Public Service Company of Colorado

10-Year Transmission Plan

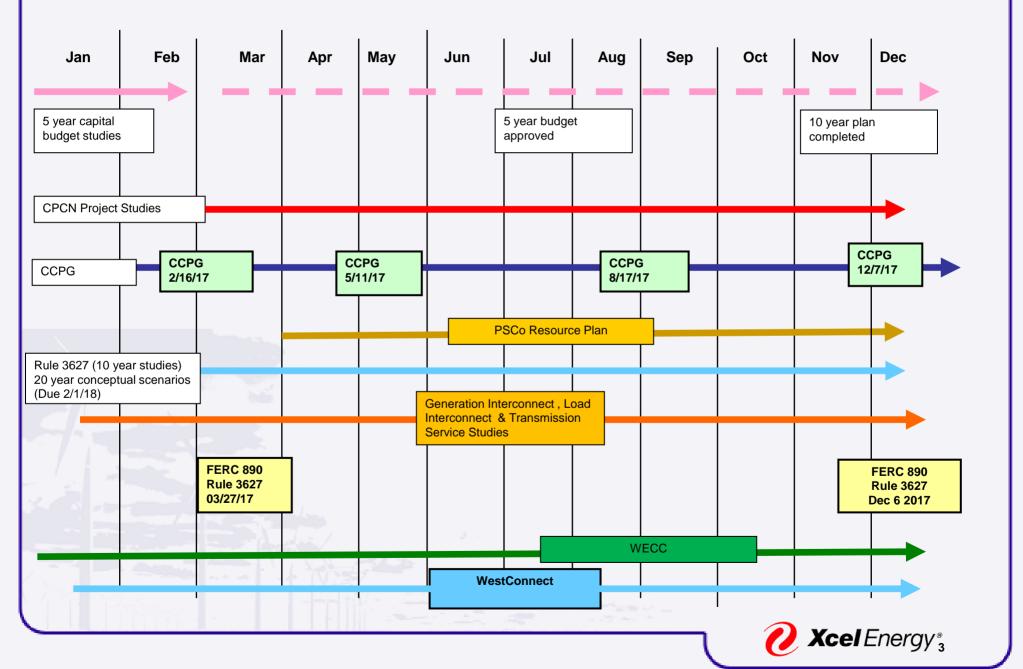
Q4 Stakeholder Meeting for FERC 890 and CPUC Rule 3627 1800 Larimer Street Denver, CO December 6, 2017



Transmission Planning Process



Planning Process Calendar 2017



Reporting

Rule 3627 (10 year plan and 20 year conceptual scenarios)	CPUC	February 1, 2018
WECC Study Program Survey	WECC	February
FERC 715	WECC/FERC	March 4, 2017
Annual Progress Report	WECC	March 15, 2017
Self Certification Forms	NERC/WECC	March
State of the Interconnected System	WECC	April
Rule 3206	CPUC	April 30
SB-07-100 Biennial Report	CPUC	October 31, 2017
WestConnect 10 year plan	WestConnect	December



Reporting - Postings

- Tariff Studies
 - http://www.rmao.com/wtpp/PSCO_Studies.html
- FERC 890 Information
 - http://www.oasis.oati.com/psco/index.html under "FERC 890 Postings"
- SB07-100
 - http://www.transmission.xcelenergy.com/Projects/Colorado
 - http://regplanning.westconnect.com/ccpg_senate_bill_wg.htm
- CCPG, WestConnect
 - http://www.westconnect.com/
- Rule 3627 (10-Year Plan)
 - http://www.transmission.xcelenergy.com/Planning/Planning-for-Public-Service-Company-of-Colorado/Colorado-Public-Utilities-Commission-Rule-3627
 - http://regplanning.westconnect.com/ccpg_rule_3627.htm

> Transmission Planning Documents

http://www.rmao.com/public/wtpp/PSCO_Transmission_Planning_Docs.html



FERC Order 890 Links (PSCo)

- Contacts:
 - http://www.oasis.oati.com/PSCO/PSCOdocs/PSCo_Contacts-14.pdf
- > Hyperlink List:
 - http://www.oasis.oati.com/PSCO/PSCOdocs/PSCo_Attachme nt_R_Hyperlinks_List11-9-12.pdf
- Meeting Notices and Materials
 - <u>http://www.oasis.oati.com/psco/index.html /</u> under "FERC 890 Postings" -> "Stakeholder Meetings"
- Open Access Transmission Tariff
 - http://www.transmission.xcelenergy.com/Resources/Open-Access-Same-Time-Information-System-&-Open-Access-Transmission-Tariff



2017 Transmission Planning Studies and Assessments



Transmission Planning Drivers

Load Service / Reliability

- Near-Term (1-5 years)
 - TPL Studies (5 year capital budget)
- Longer-Term (5-10 years)
 - WestConnect, CCPG, Public Policy
- Resource Accommodation
 - > PSCo Resource Plans (2016 ERP)
 - Generator Interconnection Requests
- Public Policy
 - > 2017 Colorado Energy Plan (CEP)
 - Senate Bill 07-100 (SB-100)
- >Other
 - Tariff Studies
 - > Transmission Service



Planning Study Process

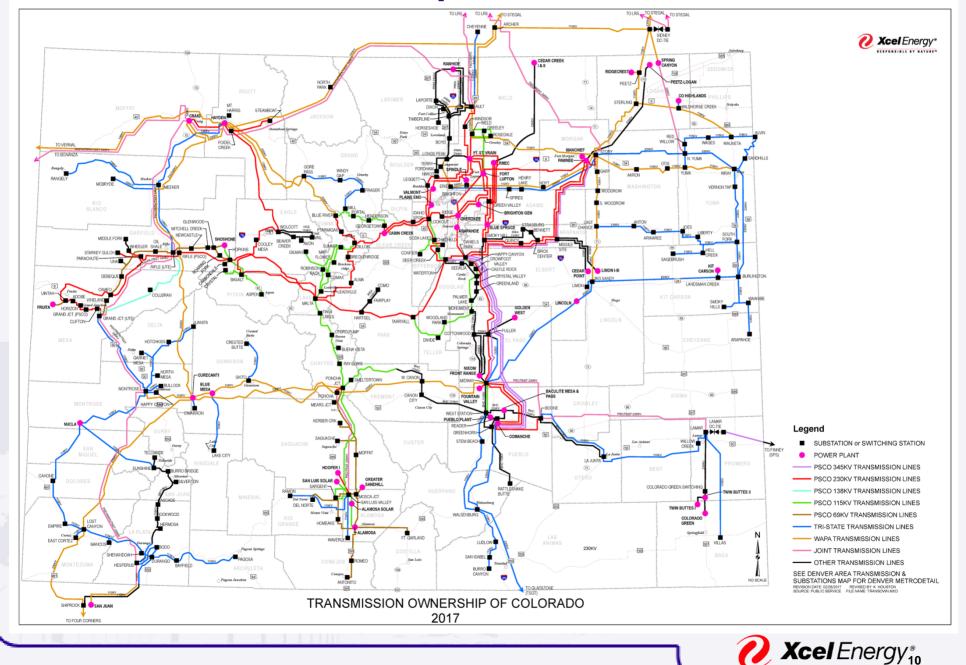
- Prepare Study Models
 - WECC Study Program
 - Recent Forecasts
 - > Area Coordination
- Studies

