Colorado PUC E-Filings System

Appendix K:

CCPG Stakeholder Process

OCC Comments & Responses

to the CCPG

Northeast Colorado Studies

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.

Requester Information:	
Date:	26-Jun-15
Requester:	Chris Neil, Colorado Office of Consumer Counsel
Address:	1560 Broadway, Suite 200
State & Zip:	CO 80202
Requester Contact:	chris.neil@state.co.us
Title:	Rate/Financial Analysit
Phone Number:	303-894-2124
Email:	chris.neil@state.co.us

General Information:	
Study or Project Name:	OCC Comments Related to PSCo's SWEP and Expansion Alternative Analysis Presentation of June 17, 2015
New Study or Alternative:	Several alternatives are identified in the attached discussion. Those that pass an initial screening could be studied in detail.
Narrative Description:	See attached discussion.
Study Horizon Date:	Not specified in PSCo's presentation, though PSCo indicates a near-term consideration and long-term aspect.
Geographic Footprint Impacted:	Northeast Colorado, Greeley, TOT7, and South Weld
Load and Resource Modeling:	Oil and gas loads are the driving factor for transmission additions, as discribed in the attached document.
Transmission Modeling	Transmission modeling of the alternatives discussed in the attached document, for those that pass an initial screening.
Suggested Participants: (TP's, LSE's, Work Groups)	Northeast Colorado Work Group
Policy Issues to be Addressed: (SB100, RES, FERC, NERC, etc)	Not directly applicable. Could possibly be a related to SB 100 and RES.
Other Factors to be Considered:	Impacts both PSCo and Tri-State. Costs of the alternatives needs to be considered.
Type (Powerflow or Stability):	Powerflow modeling of the alternatives discussed in the attached document, for those that pass an initial screening.

Return To:	
CCPG Chair:	**Wes Wingen**
In care of:	**Black Hills Corporation**
Address:	**PO Box 1400**
City, State, Zip:	**Rapid City, SD 57709-1400**
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.

January 7, 2016

Chris Neil
Colorado Office of Consumer Council (OCC)
1560 Broadway, Suite 200
Denver, CO, 80202

Re. OCC comments to the Northeast Colorado (NECO) Subcommittee.

Dear Mr. Neil:

Thank you for your comments and suggestions for alternatives to be considered by the NECO Subcommittee. Your meaningful participation in the planning process for Northeast Colorado, and all the other CCPG subcommittees for that matter, is valuable and helps ensure that transmission planning in Colorado is done on a comprehensive, transparent, and state-wide basis.

This letter is a summary of how CCPG has either addressed or plans to address your comments and suggestions for alternatives.

You provided formal input to the NECO Subcommittee on two occasions: June 26, 2015 and October 13, 2015. In response, CCPG formed an ad-hoc task force, consisting of members of the NECO Subcommittee, to review and categorize your input. Follow up meetings where held on September 17, 2015 and December 2, 2015.

Your input submitted on June 26th consisted of fifteen sections, several of which contained multiple comments and suggestions for alternatives. The task force drafted diagrams of each of your proposed transmission alternatives during the meeting on September 17th, primarily so that they could confirm their understanding of your suggestions.

Your October 13th comments consisted of additional northern Greeley alternatives resulting from the September 17th meeting.

On December 2, the task force again convened with you to ensure that each alternative was understood by the subcommittee.

Of the fifteen sections of input submitted on June 26th, eight were for comment only. We reflected on your comments and discussed them with you during the September 17th and December 2nd follow up meetings. These were numbered 1, 2, 6, 7, 12, 13, 14, and 15.

Some of the alternatives were in lieu of transmission projects already under construction. Tri-State has received a Certificate of Public Convenience and Necessity (CPCN) from the Colorado Public Utilities Commission (PUC) and is presently constructing SWEP. Some of the alternatives proposed in your June 26th input contemplate changing the SWEP plans, which is not practical at this stage. Therefore, alternatives that modify the current SWEP plans were not analyzed, as was discussed during the follow

up meetings. These were numbered 3a, 4b, 4c1, 4c2, 5a, 5a2, 5c, 5d, 5e1, 5e2, 9a, 9b, 10a, 10b, 10c, 11a, 11b, 11c, and 11d1.

Also, some of the alternatives were electrically similar and were therefore combined.

A parred down list of alternatives to be considered by the NECO Subcommittee was developed through this process. The table below summarizes what the ad-hoc task force considers to be the remaining suggestions. The table also lists some of the potential benefits of your suggestions and how CCPG and the NECO Subcommittee will consider them in the future.

