West Texas Sensitivity (WTS) Study – Preliminary Results

RPG
June 25, 2013
West Texas Sensitivity Study

- ERCOT is conducting a study to analyze the system needs in west Texas due to the oil and gas load growth

- Reliability Analysis/ Assumptions:
  - 2015 and 2017 steady-state reliability and economic analysis
    - final summer peak cases from the 2012 5YTP with an updated load forecast from the TDSPs
    - Cases include all recently approved RPG projects in the area

<table>
<thead>
<tr>
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<th>2017 Summer Peak (2012 5YTP case) MW</th>
<th>2017 Summer Peak (WTS Normal) MW</th>
<th>2017 Summer Peak (WTS High) MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>2362</td>
<td>2585</td>
<td>2696</td>
</tr>
<tr>
<td>Far West</td>
<td>2192</td>
<td>3569</td>
<td>3944</td>
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- Reliability analysis assumes zero MW wind output for West zone and 10% output for the Coastal zone
2017 WTS loads compared to 2012 5YTP - 2017 case
2017 West Texas Normal Load Case Study

• Purpose of study:
  – To identify system problem
  – To find potential solutions to meet the system need

• The results are preliminary, pending TSP comments and the results of ongoing reliability analysis
2017 WTS Overloads (Northwest of WT)

Midland East-Windwood 138 kV,
Westover-Amoco South 138 kV,
Foster-Odessa North 138 kV,
Moss Switch-Ector Hillmont 138 kV,
Texas Junction Tap-Odessa Texas Instruments 138 kV,
Midland Airport-CRMWD 8 Tap-Glenhaven 138 kV

Permian Basin-Wink 138 kV,
Wink SS-Wink TNP 69 kV,
Wink-AA Pipeline TNP-Lonestar Tap TNP 69 kV

IH20-Barilla Draw Tap 69 kV
IH20-Pecos 69 kV
Pecos-Barstow Tap TNP 69 kV

Fullerton-Exxon Fullerton 69 kV

Midland 345/138 kV XMF

Moss 345/138 kV XMF

Crane 138/69 kV XMF
Crane 69 kV bus tie
2017 WTS Potential Options (Northwest of WT)

WT-NL-1-A: Amoco Tap-Moss Tap-Gardendale 345 kV (36 miles), Two new 345/138 kV transformers, New Gardendale-Midessa 138 kV (7 miles)

WT-NL-1-B: Existing 138 kV line upgrades (6 lines, 22 miles), Existing 69 kV line upgrade (1 line, less than 1 mile), Install capacitor banks at Mocking Bird and N. Andrew

WT-NL-5: Upgrade Wink-TNP Wink 69 kV

WT-NL-3: Upgrade Crane 138/69 XMF and bus tie

WT-NL-4: Loop in the existing Musquiz-Country Rd 101 138 kV line into FlatTop, Upgrade existing 69 kV lines (3 lines, 19.6 miles)
2017 WTS Overloads (South of WT)

- San Angelo North 138/69 kV XMF
- San Angelo Concho-Mathis Field 69 kV,
- San Angelo Red Creek-Coke Street-
  Highland Street 138 kV

- Segment of Big Lake-
  Twin Buttes 138 kV

- Big Lake 138/69 kV XMFs,
  Big Lake-Humble Tap 69 kV,
  Shell Powell Tap-Powell Field-Midway Ln 69 kV,
  Midway Ln-Ozona-Friend Ranch 69 kV,
  Big Lake-Phillips Tap-Strauss Rea 69 kV.

- San Angelo Red Creek 345/138 kV XMF

- Segment of N McCamey-Big Lake 138 kV

- Yellow Jacket-Eden 69 kV
WT-NL-2-A and 2-B:
Loop Big Lake-N McCamey 138 kV into Powell Field Tap and install a new 138/69 kV XMF,
Upgrade the existing Big Lake 138/69 kV XMFs and 11 miles of existing 69 kV lines in the area
Install capacitor banks at Big Lake and Ring Tail

WT-NL-6-A and 6-B:
New 345/138 kV XMF at Twin Butte,
New 138 kV line from Twin Butte to San Angelo College Hill (7 miles),
Upgrade existing 138/69 kV transformer at San Angelo N.,
Install Capacitor banks at Barnhart and Yucca
New 138 kV line from Yucca to Barnhart (3 miles)

WT-NL-7:
Upgrade Yellow Jacket-Eden 69 kV
2017 WTS Overloads (Northeast of WT)

