October 4, 2011

Black Hills Colorado Transmission Q2-Q3 TCPC / SB-100 Stakeholder Meeting

Improving life with energy

Black Hills Energy

Meeting Overview

- Welcome and Introductions
- 2011 TCPC / SB-100 Study Scope
- Preliminary Study Results
- Stakeholder Input & Questions

Black Hills Corporation
one vision
one community
one company

TCPC Meeting Policies

- FERC Standards of Conduct
- Anti-Trust Policy
- Confidentiality

Black Hills Corporation
one vision
one community
one company

BHCE Ten Year Plan

- Baculite Mesa 115 kV substation (complete)
- Nyberg 115 kV substation (complete)
- West Station 115 kV substation expansion (complete)
- Baculite Mesa-Airport Memorial 115 kV rebuild (complete)
- West Station-Baculite Mesa 115 kV double circuit (2011)
- Baculite Mesa-Nyberg 115 kV line (2011)
- Portland-West Station #2 115 kV line (2012)
- Baculite Mesa-Overton 115 kV line rebuild (2012)
- Reader-Rattlesnake Butte 115 kV line (2012)
- Second Boone 230:115 kV transformer (2013)
- Pueblo-Hyde Park-West Station 115 kV rebuild (2013)
- Overton 115 kV substation (2013)
- Reader 115:69 kV transformer #1&2 replacement (2013)
- Greenhorn-Reader 115 kV line rebuild (2013)
- La Junta Tri-State 115 kV Interconnection (2014)

Black Hills Corporation
one vision
one community
one company

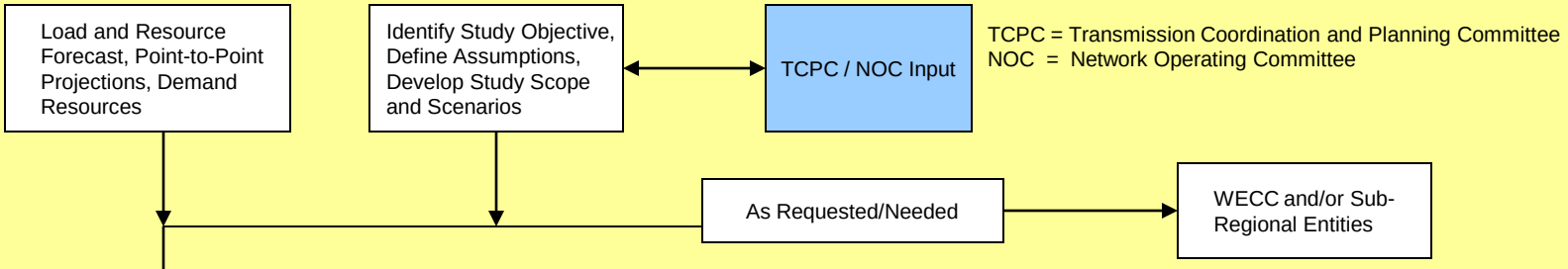
Local Transmission Plan (LTP) Study Cycle

<table>
<tr><th>Quarter</th><th>Planning Steps</th><th>Data Collection</th><th>TCPC Meetings</th></tr>
<tr><td>Q4</td><td>Study Scope, Data Collection & Scenario Development</td><td>Open</td><td>X</td></tr>
<tr><td>Q1</td><td rowspan="2">Technical Study</td><td>Optional</td><td>X</td></tr>
<tr><td>Q2</td><td rowspan="2">Closed</td><td>X</td></tr>
<tr><td>Q3</td><td>Decision & Reporting</td><td>X</td></tr>
</table>