 \succ

- Steady State, Transient Stability, Short Circuit
- Methodology
 - NERC Standards (TPL, MOD, FAC)
 - > PSCo Criteria
 - Variable Energy Resource (VER) Guidelines
 - **Recommendations for System Upgrades**



Transmission Ownership Colorado - 2017



Generation Projects



Generation Additions/Reductions

Name	Interconnection	Owner	Net MW	Туре	ISD
Zuni 2 (retired)	Zuni	PSCo	-65	Coal	2015
Golden West	Fuller 230 kV	Golden West	250	Wind	2015
Hooper 1	San Luis Valley 230 kV	Solar Star	52	Solar (PV)	2015
Comanche Solar	Comanche 230 kV	Comanche Solar	120	Solar (PV)	2016
Cherokee 3 (retired)	Cherokee 115kV	PSCo	-152	Coal	2016
Cherokee 5,6,7	Cherokee 115kV	PSCo	570	Gas (CC)	2016
Rush Creek	Missile Site 345 kV	PSCo	600	Wind	2018
ERP/CEP	55		<u>;</u> ;	Wind, Solar, Gas	



Rush Creek Wind Project

- > CPUC Rule 3660
- > 600 MW of New Wind Generation
- > 90 Miles of 345 kV Transmission (Gen-Tie)
- > PSCo-Owned
- Interconnect at Missile Site
- In-Service Date: October 2018
- Filed with the Commission on May 13, 2016
- Combined Rush Creek and Pawnee Daniels Park
- Settlement Agreement
- > Received PUC Approval October 20, 2016



Rush Creek Wind Project



Rush Creek Task Force (CCPG)

Scope:

Evaluate Alternative Proposals to Integrate the Gen-Tie as a Network Facility

>PSCo to Provide Leadership & Resources

>Alternatives Must be Reasonable

Status:

RCTF Kicked off December 2016

≻Meets

>Plan

> Publish RCTF Report by September 2017

Document Results in 2018 Rule 3627 Report (PSCo)



Electric Resource Plan (ERP) / Colorado Energy Plan (CEP)

CEP Filed August 2017

- > Retire Comanche 1 (335 MW) by end of 2022
- > Retire Comanche 2 (325 MW) by end of 2025
- New Switching Station in Energy Resource Zone 5

CCPG CEP Task Force (CEPTF)

- Southern Reliability Assessment
 - Evaluate Retirement of Comanche 1 & 2
- Generation Capacity Assessment
 - 3 Injection Areas

Documentation

http://regplanning.westconnect.com/ccpg_ceptf.htm



Pueblo Reliability Studies

> Objective:

Ensure there are no system performance or reliability issues due to the retirement of Comanche 1&2 generating units.

> Types of Analyses:

Steady State, Transient Stability, Short Circuit, Flicker

Conditions:

- Peak, Off-peak
- C1 & C2 Out
- C1, C2 & C3 Out

Results

- No Performance Issues (Voltage or Loading)
- System Stable



Capacity Studies

> Objective:

Evaluate potential for additional generation to meet needs identified from ERP / CEP.

Locations for Generation:

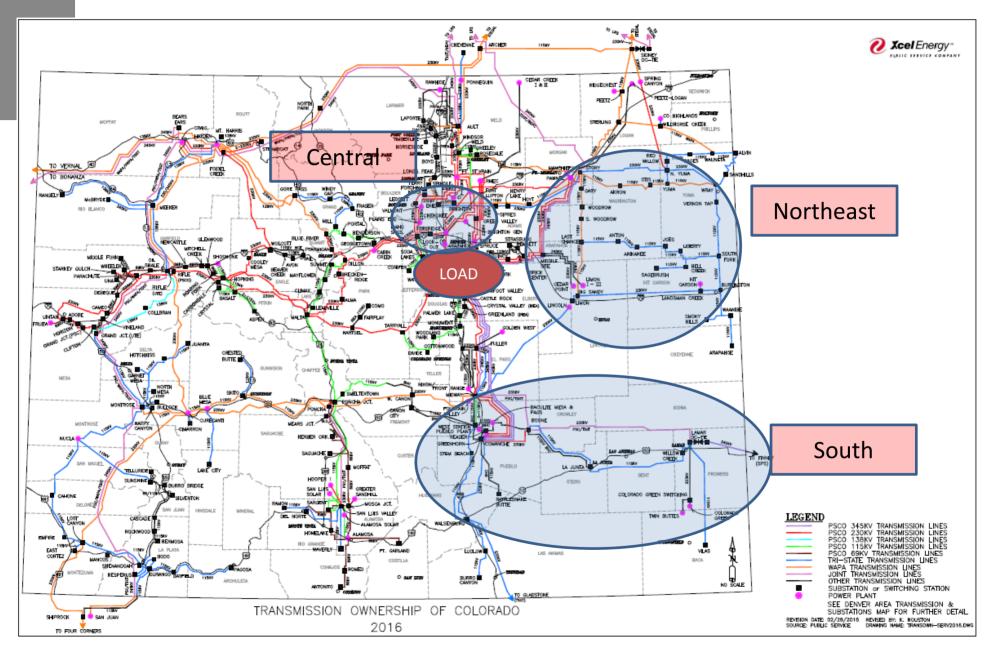
Northeast, South, Central

Methodology

- Rely on Previous Studies
- Perform Additional Analyses
- VER Assumptions



Injection Areas



Capacity Results

> North:

- > 550 MW No Upgrades
 - Limit: Denver-Metro
- 850 MW Metro Upgrades
- South:
 - > 250 MW No Upgrades (PSCo/CSU Operating Procedure)
 - Limit: CSU
 - Central:
 - > 400 MW (2 x 200) @ Ft. St. Vrain, Spruce, Cherokee 230
 - > 250 MW @ Spindle, Cherokee 115
 - > 100 MW @ RMEC
 - > All with No Upgrades



CEP Process / Next Steps

- Filed Supplemental Testimony: 11/28/17
- > RFP Bids Received: 11/28/17
- Portfolio Studies: Dec 17 March 2018
- CEPTF through March 2018
- LGIP Studies: 4/30/18 1/31/19