- Morgan Creek-China Grove 138 kV
- Morgan Creek 138/69 kV XMF
- Morgan Creek-Cosden 138 kV

- Abilene NW-Ely Rea Tap 69 kV
- Abilene South-TEX Gulf Tap 69 kV
- Cedar Hill 138/69 kV XMF
2017 WTS Potential Options (Northeast of WT)

WT-NL-8:
Upgrade Morgan Creek 138/69 kV XMF,
Upgrade Morgan Creek-Barber Lake 138 kV lines

WT-NL-12:
Upgrade Cedar Hill 138/69 kV XMF,
Install capacitor banks at Spade Ranch Tap,
Sterling City and Cedar Hill

WT-NL-13:
Upgrade Abilene South-Abilene West Texas Gulf 69 kV line

WT-NL-14:
345 kV line from Longdraw to Vealmoor,
A new 345/138 kV transformer at Vealmoor,
Sharyland Northern Loop 138 kV lines (Stanton to Vealmoor)
Purpose of Studying 2017 High Load Case

- Check strength of the 2017 projects found in normal load case
- Identify potential additional projects to meet system need under high load condition
- Not intend to propose projects based on the issues identified in high load case
2017 WTS Overloads in High Load Case (NW of WT)

- Wink-Vest-Midway 69 kV
- Sandridge-Odessa Basin 69 kV
- Permian-Wink 138 kV
- Permian-Ward Gulf Tap 138 kV
- Odessa 345/138 kV XMF
- Odessa-Odessa Liquid air 138 kV
- Garden City-Tex Harvey 69 kV
- Spraberry-Pecktap-Targa 69 kV
- Glasscock-Reagan Shell-Midkiff Switch 69 kV
- Skywest-Driver-Midkiff 138 kV
- Pembrook-Stiles-St Lawren 138 kV
- St Lawren-Einstein Tap 138 kV
2017 WTS Overloads in High Load Case (South of WT)

Segment of Big Lake-Twin Buttes 138 kV

McCamey North-TempPrank 138 kV

San Angelo Concho-Mathis Field 69 kV
2017 WTS Overloads in High Load Case (NE of WT)
Next Step and Other Potential Issue

- **Next Step**
  - Explore feasibility of solutions with TSPs
  - Solicit project alternatives
  - Complete 2015 and 2017 reliability analysis
  - Perform reliability sensitivity analysis
    - **A-1, N-1 criterion**
  - Perform congestion (economic) analysis
  - Draft report of West Texas Sensitivity Study

- **Other Potential Issue**
  - Timing of projects
  - Tradeoffs between new line construction and rebuild/reconductor
    - Operational flexibility
    - Outage time/availability
    - Regulatory filings
    - Constructability (energized reconductor, temporary configuration, etc)
Questions?
## 2017 WTS Potential Options (Northwest of WT)

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<th>Project Index</th>
<th>Project Description</th>
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| **WT-NL-1-A** (Midland-Ector-Andrew County Reliability Project) | 1. Construct a new 345 kV substation ("New-MossTap") adjacent to the existing Moss-Midland 345 kV line.  
2. Loop the existing Moss-Midland 345 kV line into the new New-MossTap 345 kV substation.  
3. Expand the Gardendale 138 kV substation to accommodate 345/138 kV facilities.  
4. Connect a 345 kV line from the new 345 kV substation to Gardendale.  
5. Install a new 345/138 kV transformer at Gardendale.  
6. Construct a new 138 kV line from Gardendale to Midessa.  
7. Construct a new 345/138 kV substation ("New-AmocoTap") adjacent to the existing Amoco-Arena 138 kV line and install a new 345/138 kV transformer at New-AmocoTap.  
8. Connect a 345 kV line from the new New-MossTap 345 kV substation to the AmocoTap  
9. Loop the existing Amoco-Arena 138 kV line into the new New-AmocoTap 345/138 kV substation. |
| **WT-NL-1-B** (Midland-Ector-Andrew County Reliability Project) | 1. Upgrade Midland East-Windwood 138 kV line  
2. Upgrade Westover-Amoco South Foster 138 kV line  
3. Upgrade Odessa North-Amoco South Foster 138 kV line  
4. Upgrade Fullerton-Exxon Fullerton 69 kV line  
5. Upgrade CRMWD 8 Tap-Glenhaven 138 kV line  
6. Upgrade CRMWD 8 Tap-Midland Airport 138 kV line  
7. Upgrade Odessa EHV Switch-Odessa 138 kV line  
8. Upgrade Texaco Tap-Gardendale 138 kV line  
9. Install 36.8 Mvar capacitor bank at North Andrew 138 kV substation  
10. Install 36.8 Mvar capacitor bank at Mocking Bird |
| **WT-NL-3** (Crane County) | 1. Upgrade the existing 138/69 kV transformer at Crane  
2. Upgrade the existing 69 kV bus tie at Crane |
| **WT-NL-4** (Reeves County) | 1. Upgrade the existing IH 20 Switching Station-Barilla Draw Field Tap 69 kV line (terminal equipment)  
2. Expand the existing Flattop 69 kV substation to accommodate new 138/69 kV facilities  
3. Loop the existing Country Rd 101 SW-Musquiz 138 kV line into the expanded Flattop substation and install a new 138/69 kV transformer at Flattop  
4. Upgrade the existing IH 20 Switching Station-Pecos 69 kV line (terminal equipment)  
5. Upgrade the Barilla Draw Field Tap-Flattop 69 kV line |
| **WT-NL-5** (Winkler County) | 1. Upgrade the Wink SS-Wink 69 kV line (terminal equipment) |
# 2017 WTS Potential Options (South of WT)