Alternative/Suggestion	**Consideration**
New Ennis – Rattlesnake Ridge 115 kV.	This addition would provide looped transmission service to Ennis Substation This may be considered by NECO in the future depending on load development at Ennis and the southern SWEP system
New Ennis – "Ennis South" 115 kV.	"Ennis South" is a new substation on the Pawnee – Ft. Lupton 230kV line. This addition could provide a strong transmission source to Ennis. This may be considered by NECO in the future depending on load development at Ennis and the southern SWEP system.
New "Rattlesnake South" substation.	This substation would connect one or both 230kV lines that run south of Rattlesnake Ridge and also tie to the SWEP lines. This may be considered by NECO in the future depending on load development on the southern SWEP system.
Convert the South Kersey – Kersey West 115 kV line to a double-circuit line.	This is being considered by Tri-State and PSCo.
New Neres – Box Elder – Willoby 115 kV line.	This addition would provide looped transmission service to Box Elder. This may be considered by NECO in the future depending on load development on the northern SWEP system.
Construct Ault – New Ault – New Eaton – New Pleasant Valley – Lucerne – Monfort as a double-circuit 115 kV line rather than a single-circuit line.	Replaces old 44 kV lines with new 115 kV and completes the 115 kV loop around Greeley from the north to east. Also, with the closure of the Godfrey – Ft. Lupton line and the addition of SWEP, a double circuit line would essentially create two new paths from Ault to Denver. This will be considered by the NECO Subcommittee in the future.
Construct Ault – New Ault – New Eaton – New Pleasant Valley – Lucerne – Monfort as a 230 kV line rather than a 115 kV line.	Initially operated at 115 kV. This is consistent with the long-term plan that new load serving lines should be designed to be 230 kV capable. This will be considered the NECO Subcommittee in the future.

This letter summarizes how CCPG has addressed or plans to address your comments and suggestions for alternatives regarding transmission developments in northeastern Colorado. If you do not feel they have been or will be adequately addressed, please let me know as soon as possible.

Again, thank you for your participation and contributions to CCPG's transmission planning efforts. Please feel free to contact me or the NECO Subcommittee Chair, Mike Rein, with any other concerns or questions.

Sincerely,

Jeremy Brownrigg
Vice-Chair, Colorado Coordinated Planning Group
(970) 266-7979
Email: brownriggj@prpa.org

CC: NECO Subcommittee

OCC Comments Regarding PSCo's June 17, 2015 Presentation Titled
SWEP and Expansion Alternative Analysis

The Office of Consumer Counsel ("OCC") provides the following informal comments and suggestions for alternatives that could be considered in comparison with the alternatives discussed by PSCo on June 17, 2015. If any of the alternatives are deemed promising, they could be advanced to more detailed analysis and modeling.

There appeared to be some alternatives that PSCo did not consider. Tri-State also indicated that slower load growth may lead it to consider more incremental transmission additions.

Nothing in these comments should be construed as an endorsement of any alternative or approval by the OCC of any alternative.

1. Projected loads drive transmission needs. Tables 1 and 2 below summarize the loads studied by PSCo from slides 7 and 9 of PSCo's presentation. PSCo states that it has 47 MW of existing load. Table 1 below summarizes the loads for PSCo's "base case" that includes 110 MW of new PSCo load. Table 2 summarizes the loads that PSCo apparently considered in Alternative No. 4 that includes 195 MW of new PSCo loads. Loads were split between Tri-State and PSCo by substation. The Milton and Neres Canal loads were listed together in PSCo's presentation, so the split between Tri-State and PSCo is not clear. In these discussions, all of the load at Milton/Neres Canal has been assigned to PSCo. The PSCo loads are probably a little on the high side, therefore.

   The oil and gas loads are uncertain with the recent decline in oil and gas prices. Yet the loads drive the need for the transmission facilities. The loads need to be provided to the Commission in order to justify the new transmission facilities, and there needs to be confidence in the load projections.

   Oil and gas load development will drive transmission development, but oil and gas development could result in some less than optimal solutions. For example, if oil and gas loads develop at Ennis before there is enough load to add the Rattlesnake Ridge substation, then the Eniss South substation may need to be built even though the Eniss-Rattlesnake Ridge transmission line would have been less expensive.

Table 1 Northeast Colorado Oil and Gas Loads and Transmission Requirements					
Base with 110 MW of New PSCo Load					
From PSCo NECO Presentation of June 17, 2015					
Megawatts					
	Tri-State	PSCo	Total		
Northern Substations					
Rosedale		42	42		
South Kersey	12		12		
Milton/Neres Canal		25	25	T/P Spllit?	
Box Elder		52	52		
North Total	**12**	**119**	**131**		
Southern Substations					
Rattlesnake Ridge	120		120		
Colfer	74		74		
Ennis		63	63		
South Total	**194**	**63**	**257**		
Total NECO	**206**	**182**	**388**		

Table 2 Northeast Colorado Loads for Alternative No. 4				
Alternative 4 with 195 MW of New PSCo load				
From PSCo NECO Presentation of June 17, 2015				
Megawatts				
	Tri-State	PSCo	Total	
Northern Substations				
Rosedale		65	65	
South Kersey	12		12	
Milton/Neres Canal		25	25	T/P Spllit?
Box Elder		80	80	
North Total	**12**	**170**	**182**	
Southern Substations				
Rattlesnake Ridge	120		120	
Colfer	74		74	
Ennis		97	97	
South Total	**194**	**97**	**291**	
Total NECO	**206**	**267**	**473**	
Additional Load Split Calculation				
	Start	Pct of Total		
Rosedale	42	26.8%	65	
Box Elder	52	33.1%	80	
Ennis	63	40.1%	97	
Total	157	100.0%	242	
Additional 85 MW				

Southern Substations

2. PSCo's presentation seemed to focus on additional loads in the Rosedale-Milton-Box Elder area. Tables 1 and 2 show, however, that the majority of the load is located near the southern substations and that there is significant load in the Ennis-substation area in particular.