FERC Generation Interconnection Process



Generation Interconnection Process

FERC Orders 2003 and 2006

- Order 2003 for Large Generators
 - Greater than 20MW
 - Large Generator Interconnection Procedures (LGIP)
 - Large Generator Interconnection Agent (LGIA)
 - > Applies to all generation technologies
- Order 2006 for Small Generators
 - Less than or equal to 20MW
 - Small Generator Interconnection Procedures (SGIP)
 - Small Generator Interconnection Agreement (SGIA)
 - > Applies to all generation technologies



Large Generator Interconnection Process

Feasibility Study

- > \$10,000 deposit
- Preliminary determination of interconnection and delivery facilities
- Study Cost based on actual costs
- Feasibility schedule: approximately 45-60 days

System Impact Study

- \$50,000 deposit
- Proof of Site Control required
- > Transient stability of system is studied
- Study Cost based on actual costs
- SIS schedule: approximately 90 days

Facilities Study

- \$100,000 deposit
- Detailed engineering design and cost estimates
- Study cost based on actual costs
- Facilities Schedule: approximately 90 days
- Study results become the basis for the LGIA



Generator Queue Status

Solar 8306.05MW

- Wind 8556.47MW
- Biomass 0
 - Gas 280.60MW

Total 17143.12MW



Totals updated 12/04/2017

Reliability Projects



Substations

Completed

- >Ridge 230kV Uprate
- Happy Canyon (IREA Wholesale Load)
- Cloverly (Pleasant Valley Retail Load)

>2018

- Harvest Mile
- Bluestone Valley
- >Wolcott (2-20MVAR Reactors)

≻2020

- Husky (Ault 44kV Replacement)
- > Graham Creek (Easton 44kV Replacement)

≻TBD

- Reliability:
 - Bluestone Valley Phase 2

Distribution

- ≻Moon Gulch (2018)
- > Avery (2019)
- >Thornton (2019)
- Barker (2022: Banks 1,2; 2024, Bank 3)
- > Titan (2022)
 - Formerly Sterling Ranch
- > High Point (2021)
 - Formerly Pena Station
- Stock Show (2022)
 - Formerly National Western
- ➢ Conceptual, ISD TBD
 - Box Elder Replacement
 - New Castle
 - Wilson
 - Dove Valley
 - Formerly Surrey Ridge
 - Solterra
 - Superior
 - Sandy Creek



Transmission

Completed

≻ 2016

> Cherokee – Ridge 230kV Uprate

- > Rifle Parachute 230kV #2
- > DCP Lucerne 2 Cloverly 115kV

Planned

- **≻ 2018**
 - > Rush Creek Missile Site 345kV
- **≻ 2019**
 - Pawnee Daniels Park 345kV
- **≻ 2020**

> Ault – Cloverly 115kV (future 230kV)

≻ 2021

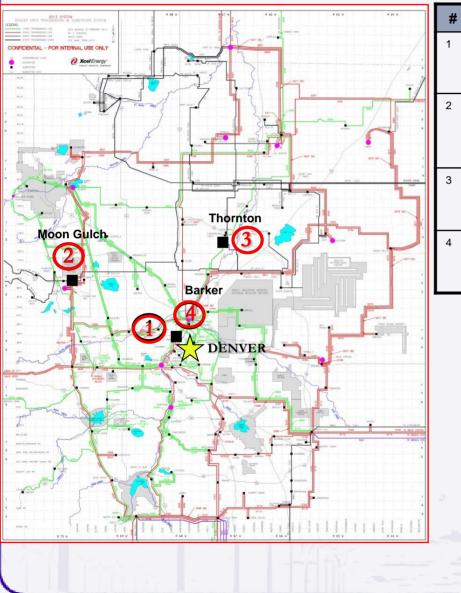
> Gilman – Avon 115kV

Conceptual, ISD TBD

- > Glenwood Rifle Upgrade
- Parachute Cameo 230kV
- Lamar Front Range
- > Hayden Foidel Gore Pass 230kV Loop
- San Luis Valley Poncha 230kV #2**
- Poncha W.Canon Midway 230kV #2
- > Weld Rosedale 230kV
- > Milton Rosedale 230kV
- ** TSGT lists SLV as 2022



Denver/Boulder

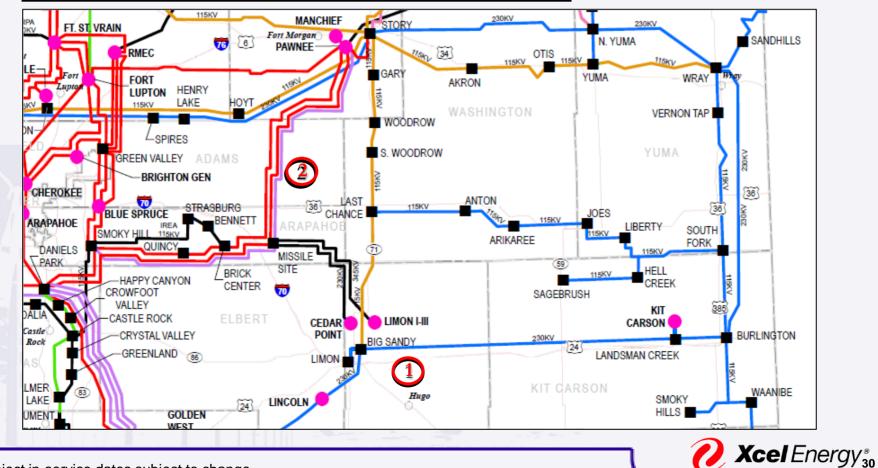


Project	Comments	ISD*	Drivers	
Cherokee- Arvada-Ridge 230kV Conversion	Convert the existing 115kV line between the Cherokee and Ridge substations to a 230kV line.	prokee and Ridge substations to a 230kV		
Moon Gulch Substation	Proposed new Distribution Substation in either the City of Arvada or Jefferson County to serve distribution loads	2017	Distribution	
Thornton Substation	New substation in Thornton to serve distribution loads. Replaces the Brantner Substation project.	2019	Distribution	
Barker Substation	New Substation in Denver Area to serve distribution load growth in Historic Ballpark Area	2021	Distribution	

