Appendix M

Tri-State Generation and Transmission Association, Inc.

CCPG Stakeholder Comments

Tri-State held its most recent annual FERC Order 890 and Colorado Rule 3627 Stakeholder Outreach meetings on October 8, 2020, and October 15, 2021. During these annual meetings, stakeholder comments were solicited, and stakeholders were asked to submit their comments through the CCPG stakeholder request form. No stakeholder comments were received.

Tri-State received significant stakeholder input as a part of the CCPG Responsible Energy Plan Task Force ("REPTF"). Seven REPTF meetings were held in 2021 and included participation from 59 stakeholders. Stakeholder input was openly discussed during meetings and documented in the meeting minutes. Meeting minutes for all REPTF meeting are posted to the following REPTF webpage: https://doc.westconnect.com/Documents.aspx?NID=19324.

Additional stakeholder input in the REPTF was received through e-mail and are attached to the end of this Appendix. A summary of alternatives and analysis requested, and narrative responses is provided below. All analysis performed can be found in the REPTF Study Report found in Appendix O.

- Chris Neil (April 12, 2021, e-mail)
  - Requested standalone injection capability be performed.
  - Requested that upgrading Big Sandy-Burlington to 100 deg C be considered.

RESPONSE: Tri-State performed standalone injection capability analyses as part of the REPTF studies and the results are documented in the REPTF Study Report. Tri-State supported evaluation of alternatives that leveraged existing infrastructure and, as a result, included Alternatives 11-14 that evaluated upgrading the Big Sandy-Burlington 230 kV line to 100 deg C. The analyses conducted on Alternatives 11-14 are documented in the REPTF Study Report.

- Chris Neil (April 13, 2021, e-mail)
  - Asked whether the 115 kV line that shares towers with the Story-Henry Lake 230 kV could be easily converted to 230 kV.
  - Asked that an alternative include a Big Sandy – Story 230 kV line.

RESPONSE: Tri-State did not include any alternatives in the REPTF studies that converted the 115 kV line that shares towers with the Henry Lake-Story 230 kV line to 230 kV. The rationale for not including any such alternatives is that the 115 kV line conversion to 230 kV would be costly due to the numerous 115 kV substations served by the 115 kV line. Tri-State supported evaluation of an alternative with a direct Big Sandy – Story 230 kV line and, as a result, included Alternatives 12-14. The analyses conducted on Alternatives 12-14 are documented in the REPTF Study Report.

- Chris Neil (April 14, 2021, e-mail)
    - Requested that upgrading Big Sandy-Burlington to 100 deg C be studied.
    - Requested that upgrading Wray-Story to 100 deg C be studied.

RESPONSE: Tri-State supported evaluation of alternatives that leveraged existing infrastructure and, as a result, included Alternatives 11-14 that evaluated upgrading the Big Sandy-Burlington 230 kV line to 100 deg C. The analyses conducted on Alternatives 11-14 are documented in the REPTF Study Report. Tri-State did not include any alternatives that considered upgrades to the Wray-Story 230 kV line to 100 deg C. The rationale for not including any such alternatives is the Wray-Story 230 kV line was not observed as a transmission constraint in the standalone injection studies or any alternative analysis in the REPTF Study Report. Therefore, upgrades to the Wray-Story 230 kV line were found to not be needed to meet the objectives and needs of the REPTF studies.

- Larry Miloshevich (May 2, 2021, e-mail)
    - Requested that sensitivity studies be considered that include Dynamic Line Ratings and Topology Optimization.
    - Requested that sensitivity studies be considered that apply ATT to the base case.

RESPONSE: Tri-State included discussion and evaluation of Dynamic Line Rating, Topology Optimization, and ATT in the REPTF meeting and studies, respectively. REPTF Alternative 1 evaluated such technologies on the existing transmission system, and REPTF sensitivity studies evaluated the potential of ATT (power flow control) to enhance the proposed transmission alternatives that were able to meet all the REPTF objectives and needs. The rationale for not including Dynamic Line Rating in sensitivity studies is due to Dynamic Line Ratings being a real-time, operational tool and not applicable to transmission planning which is performed with static line ratings. The rationale for not including Topology Optimization in sensitivity studies is due to the nature of the eastern Colorado transmission system. Specifically, Topology Optimization would create normally open points on the existing 115 kV transmission system and thereby reduce reliability to existing customers in eastern Colorado. The analysis and challenges associated with Dynamic Line Ratings, Topology Optimization, and ATT are discussed in the REPTF Study Report.

- Connie Paoletti (May 3, 2021, e-mail)
    - Requested the addition of six alternatives with connections to the Xcel Energy transmission system at Pawnee, Cheyenne Ridge West, and/or Tundra Substations.

RESPONSE: Tri-State supported the evaluation of alternatives that provided connectivity to other transmission owners at Pawnee, Cheyenne Ridge West, and/or Tundra substations. As a result, Tri-State included Alternatives 4, 5, 6, 8, 9, and 10 in the REPTF

studies. The analyses conducted on Alternative 4, 5, 6, 8, 9, and 10 are documented in the REPTF Study Report.

- Mark Detsky (May 13, 2021, e-mail)
    - Requested a double circuit 345 kV structure design be considered in the analysis.

RESPONSE: Tri-State did not consider REPTF alternatives that included double circuit 345 kV due to the lack of need for such large and costly construction. All alternatives in the REPTF studies considered only single circuit 230 kV and/or 345 kV and were found to be sufficient to meet the identified objectives and needs. The analysis is summarized in the REPTF Study Report found in Appendix O.