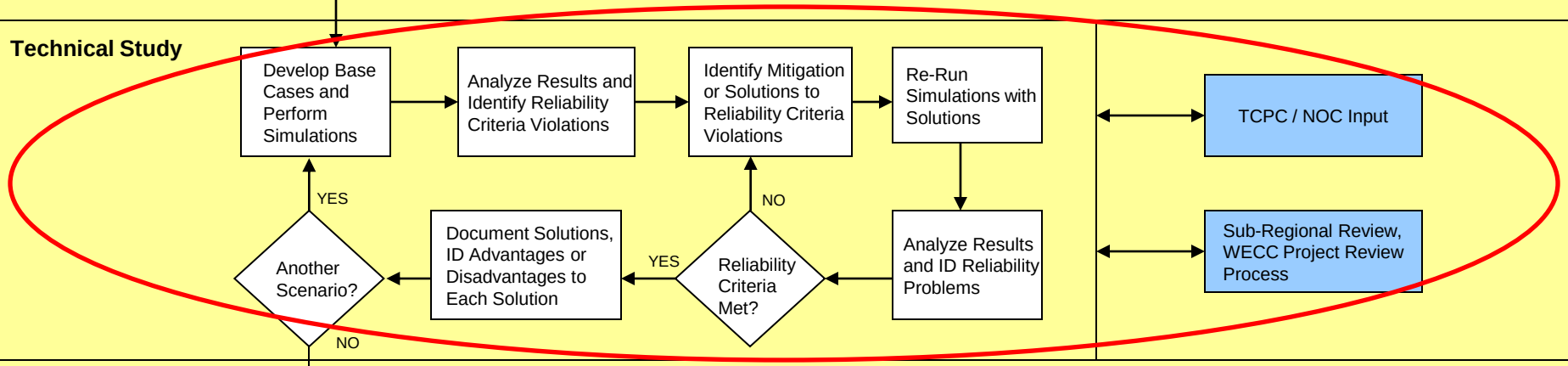
Black Hills Corporation
one vision
one community
one company

LTP Study Process

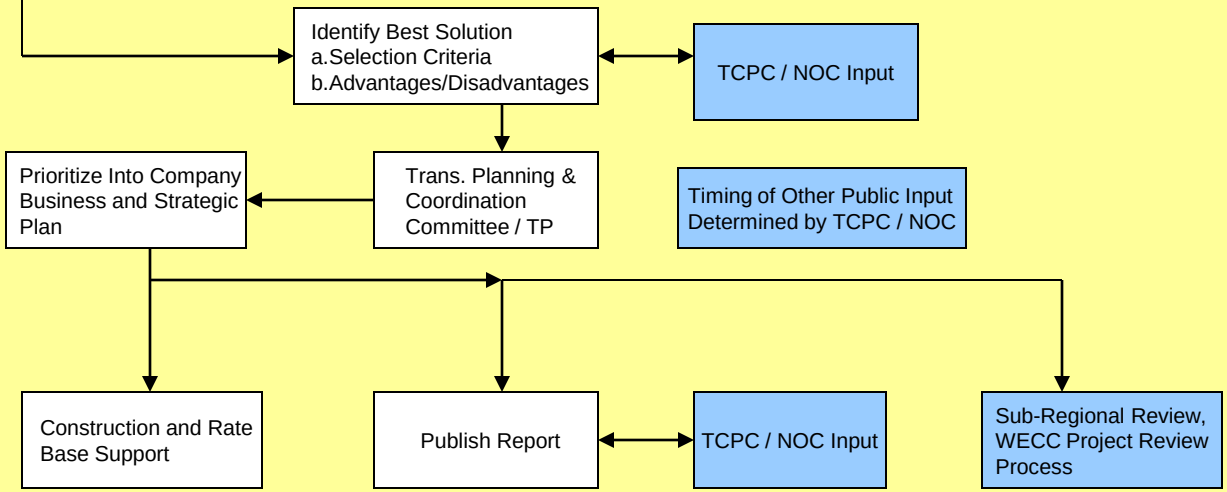
Data Collection, Study Scope and Scenario Development