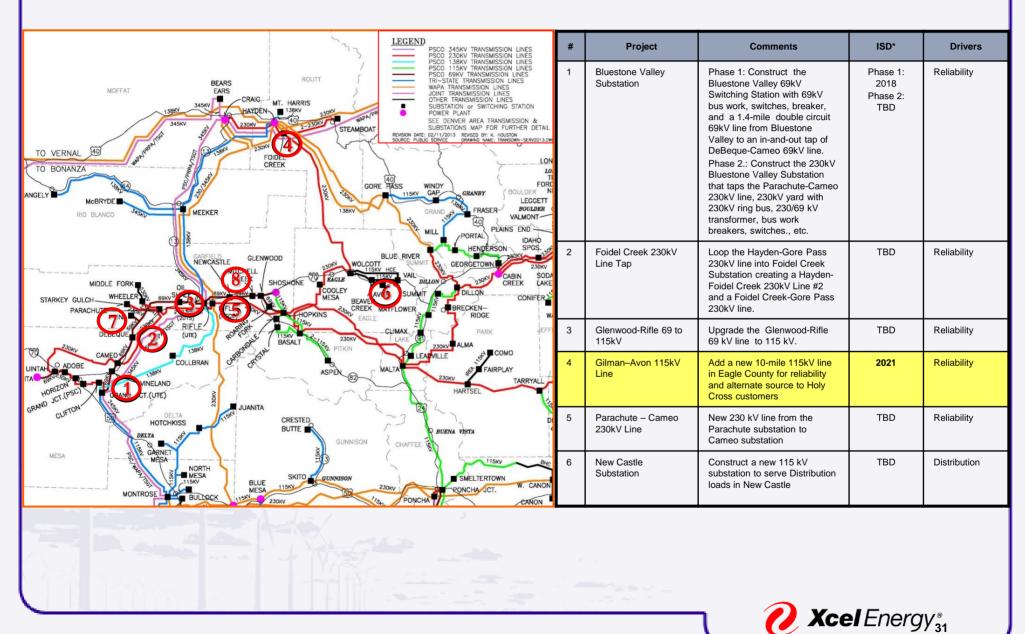


East Plains Area

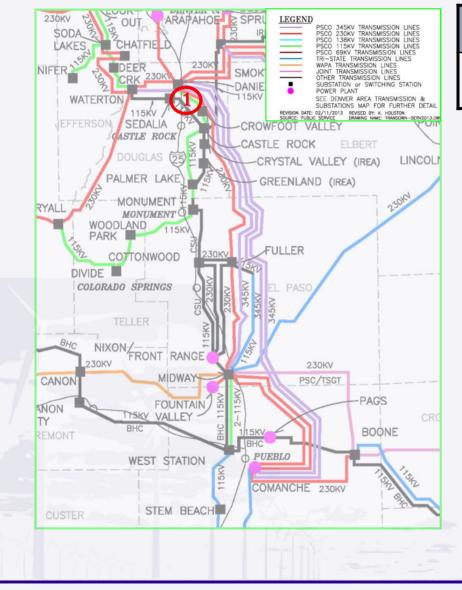
#	Project	Comments	ISD*	Drivers
1	Missile Site – Rush Creek 345 kV Transmission Line	New generation tie-line for the Rush Creek Wind Project	2018	Generation
2	Pawnee – Daniels Park 345 kV Transmission Line	Add an additional 345 kV line between the Pawnee and Daniels Park substations. Add Harvest Mile Substation near Smoky Hill	2019	Reliability



Western Slope / Mountain Area



South Denver/CO Springs Area



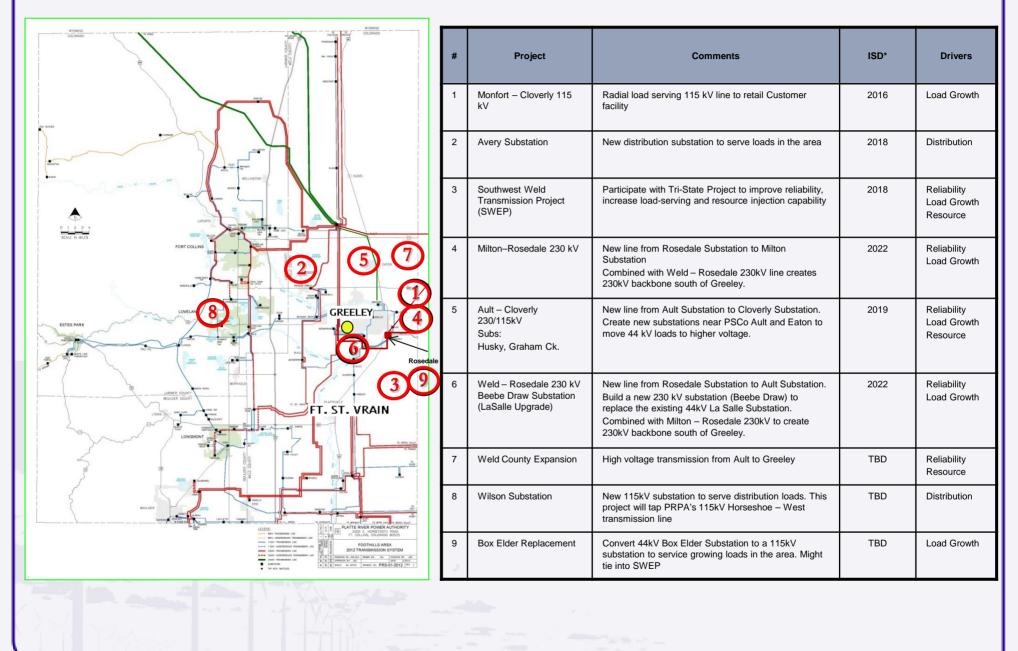
#	Project	Comments	ISD*	Drivers
1	IREA Happy Canyon	Construct a new 115 kV substation for IREA	2016	Wholesale Customer



Proposed Transmission Projects San Luis Valley Area, 2016-2020

2	#	Project	Comments	ISD*	Drivers
	1	Alamosa Bank #4 115/69kV Autotransformer	Installing a new 84 MVA 115/69kV at Alamosa Terminal to replace the aging 25 MVA bank.	1Q 2017	Reliability
3	2	Motor Operated Gang Switches at Otero Pump and Buena Vista Substation	Installing MOGs at Otero Pump and Buena Vista 115kV line to minimize restoration time.	2Q 2017	Reliability
3	3	Rebuilding 69kV lines (SLV-Poncha, Villa Grove-KerberCk, and Alamosa-Ft.Garland)	Rebuilding 69kV lines in the SLV area due to aging.	4Q 2017	Reliability
1 3					
					el Energy ₃₃