3. Rattlesnake Ridge-Ennis. One alternative that could be considered to improve the southern system load serving capability and reliability is a transmission line from Rattlesnake Ridge to Ennis. This appears to be a distance of about five to six miles on the attached transmission map.[1] This transmission connection is expected to have modest costs because it would not require any additional substations to be built (assuming Rattlesnake Ridge is built). This transmission line would loop in Ennis and, therefore, improve the reliability in the Ennis area.

[1] Originally Exhibit DPK-2 from Proceeding No. 14A-0287E. The map shows the sections from the township and range division of the west, and sections are assumed to be about 1 miles on a side.

This transmission line would also improve the reliability of Rattlesnake Ridge when the Rattlesnake Ridge to Greenhouse transmission line was out.

This Rattlesnake Ridge-Ennis line will also be identified in several of the alternatives discussed below. In some situations, a double circuit line might be appropriate.

a. An initial option might start with Greenhouse to Rattlesnake Ridge to Ennis. More transmission components could be added as load grew.

4. Add connection to Ennis from Pawnee-Ft. Lupton transmission line.
    a. New substation south of Ennis. Another alternative would be to build a new 230 kV-115 kV substation on the Pawnee-Ft. Lupton line south of Ennis, called Ennis South in this discussion. Ennis South would improve the reliability between it and the Ft. Lupton substation. Ennis South could reduce the transmission line to Ennis to only a one-mile radial line or the line could be converted to double circuit for greater reliability depending on the loads in the Ennis area.
    b. A variation on the above is to cut the 230 kV Pawnee-Ft. Lupton line and run it up one side of double circuit transmission towers to Ennis and back down the other side of the poles. This would locate the 230 kV substation at Ennis. This would appear to enable a substantial amount of load to be served in the Ennis area.
    c. Could Tri-State serve its Rattlesnake Ridge loads from the east at Ennis? Or the Rattlesnake Ridge-Ennis line and Rattlesnake Ridge substation could be built to serve loads in Rattlesnake Ridge area. As loads grew, then the Greenhouse to Rattlesnake Ridge line could be added.
    d. Replacing the conductor on the Ft. Lupton to Ennis line should be considered at some point (that seemed to be mentioned someplace).

5. Connect Rattlesnake Ridge to PSCo lines south of there.
    a. Another alternative might be to add a substation south of Rattlesnake Ridge on the PSCo lines. This new substation is called Rattlesnake South in this discussion. The suggested location for this substation is at the point that the Ft. Lupton to Ennis line comes up to the Pawnee-Ft. Lupton and Ft. St. Vrain-Keenesburg lines (see Exhibit DPK-2). From this point, and assuming transmission lines follow section lines and make square corners, it would be about two to three miles to Rattlesnake Ridge. Placing it here has the advantage of being able to connect to the Ft. Lupton-Ennis line and thereby improve the reliability between Rattlesnake South and Ft. Lupton.
        i. It might be possible to serve the initial Rattlesnake Ridge area loads directly from Rattlesnake South and then add the Rattlesnake Ridge substation as loads increased.
        ii. The Greenhouse to Rattlesnake Ridge line could also be added as load grew.
        iii. Tri-State stated in the SWEP case that it preferred using its own lines. One alternative as load grew would be that instead of adding the Greenhouse to Rattlesnake Ridge transmission line, this new line would go from Greenhouse to Rattlesnake South and then up to Rattlesnake Ridge. This would then be entirely a Tri-State line with an additional connection to PSCo at Rattlesnake South.

b. From Rattlesnake South, Ennis would now be a radial line of about 5 miles, which is much shorter than it is now. The Rattlesnake South-Ennis line could be converted to double circuit to improve reliability, or the Rattlesnake Ridge-Ennis line could be added to loop in Ennis.
c. It is not clear whether it would be better to connect this Rattlesnake south substation to the Pawnee-Ft. Lupton line or the Ft. St. Vrain-Keenesurg line, which is part of PSCo's outer transmission belt. The Ft. St. Vrain-Keenesburg line might be preferred if there was going to be an eventual connection to Ault because it would flow to PSCo's outer transmission belt.
d. It might be interesting to consider connecting both the Pawnee-Ft. Lupton and Ft. St. Vrain-Keensburg 230 kV transmission lines at Rattlesnake South. This would mean that the Pawnee connection would include PSCo's outer transmission belt, and Pawnee would have connections directly with the Ft. St. Vrain, Ft. Lupton and Keenesurg substations. If the Pawnee line were upgraded to 345 kV, it might stop at Rattlesnake South given all the connections there.
e. As above with Ennis South, an alternative would be to cut one of PSCo's 230 kV lines and run it up and back on double circuit transmission towers to Rattlesnake Ridge. The 230 kV substation would then be located at Rattlesnake Ridge. This alternative would be start directly south of Rattlesnake Ridge and would require only a one mile diversion of the 230 kV transmission line (and would not connect to the Ft. Lupton-Ennis line). This alternative would create a strong connection at Rattlesnake Ridge and would eliminate the cost of one substation (Rattlesnake South).
    i. The Rattlesnake Ridge to Ennis line could be built to loop in Ennis.
    ii. The Greenhouse to Rattlesnake Ridge line could be added as load grew.
    iii. Again in consideration of Tri-State's desire to use its own lines, the transmission line from Greenhouse substation could go up to the takeoff point of this new diversion. It would connect at that point to the line going to Rattlesnake Ridge. PSCo's line would be re-connected so that it did not divert to Rattlesnake Ridge. The Greenhouse-Rattlesnake Ridge line would then be entirely Tri-State's, and there would no longer be a connection with PSCo.