Technical Study



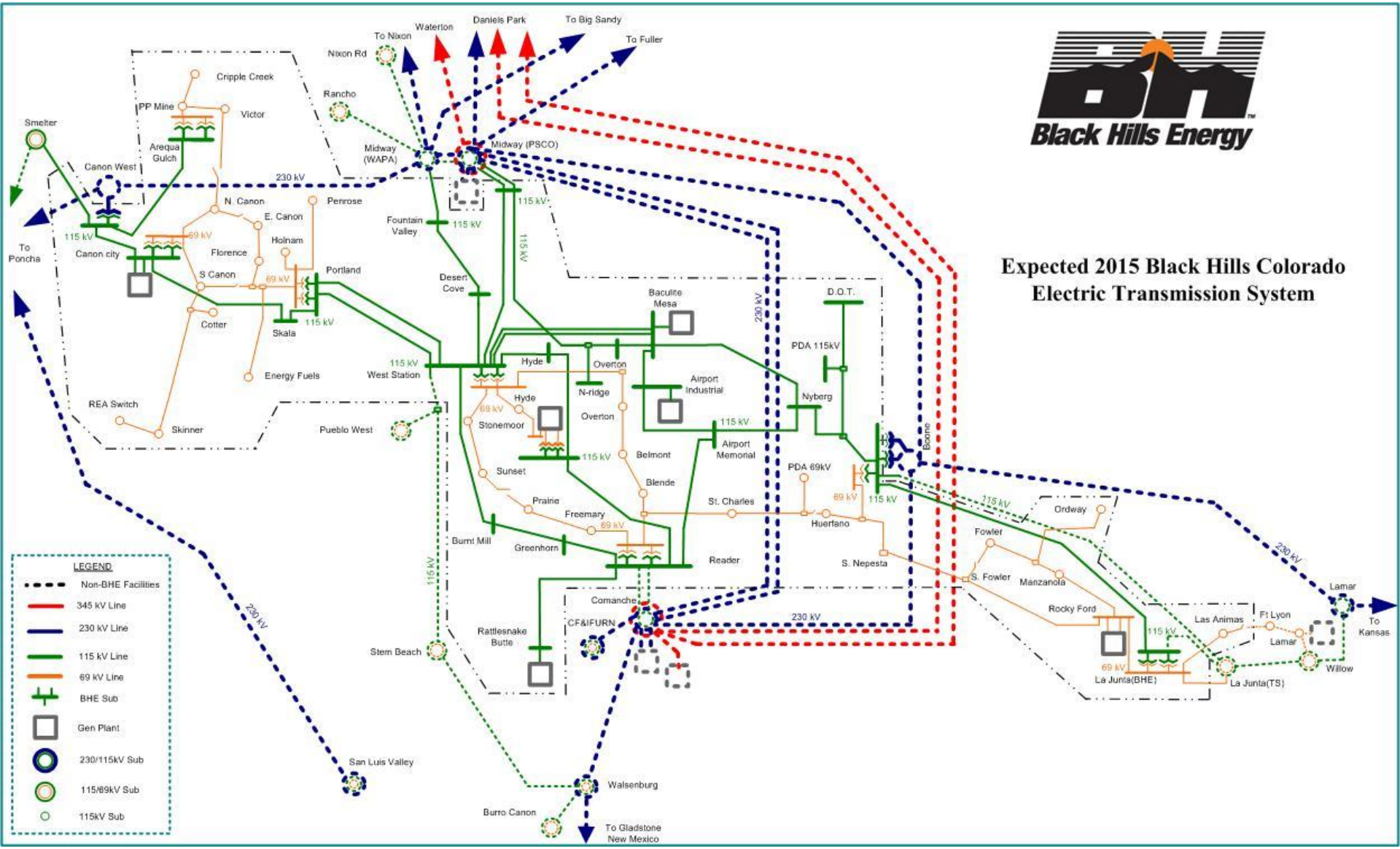
Decision And Reporting



LTP Study Scope

- 2015 and 2021 timeframes
- Analyze peak and off-peak scenarios
  - Power Flow
  - Transient Stability
- Use NERC/WECC planning criteria
- Evaluate N-0, N-1, N-2 and N-1-1 scenarios (Category A-C)
- Worst-case extreme outages evaluated (Category D)
- Validate committed projects/recommend additional solutions
- Include SB-100 analysis

Black Hills Corporation
one vision
one community
one company


Black Hills Energy
Expected 2015 Black Hills Colorado Electric Transmission System
LEGEND
Non-BHE Facilities
345 kV Line
230 kV Line
115 kV Line
69 kV Line
BHE Sub
Gen Plant
230/115kV Sub
115/69kV Sub
115kV Sub
Smelter
Canon West
To Poncha
Canon city
Cripple Creek
PP Mine
Victor
Arequa Gulch
N. Canon
E. Canon
Penrose
Holnam
Florence
S Canon
Portland
Cotter
Skala
Energy Fuels
REA Switch
Skinner
Pueblo West
Nixon Rd
To Nixon
Waterton
Daniels Park
To Big Sandy
To Fuller
Rancho
Midway (WAPA)
Midway (PSCO)
Fountain Valley
Desert Cove
West Station
Hyde
Overton
N-ridge
Stonemoor
Sunset
Prairie
Freemary
Burnt Mill
Greenhorn
Reader
Baculite Mesa
Airport Industrial
Airport Memorial
Belmont
Blende
St. Charles
Comanche
CF&IFURN
Rattlesnake Butte
Stem Beach
San Luis Valley
Walsenburg
Burro Canon
To Gladstone New Mexico
D.O.T.
PDA 115kV
Nyberg
PDA 69kV
Huerfano
S. Nepesta
Boone
Ordway
Fowler
S. Fowler
Manzanola
Rocky Ford
La Junta(BHE)
La Junta(TS)
Las Animas
Ft Lyon
Lamar
Willow
To Kansas
230 kV
115 kV
69 kV

