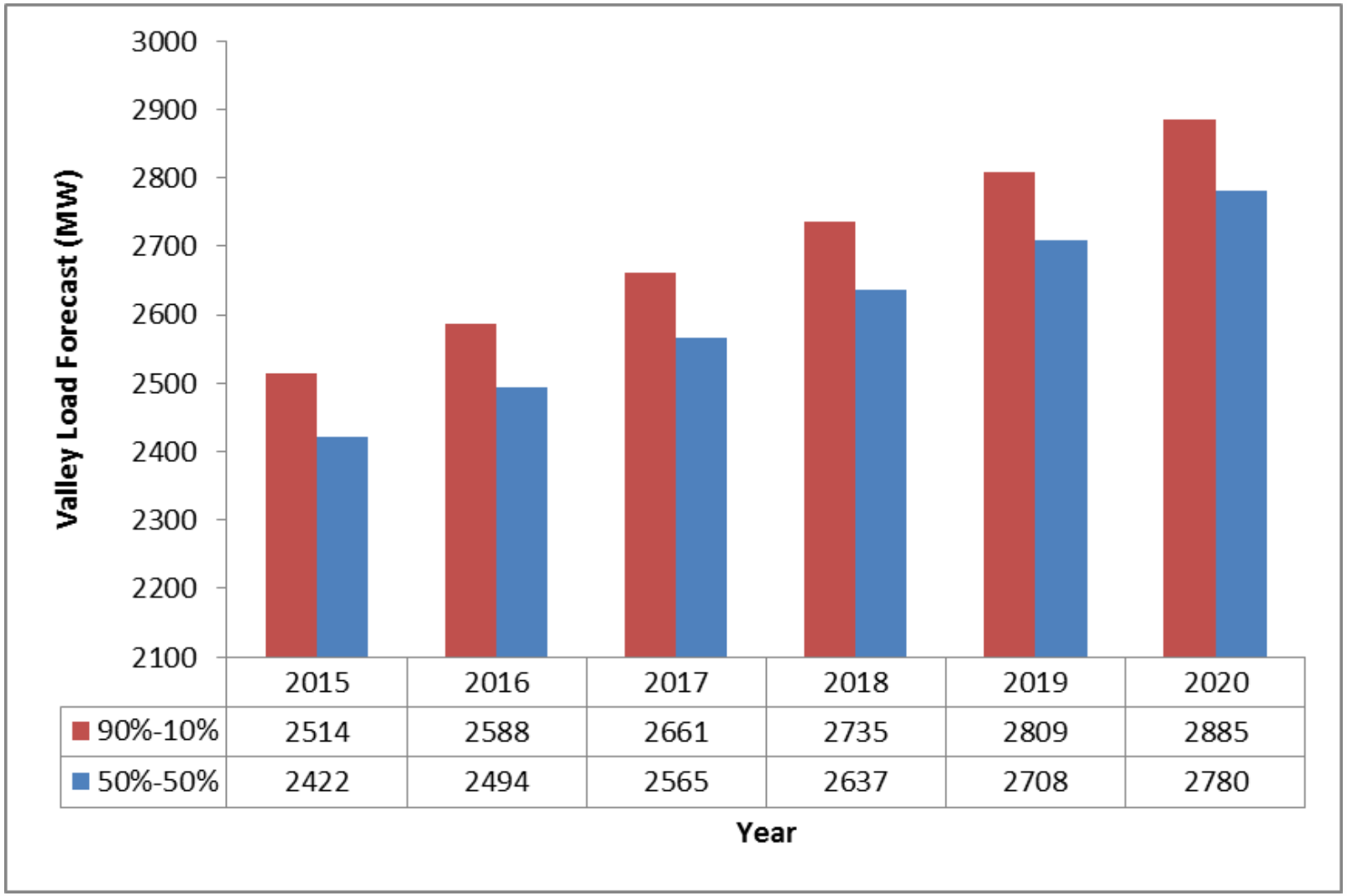
Valley Overview - 2016



#	Plant	Fuel	Capacity (MW)
1	Frontera	NG	524
2	NEDIN	NG	678
3	DUKE	NG	463
4	SILASRAY	NG	104
5	LV	Wind	400
6	REDFISH	Wind	200
7	Rail Road-DC	DC-Tie	300
8	LV III	Wind	200
9	Cameron Wind	Wind	165



Valley Load Forecast



	2015	2016	2017	2018	2019	2020
90%-10%	2514	2588	2661	2735	2809	2885
50%-50%	2422	2494	2565	2637	2708	2780

Frontera Facility Availability

- Frontera Generation Limited Partnership has reported to ERCOT that all or part of the Frontera Facility, will not be available to the ERCOT System beginning January 1, 2015 through December 31, 2023.
  - One CT with 170 MW of the overall capacity at the Frontera Facility will not be available to the ERCOT System beginning January 1, 2015
  - Entire Facility with 524 MW will not be available after the new transmission projects, Lobo--North Edinburg and North Edinburg--Loma Alta 345 kV lines, are energized in 2016.

Study Scope

- To determine whether the absence of the Frontera Facility will cause violations of ERCOT and NERC reliability planning reliability requirements that would not occur if the facility were available.

- To analyze whether all or a portion of the Frontera Facility might be needed until these reliability criteria can be met through
  - the construction of new facilities, or
  - implementation of acceptable Remedial Action Plans (RAPs), or
  - Special Protection Systems (SPSs).

