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February 22, 2018

Subject: Comments from AltaGas Services (U.S.) Inc. on the CAISO 2017-2018 Draft Transmission Plan

AltaGas Services (U.S.) Inc. ("AltaGas") hereby respectfully submits its comments on the California ISO ("CAISO") 2017-2018 Draft Transmission Plan and requests that its recommendation and request in relation to the identified issues be seriously reviewed and acted upon by the CAISO. We should note that our comments and recommendations are limited to CAISO's assessment of the "Colorado River 230 kV Bus-Julian Hinds 230 kV" transmission project[1] (the "Project"); a project sponsored by AltaGas and its technology partner Smart Wires, Inc. ("Smart Wires"). AltaGas and Smart Wires will be jointly referred to as the "Project Team" in this letter.

On page 187 of the CAISO 2017-2018 Draft Transmission Plan notes that the Project when "modeled in the S3 Heavy Renewables sensitivity case, with the Smart Wires devices on the Colorado River – Julian Hinds 230 kV line fully activate, the Julian Hinds – Mirage 230 kV line was heavily overloaded under contingency conditions." The contingency conditions considered here were the loss of two 500 kV lines between Colorado River and Red Bluff substations or the loss of two 500 kV lines between Red Bluff and Devers substations. As a result, CAISO has come to the implied conclusion that the Project should not be "further considered as an economic-driven project."

AltaGas respectfully provides the following comments on the CAISO finding and implied conclusion:

- The Project Team designed the Project, including sizing its Smart Wires devices, based on all the available 2017-2018 study cases. The sensitivity case "S3 Heavy Renewables sensitivity case" does not exist and the actual sensitivity case used for the CAISO studies to reach its conclusion about the Project, "S4 High Renewables sensitivity case," was unknown to the Project Team for its design efforts at the time of submittal of the Project application last October. Unfortunately, and without interim interactions and information exchanges with CAISO, the Project Team was totally unaware that the CAISO would identify a reliability concern for a less common sensitivity scenario until the CAISO 2017-2018 Draft Transmission Plan was publicly released. Before moving to our next point, we recommend that the CAISO consider refining its TPP process to allow project sponsors to hear about such CAISO study findings before the draft transmission plan is "finalized and publicly released" to allow these sponsors to refine their offering, if at all possible.

- After carefully review of all draft transmission plan study cases and understanding the source of the CAISO reliability concerns, the Project Team made a slight refinement to the project design by adding a straightforward scheme (for example, a simple thermal relay) to solve the identified reliability problems (two altogether). The straightforward scheme that was added to our design would trip the Colorado River – Julian Hinds 230 kV line under the "S4 High Renewables operating condition" (operating condition corresponding to the S4 scenario) plus the forced outage of two 500 kV lines between Colorado River and Red Bluff

[1] The Project consists of converting a portion of the existing privately owned Buck Blvd – Julian Hinds 230 kV gen-tie line into a network facility by way of segmenting the gen-tie line and connecting one terminal of both segments into the Colorado River substation 230 kV bus. It creates a network facility identified as Colorado River – Julian Hinds 230 kV line. To protect against thermal overloads on the Julian Hinds – Mirage 230 kV in select contingencies, the line would have approximately 20 Ohms per phase Smart Wires devices.

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substations or loss of two 500 kV lines between Red Bluff and Devers substations. We should remind that the probability of triggering this scheme will be infinitesimally small due to extremely low chance of the occurrence of "S4 High Renewables operating condition" combined with the loss of two 500 kV lines in the Colorado River to Devers 500 kV transmission corridor. The rarity of this specific N-2 contingency, under these specific conditions, means that the newly networked facilities will provide economic benefits effectively 100% of the time.

- As emphasized in the original application submitted for the Project, although the proposed Project effectively solves all the existing and known reliability problems at the Julian Hinds substation, its main contribution to the CAISO controlled grid is its economic value. Based on CAISO's own economic studies (performed in an earlier year) and the proposed Project cost of $62 million, the Benefit to Cost Ratio ("BCR") for this Project exceeds 2.0 (BCR = 2.17). At the same time, it should be noted that the Project Team is committed to internalize the cost of the scheme to trip the Colorado River – Julian Hinds 230 kV line under the "S4 High Renewables operating condition" plus the loss of two 500 kV lines in the Colorado River to Devers 500 kV transmission corridor. Hence, the project cost, even with the addition of this scheme would remain at $62 million keeping the Project's BCR above 2.0, as originally calculated.

In conclusion, the Project Team has demonstrated that, with a simple refinement to the project design, there remain no reliability concerns with the Project. We recognize that the end of the current TPP is drawing near; however, we believe that our project submission has not yet been given a comprehensive and proper review up to now based on its merits. Given CAISO procedures and past precedence, we believe the evaluation of this Project should continue as an extension of the 2017-2018 CAISO TPP. We, therefor, would like to request that the CAISO consider the Project as an economic-driven project and perform the necessary economic assessment on it and, upon demonstration of significant net value to the ratepayers (BCR $\geq$ 1.5), approve the Project.

