

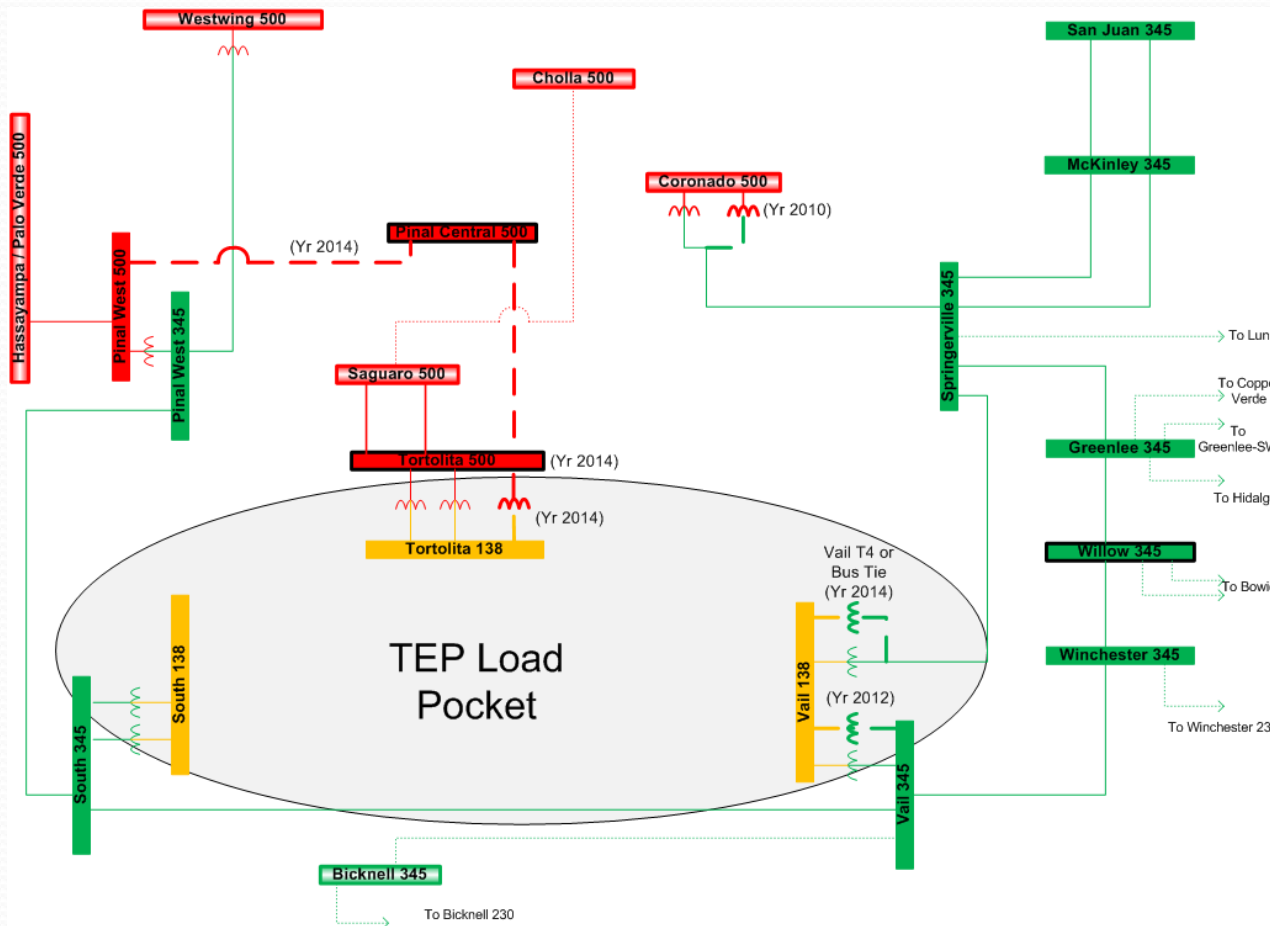
# Reliability Must Run Study Results

Presented to the  
**SWAT Oversight Committee**

Tucson Area  
Mohave County Area  
Santa Cruz County Area

Gary Trent  
Tucson Electric Power  
February 16, 2010  
Las Vegas, NV

# Tucson Area



# Tucson Area Generation

- Sundt – 424 MW capacity
  - 4 Steam Units – 375 MW capacity
  - 2 Combustion Turbines – 44 MW capacity
- DeMoss Petrie
  - 1 Combustion Turbine – 73 MW capacity
  - Limit output to 44 MW to account for local spinning reserves
- North Loop
  - 4 Combustion Turbines – 83 MW capacity
- TEP Total Local Generation – 575 MW capacity
  - Maximum dispatch – 546 MW