Northern Substations

6. Rattlesnake Ridge to Milton/Neres Canal. It is not clear what triggers the need to add a connection between the southern system's Rattlesnake Ridge substation and the northern system's Milton/Neres Canal. If there is a strong connection in the south as discussed above, then the southern system may not need a connection to the north until substantial new load has been added.

7. Rosedale Substation. Tables 1 and 2 above show the load at Rosedale substation is projected to range from 42 MW to 65 MW. Because Rosedale has many transmission connections; it would appear that Rosedale should be able to handle load of tis magnitude.

8. South Kersey substation. South Kersey is an existing 115 kV substation. Table 1 shows a load of 12 MW at South Kersey, which is not changed in Table 2, and the substation should be adequate to handle loads of this magnitude.
    a. Eventually Kersey West-South Kersey may need to be converted to double circuit.

9. Milton/Neres Canal substations. Table 1 shows a load of 25 MW at Milton/Neres Canal (this load is not changed in Table 2). It appears that Milton is an existing, PSCo 44 kV substation. Milton may be able to serve the load in the area until it grows beyond a certain point. Milton might even be able to serve all the 25 MW of load except for the additional load at Box Elder.
    a. Adding a 115 kV transmission line and the Neres Canal substation would improve the ability to serve the load in the area.
    b. Since South Kersey to Milton/Neres Canal will be a new transmission line, it should be built as double circuit or double circuit poles with just one side installed in order to accommodate additional load growth or reliability considerations.

10. Box Elder substation. Box Elder is expected to have the largest load among the northern substations: 52 MW in the base case and 80 MW in Alternative 4. PSCo appears to increase the Milton/Neres Canal-Box Elder transmission line to 115 kV in order to accommodate this additional load. However, this is a radial line to Box Elder.
    a. Loop in Box Elder. It would be good to loop in Box Elder somehow. One alternative might be to extend a line from Box Elder to Willoby. This would result in a Willoby-Box Elder-Milton/Neres Canal-South Kersey loop. Powerflow modeling would be necessary to confirm it, but it would appear that this 115 kV loop would be able to meet the projected loads at the substations in this loop that total 89 MW (Base) to 117 MW (Alternative 4).
        i. That is, this loop could handle these loads without the connection to the southern substations. Adding the Rattlesnake Ridge-Milton/Neres Canal connection would further enhance the reliability of this system.
    b. If one of the southern alternatives results in a strong substation at Ennis, PSCo may be tempted loop in Box Elder by connecting it to Ennis. It does not appear to be that much farther from Box Elder to Ennis than it is from Box Elder to Willoby. This might create a SWEP East alternative. This also could result in a semi-direct connection from Pawnee to Greeley.
    c. Is 69 kV reasonable for the lines in the Milton and Box Elder areas? If the oil and gas loads end up being revised towards the lower end of the range, would 69 kV be adequate to serve them? 69 kV seems to have been a standard in many rural applications. Of course, that was when the connection was mostly with farm loads and not large oil and gas loads.

11. Rosedale-Kersey West alternatives:
    a. Re-conductor Rosedale-Kersey West (part of PSCo's Alt. 3).
    b. Does a stronger southern system or the addition of the Box Elder-Willoby connection eliminate the need for a second circuit on the Rosedale-Kersey West line to address the Alt 0-Limiting Contingencies (Slide 6)?

c. Convert 115 kV Rosedale-Kersey West to double circuit
d. Convert to 115 kV the existing 44 kV Milton-LaSalle line and add a new 115 kV substation near La Salle on the Weld-Rosedale line. This is basically parallel to and provides a second circuit like a second Rosedale-Kersey West circuit.

12. 230 kV Weld-Rosedale-Milton Recommendation. PSCo recommendation is a 230 kV Weld-Rosedale-Milton alternative (Alternative No. 4 in its presentation). Table 1 and Table 2 show that the need for this upgrade is based on approximately 119 MW of new PSCo load at the northern substations in the base case and 170 MW of new PSCo load at the northern substations in Alternative No. 4. This 230 kV configuration seems excessive given the loads in the area and their locations.

13. Ault-Rosedale Alternative. A long term consideration shown in PSCo's presentation is to connect Ault with Rosedale (slide 14). This line could help address issues in the larger area, such as TOT7 limitations. This Ault-Rosedale line also appears to address the same issues among the northern substations that PSCo's proposed Weld-Rosedale-Milton line aaddresses. PSCo seems to prefer to eventually add both the Weld-Rosedale-Milton 230 kV line and the Ault-Rosedale 230 kV line.