Near Term Baseline Cases

- 2015 Heavy Summer (peak)
  - Starting Case: TSG&T 2015HS LGI Case
  - BHCE Loads + Losses = 483 MW
- 2015 Light Autumn (off-peak)
  - Starting Case: TSG&T 2015LA LGI Case
  - BHCE Load + Losses = 323 MW

Black Hills Corporation
one vision
one community
one company

Far Term Baseline Case

- 2021 Heavy Summer (peak)
  - Starting Case: WECC 21hs1a1p.sav
  - Updated for Regional DEEP study
  - BHCE Load + Losses = 515 MW
- 2021 Light Winter (off-peak)
  - No longer evaluating this scenario

Black Hills Corporation
one vision
one community
one company

SB-100 Overview

- On or before October 31 of each odd-numbered year, submit to the Commission:
  - Designated Energy Resource Zones
  - Plans for construction or expansion of transmission facilities
  - Applications for Certificates of Public Convenience and Necessity

Black Hills Corporation
one vision
one community
one company

Senate Bill 07-100 Scenarios

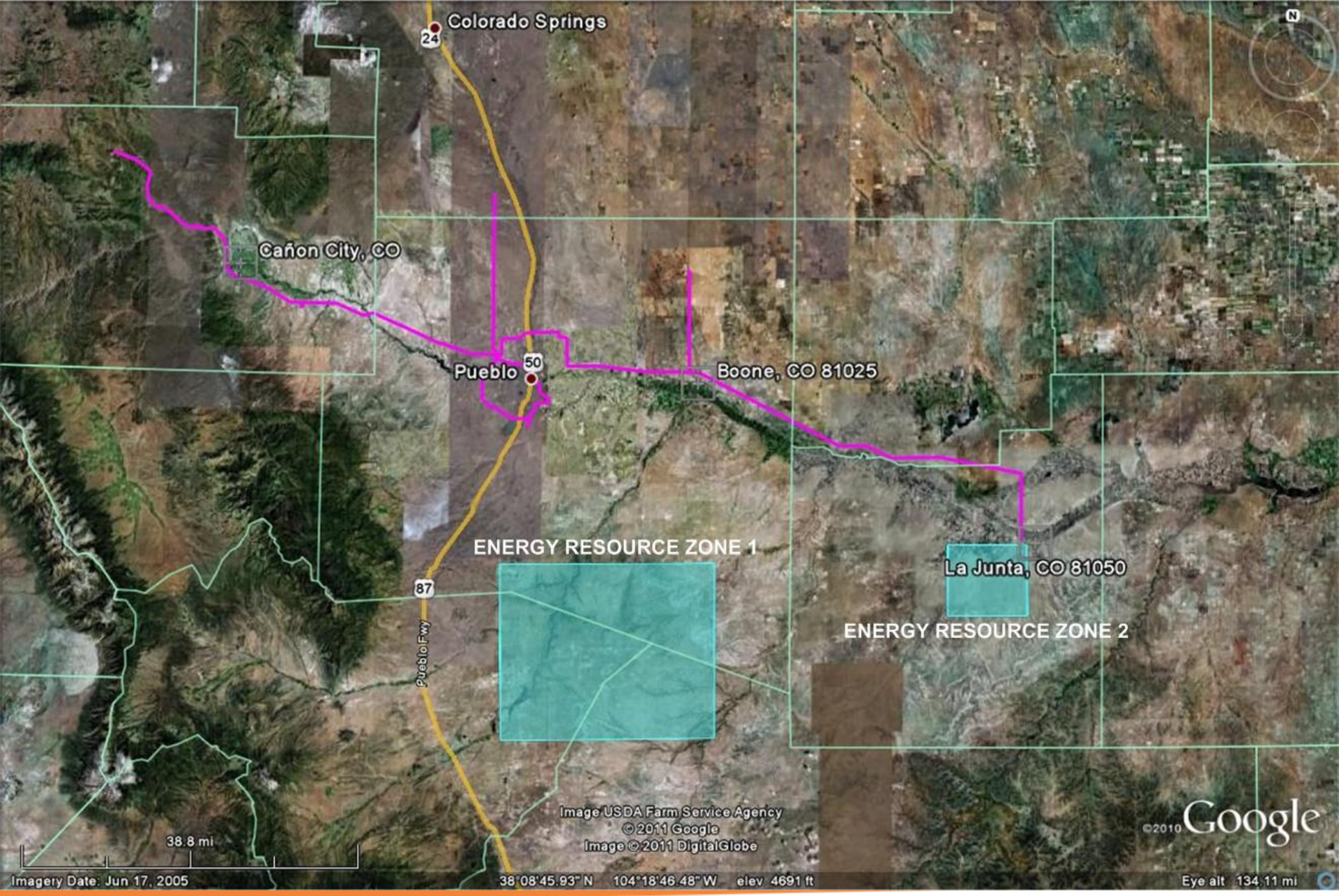
- Model transmission facilities to accommodate resource injection from Energy Resource Zones (ERZ)
- Identify maximum resource injection into BHCE system from each ERZ
- Perform SB-100 sensitivity for each of the TCPC study cases