Please do not hesitate to contact me at 214-213-9944 or our transmission consultant, Dr. Dariush Shirmohammadi at 310-858-1174, if you have any questions or concerns.

Best regards,

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P.S. - Attached with this letter, there are two Appendices:

- Appendix A: Transmission planning study report justifying reliability of tripping scheme.
- Appendix B: Description of supporting cases/documents used in the transmission planning study (not available for the public version of these comments due to CEII restrictions)

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Appendix A: AltaGas – Blythe Loop-In Project Refinement Details

Problem Statement:

Page 187 of the CAISO 2017-2018 Draft Transmission Plan notes that the Project when "modeled in the S3 Heavy Renewables sensitivity case, with the Smart Wires devices on the Colorado River – Julian Hinds 230 kV line fully activate, the Julian Hinds – Mirage 230 kV line was heavily overloaded under contingency conditions." The contingency conditions considered were the loss of two 500 kV lines between Colorado River and Red Bluff substations or the loss of two 500 kV lines between Red Bluff and Devers substations.

AltaGas submits this Project Scope Refinement to address the overload conditions referenced in the CAISO 2017-2018 Draft Transmission Plan.

Project Scope Alteration:

On October 14, 2017 AltaGas submitted into the CAISO TPP Open Submission Window a project described with the following language.

> *"The Colorado River - Julian Hinds 230 kV Line consists of converting AltaGas' existing privately owned Buck Blvd - Julian Hinds 230 kV generation tie-line from AltaGas' Blythe Energy Project #1, or BEP1, connected to the Buck Boulevard substation to a network facility. The connection would occur by converting the line into two segments, and connecting one terminal of both segments into the Colorado River Substation 230 kV bus. This creates a networked transmission line identified as Colorado River - Julian Hinds 230 kV line, and a revised 230 kV gen-tie line identified as Buck Blvd - Colorado River 230 kV line. See Figure 1 and 2 for diagrammatic representations. In addition, 117 Power Guardian 700-1150 (~19.58Ω/phase) from Smart Wires Inc. (Smart Wires) will be installed at the Colorado River Substation end of the Colorado River - Julian Hinds 230 kV line. These Power Guardians will be set to switch into injection mode to limit the power flow on the Julian Hinds - Mirage 230 kV line to avoid potential overloads. The Colorado River Corridor RAS will be modified to include BEP1.*
>
> *The Project will include installing all equipment necessary and building approximately 0.4 miles of 230 kV transmission line to loop the current gen-tie line into the Colorado River station 230 kV bus and the Smart Wires Power Guardians."*

AltaGas proposes to maintain the same submission as an economic project with one refinement to the project design. The installation will now include a straightforward tripping scheme to eliminate thermal overloads on the Julian Hinds – Mirage 230 kV circuit under Heavy Renewable scenarios.

Tripping Scheme Study:

Smart Wires Inc. performed the following study for AltaGas in support of this Project Scope Alteration:

- Smart Wires performed steady state analysis on many CAISO 2017-2018 TPP study cases including the "S4 High Renewables operating condition" case[2]. Smart Wires' steady state study on the High Renewables sensitivity case indicates that the original AltaGas submission would not relieve all overloads on the Julian Hinds – Mirage 230 kV circuit following two Red Bluff – Devers

[2] The "S4 High Renewables operating condition" case was provided by the CAISO to simulate the High Renewables sensitivity case.

500kV N-2 and Colorado River – Red Bluff 500 kV N-2 conditions. Our analysis agreed with CAISO's findings in the first draft TPP release.

- Smart Wires continued their analysis with guidance from CAISO, and found that if the original submission was amended to include a tripping of the Colorado River – Julian Hinds 230 kV circuit under the Heavy Renewable scenario following either identified N-2 conditions, the overloads on Julian Hinds – Mirage 230 kV circuit would be cleared. Further, all other circuits in the area would be reliably under their current ratings under these studied conditions.

Tables 1 and 2, below, and their descriptions illustrate the loadings seen on Julian Hinds – Mirage 230 kV circuit and the most affected circuits in the region.