    It appears that only one of these two lines should be built. Weld-Rosedale-Milton is less expensive than Ault-Rosedale. If Ault-Rosedale is not going to be built, then Weld-Rosedale-Milton is the less expensive alternative. But if both lines are going to be considered, then adding just Ault-Rosedale is less expensive than building both the lines.

14. Ault-Kersey West instead of Ault-Rosedale depending on who was building the line and where the oil and gas loads develop. PSCo may prefer Ault-Rosedale; Tri-State may prefer Ault-Kersey West.
    a. Going to Kersey West could eliminate the need for a second circuit on the Rosedale-Kersey West line if the focus is on the oil and gas loads to the east.
    b. That could leave a weak link to Greeley, however.

15. Cost of alternatives. The cost of the alternatives has not been provided, and cost is obviously an important consideration.

Northeast Colorado Transmission Committee
Additional Northern Greeley Alternatives Resulting from the 9/17/2015 Meeting
From the Office of Consumer Counsel after review with PUC Staff

Northern Greeley Alternatives

PSCo's proposed Ault-New Ault-New Eaton-New Pleasant Valley-Lucerne-Monfort ("Northern Greeley") replaces 44 kV with 115 kV and completes the 115 kV loop around Greeley from the north to east.

1. Double-Circuit 115 kV. PSCo is proposing a single-circuit 115 kV line. We suggest also studying a double-circuit 115 kV line from Ault to Monfort.
    a. With the closure of the Godfrey to Ft. Lupton line and the addition of SWEP, a double circuit line would essentially create two new paths from Ault to Denver.

2. 230 kV Capable Line initially operated at 115 kV. PSCo is proposing a single-circuit 115 kV line from New Ault to Monfort. We suggest also studying building this line as a 230 kV capable line that would initially be operated at 115 kV.
    a. This would involve determining whether PSCo can obtain sufficient right-of-way to upgrade from 44 kV to 230 kV from Ault to Monfort.
    b. Eventually, the sections from Monfort to Rosedale to Kersey West and down to SWEP could also be considered for conversion to 230 kV.
    c. This is consistent with the long-term plan that new load serving lines should be designed to be 230 kV capable.

ALTERNATIVE ROUTES

9/4/2015

230 kV System — Proposed
115 kV System — Proposed
44 kV System — Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT 115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
JOHNSTOWN
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
MILTON
GODFREY BREAKER STATION
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

ALTERNATIVE
ROUTES

9/4/2015

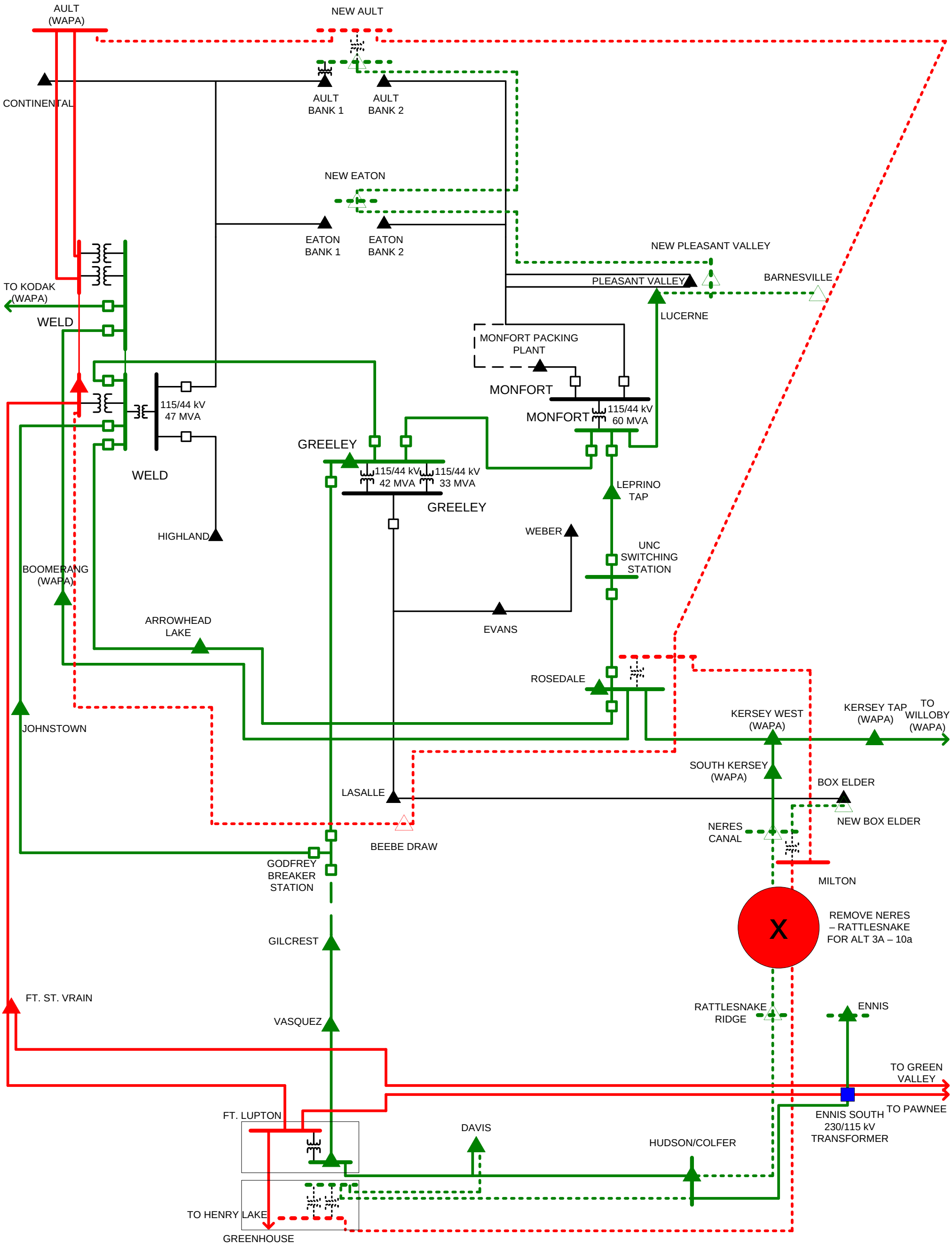
230 kV System
115 kV System
44 kV System
Proposed
Proposed
Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT
115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
ARROWHEAD LAKE
EVANS
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
JOHNSTOWN
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
GILCREST
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