# Tucson Area RMR Results

Year	TEP Forecasted Load (MW)	Study System Load (MW)	Metric	Metric Value (MW)	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch (MW)
2010	2384	2175	SIL	2239	Kartchner 115 kV Voltage deviation	Winchester – Vail 345 kV line	None	
		2575	MLSC	2575	DMP – Santa Cruz 138 kV line overload	Saguaro – Tortlita 500 kV lines #1 and #2	All	546
2013	2527	1900	SIL	1948	Kartchner 115 kV Voltage deviation	Winchester – Vail 345 kV line	None	0
		2575	MLSC	2575	Kartchner 115 kV Voltage deviation	Winchester – Vail 345 kV line	All	546
		2527	RMR	430	Kartchner 115 kV Voltage deviation	Winchester – Vail 345 kV line	Sundt ST #1 – #4 DMP CT Sundt CT #1	430

# Tucson Area RMR Results

Year	TEP Forecasted Load (MW)	Study System Load (MW)	Metric	Metric Value (MW)	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch (MW)
2019	2792	2375	SIL	2442	Greaterville and Rosemont 138 kV Voltage deviation	Pinal West – South / South – Vail 345 kV lines	None	0
		3025	MLSC	3025	Irvington – Drexel 138 kV line	Pinal West – South / South – Vail 345 kV lines	All	546
		2792	RMR	30	None	All units at minimum output	Sundt #1 Sundt #4	10 20

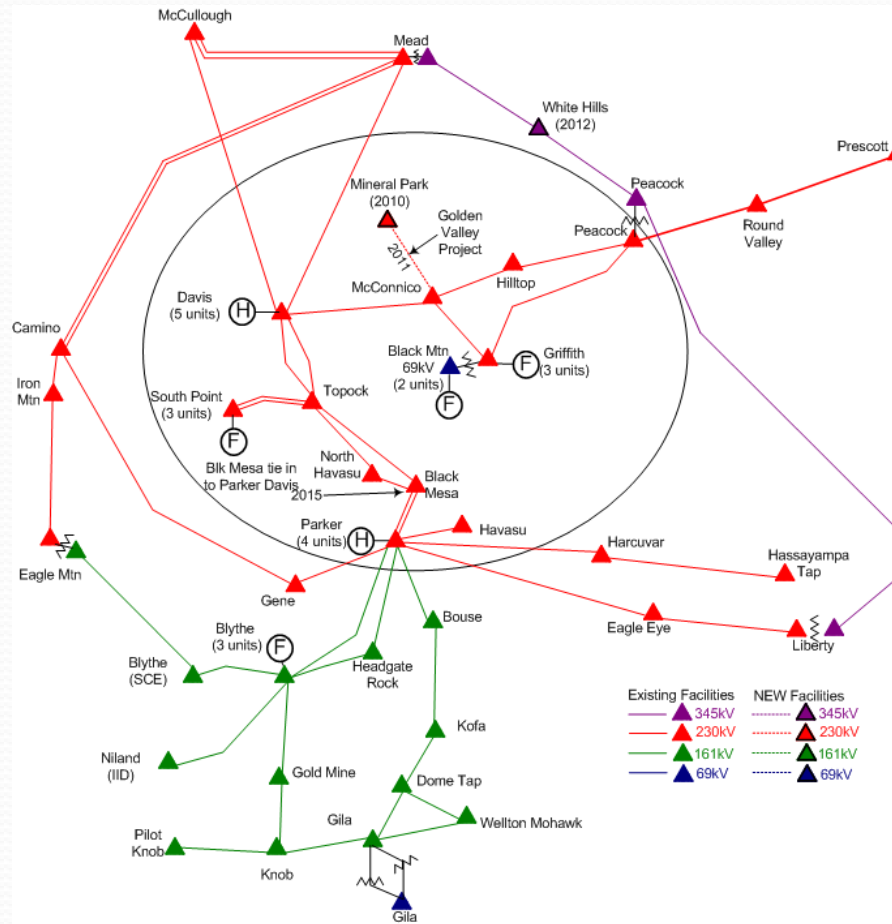
# Tucson Area RMR Mitigation

- Accelerate the Pinal Central – Tortolita and Pinal West – Pinal Central lines from 2014 to 2013
- Add 4<sup>th</sup> 345/138 kV transformer at Vail
- Add SVC at Valencia 138 kV bus
- Add SVC at Kartchner 115 kV bus
- New 230 kV line parallel to Apache – Butterfield
- Increase line ratings for the following TEP 138 kV lines
  - Northeast – Rillito
  - DMP – North Loop
  - Vail – Irvington
  - Irvington – RB Wilmot
  - Vail – RB Wilmot

# RMR Costs vs. RMR Mitigation Costs

- 2013 RMR Cost
  - \$624k
- 2013 RMR Mitigation Cost
  - \$156M - \$198M
- 2019 RMR Cost
  - \$261k
- 2019 RMR Mitigation Cost
  - \$1.4M – \$3.4M

# Mohave County Area



# Mohave County Area Generation

- Griffith
  - 2X1 Combined Cycle – 602 MW Capacity
- South Point
  - 2X1 Combined Cycle – 520 MW Capacity
- Black Mountain
  - 2 Combustion Turbines – 94 MW Capacity
- Davis
  - 5 Hydro Units – 255 MW Capacity
- Parker
  - 4 Hydro Units – 120 MW Capacity
- Mohave County Total – 1591 MW