From: Neil - DORA, Chris <chris.neil@state.co.us>
Sent: Monday, April 12, 2021 5:38 PM
To: Hubbard, Ryan
Subject: [EXTERNAL] CCPG REPTF Kick Off Meeting and 400 MW in Eastern Colorado

Follow Up Flag: FollowUp
Flag Status: Completed

Ryan,

You started with two issues:
400 MW of injection in Eastern Colorado
Transmission across eastern Colorado and to New Mexico if possible

The 400 MW of injection in Eastern Colorado does not appear to be a problem. You might look for multiple smaller projects rather than a big one.

First, you need to provide Standalone Injection Capability at many locations. That gives everybody a starting point.

Some projects and capacities proposed in your old queue:

Keota TI-18-0720 200 solar + 80 MW storage or TI-20-0925B 170 solar + 85 MW storage
Story TI-19-1223 400 solar +320 MW Storage
Story-Banner-County, NE PSCo GI-2018-8 to -18 for 200 MW to 1,000 MW, plus possibility of a connection to SPP with an AC-DC Tie.
North Yuma to Story TI-19-082 200 MW
Story-Henry Lake 250 MW?
Wray because two 230 kV lines and two 115 kV lines
Big Sandy-Lincoln-Midway line PSCo GI-2020-12 400 MW especially when Lincoln CTs are not running. Seems like there could be more wind between Rush Creek I and Golden West right where your line goes.
Big Sandy-Burlington
- Upgrade line to 100 degrees C
- Additional 100 MW when CTs are not operating
- Dynamic line rating when it is windy

Craig-Ault 504 MW Rail Tie Wind Project
Vilas 100 MW?

Also a bunch of small solar or wind projects that mostly serve local load.

Thus, there does not appear to be any problem locating a total of 400 MW of wind (and some solar) in eastern Colorado.

A line across eastern Colorado is a different issue.

Talk to you on May 2.

Chris

Chris Neil
Rate/Financial Analyst

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From: Hubbard, Ryan
Sent: Wednesday, April 14, 2021 12:58 PM
To: Neil - DORA, Chris
Subject: RE: [EXTERNAL] CCPG REPTF Kick Off Meeting and 400 MW in Eastern Colorado

Hi Chris,
Thanks for the e-mail. You're correct that Standalone Injection Capability will be helpful. We'll be doing such analysis at the Burlington and Lamar substations, at a minimum, to give everyone a good starting point. Our hope is to have that information for our next task force meeting.

I've added a few notes to some of the projects/capacities you've provided from our old queue that may be helpful:

Keota TI-18-0720 200 solar + 80 MW storage or TI-20-0925B 170 solar + 85 MW storage

- TI-18-0720 relied upon upgrades assigned to TI-17-0225 (248.4MW on Laramie River Station-Wayne Child 345kV), which included a new 45 mile 230kV line and a 2nd 345/230kV 600MVA transformer at Wayne Child. A study report can be found on Tri-State's OASIS site for reference. Without TI-17-0225, the same transmission upgrades would likely be required for TI-18-0720.
    - TI-17-0225 has an executed LGIA with Tri-State, however is in suspension.
- TI-20-0925B was never studied. With a proposed POI at Keota, upgrades similar to those with TI-18-0720 and TI-17-0225 would likely be required.

Story TI-19-1223 400 solar +320 MW Storage

- TI-19-1223 was never studied. With the local generation and significant flows into Story from Wyoming, some amount of upgrade would likely be needed.

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- TI-19-0828 is the 200MW Niyol project interconnecting at North Yuma. It has a PPA with Tri-State is expected to be online later this year. The 400MW will be in addition to this.

Story-Henry Lake 250 MW?

- We've had a solar request on this line. The study, at the time, showed 101MW solar could be accommodated.

Wray because two 230 kV lines and two 115 kV lines

- Wray can be challenging because flows are predominately towards Story. From Wray, there is a single 230kV and a 115kV line towards Story. Loss of the 230kV line towards Story will force significant flows on the 115kV system. We can add Wray to the benchmarking study for confirmation.

Big Sandy-Lincoln-Midway line PSCo GI-2020-12 400 MW especially when Lincoln CTs are not running. Seems like there could be more wind between Rush Creek I and Golden West right where your line goes.

- The challenge with this line is the outage of the line towards Midway forces all flow north towards Big Sandy. With existing generation between Big Sandy and Burlington, the WAPA 115kV between Big Sandy and Beaver Creek (Story area) becomes overloaded.

Big Sandy-Burlington
Upgrade line to 100 degrees C
Additional 100 MW when CTs are not operating
Dynamic line rating when it is windy

- Big Sandy-Burlington and Wray-Story both could be benefit from uprating to 100 deg C. The former is included as part of Alternative 5.

- The challenge with assuming wind is used when CTs are not operating is that developers need high levels of certainty to gain financing to develop the projects. The certainty generally comes with firm transmission service. Since the CTs already have firm transmission service associated with them, we can't assume they are offline in Network Resource studies. Developers could request to be studied on a non-firm basis, which allows the CT's to be backed off, but would have a hard time getting financing.

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- TI-17-0830 was a 45MW wind project at Vilas. It required approximately $3M to accommodate the resource at this location. The challenge above this level, is getting west of Lamar.

Please let me know if you have any questions or concerns.

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From: Neil - DORA, Chris <chris.neil@state.co.us>
Sent: Tuesday, April 13, 2021 5:09 PM
To: Hubbard, Ryan
Subject: [EXTERNAL] Re: REPTF Meeting #2

Follow Up Flag: Follow up
Flag Status: Completed

Ryan,

A couple of thoughts on REPTF transmission:

Alternative 5 goes from Big Sandy to the Henry Lake line. Going to the Henry Lake line looks good for moving power from Big Sandy into Denver.

Also, the switching station out where it connects to the Henry Lake line could be a location for solar and wind projects to interconnect without the projects having to pay the full cost of a switching station. I've seen low cost proposals in this region that get hammered with the cost of an interconnection.