Foothills/Greeley Area

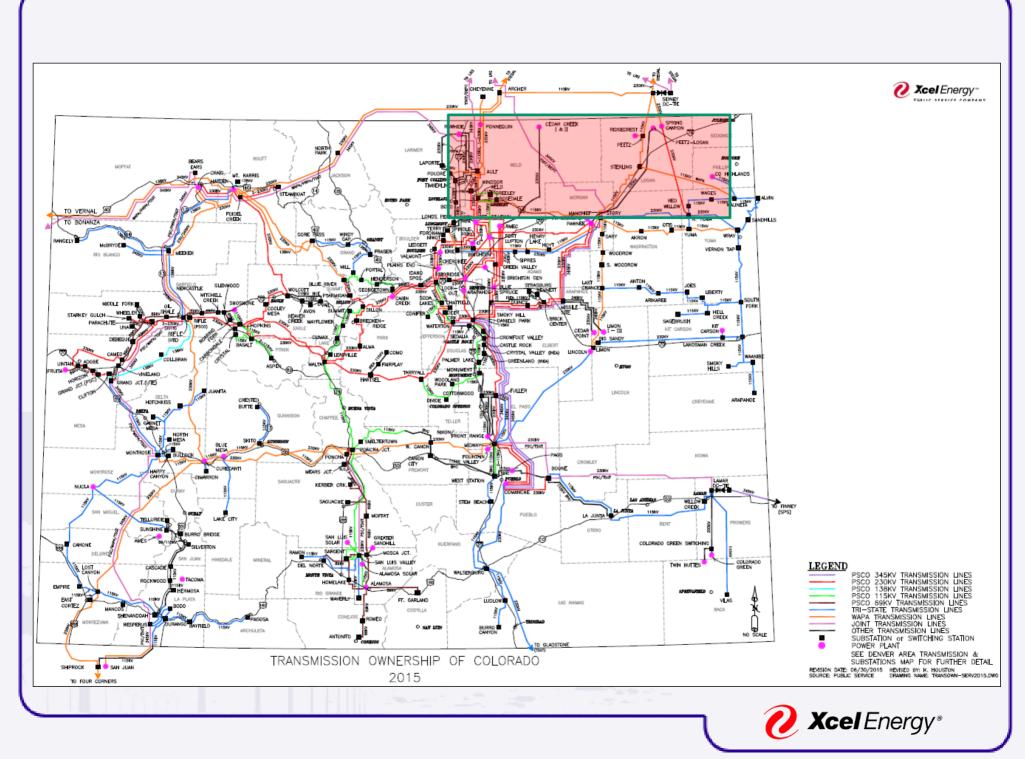




Northeast Colorado (NECO)



35



Northern Greeley Area Plan (2016) Ault – Cloverly 230/115 kV

Study Objectives

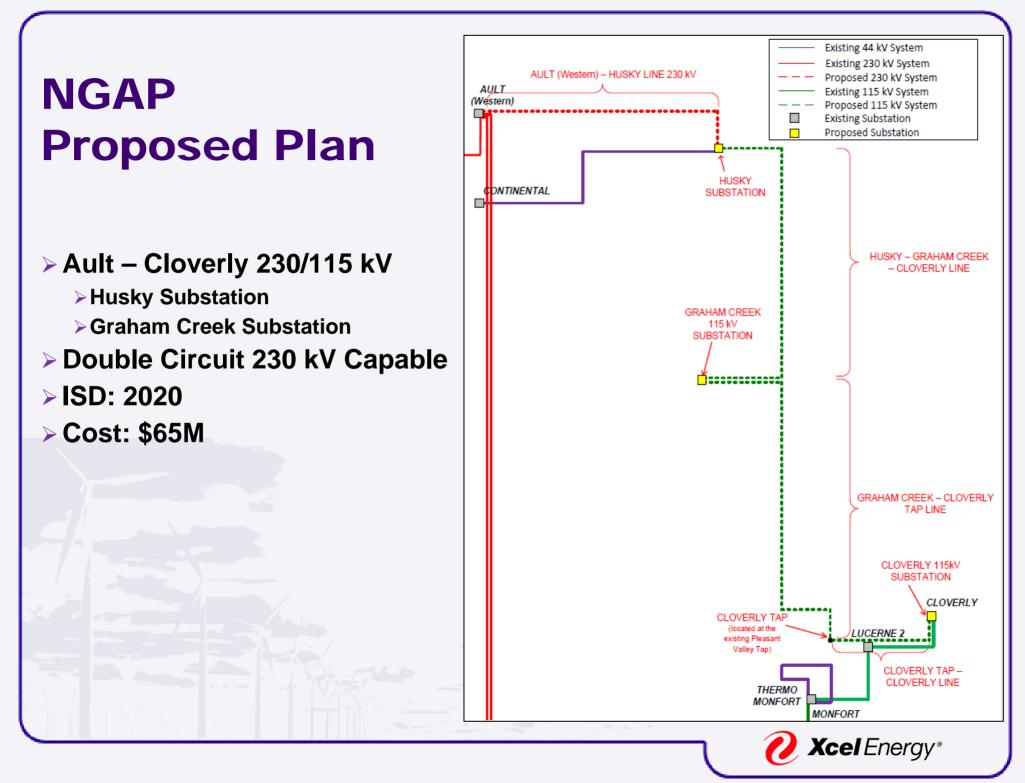
Replace 44 kV transmission system

- Improve reliability
- Increase load serving capability
- Increase resource accommodation
- Align with other transmission plans

Status

- ▷CCPG Acceptance February 16th, 2017
- CPCN Filed with CPUC March 9th, 2017





2017 Scope – Southern Greeley Plan

>Objectives (Similar to Northern Greeley Plan)

- Replace 44 kV Transmission System
- Improve Reliability

Increase Load Serving Capability

- Increase Resource Accommodation
- Align with Other Transmission Plans
 NGAP, SWEP

Status:

Kick-off Meeting March 8th, 2017

- Study in-progress
- Expected completion date 1Q 2018



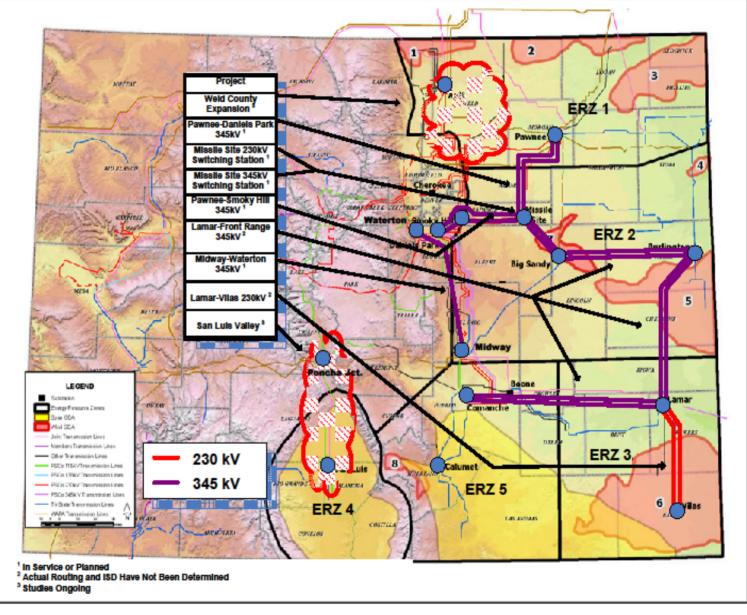
Public Policy Planning Senate Bill 07–100



