Transmission Coordination and Planning Committee
2015 Q4 Stakeholder Meeting

December 9, 2015
Agenda

• Introductions
• TCPC Policies
• CLF&P Planning Department Update
• 2015 LTP Study Scope
• Study Results
• Stakeholder Input and Questions
TCPC Meeting Policies

FERC Standards of Conduct

The FERC Standards of Conduct state that Transmission Function Employees are prohibited from disclosing non-public Transmission Information unless they disclose it on the OASIS. Also, Transmission Function Employees and Shared Employees are expressly prohibited from disclosing non-public information to Energy or Marketing Affiliates.

Anti-Trust Policy

It is the committee’s policy to comply with all state and federal anti-trust laws. One objective of the TCPC is to promote or enhance competition. Careful attention should be paid to any discussions regarding you or your competitor’s prices, allocation of markets, customers, or products, limiting production, and excluding dealings with other companies.

Confidentiality

Certain information may be protected as confidential due to Standards of Conduct concerns or because it is classified as Critical Energy Infrastructure Information. Otherwise, it should be on the OASIS. Committee members agree not to share committee activities with the media and not to discuss ideas or concerns other than a member’s own in a public forum.
Transmission Planning Groups

Transmission Coordination & Planning Committee (local)
    - Select “Transmission Planning” folder

Colorado Coordinated Planning Group (sub-regional)

WestConnect (regional)
CLF&P Resource Update

• Active Large Generator Interconnection Request
  o CLPT-G5 40 MW CT at Cheyenne Prairie Generation Station substation
    • In-Service-Date June 2017
    • Facilities Study Report completed July 26, 2015
    • Request withdrawn September 29, 2015
  o CLPT-G6 125 MW CCT at Cheyenne Prairie Generation Station substation
    • In-Service-Date January 2023
    • Scoping Meeting (TBD)
  o CLPT-G7 102 MW Wind approximately 7 miles west of North Range substation
    • In-Service-Date December 2017
    • Point of Interconnection TBD
## Multi-Year Transmission Plan

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>ESTIMATED ISD</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Center #1 115 kV Substation &amp; Transmission</td>
<td>2015</td>
<td>In-Service</td>
</tr>
<tr>
<td>South Cheyenne 230/115 kV T2 Transformer</td>
<td>2015</td>
<td>In-Service</td>
</tr>
<tr>
<td>North Range-Swan Ranch Tap-South Cheyenne 115 kV Circuit</td>
<td>2015</td>
<td>In-Service</td>
</tr>
<tr>
<td>Corlett-North Range 115 kV Circuit</td>
<td>2015</td>
<td>In-Service</td>
</tr>
<tr>
<td>Cheyenne Prairie – Archer 115 kV Line</td>
<td>2017</td>
<td>Planned</td>
</tr>
<tr>
<td>Cheyenne Prairie-E. Business Park 115 kV Circuit</td>
<td>2017</td>
<td>Planned</td>
</tr>
<tr>
<td>King Ranch 115 kV Substation &amp; Transmission</td>
<td>2017</td>
<td>Planned</td>
</tr>
<tr>
<td>North Range-King Ranch-Swan Ranch Tap 115 kV Circuit</td>
<td>2017</td>
<td>Planned</td>
</tr>
<tr>
<td>Swan Ranch 115 kV Substation</td>
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<td>Cheyenne Prairie - South Cheyenne 115 kV Double-Circuit Line</td>
<td>TBD</td>
<td>Proposed</td>
</tr>
<tr>
<td>Happy Jack – North Range 115 kV Line Rebuild</td>
<td>TBD</td>
<td>Proposed</td>
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</table>
CLFP Transmission Plan

[Diagram showing various nodes and connections including:
- TO SNOWY RANGE
- TO GEM CITY
- HAPPY JACK
- NORTH RANGE
- CORLETT
- SWAN RANCH
- SOUTH CHEYENNE
- TERRY RANCH
- TO AULT
- TO PONNEQUINN
- WARREN AFB
- SKYLINE
- EAST BUSINESS PARK
- TO MYERS TAP
- TO STEGALL
- TO PINE BLUFFS