Can the 115 kV line that is on the same towers as the Story-Henry Lake line be converted to 230 kV easily and cheaply? That would provide more access into the north Denver area which seems to be a major load center for Tri-State.

Alternative No. 6 could be Big Sandy to Story. Kind of a variation of Alternative 5. Going to Story looks better for moving power across the Tri-State system, as opposed to sending power into Henry Lake and north Denver.

I would stop there with Alternative 6: simply Big Sandy to Story. Alternative 5 has more lines to the south, but they seem unnecessary.

Tri-State has a Big-Sandy to Midway line and part ownership of Midway to Boone. There are lots of lines from Midway and Boone to Comanche. These may not be Tri-State lines, but it seems like you can send power over them. Then there is Tri-State's Comanche-Walsenburg-Gladstone line. After Gladstone, I can't help you (no map of New Mexico).

The Big Sandy-Story line seems better than lines way out on the eastern plains like in Alternatives 1-3. That would depend on customer loads and line loadings in the various places, and I have not looked up the loads out in the east to see if more transmission is needed in the far east.

Another thought: is Lamar really that important of a place to put transmission? Is there that much load there? Alternative 1-3 all have lines to Lamar. Where do you go from Lamar - not to New Mexico? And the good wind seems to be south of Lamar near Springfield and Villas. It seems that the only reason lines are now proposed to go to Lamar is that somebody built a line there long ago.

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On Tue, Apr 13, 2021 at 3:54 PM Hubbard, Ryan <rhubbard@tristategt.org> wrote:

All,

As a reminder, please provide potential alternatives for discussion in advance of the next meeting so slides can be created to facilitate discussion.

Agenda will be provided in advance of the meeting.

Regards,

Ryan

Hi there,

Ryan Hubbard is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting

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Meeting ID: 963 5804 3394

Passcode: 854739

International numbers

From: Hubbard, Ryan
Sent: Wednesday, April 14, 2021 2:46 PM
To: Neil - DORA, Chris
Subject: RE: [EXTERNAL] Re: REPTF Meeting #2

Hi Chris,
Thanks for the thoughts and suggestions. I've added a few comments below.

Alternative 5 goes from Big Sandy to the Henry Lake line. Going to the Henry Lake line looks good for moving power from Big Sandy into Denver.

- That was the general thought. It provides an alternative connection to Story, as well as the Denver area.

Also, the switching station out where it connects to the Henry Lake line could be a location for solar and wind projects to interconnect without the projects having to pay the full cost of a switching station. I've seen low cost proposals in this region that get hammered with the cost of an interconnection.

- Good to know. We've had a single Interconnection Request on this line in the past, as referenced in my previous e-mail, but I have no idea of the prices associated with the output.

Can the 115 kV line that is on the same towers as the Story-Henry Lake line be converted to 230 kV easily and cheaply? That would provide more access into the north Denver area which seems to be a major load center for Tri-State.

- The 115kV line it parallels is WAPA's Beaver Ck-Adena-Hoyt 115kV. The 230kV construction (operated at 115kV) continues from Hoyt to Sand Creek Tap to Brighton to Erie. The conversion would require some amount of work: including moving the Beaver Creek 115kV connection to a nearby 230kV yard (likely Story), expansion of Adena to a 230/115kV yard, and expansion of Hoyt to a 230/115kV yard. The same would apply if the Hoyt-…-Erie section is converted. Erie is the only substation along the route with 230kV existing.

Alternative No. 6 could be Big Sandy to Story. Kind of a variation of Alternative 5. Going to Story looks better for moving power across the Tri-State system, as opposed to sending power into Henry Lake and north Denver.

- Hari requested this alternative during the meeting. We were going to a 5B with this wrinkle.

I would stop there with Alternative 6: simply Big Sandy to Story. Alternative 5 has more lines to the south, but they seem unnecessary.

- Could this be characterized as Alternative 5 without a Big Sandy-Boone 230kV connection? The Big Sandy-…-Burlington will likely be needed, and the Boone to Comanche-

Walsenburg 230kV line open up scheduling on the Tri-State transmission system to/from SE Colorado and NE New Mexico.

Tri-State has a Big-Sandy to Midway line and part ownership of Midway to Boone. There are lots of lines from Midway and Boone to Comanche. These may not be Tri-State lines, but it seems like you can send power over them. Then there is Tri-State's Comanche-Walsenburg-Gladstone line. After Gladstone, I can't help you (no map of New Mexico).

- You're correct that other transmission systems could be scheduled over, however many of these lines have little to no available transmission capacity. Additionally, use of other entities transmission systems by our network customers results in pancaking transmission rates, driving up their electric bills. Use of a single transmission provider's system is preferred by our network customers from a cost standpoint.

The Big Sandy-Story line seems better than lines way out on the eastern plains like in Alternatives 1-3. That would depend on customer loads and line loadings in the various places, and I have not looked up the loads out in the east to see if more transmission is needed in the far east.

- Most of the transmission system in eastern Colorado is 30+ years old and designed from a load serving standpoint. Studies have shown development of new resources in the Burlington area creates a domino effect of upgrades on the underlying system.

Another thought: is Lamar really that important of a place to put transmission? Is there that much load there? Alternative 1-3 all have lines to Lamar. Where do you go from Lamar - not to New Mexico? And the good wind seems to be south of Lamar near Springfield and Villas. It seems that the only reason lines are now proposed to go to Lamar is that somebody built a line there long ago.