PSCo Public Policy Senate Bill 07-100

- Designate "Energy Resource Zones (ERZ)"
- Develop plans for the construction or expansion of transmission facilities necessary to deliver electric power consistent with the timing of the development of beneficial energy resources located in or near such zones
- Consider how transmission can be provided to encourage local ownership of renewable energy facilities
- Submit proposed plans, designations, and applications for certificates of public convenience and necessity to the commission







Senate Bill 100 Project List

ltem	Project	Zone	In Service Date*	Project Status
Planne	d			
1.	Missile Site 230kV Switching Station	2	Nov 2010	In Service No CPCN Required
2.	Midway-Waterton 345kV Transmission Project	3,4,5	Jun 2011	In Service CPCN: July 2009
3.	Missile Site 345kV Switching Station	2	October 2012	In service CPCN: June 2010
4.	Pawnee-Smoky Hill 345kV Transmission Project	1	June 2013	IN Service CPCN: Feb 2009
5.	Pawnee-Daniels Park 345kV Transmission Project	1	2019	CPCN: April 2015
Concep	otual			
6.	Lamar-Front Range 345kV Transmission Project	2, 3	TBD	Studies Complete. No plans for full build-out at this time
7.	Lamar-Vilas 230kV Transmission Project	3	TBD	See Lamar – Front Range
8.	Weld County Expansion Project	1	TBD	Studies Ongoing CCPG – NECO Subcommittee
9.	San Luis Valley	4	TBD	CCPG – SLV Subcommittee



Pawnee - Daniels Park Project

≻Purpose

- ≻SB100
- >PSCo Base Resource Needs
- ➢Reliability

Project Components

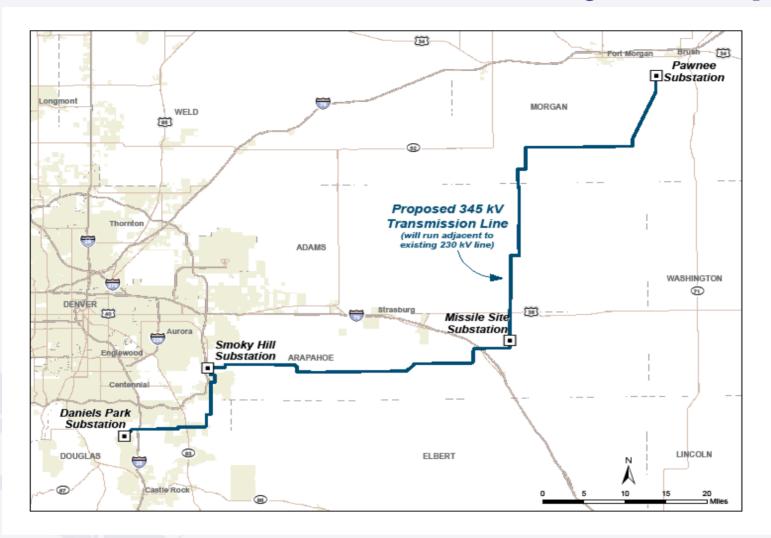
- Pawnee Missile Site Daniels Park 345 kV (115 miles)
- Smoky Hill Daniels Park 345 kV line (21 miles)
- Entire Project within existing PSCo corridors
- >About 51 miles already constructed
- New Harvest Mile Substation
- Cost Estimate ~ \$180 M

≻<u>Plan</u>

- >CPCN Filed 3/28/14
- **CPCN** Approved March 2015
- >ISD 2019 (approved by PUC)



Pawnee - Daniels Park Project Map



Location: Morgan, Adams, Arapahoe, Elbert and Douglas counties

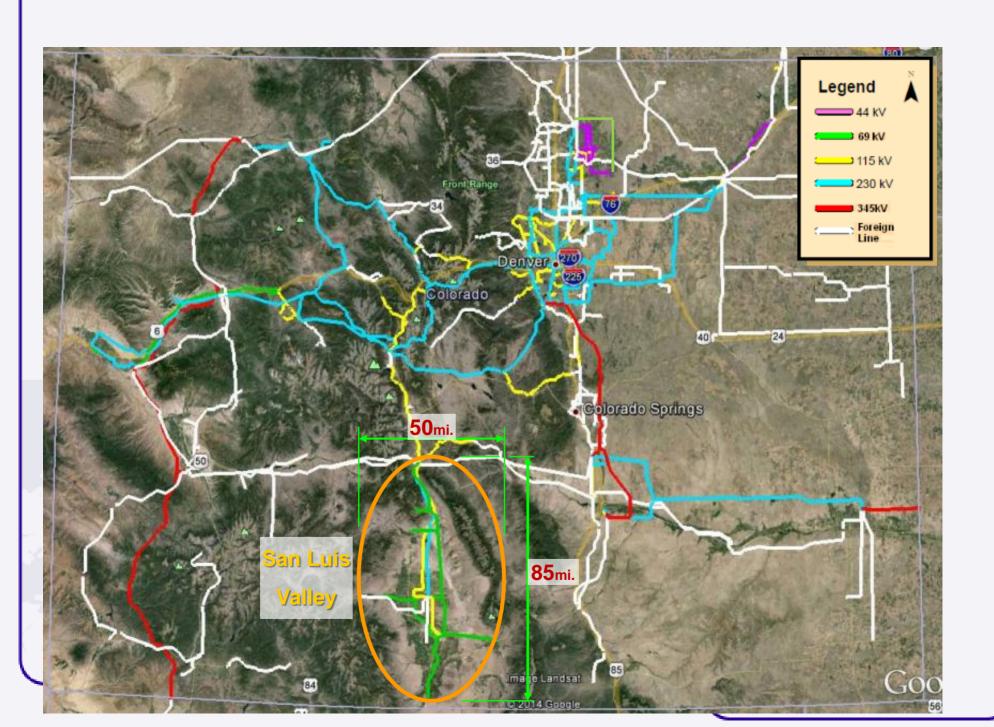
Infrastructure: 115-mile transmission line from Pawnee Substation to Daniels Park Substation and from Smoky Hill Substation to Daniels Park Substation



San Luis Valley



46



San Luis Valley Subcommittee (CCPG)

Objectives

- Phased Approach
- Increase Reliability
- Load Serving Capability
- Resource Accommodation
- Phase 1
 - Conclusion: New 230 kV line from San Luis Valley Poncha
 - Report Posted
- Phase 2
 - Conclusion: New 230 kV line from Poncha to Midway or Malta
 - Report Posted 2016
- Phase 3
 - Scope Under Development
 - Existing Infrastructure Upgrades