Ownership Legend:
- CLF&P 115 kV
- WAPA 230 kV
- WAPA 115 kV
- PLANNED PROJECTS
- PROPOSED PROJECTS]
2015 Study Scope: 2, 5 and 10-Year Scenarios

• 2017 Heavy Summer Load
  o Power flow and short-circuit analysis
  o Starting Case: ccpg_2017hs_r7.sav
  o CLF&P System Demand = 252 MW Total
  o Data Center Load = 57 MW (included)
  o Warren AFB Demand = 12.3 MW

• 2017 Light Spring Load
  o High Renewable Generation Output
  o Power flow and transient stability
  o Starting Case: ccpg_2017lsp_r5.sav
  o CLF&P System Demand = 136 MW Total
  o Data Center Load = 51 MW (included)
  o Warren AFB Demand = 5 MW
2015 Study Scope: 2, 5 and 10-Year Scenarios

• **2020 Heavy Summer Load**
  o Power flow, transient stability and short-circuit analysis
  o Short-circuit analysis
  o Starting Case: ccpg_2020hs_r7.sav
  o CLF&P System Demand = 282 MW Total
  o Data Center Load = 82 MW (included)
  o Warren AFB Demand = 13.3 MW

• **2024 Heavy Summer Load**
  o Power flow only
  o Starting Case: ccpg_2024hs_r4.sav
  o CLF&P System Demand = 385 MW
  o Data Center Load = 180 MW (included)
  o Warren AFB Demand = 14.4 MW
2015 Study Criteria

• 2015 Local Transmission Planning Studies
  o New NERC TPL-001-4 Transmission System Planning Performance Requirements Standard replaces the old TPL-001-0.1 thru TPL-004-0 System Performance Standard
  o Category (P0 – P7) events evaluation replaces Category (A – C)
    o P0 = No Contingency (N-0)
    o P1 = Single Contingency (N-1)
    o P2 = Single Contingency (N-1 or N-2)
    o P3 – P7 = Multiple Contingency (N-2 or N-1-1)
  o Extreme Events evaluation replaces Category D
  o A replacement for TPL-001-WECC-CRT-2.1 Regional System Performance Criteria is currently going through the drafting/approval process.
### 2015 LTP Study Sensitivity Scenarios (Steady-state)

#### 2017 Heavy Summer Case Sensitivities
- Benchmark Case includes all planned projects in service and forecast loads.
  - Sensitivity 1 – Impact of Cheyenne Prairie Generation at output of 265 MW and off-line.
  - Sensitivity 2 – Impact of planned transmission upgrades delayed.
  - Sensitivity 3 – Impact of Data Center load of 225 MW.
  - Sensitivity 4 – Impact of New Load (15 MW @ Crow Creek 115)

#### 2017 Light Spring Case Sensitivities
- Benchmark Case includes all planned projects in service and scaled forecast loads with high renewable generation.
  - Sensitivity 1 – Impact 102 MW New Generation
  - Sensitivity 2 – Impact if planned transmission upgrades delayed.
  - Sensitivity 3 – Impact of Data Center load of 162 MW.
2015 LTP Study Sensitivity Scenarios (Steady-state)

• 2020 Heavy Summer Case Sensitivities
  o Benchmark Case includes all planned projects in service and forecast loads.
  o Sensitivity 1 – Impact of Cheyenne Prairie Generation at output of 265 MW and off-line.
  o Sensitivity 2 – Impact of planned transmission upgrades delayed.
  o Sensitivity 3 – Impact of Data Center load of 225 MW.
  o Sensitivity 4 – Impact of New Load (18 MW @ Crow Creek 115)

• 2024 Heavy Summer Case Sensitivities
  o Benchmark Case includes all planned projects in service and scaled forecast loads with high renewable generation.
  o Sensitivity 1 – Impact of Cheyenne Prairie Generation off-line.
  o Sensitivity 2 – Impact of Data Center load of 225 MW.
  o Sensitivity 3 – Impact of New Load (22 MW @ Crow Creek 115)
  o Sensitivity 4 – Impact of New Generation at TSGT Wayne Child 230
2015 LTP Study Sensitivity Scenarios (Dynamic)