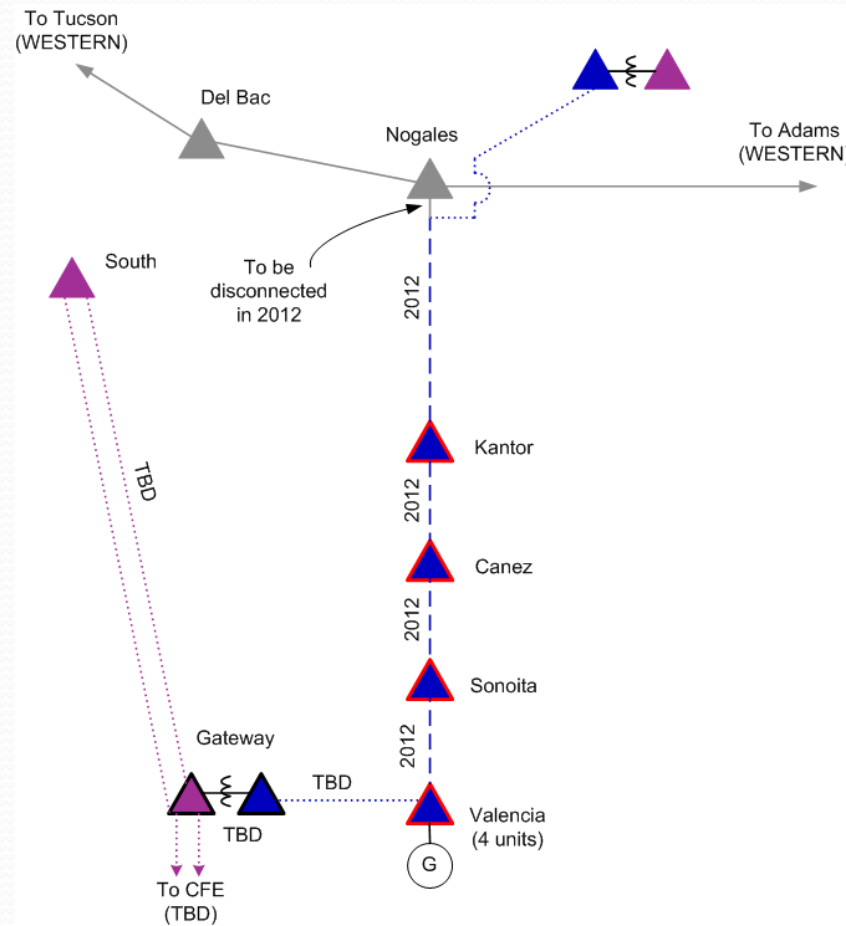
# Mohave County Area RMR Results

Year	Mohave Forecasted Load (MW)	Study System Load (MW)	Metric	Metric Value (MW)	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch (MW)
2010	826	800	SIL	816	Black Mesa 230 kV Voltage deviation	Parker – Black Mesa 230 kV line	None	0
		1050	MLSC	1050	Black Mesa 230 kV Voltage deviation	Parker – Black Mesa 230 kV line	All	1591
		826	RMR	10	Black Mesa 230 kV Voltage deviation	Parker – Black Mesa 230 kV line	Davis #1	10
2018	935	875	SIL	889	Peacock 230 kV Voltage deviation	Peacock 345/230 kV transformer	None	0
		1200	MLSC	1200	Mercator 230 kV Voltage deviation	Griffith – McConnico 230 kV line	All	1591
		935	RMR	40	Peacock 230 kV Voltage deviation	Peacock 345/230 kV transformer	Davis #1-4	40

# Mohave County RMR Mitigation

- 2013: Construction of the certificated North Havasu – Griffith 230 kV line
- 2013: Loop-in of the Parker – North Havasu 230 kV line to Black Mesa
- 2018: Addition of the White Hills 345/230 kV Substation on the Peacock – Mead 345 kV line with a 230 kV line to Mercator
- No economic benefits result from the above additions due to Bureau of Reclamation water release requirements at Parker and Davis resulting in power output exceeding the RMR requirements

# Santa Cruz County Area



# Santa Cruz County Area Generation

- Valencia
  - 4 Combustion Turbines – 62 MW Capacity
    - 3 – 14 MW units
    - 1 – 20 MW unit

# Santa Cruz County Area RMR Results

Year	Santa Cruz Forecasted Load (MW)	Study System Load (MW)	Metric	Metric Value (MW)	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch (MW)
2010	85	49	SIL	51	Valencia 115 kV Voltage deviation	Del Bac – Nogales 115 kV line	None	0
		130	MLSC	130	Nogales 115 kV Voltage deviation	Del Bac – Nogales 115 kV line	All	62
2013 / 2019	95 / 112	120	SIL	127	Nogales – Kantor 138 kV line overload	N-0	None	0
		190	MLSC	190	Nogales – Kantor 138 kV line overload	N-0	All	62
		100 / 117	RMR	0	N/A	None	None	0

# Santa Cruz County Area RMR Mitigation

- None
- Planned conversion from 115 kV to 138 kV in 2012 eliminates RMR generation until 2020 or later based on current forecasts



# Questions