CPUC Rule 3627



CPUC Rule 3627

Requires Regulated Utilities to File Transmission Report

>10-Year Plan, 20-Year Scenario; 2-year cycle

Black Hills, Tri-State, Public Service

Use CCPG as Forum

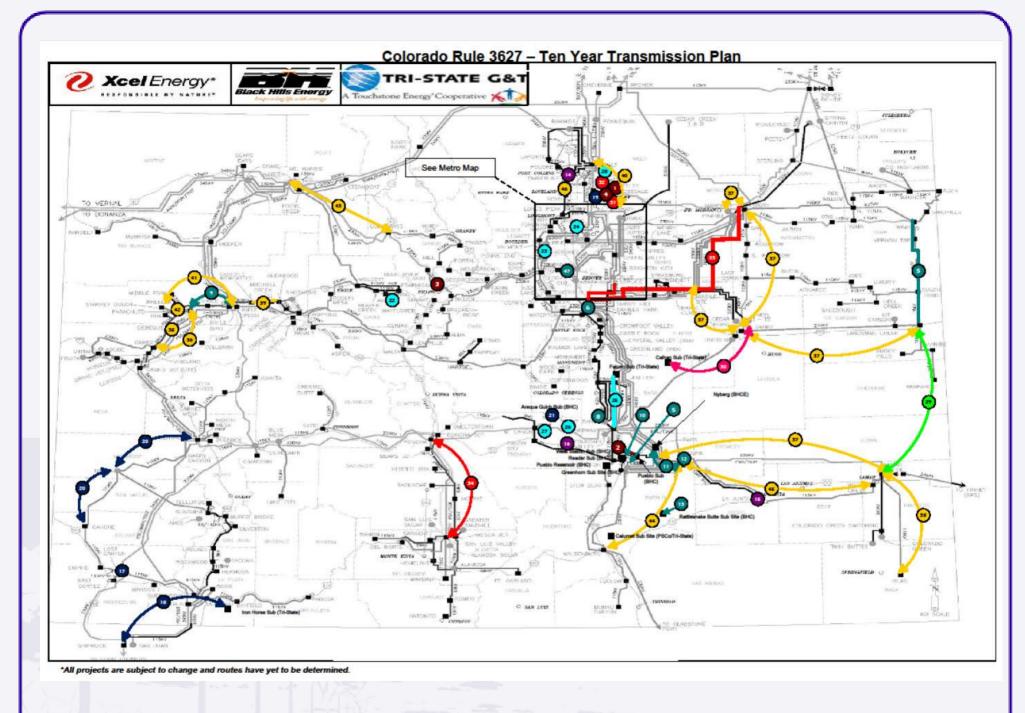
Proactive Stakeholder Participation

- Report Filed February 2016
 - Proceeding Consolidated with SB07-100
 - Comments Received from OCC and IEA

>ALJ Assigned → Evidentiary Hearing

- Hearing December 6, 2016
- Commission Meeting 11/29/17:
- >Ruling / Recommendation:
 - Most Utility Exceptions Granted
 - > 2016 Plan Adequate





∂ Xcel Energy₅₁

PSCo PUC Rule 3627 Information

> On the Xcel Energy website at:

- http://www.transmission.xcelenergy.com/Planning/Planningfor-Public-Service-Company-of-Colorado/Colorado-Public-Utilities-Commission-Rule-3627
- > WestConnect website for all regional projects:
 - http://regplanning.westconnect.com/ccpg.htm



Regional & Subregional Updates (CCPG, WestConnect, WECC)



CCPG Updates



Subcommittees Specific Geographic Portion multi-year	Work Groups Entire Footprint multi-year	Task Forces Portion or Entire Footprint 1-2 year duration (includes potential joint projects)	CCPG Liaisons
Foothills Chair: Jeremy Brownrigg (PRPA)	3627 Compliance (includes Long Range & SB 100) Co-chair: Tom Green (Xcel) Co-chair: Chris Pink (TSGT)	TOT 3 Study Methodology Chair: David Gustad (TSGT)	Colorado Regulatory Chris Neil (OCC) Paul Caldara (CPUC) Chris Worley (CEO)
DEEP Chair: Gary Simonson (CSU)	Conceptual Planning (20-year) Co-chair: Paul Caldara (CPUC) Co-chair: James Nguyen (Xcel)	Rush Creek Chair: Patrick Corrigan (Xcel)	WECC TEPPC: Mike Rein (Xcel) PCC: Bob Easton (WAPA
WY/SD Common Use Chair: Charles Shue (BHC)	Base Case Coordination Updates Chair: Sirisha Tanneeru (Xcel)	CCPG Charter Update Chair: Chris Pink (TSGT)	WestConnect PMC Chair: Blane Taylor (TS PS Chair: Tom Green (Xce
Western Slope Chair: Chris Pink (TSGT)	TOT 3 Study Methodology Chair: David Gustad (TSGT)		Rocky Mountain Operating Stuc Frank Li (WAPA)
Northeast Colorado Chair: Mike Rein (Xcel)	TPL Studies Chair: Jim Hirning (WAPA)		
San Luis Valley Co-chair: James Nguyen (Xcel) Co-chair: Jonathan Fidrych (TSGT)	Voltage Coordination Chair: Bill Andersen (Xcel)		
Southeast Wyoming Chair: TBD	Short Circuit Data Base Chair: Don Loftis (CSU)		

Updated: 12/08/2016

CCPG EVENTS

CCPG Meetings

- February 16, 2017
- May 11, 2017
- August 17, 2017
- December 7, 2017

<u>CCPG Contacts:</u> Susan Lovejoy – Chair <u>slovejoy@csu.org</u> (719)-668-8384 Jeremy Brownrigg – Vice-Chair <u>brownriggj@prpa.org</u> (970) 266-7979