• **2017 Light Spring Case Sensitivities**
  o Benchmark Case includes all planned projects in service and scaled forecast loads with high renewable generation.
  o Sensitivity – Impact of 102 MW New Generation at Happy Jack 115

• **2020 Heavy Summer Case Sensitivities**
  o Benchmark Case includes all planned projects in service and forecast loads.
  o Sensitivity – Impact of 125 MW New Generation at Cheyenne Prairie Generation
2015 LTP Study Results (2017 Heavy Summer)

• **2017 Heavy Summer Case (CPGSTN @ 265 MW)**
  o Facility Rating Limits Exceeded (post-contingency):
  o CPGSTN – Archer 115 kV and CPGSTN – EB Park 115 kV line conductor. New CPGSTN – Cheyenne South 115 kV circuit identified in previous LGIR studies.

• **2017 Heavy Summer Case (Data Center @ 225 MW)**
  o Facility Rating Limits Exceeded (post-contingency):
  o Corlett 115 kV substation line jumpers
  o North Range – Happy Jack 115 kV line jumpers at Happy Jack 115 kV substation and line conductor
  o Cheyenne – Happy Jack 115 kV line & breaker jumpers at Happy Jack 115 kV substation
2015 LTP Study Results (2017 Heavy Summer)

Contingency
- Happy Jack – North Range 115 kV
- South Cheyenne – Swan Ranch 115 kV

Overload(s)
- South Cheyenne – Corlett 115 kV
- Corlett – North Range 115 kV
2015 LTP Study Results (2017 Heavy Summer)

Contingency
South Cheyenne – Corlett 115 kV
South Cheyenne – Swan Ranch 115 kV

Overload(s)
Cheyenne – Happy Jack 115 kV
Happy Jack – North Range 115 kV

OWNERSHIP LEGEND
- CLF&P 115 kV
- WAPA 230 kV
- WAPA 115 kV
- CONTINGENCY
- PROPOSED PROJECTS
2015 LTP Study Results (2017 Light Spring)

• 2017 Light Spring Case (102 MW @ Happy Jack 115)
  o Facility Rating Limits Exceeded (post-contingency):
  o North Range – Happy Jack 115 kV line jumpers at Happy Jack 115 kV substation and line conductor
  o Cheyenne – Happy Jack 115 kV line & breaker jumpers at Happy Jack 115 kV substation
  o Gem City Tap – Happy Jack (WAPA) 115 kV at 165 MVA (124%) and Gem City Tap – Snowy Range (WAPA) 115 kV at 145 MVA (109%) line conductor rating
2015 LTP Study Results (2017 Light Spring)

Contingency
Cheyenne – Happy Jack 115 kV
Happy Jack – North Range 115 kV

Overload(s)
Happy Jack – Gem City Tap 115 kV
Gem City Tap – Snowy Range 115 kV

Ownership Legend
- CL&P 115 kV
- WAPA 230 kV
- WAPA 115 kV
- Contingency
- Proposed Projects

Diagram showing electrical connections and locations such as Warren AFB, Skyline, East Business Park, East Taps, etc.
2015 LTP Study Results (2020 Heavy Summer)

• 2020 Heavy Summer Case (without planned upgrades)
  o Facility Rating Limits Exceeded (post-contingency):
    o Corlett 115 kV substation line jumpers
    o North Range – Happy Jack 115 kV line jumpers at Happy Jack 115 kV substation and line conductor
    o Cheyenne – Happy Jack 115 kV line & breaker jumpers at Happy Jack 115 kV substation

• 2020 Heavy Summer Case (Crow Creek load addition)
  o Facility Rating Limits Exceeded (post-contingency):
    o Archer – Crow Creek 115 kV line (WAPA Rating)
    o Archer - Cheyenne S 115 kV line (WAPA Rating)
    o Studies indicate this is a through flow issue rather than a load service issue. Opening both 115 kV circuits between Archer – Cheyenne post-contingency eliminates the overloads. Alternative solution would be a new CPGSTN – Crow Creek 115 kV circuit.
2015 LTP Study Results (2020 Heavy Summer)

Contingency
CFCSTN – East Business Park 115 kV
Archer – Terry Ranch Rd (WAPA) 115 kV