- The Lamar area requires new transmission to reliably serve the load under peak load conditions for the loss of Boone-Lamar 230kV. Today with the loss of the 230kV line, all PSCo generation and the DC tie trip offline at Lamar, and the Lamar area load is served by the remaining 115kV line from Boone which has its limits. The alternatives from a Tri-State transmission system standpoint, are north to Burlington, west to Boone, or south to New Mexico. There is limited capacity out of NE New Mexico, a recent Generator Interconnection Study identified $400+ million in upgrade costs to bolster the system west of Gladstone.

Please let me know if you have any questions or concerns.

Thanks,

Ryan

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Telephone

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Dial: US: +1 720 928 9299 or +1 206 337 9723 or +1 213 338 8477 or +1 346 248 7799 or +1 312 626 6799 or +1 646 518 9805

Meeting ID: 963 5804 3394

Passcode: 854739

International numbers

From: Neil - DORA, Chris <chris.neil@state.co.us>
Sent: Wednesday, April 14, 2021 1:56 PM
To: Hubbard, Ryan
Subject: [EXTERNAL] Re: [EXTERNAL] CCPG REPTF Kick Off Meeting and 400 MW in Eastern Colorado

Follow Up Flag: Follow up
Flag Status: Completed

Ryan,

Thanks for the detailed response.

The situation seems to be:

Keota-LRS: TI-17-0225 for 248.4 MW Wind on suspension with quite a bit required (45 mile line, 345-230 Xformer).

Story: Some amount of upgrades required.

N. Yuma to Story: 200 MW Niyol project being added. Not much additional capacity???

Story-Henry Lake: 101 MW solar available.

Wray: Limited by 115 kV. Quick check in the benchmark.

Big Sandy-Lincoln-Midway: Overloads the 115 kV with loss of wind POI-Midway.
PSCo's GI-2020-12 400 MW wind is an ERIS proposal in PSCo's DISIS, so firm transmission capacity does not appear to be required.
Would Big Sandy-Story 230 kV suggested as Alternative 6 for Tri-State transfer capability help?

Big Sandy-Burlignton: Study upgrade to 100C

Wray-Story: Study upgrade to 100C. Is this the Wray-N. Yuma-Story 230 kV line or the 115 kV or both?

Villas: 45 MW cost approx $3 million.

Looks like Story is the most promising place for further investigation. 400 MW at one location may not be likely, however.

Chris

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You started with two issues:

400 MW of injection in Eastern Colorado

Transmission across eastern Colorado and to New Mexico if possible

The 400 MW of injection in Eastern Colorado does not appear to be a problem. You might look for multiple smaller projects rather than a big one.

First, you need to provide Standalone Injection Capability at many locations. That gives everybody a starting point.

Some projects and capacities proposed in your old queue:

Keota TI-18-0720 200 solar + 80 MW storage or TI-20-0925B 170 solar + 85 MW storage

Story TI-19-1223 400 solar +320 MW Storage

Story-Banner-County, NE PSCo GI-2018-8 to -18 for 200 MW to 1,000 MW, plus possibility of a connection to SPP with an AC-DC Tie.
North Yuma to Story TI-19-082 200 MW
Story-Henry Lake 250 MW?

Wray because two 230 kV lines and two 115 kV lines

Big Sandy-Lincoln-Midway line PSCo GI-2020-12 400 MW especially when Lincoln CTs are not running. Seems like there could be more wind between Rush Creek I and Golden West right where your line goes.
Big Sandy-Burlington
- Upgrade line to 100 degrees C
- Additional 100 MW when CTs are not operating
- Dynamic line rating when it is windy

Craig-Ault 504 MW Rail Tie Wind Project
Vilas 100 MW?

Also a bunch of small solar or wind projects that mostly serve local load.

Thus, there does not appear to be any problem locating a total of 400 MW of wind (and some solar) in eastern Colorado.

A line across eastern Colorado is a different issue.

Talk to you on May 2.

Chris

Chris Neil
Rate/Financial Analyst

P. 303.894.2124 | F. 303.894.2117
1560 Broadway, Suite 200 Denver, CO 80202

chris.neil@state.co.us | www.dora.colorado.gov/occ

From: Hubbard, Ryan
Sent: Wednesday, April 14, 2021 9:05 PM
To: Neil - DORA, Chris
Subject: RE: [EXTERNAL] Re: [EXTERNAL] Re: REPTF Meeting #2

Hi Chris,
Your comment on 230 kV over 115 kV sums up the struggle in Eastern Colorado nicely. It is certainly the struggle with a system originally designed to serve load reliably, versus being a backbone system for renewable wind development.

You're correct that opening the 115kV system would increase injection capability, but at the cost of reliability to rural Colorado customers who currently enjoy looped service. It is certainly a challenge. It's been on my mind for some time because I want to find a cost effective, long term solution that doesn't sacrifice reliability.

With opening up the Lamar 115kV system, it would create a similar situation to the existing Rush Creek Gen-Tie. It may increase injection capability, but I'm unsure how much generation can be hung off a ~100-mile 230kV line. Power flow analysis could show this, but similar to NE Colorado, it would reduce reliability to ARPA and Tri-State member loads.

Unfortunately, I'm not aware of any type of ATO at the transmission level. When radial load trips, it takes operator action to gradually switch load back online.

Please let me know if you think of other options. I certainly appreciate your ideas and participation in this study process.

Thanks,

Ryan

From: Neil - DORA, Chris <chris.neil@state.co.us>
Sent: Wednesday, April 14, 2021 4:30 PM
To: Hubbard, Ryan <rhubbard@tristategt.org>
Subject: [EXTERNAL] Re: [EXTERNAL] Re: REPTF Meeting #2

Ryan,

We might focus some thought on the Lamar area since it is relevant to both the REPTF and the East-West TF.

Have I mentioned that 230 kV over 115 kV is a hassle because you have this big, wonderful 230 kV line and can't use it because when it trips, it overloads the 115 kV system.