Black Hills Corporation
one vision
one community
one company

SB-100: ERZ Identification

- Selected based on publicly announced generation projects and the BHCE Generator Interconnection Queue
- Two active requests used for the 2011 SB-100 ERZ selection

Black Hills Corporation
one vision
one community
one company



Black Hills Corporation

one vision
one community
one company

2015HS SB-100 Initial Results
(ERZ #1-South of Pueblo)

- Conductor thermal limit reached on Burnt Mill-W. Station 115 kV line (100 MVA) for ERZ Injection of **140 MW****
  - Baculite Mesa-W. Station + Reader-Pueblo 115 kV (N-1-1)

- Reader-Pueblo 115 kV overload for multiple N-1 & N-1-1 outages
  - Overloads mitigated by removing CT limitation

- Reader-Blende 69 kV overload for single N-1-1 outage
  - Overload mitigated by removing CT limitation

**Not including planned 29 MW wind project (modeled online) at Rattlesnake Butte substation

Black Hills Corporation
one vision
one community
one company

2015HS SB-100 Initial Results
(ERZ #2-La Junta)

- Conductor thermal limit reached on Rocky Ford-LaJunta (BH) 69kV line (41 MVA) for ERZ Injection of **50 MW**
  - Boone-LaJunta (BH)+ LaJunta (TS)-LaJunta (BH) 115 kV (N-1-1)

- LaJunta (BH) 115:69 kV transformer continuous thermal limit reached for ERZ Injection of **50 MW**
  - LaJunta (TS)-LaJunta (BH) 115 kV + LaJunta (BH)115:69 XFMR (N-1-1)
  - Assumed 42 MVA rating on both La Junta (BH) 115:69 transformer replacements for this analysis

Black Hills Corporation
one vision
one community
one company

2015LA SB-100 Initial Results
(ERZ #1-South of Pueblo)

- Conductor thermal limit reached on Burnt Mill-W. Station 115 kV line (100 MVA) for ERZ Injection of **140 MW****
  - Reader-Airport Memorial+ Reader-Pueblo 115 kV (N-1-1)
  - Overload occurs for greater number of outages as injection approaches 160 MW.

- Reader-Pueblo 115 kV overload for single N-1-1 outage with ERZ Injection of **160 MW****
  - Overloads mitigated by removing CT limitation

**Not including planned 29 MW wind project (modeled online) at Rattlesnake Butte substation

2015LA SB-100 Initial Results
(ERZ #2-La Junta)

- Conductor thermal limit reached on Rocky Ford-LaJunta (BH) 69kV line (41 MVA) for ERZ Injection of **45 MW**
  - Boone-LaJunta (BH) + LaJunta (TS)-LaJunta (BH) 115 kV (N-1-1)

- Boone 115:69 kV XFMR continuous thermal limit reached (33 MVA) for ERZ Injection of **45 MW**
  - Boone-LaJunta (BH)+ LaJunta (TS)-LaJunta (BH) 115 kV (N-1-1)

2021HS SB-100 Initial Results
(ERZ #1-South of Pueblo)

- Conductor thermal limit reached on Reader-Rattlesnake Butte 115 kV line (222 MVA) for ERZ Injection of **190 MW****
  - ➢ System Intact overload on radial transmission line

**Not including planned 29 MW wind project (modeled online) at Rattlesnake Butte substation

2021HS SB-100 Initial Results
(ERZ #2-La Junta)