ALTERNATIVE
ROUTES

9/4/2015

230 kV System — Proposed
115 kV System — Proposed
44 kV System — Alternatives



ALTERNATIVE ROUTES

9/4/2015

230 kV System
115 kV System
44 kV System
Proposed
Proposed
Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT 115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
ARROWHEAD LAKE
EVANS
ROSEDALE
JOHNSTOWN
KERSEY WEST (WAPA)
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SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
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TO PAWNEE
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GREENHOUSE

ALTERNATIVE
ROUTES

9/4/2015

230 kV System — Proposed
115 kV System — Proposed
44 kV System — Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT 115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
ARROWHEAD LAKE
EVANS
ROSEDALE
JOHNSTOWN
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
GILCREST
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
ENNIS SOUTH 230/115 kV TRANSFORMER
TO HENRY LAKE
GREENHOUSE

ALTERNATIVE
ROUTES

9/4/2015

230 kV System
115 kV System
44 kV System
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Proposed
Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
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MONFORT 115/44 kV 60 MVA
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WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
ARROWHEAD LAKE
EVANS
ROSEDALE
JOHNSTOWN
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

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9/4/2015

230 kV System — Proposed
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NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
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PLEASANT VALLEY
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LUCERNE
TO KODAK (WAPA)
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MONFORT 115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
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NERES CANAL
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BEEBE DRAW
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GILCREST
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
RATTLESNAKE SOUTH SUB 230/115 TRANSFORMER
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

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230 kV System
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44 kV System
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AULT (WAPA)
NEW AULT
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AULT BANK 1
AULT BANK 2
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PLEASANT VALLEY
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MONFORT 115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
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SOUTH KERSEY (WAPA)
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LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
MILTON
GODFREY BREAKER STATION
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
GILCREST
FT. ST. VRAIN
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ENNIS
VASQUEZ
TO GREEN VALLEY
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DAVIS
HUDSON/COLFER
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GREENHOUSE

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44 kV System
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PLEASANT VALLEY
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MONFORT
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GREELEY
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115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
JOHNSTOWN
SOUTH KERSEY (WAPA)
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LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
GILCREST
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
RATTLESNAKE SOUTH SUB 230/115 TRANSFORMER
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

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230 kV System
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NEW EATON
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PLEASANT VALLEY
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LEPRINO TAP
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KERSEY WEST (WAPA)
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TO WILLOBY (WAPA)
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SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
GILCREST
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
VASQUEZ
RATTLESNAKE RIDGE
ENNIS
RATTLESNAKE SOUTH SUB 230/115 TRANSFORMER
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

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230 kV System
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EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT
115/44 kV 60 MVA
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WELD
GREELEY
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115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
JOHNSTOWN
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
RATTLESNAKE SOUTH "SUPRER SUB" 230/115 TRANSFORMER
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

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NEW EATON
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PLEASANT VALLEY
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MONFORT 115/44 kV 60 MVA
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BOOMERANG (WAPA)
EVANS
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LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
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MILTON
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
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FT. LUPTON
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HUDSON/COLFER
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GREENHOUSE

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230 kV System
115 kV System
44 kV System
Proposed
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AULT BANK 1
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NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
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MONFORT
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GREELEY
115/44 kV 42 MVA
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GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
ARROWHEAD LAKE
EVANS
ROSEDALE
JOHNSTOWN
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
GILCREST
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
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DAVIS
HUDSON/COLFER
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GREENHOUSE

ALTERNATIVE
ROUTES

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230 kV System
115 kV System
44 kV System
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Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT
115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
JOHNSTOWN
SOUTH KERSEY (WAPA)
BOX ELDER
LASALLE
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
MILTON
GODFREY BREAKER STATION
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
TO HENRY LAKE
GREENHOUSE