One thought is to open the 115 kV system so that a 230 kV trip has no impact on the 115 kV system.

The 115 kV system would be for serving load. The 230 kV system would essentially be a gen tie for renewable generation or import/export over the DC tie.

The Boone-Lamar 230 kV line could handle about 500 MW if it weren't for the 115 kV system. In fact, this might be a line to consider for dynamic line rating to increase the injection even further: 550 MW to 600 MW???

The trick would be to keep the 115 kV system reliable. The Boone-La Junta line is a double circuit line, so it has the minimum N-1 reliability.

The 115 kV line from La Junta to Willow Creek is a single circuit line, however. A possible approach would be to add an automatic throwover (ATO) between the Willow Creek 115 kV system and the Lamar 230 kV systems. In this scheme, Willow Creek would normally be served on the 115 kV system with the connection to Lamar 230 kV open. If the 115 kV tripped, however, then the ATO would transfer Willow Creek service to the 230 kV system. There would be a short blink, but not a long interruption.

As far as I know, however, an ATO is distribution level equipment. Whether it can be done on a 230 kV -115 kV system is a question. It would result in a little sacrifice in reliability for the people in Lamar in return for much greater renewable injection or transfer across the DC Tie.

A similar approach might be considered for the Poncha to Midway area where one of the 115 kV lines is already normally operated open (I didn't dream this up entirely myself).

Chris

Chris Neil
Rate/Financial Analyst

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1560 Broadway, Suite 200 Denver, CO 80202
chris.neil@state.co.us | www.dora.colorado.gov/occ

On Wed, Apr 14, 2021 at 2:45 PM Hubbard, Ryan <rhubbard@tristategt.org> wrote:

> Hi Chris,
>
> Thanks for the thoughts and suggestions. I've added a few comments below.

Alternative 5 goes from Big Sandy to the Henry Lake line. Going to the Henry Lake line looks good for moving power from Big Sandy into Denver.

- That was the general thought. It provides an alternative connection to Story, as well as the Denver area.

Also, the switching station out where it connects to the Henry Lake line could be a location for solar and wind projects to interconnect without the projects having to pay the full cost of a switching station. I've seen low cost proposals in this region that get hammered with the cost of an interconnection.

- Good to know. We've had a single Interconnection Request on this line in the past, as referenced in my previous e-mail, but I have no idea of the prices associated with the output.

Can the 115 kV line that is on the same towers as the Story-Henry Lake line be converted to 230 kV easily and cheaply? That would provide more access into the north Denver area which seems to be a major load center for Tri-State.

- The 115kV line it parallels is WAPA's Beaver Ck-Adena-Hoyt 115kV. The 230kV construction (operated at 115kV) continues from Hoyt to Sand Creek Tap to Brighton to Erie. The conversion would require some amount of work: including moving the Beaver Creek 115kV connection to a nearby 230kV yard (likely Story), expansion of Adena to a 230/115kV yard, and expansion of Hoyt to a 230/115kV yard. The same would apply if the Hoyt-…-Erie section is converted. Erie is the only substation along the route with 230kV existing.

Alternative No. 6 could be Big Sandy to Story. Kind of a variation of Alternative 5. Going to Story looks better for moving power across the Tri-State system, as opposed to sending power into Henry Lake and north Denver.

- Hari requested this alternative during the meeting. We were going to a 5B with this wrinkle.

I would stop there with Alternative 6: simply Big Sandy to Story. Alternative 5 has more lines to the south, but they seem unnecessary.

- Could this be characterized as Alternative 5 without a Big Sandy-Boone 230kV connection? The Big Sandy-…-Burlington will likely be needed, and the Boone to Comanche-Walsenburg 230kV line open up scheduling on the Tri-State transmission system to/from SE Colorado and NE New Mexico.

Tri-State has a Big-Sandy to Midway line and part ownership of Midway to Boone. There are lots of lines from Midway and Boone to Comanche. These may not be Tri-State lines, but it seems like you can send power over them. Then there is Tri-State's Comanche-Walsenburg-Gladstone line. After Gladstone, I can't help you (no map of New Mexico).

- You're correct that other transmission systems could be scheduled over, however many of these lines have little to no available transmission capacity. Additionally, use of other entities transmission systems by our network customers results in pancaking transmission rates, driving up their electric bills. Use of a single transmission provider's system is preferred by our network customers from a cost standpoint.

The Big Sandy-Story line seems better than lines way out on the eastern plains like in Alternatives 1-3. That would depend on customer loads and line loadings in the various places, and I have not looked up the loads out in the east to see if more transmission is needed in the far east.

- Most of the transmission system in eastern Colorado is 30+ years old and designed from a load serving standpoint. Studies have shown development of new resources in the Burlington area creates a domino effect of upgrades on the underlying system.

Another thought: is Lamar really that important of a place to put transmission? Is there that much load there? Alternative 1-3 all have lines to Lamar. Where do you go from Lamar - not to New Mexico? And the good wind seems to be south of Lamar near Springfield and Villas. It seems that the only reason lines are now proposed to go to Lamar is that somebody built a line there long ago.

- The Lamar area requires new transmission to reliably serve the load under peak load conditions for the loss of Boone-Lamar 230kV. Today with the loss of the 230kV line, all PSCo generation and the DC tie trip offline at Lamar, and the Lamar area load is served by the remaining 115kV line from Boone which has its limits. The alternatives from a Tri-State transmission system standpoint, are north to Burlington, west to Boone, or south to New Mexico. There is limited capacity out of NE New Mexico, a recent Generator Interconnection Study identified $400+ million in upgrade costs to bolster the system west of Gladstone.

Please let me know if you have any questions or concerns.