WestConnect



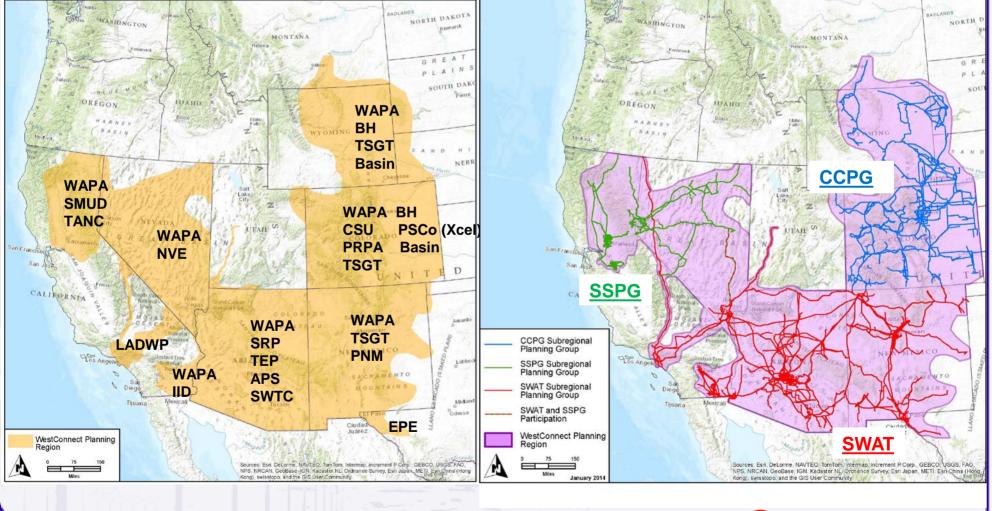
PMC Organization and Activities

- FERC Order 1000 Compliance
- Manage Regional Transmission Planning Process
- Monthly in-person meetings
- Currently Comprised of 26 Members



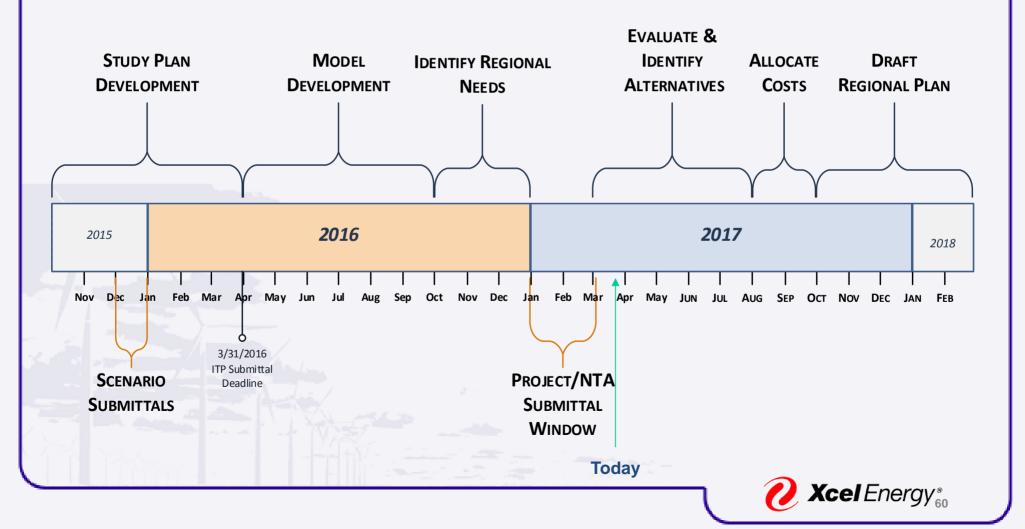
WestConnect Planning Region

WestConnect Subregional Planning Groups





2016-17 Planning Cycle Schedule



Regional Needs Assessment

Regional Needs Assessment Results:
 No regional needs identified

Sensitivity Analyses
 Informational analysis only
 High renewables; low headroom
 Backcast

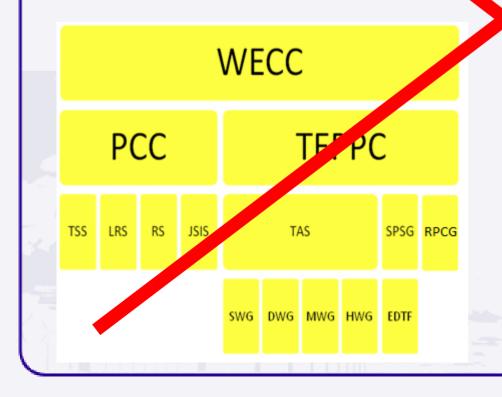
Next Cycle Begins 2018





WECC Committee Participation

- > Planning Coordination Committee
- > Transmission Expansion Planning Policy Committee
 - > Technical Advisory Subcommittee
 - Regional Planning Coordination Group
 - Scenario Planning Scering Group



WECC	Western Electricity Coordinating Council	
C I	Planning Coordination Committee	
LRS	Loads and Resource Subcommittee	
TSS	hnical Studies Subcommittee	
RS	Relias ty Subcommittee	
JSIS	Joint Synch nized Information Subcommittee	
TEPPC	Transmission Ex, asion Planning Policy Committee	
TAS	Technical Advisory Supermittee	
DWG	Data Work Group	
HWG	Historical Work Group	
MWG	Modeling Work Group	
SWG	Studies Work Group	
SPSG	Scenario Planning Steering Group	
EDTF	Environmental Data Task Force	

💋 Xcel Energy 👸

Stakeholder Opportunity for Comment



Transmission customers update loads, resources and demand responses

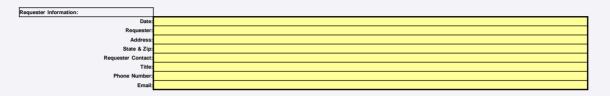


Comment Form

CCPG Comment Form

(For Stakeholder Comments, Requests for Clarification, Reliability Studies, Alternative Evaluation, and other General Feedback)

Provide the information in the yellow boxes. If the information is unavailable or unknown, please indicate



General Information:	
Study or Project Name:	
New Study or Alternative:	
Narrative Description:	
Study Horizon Date:	
Geographic Footprint Impacted:	
Load and Resource Modeling:	
Transmission Modeling	
Suggested Participants: (TP's, LSE's, Work Groups)	
Policy Issues to be Addressed: (SB100, RES, FERC, NERC, etc)	
Other Factors to be Considered:	
Type (Powerflow or Stability):	

Return To: CC

1	
CCPG Chair:	Wes Wingen
In care of:	Black Hills Corporation
Address:	PO Box 1400
City, State, Zip:	Rapid City, South Dakota, 57709
Phone:	605-721-2268
Email:	Wes.Wingen@blackhillscorp.com

All study requests received from stakeholders will be reviewed and evaluated to determine the appropriate process for addressing. This planning process does not replace the System Impact Study process. Specific requests for transmission service or generation interconnection will continue to be studied pursuant to existing OATT processes.



http://www.oasis.oati.com/PSCO/PSCOdocs/FERC_890_customer_request_.pdf

Stakeholder Questions & Comments



Contact Information

Transmission Planning:

Betty Mirzayi Betty.Mirzayi@xcelenergy.com 303.571.7169

Tom Green <u>thomas.green@xcelenergy.com</u> 303.571.7223

Generator / Load Interconnection:

Melissa Crosby

Melissa.M.Crosby@xcelenergy.com

303.273.4679

Jennifer Baker

Jennifer.Baker@xcelenergy.com

303.273.4660



Next Meeting March 15, 2018 9:00 a.m.