- LaJunta (BH) 115:69 kV transformer continuous thermal limit reached for ERZ Injection of **40 MW**
  - LaJunta (TS)-LaJunta (BH) 115 kV + LaJunta (BH) 115:69 XFMR (N-1-1)
  - Assumed 42 MVA rating on both La Junta (BH) 115:69 transformer replacements for this analysis
- Conductor thermal limit reached on Rocky Ford-LaJunta (BH) 69kV line (41 MVA) for ERZ Injection of **50 MW**
  - Boone-LaJunta (BH) + LaJunta (TS)-LaJunta (BH) 115 kV (N-1-1)

SB-100 Conclusions: ERZ #1

- Assume all terminal equipment limitations removed
- ERZ #1 can accommodate 140 MW of new generation before overloading Burnt Mill-W. Station 115 kV line, assuming SLV-Calumet-Comanche and Lamar-Front Range facilities are not in service.
- ERZ #1 can accommodate 190 MW of new generation before overloading Reader-Rattlesnake Butte 115 kV line, assuming SLV-Calumet-Comanche and Lamar-Front Range facilities are in service.
- Planned Reader-Rattlesnake Butte 115 kV line needed to deliver potential renewable energy resources to BHCE load.

Black Hills Corporation
one vision
one community
one company

SB-100 Conclusions: ERZ #2

- Assume all terminal equipment limitations removed
- ERZ #1 can accommodate 40 MW of new generation before reaching La Junta (BH) 115:69 xfmr continuous thermal rating (assumed replacement rating)
- ERZ #1 can accommodate 45 MW of new generation before reaching the Rocky Ford-LaJunta (BH) 69kV conductor limit and the Boone 115:69 kV transformer continuous thermal rating

Black Hills Corporation
one vision
one community
one company

2015HS TCPC Initial Results (Canon City Area 115 kV)

- Arequa Gulch low voltages for A. Gulch-W. Canon 115 kV outage
- Poncha-Smelter 115 kV line overloads for Portland-Skala or Skala-Canon City prior outage + W. Canon 230:115 xfmr forced outage (low voltages also)
- W. Canon 230:115 kV transformer and Canon City-W. Canon 115 line overloads following loss of both Portland-W. Station 115 kV lines
- W. Station-Portland #1 115 kV line overloads for N-1-1 loss of W. Station-Portland #2 and W. Canon-Canon City 115kV lines

2015HS TCPC Initial Results (Canon City Area 69 kV)

- N-1 overloads on Portland 25 MVA 115:69 kV transformer
- N-1-1 overload on Portland 42 MVA 115:69 kV transformer
- N-1-1 overload on Canon City 115:69 kV transformer
- Canon City area 69 kV low voltages for N-1 and N-1-1 outages
- N-1-1 overloads on Portland-Highland and Canon City-S. Canon W. 69 kV lines

2015HS TCPC Initial Results (Pueblo Area)

- N-1 overloads on both W. Station 115:69 kV transformers
- N-1 overloads on Reader-Freemary 69 kV line
- St. Charles 69 kV low voltages for N-1-1 outage
- N-1-1 overloads on Reader-Blende-West Station 69 kV lines

2015HS TCPC Initial Results (Rocky Ford Area)

- La Junta (TS) 115:69 kV transformer overload for single N-1-1 outage of La Junta (TS)-La Junta (BH) and Boone-La Junta (BH) 115 kV lines.
- Mitigated by dispatching Rocky Ford diesel generation, moving load around on 69 kV system, etc.

2015LA TCPC Initial Results

- No new violations identified in the light autumn case that were not in the heavy summer case

Initial TCPC Mitigation Options

- Capacitors at Canon City and Arequa Gulch 115 kV buses
- Replace Portland 25 MVA transformer
- Replace all limiting terminal equipment
- Evaluate possible 115 kV transmission into Canon City area
- Evaluate additional transformation needs in Pueblo area (115:69 kV) and Canon City area (230:115, 230:69, 115:69)

Black Hills Corporation
one vision
one community
one company

Next Steps

- Seek input regarding results and solutions
- Finish Study Analysis:
  - Complete dynamic assessment
  - Complete evaluation of mitigation options
- Compile results and provide draft TCPC report for stakeholder review and approval
- Hold follow-up meeting as necessary to complete 2011 study cycle.

Stakeholder Comments

Black Hills Corporation
one vision
one community
one company

Comments / Suggestions

Wes Wingen, Trans. Planning Engineer

wes.wingen@blackhillscorp.com

(605) 721-2268

Eric Egge, Director of Trans. Services

eric.egge@blackhillscorp.com

(605) 721-2646

Black Hills Corporation
one vision
one community
one company