Thanks,

Ryan

From: Neil - DORA, Chris <chris.neil@state.co.us>
Sent: Tuesday, April 13, 2021 5:09 PM
To: Hubbard, Ryan <rhubbard@tristategt.org>
Subject: [EXTERNAL] Re: REPTF Meeting #2

Ryan,

A couple of thoughts on REPTF transmission:

Alternative 5 goes from Big Sandy to the Henry Lake line. Going to the Henry Lake line looks good for moving power from Big Sandy into Denver.

Also, the switching station out where it connects to the Henry Lake line could be a location for solar and wind projects to interconnect without the projects having to pay the full cost of a switching station. I've seen low cost proposals in this region that get hammered with the cost of an interconnection.

Can the 115 kV line that is on the same towers as the Story-Henry Lake line be converted to 230 kV easily and cheaply? That would provide more access into the north Denver area which seems to be a major load center for Tri-State.

Alternative No. 6 could be Big Sandy to Story. Kind of a variation of Alternative 5. Going to Story looks better for moving power across the Tri-State system, as opposed to sending power into Henry Lake and north Denver.

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Tri-State has a Big-Sandy to Midway line and part ownership of Midway to Boone. There are lots of lines from Midway and Boone to Comanche. These may not be Tri-State lines, but it seems like you can send power over them. Then there is Tri-State's Comanche-Walsenburg-Gladstone line. After Gladstone, I can't help you (no map of New Mexico).

The Big Sandy-Story line seems better than lines way out on the eastern plains like in Alternatives 1-3. That would depend on customer loads and line loadings in the various places, and I have not looked up the loads out in the east to see if more transmission is needed in the far east.

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Chris

Chris Neil
Rate/Financial Analyst

P. 303.894.2124 | F. 303.894.2117
1560 Broadway, Suite 200 Denver, CO 80202

chris.neil@state.co.us | www.dora.colorado.gov/occ

On Tue, Apr 13, 2021 at 3:54 PM Hubbard, Ryan <rhubbard@tristategt.org> wrote:

All,

As a reminder, please provide potential alternatives for discussion in advance of the next meeting so slides can be created to facilitate discussion.

Agenda will be provided in advance of the meeting.

Regards,

Ryan

Hi there,

Ryan Hubbard is inviting you to a scheduled Zoom meeting.

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Meeting ID:	963 5804 3394
Passcode:	854739

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Meeting ID: 963 5804 3394

Passcode: 854739

International numbers

From: Larry Miloshevich <larry.miloshevich@gmail.com>
Sent: Sunday, May 2, 2021 1:41 PM
To: Hubbard, Ryan
Cc: Adam Gribb (Colorado PUC); Ajay Pappu (Invenergy); Ben Turner (Invenergy); Carl Huslig (Grid Reliability Consulting); Chris Neil (OCC); Connie Paoletti (Xcel Energy); Dan Greenberg (Colorado PUC); David Roden (Enel North America - USA); Fate, Dylan; Feinberg, Curt; Giancarlo Leone; Gilbert Flores (Xcel Energy); Gilden, Christopher; Gimod Olapurayil (Enel North America - USA); Hari Singh (Xcel Energy); Hunter, Susan; James Nguyen (Xcel Energy); Jay Caspary (Grid Strategies); Jeremy Brownrigg (PRPA); Joel Eggemeyer (CSU); John Wolfe (Invenergy); Kavita Shenoi (Energy Strategies); Ken Wilson (Western Resource Advocates); Lindquist, Kevin; Lindsay Briggs (Black Hills); Lisa Hickey (New Law Group); Marino, Laura; Mark Detsky; Matt Israel (CSU); Matt Jacobs (Enel North America - USA); Milius, Jeff; Nelson, Jared; Orijit Ghoshal (Invenergy); Patrick Corrigan (Xcel Energy); Pink, Chris; Puneet Pasrich (Buckyball); Reasoner, John; Scrivens, Paul; Sina Baghsorkhi (Juwi Solar); Taylor Henderson (Outshine Energy); Todd Kuhn (Black Hills); Trevor Rombough (Black Hills); Tyler Cooper (Black Hills)
Subject: [EXTERNAL] Re: REPTF Meeting #2
Attachments: April-QandA.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hello All,

As the evangelist for using Advanced Transmission Technologies to modernize and improve the capacity and performance of the transmission system (existing and new), I'm sending these comments on the study scope for discussion:

1. Under V.B (Alternative Studies), item 1: "ATT (Power Flow Control)": Since increased capacity and reduced curtailment is desirable, please consider broadening the set of ATT to include Dynamic Line Ratings and Topology Optimization.

2. Under VI.B (Sensitivity Studies - Ability of Advanced Transmission Technologies to enhance proposed Alternative performance): Please consider a sensitivity study that applies ATT to the base case (i.e., to the existing transmission system). Since the amount and characteristics of any transmission expansion depends on the need, and the need depends on the performance of the existing system, it makes sense to first maximize the efficiency of the existing system to get a true feeling for the amount of needed expansion, and possibly to reduce the costs of that expansion.

3. General discussion (Agenda item 4, 5, or 6 where appropriate): Could we discuss specifically how ATT studies will be conducted? How will the group learn the details of what is available with ATT these days? The Energy Storage group plans to invite some ATT vendors to present. Will Tri-State and/or the TF devote time and resources to research ATT and consider how to model its implementation? Does that expertise and motivation exist within the group, or should ATT evaluation be tied to the bigger picture of a CCPG investigation of the broader transmission system, and/or coordination with other TFs/workgroups? Is external expertise called for?