Analysis and Study Cases

Analysis	Base Case	Monitoring
Steady State Contingency Analysis	SSWG 2015 SUM-Peak SSWG 2016 SUM-Peak	Thermal and Voltage Criteria Violations
Voltage Stability	SSWG 2015 SUM-Peak SSWG 2016 SUM-Peak	Voltage Collapse
Dynamic Stability	DWG 2018 Summer Peak Flat Start (Transmission topology is updated for 2015 and 2016 conditions)	Angular and Transient Voltage Instability

- Wind generation in the Valley region was dispatched at 10% output.
- The DC Tie at Railroad was modeled with zero transfer.
- Available reactive devices in the Valley region were adjusted to achieve a high pre-disturbance voltage profile (close to 1.03 p.u. or higher) at most Valley buses.
- Topology updates provided by TSPs for the Valley region were incorporated into the study cases.

Notable Generation and Transmission Projects

- 2015:
  - One new wind generation project (200 MW): Los Vientos III
- 2016:
  - One new wind generation project (165 MW): Cameron County Wind
  - Lobo – North Edinburg 345 kV in service (with series capacitor)
  - North Edinburg – Loma Alta (Cross Valley) 345 kV in service

Study Criteria for the Tested Contingencies

Base Case Outage	Contingency	Thermal	Voltage	No Angular Instability	Load Shed Allowed
N/A	N-1[2]	100% Rate B (Emergency Rating)	0.9~1.05 p.u.	√	No
G-1[3]	N-1	100% Rate B (Emergency Rating)	0.9~1.05 p.u.	√	No
G-1	G-1	100% Rate B (Emergency Rating)	0.9~1.05 p.u.	√	Yes[1]
N-1	N-1	100% Rate B (Emergency Rating)	0.9~1.05 p.u.	√	Yes

(1). Need to develop a system solution with no load shedding after 2020 based on NERC TPL requirement
(2). N-1 outages include the loss of a single transmission element (60 kV and above) in the Valley region.
(3). G-1 outages include the loss of a generation unit or an entire combined-cycle train in the Valley region.

Study Scenarios

Study Case	Valley Load Study Case (MW)	Valley Load 90-10 Load Forecast (MW)	FRONTERA Plant Status	Analysis
2015 Summer Peak	2580	2514	All In	Thermal/Voltage
				Voltage Stability
				Dynamic Stability
2015 Summer Peak	2580	2514	1 CT Out	Thermal/Voltage
				Voltage Stability
				Dynamic Stability
2016 Summer Peak	2650	2587	All In	Thermal/Voltage
				Voltage Stability
				Dynamic Stability
2016 Summer Peak	2650	2587	1 CT Out	Thermal/Voltage
				Voltage Stability
				Dynamic Stability
2016 Summer Peak	2650	2587	All Out	Thermal/Voltage
				Voltage Stability
				Dynamic Stability

Study Results

Case	Valley Load Study Case (MW)	Valley Load 90-10 Forecast (MW)	FRONTERA Plant Status	Analysis	N-1	G-1+N-1	G-1+G-1	N-1+N-1
2015 Summer Peak	2580	2514	All In	Thermal/Voltage	Acceptable	Acceptable	Acceptable	Acceptable
				Voltage Stability	Acceptable	Acceptable	Acceptable	**Instability**
				Dynamic Stability	Acceptable	Acceptable	Acceptable	**Instability**
2015 Summer Peak	2580	2514	1 CT Out	Thermal/Voltage	Acceptable	Acceptable	Acceptable	Acceptable
				Voltage Stability	Acceptable	Acceptable	Acceptable	**Instability**
				Dynamic Stability	Acceptable	Acceptable	**UVLS<200MW**	**Instability**
2016 Summer Peak	2650	2587	All In	Thermal/Voltage	Acceptable	Acceptable	Acceptable	Acceptable
				Voltage Stability	Acceptable	Acceptable	Acceptable	Acceptable
				Dynamic Stability	Acceptable	Acceptable	Acceptable	Acceptable
2016 Summer Peak	2650	2587	1 CT Out	Thermal/Voltage	Acceptable	Acceptable	Acceptable	Acceptable
				Voltage Stability	Acceptable	Acceptable	Acceptable	Acceptable
				Dynamic Stability	Acceptable	Acceptable	Acceptable	Acceptable
2016 Summer Peak	2650	2587	All Out	Thermal/Voltage	Acceptable	Acceptable	Acceptable	Acceptable
				Voltage Stability	Acceptable	Acceptable	Acceptable	Acceptable(1)
				Dynamic Stability	Acceptable	Acceptable	**UVLS<200MW**	**UVLS<200MW**

(1). Acceptable with < 200 MW UVLS, as demonstrated by the dynamic stability analysis

Instability Under N-1+N-1 for 2015

- An identified existing system constraint
  - An Mitigation Plan has been implemented to manage in the System Operations time horizon.
- The absence of the Frontera Facilities does exacerbate the instability problem.
  - Would require a revision to this established operating procedure.
- Based on the study results, the instability challenge under N-1+N-1 is expected to be resolved with the new 345 kV lines expected to be completed in 2016.

Conclusions

- The system maintains acceptable performance under steady state conditions.
  - No thermal or voltage violations for all tested contingencies.
- Transmission Operators will need to maintain a high voltage profile (~1.03 p.u.) in the Valley region during high demand periods.
- If the Frontera Facility is not available, planned outages for major 345 kV lines and generation in the Valley region will be further limited and will require greater coordination by ERCOT.

Conclusions (continue)

- These stability/supply issues could be mitigated if the Frontera Facility were available in ERCOT during high demand periods that coincide with the outage of following elements.
  - either of the 345 kV transmission lines into the Valley (Lon Hill - North Edinburg or Lon Hill - Rio Hondo, including sub-segments of these lines), or
  - with the outage of either of of the combined-cycle trains in the Valley (DUKE, NEDIN).

- Additional system upgrades (transmission and/or generation) will likely be required to reliably serve Valley load after 2016 if the Frontera Facility is not available after 2016 summer.