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| **WT-NL-2-A** (Reagan-Crockett County Reliability Project) | 1. Close normally-open Powell Field-Powell Field Junction 69 kV line  
2. Close normally-open Illinois #4-Pandale 69 kV line  
3. Expand the existing Powell Field Tap 69 kV substation to accommodate 138/69 kV facilities and install new 138/69 kV transformer.  
4. Loop the existing Big Lake-61008(TEMPRANK4A)-North McCamey 138 kV line into the expanded Powell Field Tap substation  
5. Open the existing phase shifter at Big Lake and close normally-open the 138 kV bus tie at Big Lake |
| **WT-NL-2-B** (Reagan-Crockett County Reliability Project) | 1. Upgrade the two existing 138/69 kV transformers at Big Lake  
2. Upgrade the existing Big Lake-Kemper Exxon Tap 69 kV line  
3. Upgrade the existing Kemper Exxon Tap-Powell Field 69 kV line  
4. Upgrade the existing Shell Powell Tap-Powell Field 69 kV line  
5. Install 40 Mvar capacitor bank at Big Lake 138 kV bus  
6. Install 20 Mvar capacitor bank at Ringtail 138 kV bus |
| **WT-NL-6-A** (Tom Green -Irion County) | 1. Expand the existing Barnhart Phillips Tap 69 kV substation to accommodate new 138/69 kV facilities  
2. Construct a new 138 kV line from Barnhart Phillips Tap to Yucca 138 kV substation  
3. Install a new 138/69 kV transformer at Barnhart Phillips Tap  
4. Install a new second 345/138 kV transformer at Twin Buttes  
5. Construct a new 138 kV line from the Twin Buttes (new transformer) to San Angelo College Hill  
6. Upgrade the existing 138/69 kV transformer at San Angelo North |
| **WT-NL-6-B** (Tom Green -Irion County) | 1. Install 10 Mvar capacitor bank at Barnhart Phillips Tap 69 kV bus  
2. Install 10 Mvar capacitor bank at Yucca0A 69 kV bus |
| **WT-NL-7** (Menard-Concho County) | 1. Upgrade the existing Yellow Jacket-Eden 69 kV line |
## 2017 WTS Potential Options (Northeast of WT)

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| **WT-NL-8**  
(Mitchell County) | 1. Upgrade the existing Morgan Creek-Barber Lake 138 kV lines  
2. Upgrade the existing Morgan Creek 138/69 kV transformer |
| **WT-NL-12**  
(Coke County) | 1. Upgrade Cedar Hill 138/69 kV transformer  
2. Install 12 Mvar capacitor bank at Spade Ranch Tap 69 kV bus  
3. Install 12 Mvar capacitor bank at Sterling City 69 kV bus  
4. Add 12 Mvar capacitor bank to the existing capacitor bank at Cedar Hill 69 kV substation |
| **WT-NL-13**  
(Taylor County) | 1. Upgrade the existing Abilene South-Abilene West Texas Gulf 69 kV line |
| **WT-NL-14**  
(Due to G-1+N-1) | 1. Expand the existing Vealmoor 138 kV substation to accommodate 345/138 kV facilities  
2. Install a new 345/138 kV transformer at Vealmoor  
3. Construct a new 345 kV line from Vealmoor to Longdraw  
4. Connect SU-W Stanton to SU-Vealmoor (Sharyland Northern Loop Project) |