4. Some info on ATT: There was a very informative Caspary/Tsuchida ESIG webinar about the SPP ATT study speaking to a technical audience like this group. Highly recommended (video here). The Q&A was very informative. Attached are

answers to the questions that they didn't get to during the webinar (so the webinar questions were even more interesting than these). This adds some color to the task of getting up to speed on ATTs these days. Note: GETs (Grid-Enhancing Technologies) and ATT are synonyms. Answer #3 is about why these technologies haven't yet taken off in the US. Here's one sentence: "*Like other GETs, Smart Wires has seen rapid adoption in markets with regulations that incentivize utilities to make the best use of their existing network*", suggesting that a performance-based incentive mechanism such as "shared savings" would be helpful motivation for IOUs, but I would think efficient use of the existing network and associated cost savings would be sufficient motivation for nonprofits like Tri-State and PRPA and CSU. [Question #1 about ATT at the distribution level is pretty interesting too]

Thanks for your consideration,

Larry

On Apr 30, 2021, at 3:17 PM, Hubbard, Ryan <rhubbard@tristategt.org> wrote:

All,
Attached is the draft agenda for REPTF Meeting #2 and latest version of the draft REPTF Study Scope for discussion on Monday.

The main topics for the next meeting are further discussion on objectives/needs and the study scope.

Please let me know if you have any questions or concerns.

Have a great weekend,

Ryan Hubbard, PE
Manager, Transmission Planning
Tri-State Generation & Transmission
Office: 303-254-3025 / Cell: 720-576-8714

<210503_REPTF_Agenda.docx><REPTF_Study Scope_DRAFT_v1.docx>

From: Paoletti, Connie L <connie.paoletti@xcelenergy.com>
Sent: Monday, May 3, 2021 11:39 AM
To: Hubbard, Ryan
Subject: [EXTERNAL] RE: REPTF Meeting #2
Attachments: REPTF_Study Scope_DRAFT_v1 (XE).docx

Hello Ryan! I hope all is well at Tri-State. We have been discussing some ideas on the REPTF meeting this afternoon and I wanted to provide you with a heads up in advance. Please see the attached and reach out to me with any follow-on questions, or we can just discuss later today. Thanks!

Connie Paoletti
Manager, PSCo Transmission Planning
Xcel Energy
1800 Larimer St, Denver, CO 80202
C: 303.588.9822

-----Original Appointment-----
From: Hubbard, Ryan <rhubbard@tristategt.org>
Sent: Tuesday, April 13, 2021 3:55 PM
To: Hubbard, Ryan; Adam.Gribb@state.co.us; Ajay Pappu (Invenergy); Ben Turner (Invenergy); Carl Huslig (Grid Reliability Consulting); Chris Neil; Paoletti, Connie L; Dan Greenberg (Colorado PUC); David Roden (Enel North America - USA); Fate, Dylan; Feinberg, Curt; Giancarlo Leone; Flores, Gilbert Y; Gilden, Christopher; Olapurayil, Gimod (Enel North America - USA); Singh, Hari; Hunter, Susan; Nguyen, James T; Jay Caspary (Grid Strategies); Jeremy Brownrigg (PRPA); Joel Eggemeyer (CSU); John Wolfe (Invenergy); Kavita Shenoi (Energy Strategies); Ken Wilson (Western Resource Advocates); Larry Miloshevich; Lindquist, Kevin; Briggs, Lindsay; Lisa Hickey; Marino, Laura; Mark Detsky; Matt Israel (CSU); Matt Jacobs (Enel North America - USA); Milius, Jeff; Nelson, Jared; Orijit Ghoshal (Invenergy); Corrigan, Patrick M; Puneet Pasrich (Buckyball); Reasoner, John; Scrivens, Paul; Sina Baghsorkhi (Juwi Solar); Taylor Henderson (Outshine Energy); Todd Kuhn (Black Hills); Trevor Rombough (Black Hills); Tyler Cooper (Black Hills)
Subject: REPTF Meeting #2
When: Monday, May 3, 2021 1:00 PM-2:30 PM (UTC-07:00) Mountain Time (US & Canada).
Where: https://tristategt-org.zoom.us/j/96358043394?pwd=ZHlORnJXNHp1L256NWphTWlDQWF1Zz09

All,
As a reminder, please provide potential alternatives for discussion in advance of the next meeting so slides can be created to facilitate discussion.

Agenda will be provided in advance of the meeting.

Regards,

Ryan

Hi there,

Ryan Hubbard is inviting you to a scheduled Zoom meeting.

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Meeting ID: 963 5804 3394

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Meeting ID: 963 5804 3394

Passcode: 854739

International numbers

From: Mark Detsky <mdetsky@dietzedavis.com>
Sent: Thursday, May 13, 2021 1:21 PM
To: Hubbard, Ryan
Subject: [EXTERNAL] Re: REPTF Meeting #2 DRAFT Meeting Notes
Attachments: 20210216 New Approaches Workshop Item 02 AEP BOLD Transmission521466.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Ryan-

I'm sorry for the late comment. In the ATT scenario you are doing for the REP Task Force, would TSGT please consider also looking at arched pole design as used in AEP to reduce impedance? See the attached slide deck.

Please contact me with any questions.