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230 kV System — Proposed
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44 kV System — Alternatives

AULT (WAPA)
NEW AULT
CONTINENTAL
AULT BANK 1
AULT BANK 2
NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
LUCERNE
TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
MONFORT
MONFORT 115/44 kV 60 MVA
115/44 kV 47 MVA
WELD
GREELEY
115/44 kV 42 MVA
115/44 kV 33 MVA
GREELEY
LEPRINO TAP
HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
EVANS
ARROWHEAD LAKE
ROSEDALE
JOHNSTOWN
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
DOUBLE CIRCUIT
SOUTH KERSEY (WAPA)
LASALLE
BOX ELDER
NERES CANAL
NEW BOX ELDER
BEEBE DRAW
GODFREY BREAKER STATION
MILTON
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
ENNIS
VASQUEZ
TO GREEN VALLEY
TO PAWNEE
FT. LUPTON
DAVIS
HUDSON/COLFER
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GREENHOUSE

ALTERNATIVE
ROUTES

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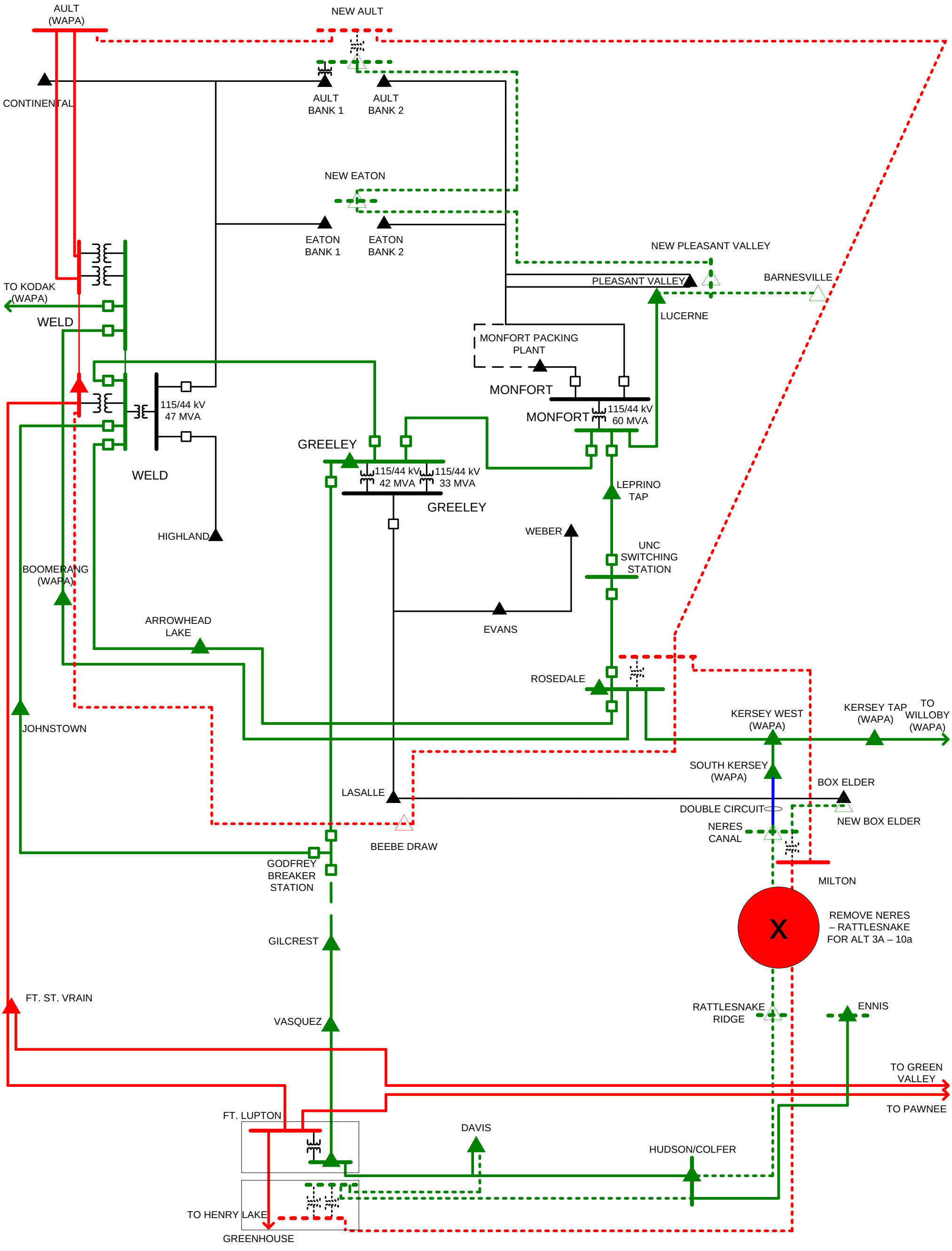
230 kV System — Proposed
115 kV System — Proposed
44 kV System — Alternatives