Overload(s)
Archer – Crow Creek (WAPA) 115 kV

[Diagram of power grid with labels and connections, including major nodes such as Cheyenne, Ault, and Terry Ranch.]
2015 LTP Study Results (2020 Heavy Summer)

Contingency
Archer – Crow Creek (WAPA) 115 kV
Archer – Terry Ranch Rd (WAPA) 115 kV

Overload(s)
Archer – Cheyenne S (WAPA) 115 kV
2015 LTP Study Results (2024 Heavy Summer)

• 2024 Heavy Summer Case (Data Center @ 225 MW)
  - Facility Rating Limits Exceeded (post-contingency):
    - Corlett – North Range 115 kV at 208 MVA (98%) line rating
    - Swan Ranch – S Cheyenne 115 kV at 213 MVA (100%) line rating
    - Cheyenne – Happy Jack (WAPA) 115 kV at 216 MVA (96%) line rating
    - Happy Jack – North Range 115 kV at 240 MVA (113%) line rating
    - Archer – Crow Creek (WAPA) 115 kV at 152 MVA (103%) line rating
    - Archer – Terry Ranch (WAPA) 230 kV at 352 MVA (110%) line rating
  
  - Above based upon N-1-1 contingencies with CPGSTN off-line as worst case. All are reduced (<100%) with CPGSTN at full output (265 MW).
  
  - The 2024HS Case includes 200 MW Generation at Wayne Child (TSG&T) 230 kV which further increases the flows around the Cheyenne system.
2015 LTP Study Results (2024 Heavy Summer)

Contingency

Archer 115 kV bus
[Data Center Load @ 225 MW and CPGSTN @ 0 MW]

Overload(s)

Archer – Terry Ranch (WAPA) 230 kV
2015 LTP Study Preliminary Results (Dynamics)

• **2017 Light Spring Case Sensitivities**
  - Benchmark Case includes all planned projects in service and scaled forecast loads with high renewable generation.
  - Sensitivity – Impact of 102 MW New Generation at Happy Jack 115
  - Dynamic simulations currently in progress. No issues anticipated.

• **2020 Heavy Summer Case Sensitivities**
  - Benchmark Case includes all planned projects in service and forecast loads.
  - Sensitivity – Impact of 125 MW New Generation at Cheyenne Prairie Generation
  - Dynamic simulations showed acceptable performance for all P0-P7 and Extreme Events studied.
2015 LTP Study Results Summary

• 2017HS studies indicate no problems with forecast loads and resources.
• 2017LSP studies indicate a large generation injection at Happy Jack 115 kV substation is limited by the capacity of the WAPA Happy Jack – Gem City Tap – Snowy Range 115 kV transmission line.
• 2020HS studies indicate that terminal upgrades at the Happy Jack 115 kV substation are required to meet the Data Center load growth.
• 2020HS studies also indicate a through flow issue with Wayne Child 345-230 kV interconnection until completion of the CPGSTN – South Cheyenne 115 kV circuit(s)
2015 LTP Study Results Summary……continued

• 2024HS studies indicate full output of CPGSTN (265 MW) including CLPT-G6 can be integrated onto the system as studied. Based upon completion of the CPGSTN-Cheyenne South 115 kV project.

• 2024HS studies also indicate that the addition of Generation Resources at Wayne Child (TSG&T) 230 kV increases the post-contingency flows on the Archer – Terry Ranch (WAPA) 230 kV and the 115 kV (WAPA) circuits between Archer & Cheyenne. Further studies with WAPA planned for 2016.

• 2024HS studies also indicate that CPGSTN generation is required when the Cheyenne Area load exceeds 385 MW.
Next Steps

• 2015 LTP Study
  o Complete transient stability analysis for 2017 Light Spring scenarios
  o Complete draft 2015 LTP report and distribute for stakeholder review and approval
  o Publish approved final 2015 LTP report

• 2016 LTP Study
  o Q1 Meeting (preliminary March 2016)
    • Stakeholder requests for specific scenarios or considerations should be submitted at this time to:
      • www.westconnect.com/filestorage/ccpg_request_form.xls
Questions?

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