Take care,

Mark

Mark Detsky
Dietze and Davis, P.C.
303-447-1375

From: "Hubbard, Ryan" <rhubbard@tristategt.org>
Sent: Tuesday, May 4, 2021 9:28 PM
To: Adam Gribb (Colorado PUC); Ajay Pappu (Invenergy); Ben Turner (Invenergy); Carl Huslig (Grid Reliability Consulting); Chris Neil (OCC); Connie Paoletti (Xcel Energy); Dan Greenberg (Colorado PUC); David Roden (Enel North America - USA); Fate, Dylan; Feinberg, Curt; Giancarlo Leone; Gilbert Flores (Xcel Energy); Gilden, Christopher; Gimod Olapurayil (Enel North America - USA); Hari Singh (Xcel Energy); Hubbard, Ryan; Hunter, Susan; James Nguyen (Xcel Energy); Jay Caspary (Grid Strategies); Jeremy Brownrigg (PRPA); Joel Eggemeyer (CSU); John Wolfe (Invenergy); Kavita Shenoi (Energy Strategies); Ken Wilson (Western Resource Advocates); Larry Miloshevich; Lindquist, Kevin; Lindsay Briggs (Black Hills); Lisa Hickey (New Law Group); Marino, Laura; Mark Detsky; Matt Israel (CSU); Matt Jacobs (Enel North America - USA); Milius, Jeff; Nelson, Jared; Orijit Ghoshal (Invenergy); Patrick Corrigan (Xcel Energy); Pink, Chris; Puneet Pasrich (Buckyball); Reasoner, John; Scrivens, Paul; Sina Baghsorkhi (Juwi Solar); Taylor Henderson (Outshine Energy); Todd Kuhn (Black Hills); Trevor Rombough (Black Hills); Tyler Cooper (Black Hills)
Subject: REPTF Meeting #2 DRAFT Meeting Notes

All,
Thank you for the great discussion yesterday.

As discussed in the meeting, the presentation slides have been posted to the REPTF website. Also attached are Draft Meeting Minutes for review and approval at the next meeting, as well as the latest version of the study scope (redline and clean).

Please let me know if you have any final comments on the study scope by Friday, May 14. My goal is to finalize the study scope at our next meeting.

Best Regards,

Ryan Hubbard, PE
Manager, Transmission Planning
Tri-State Generation & Transmission
Office: 303-254-3025 / Cell: 720-576-8714

From: Mark Detsky <mdetsky@dietzedavis.com>
Sent: Thursday, May 13, 2021 2:24 PM
To: Hubbard, Ryan
Subject: [EXTERNAL] RE: REPTF Meeting #2 DRAFT Meeting Notes

At least building the line dbl circuit capable would be prudent.

Mark Detsky
Dietze and Davis, P.C.
303-447-1375

From: Hubbard, Ryan <rhubbard@tristategt.org>
Sent: Thursday, May 13, 2021 2:18 PM
To: Mark Detsky <mdetsky@dietzedavis.com>
Subject: RE: REPTF Meeting #2 DRAFT Meeting Notes

Good to know.

I will tee up double circuit 345kV for discussion at the next meeting. However, I'm unsure if double-circuit 345kV is needed to meet the identified objectives and needs.

Thanks,

Ryan

From: Mark Detsky <mdetsky@dietzedavis.com>
Sent: Thursday, May 13, 2021 2:11 PM
To: Hubbard, Ryan <rhubbard@tristategt.org>
Subject: [EXTERNAL] RE: REPTF Meeting #2 DRAFT Meeting Notes

We did raise it.

Mark Detsky
Dietze and Davis, P.C.
303-447-1375

From: Hubbard, Ryan <rhubbard@tristategt.org>
Sent: Thursday, May 13, 2021 2:09 PM
To: Mark Detsky <mdetsky@dietzedavis.com>
Subject: RE: REPTF Meeting #2 DRAFT Meeting Notes

Hi Mark,
Thanks for reaching out. Looking at this presentation, it appears to be focused on a different style of double circuit design. All of the alternatives in the REPTF are currently focused on single circuit 230kV and/or 345kV.

Are you proposing alternatives that are double circuit 345kV instead? Since the minimum generation needs are 400MW, it may be hard to justify double circuit 345kV. We can certainly discuss at the next meeting.

This would have been interesting to discuss as part of the Pathway Project studies.

Thanks,

Ryan

From: Mark Detsky <mdetsky@dietzedavis.com>
Sent: Thursday, May 13, 2021 1:21 PM
To: Hubbard, Ryan <rhubbard@tristategt.org>
Subject: [EXTERNAL] Re: REPTF Meeting #2 DRAFT Meeting Notes

Ryan-

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To: Adam Gribb (Colorado PUC); Ajay Pappu (Invenergy); Ben Turner (Invenergy); Carl Huslig (Grid Reliability Consulting); Chris Neil (OCC); Connie Paoletti (Xcel Energy); Dan Greenberg (Colorado PUC); David Roden (Enel North America - USA); Fate, Dylan; Feinberg, Curt; Giancarlo Leone; Gilbert Flores (Xcel Energy); Gilden, Christopher; Gimod Olapurayil (Enel North America - USA); Hari Singh (Xcel Energy); Hubbard, Ryan; Hunter, Susan; James Nguyen (Xcel Energy); Jay Caspary (Grid Strategies); Jeremy Brownrigg (PRPA); Joel Eggemeyer (CSU); John Wolfe (Invenergy); Kavita Shenoi (Energy Strategies); Ken Wilson (Western Resource Advocates); Larry Miloshevich; Lindquist, Kevin; Lindsay Briggs (Black Hills); Lisa Hickey (New Law Group); Marino, Laura; Mark Detsky; Matt Israel (CSU); Matt Jacobs (Enel North America - USA); Milius, Jeff; Nelson, Jared; Orijit Ghoshal (Invenergy); Patrick Corrigan (Xcel Energy); Pink, Chris; Puneet Pasrich (Buckyball); Reasoner, John; Scrivens, Paul; Sina Baghsorkhi (Juwi Solar); Taylor Henderson (Outshine Energy); Todd Kuhn (Black Hills); Trevor Rombough (Black Hills); Tyler Cooper (Black Hills)
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Best Regards,

Ryan Hubbard, PE
Manager, Transmission Planning
Tri-State Generation & Transmission
Office: 303-254-3025 / Cell: 720-576-8714

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