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ROUTES

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230 kV System
115 kV System
44 kV System
Proposed
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AULT (WAPA)
NEW AULT
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AULT BANK 1
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NEW EATON
EATON BANK 1
EATON BANK 2
NEW PLEASANT VALLEY
PLEASANT VALLEY
BARNESVILLE
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TO KODAK (WAPA)
WELD
MONFORT PACKING PLANT
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MONFORT 115/44 kV 60 MVA
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GREELEY
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GREELEY
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HIGHLAND
WEBER
UNC SWITCHING STATION
BOOMERANG (WAPA)
ARROWHEAD LAKE
EVANS
ROSEDALE
JOHNSTOWN
KERSEY WEST (WAPA)
KERSEY TAP (WAPA)
TO WILLOBY (WAPA)
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BOX ELDER
LASALLE
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NERES CANAL
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MILTON
GILCREST
X
REMOVE NERES – RATTLESNAKE FOR ALT 3A – 10a
FT. ST. VRAIN
RATTLESNAKE RIDGE
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AULT BANK 1
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MONFORT PACKING PLANT
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MONFORT 115/44 kV 60 MVA
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GREENHOUSE

ALTERNATIVE
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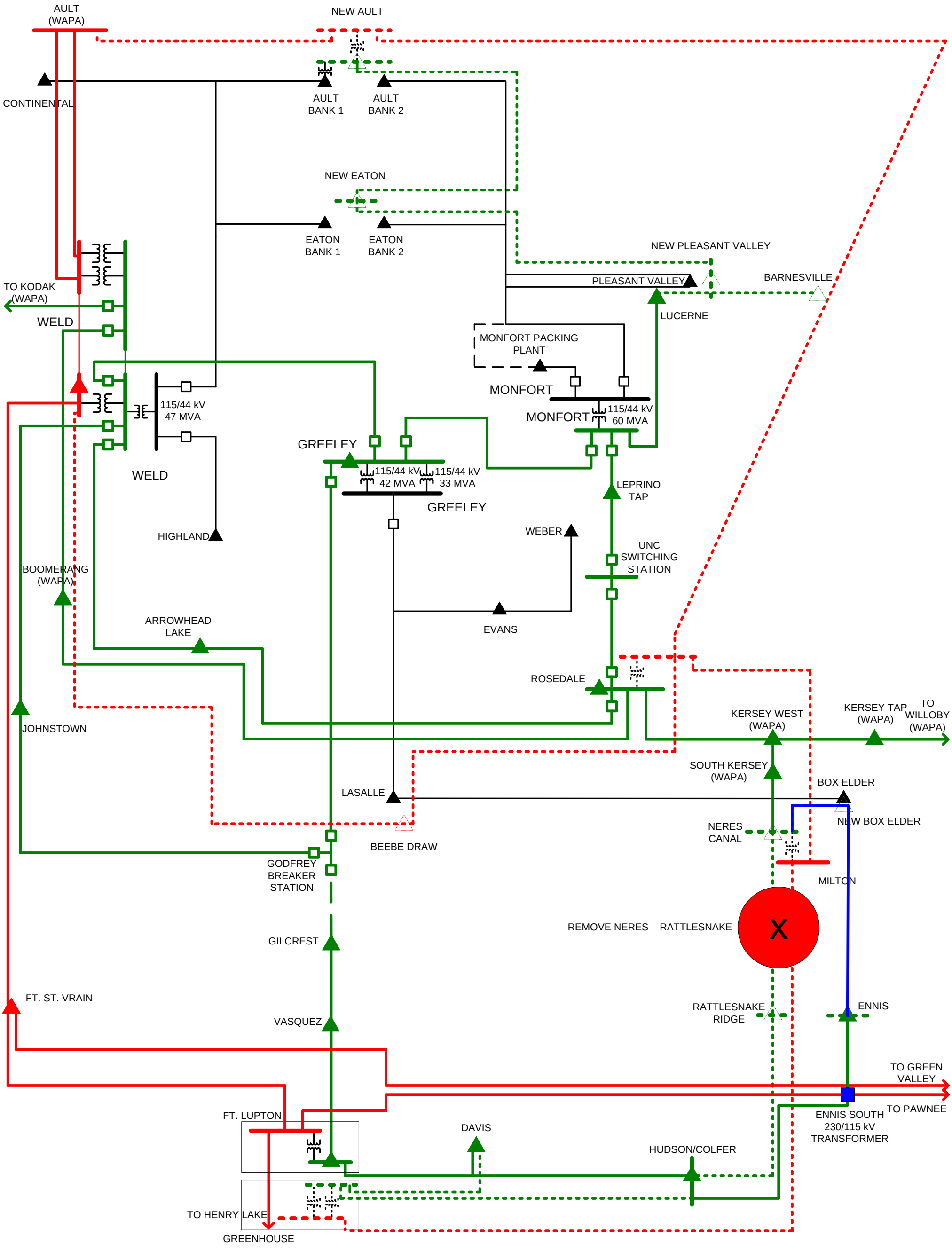
230 kV System — Proposed
115 kV System — Proposed
44 kV System — Alternatives



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230 kV System
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BEEBE DRAW
MILTON
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REMOVE NERES – RATTLESNAKE
X
GILCREST
FT. ST. VRAIN
RATTLESNAKE RIDGE
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