Facility	Base Case	Colorado River – Red Bluff 500kV DLO			
		Case 1	Case 2	Case 3	Case 4
24801 DEVERS 500 24374 REDBLUFF 500 1 1	68.81	19.8	19.8	19.8	19.8
24801 DEVERS 500 24374 REDBLUFF 500 2 1	61.92	19.45	19.45	19.45	19.45
24900 COLRIVER 500 24374 REDBLUFF 500 1 1	44.65	0	0	0	0
24900 COLRIVER 500 24374 REDBLUFF 500 2 1	30.51	0	0	0	0
24900 COLRIVER 500 24959 colrvr2i 13.8 2 1	58.03	38.8	56.28	9.02	25.59
24900 COLRIVER 500 24993 colrvr1i 13.8 1 1	58.03	38.8	56.28	9.02	25.59
24957 COLRIVER 230 24959 colrvr2i 13.8 2 1	57.32	38.21	55.58	8.97	25.56
24957 COLRIVER 230 24993 colrvr1i 13.8 1 1	57.32	38.21	55.58	8.97	25.56
24957 COLRIVER 230 25406 J.HINDS 230 1 1	18.43	28.63	31.98	23.44	0
25401 EAGLEMTN 230 25405 IRON MTN 230 1 1	16.73	22.14	21.82	28.27	79.72
25405 IRON MTN 230 24019 CAMINO 230 1 1	20.14	22.57	20.09	29.52	72.6
25406 J.HINDS 230 24806 MIRAGE 230 1 1	60.46	141.99	152.51	125.59	50.2
25512 JHINDMWD 230 25401 EAGLEMTN 230 1 1	3.78	17.82	24.04	13.24	66.14
25512 JHINDMWD 230 25406 J.HINDS 230 r1 1	15.67	22.97	31.94	7.48	49.99
29206 BUCK230 230 24957 COLRIVER 230 1 1	0.28	0.21	27.63	26.21	26.15

Table 1: Heavy Renewables CRS – Red Bluff 500kV DLO details

Base Case: S4 Heavy Renewables w/ Blythe Loop-In and 20 Ω of Power Guardian™ on Julian Hinds – Colorado River

Case 1: Colorado River – Red Bluff DLO

Case 2: Colorado River – Red Bluff DLO w/ Blythe generation added

Case 3: Colorado River – Red Bluff DLO w/ Blythe generation added, and 1400 MW generation drop

Case 4: Colorado River – Red Bluff DLO w/ Blythe generation added, and 1400 MW generation drop (RAS), and Julian Hinds to Colorado River tripped

** Note: Percentage of branch rating: Rate A for base case, Rate B for post contingent cases*

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Facility	Base Case	Red Bluff – Devers 500 kV DLO			
		Case 5	Case 6	Case 7	Case 8
24801 DEVERS 500 24374 REDBLUFF 500 1 1	68.81	0	0	0	0
24801 DEVERS 500 24374 REDBLUFF 500 2 1	61.92	0	0	0	0
24900 COLRIVER 500 24374 REDBLUFF 500 1 1	44.65	20.52	20.9	19.94	19.91
24900 COLRIVER 500 24374 REDBLUFF 500 2 1	30.51	15.12	15.39	14.69	14.67
24900 COLRIVER 500 24959 colrvr2i 13.8 2 1	58.03	35.63	53.56	6.13	25.58
24900 COLRIVER 500 24993 colrvr1i 13.8 1 1	58.03	35.63	53.56	6.13	25.58
24957 COLRIVER 230 24959 colrvr2i 13.8 2 1	57.32	34.98	52.83	6.07	25.65
24957 COLRIVER 230 24993 colrvr1i 13.8 1 1	57.32	34.98	52.83	6.07	25.65
24957 COLRIVER 230 25406 J.HINDS 230 1 1	18.43	36.93	40.26	31.83	0
25401 EAGLEMTN 230 25405 IRON MTN 230 1 1	16.73	33.39	37.74	32.83	99.66
25405 IRON MTN 230 24019 CAMINO 230 1 1	20.14	30.37	32.16	32.38	89.2
25406 J.HINDS 230 24806 MIRAGE 230 1 1	60.46	185.83	195.36	170.87	**69.11**
25512 JHINDMWD 230 25401 EAGLEMTN 230 1 1	3.78	31.25	39.04	23.23	85.24
25512 JHINDMWD 230 25406 J.HINDS 230 r1 1	15.67	33.49	43.68	18.77	68.82
29206 BUCK230 230 24957 COLRIVER 230 1 1	0.28	0.2	28.78	26.68	26.32

Table 2: Heavy Renewables Red Bluff - Devers 500kV DLO details

Base Case: S4 Heavy Renewables w/ Blythe Loop-In and 20 Ω of Power Guardian™ on Julian Hinds - Colorado River

Case 5: Red Bluff – Devers DLO

Case 6: Red Bluff – Devers DLO w/ Blythe generation added

Case 7: Red Bluff – Devers DLO w/ Blythe generation added, and 1400 MW generation drop (RAS)

Case 8: Red Bluff – Devers DLO w/ Blythe generation added, and 1400 MW generation drop (RAS), and Julian Hinds to Colorado River tripped

** Note: Percentage of branch rating: Rate A for base case, Rate B for post contingent cases*

Tripping Scheme Addition:

In the previous section Smart Wires analysis illustrated that the reliability concerns raised by CAISO in the draft TPP can be addressed by a straightforward tripping of the Julian Hinds – Colorado River 230 kV circuit. AltaGas is aware that there are many standard industry methods in which to perform the tripping scheme and provides the following as one proven example to achieve this action. AltaGas would not like to limit the scope of this submittal to the following action, rather provide this as an option, as it is a standard approach that is applied by utilities in California and across the nation.

The tripping can be performed by using a directional relay to open the Colorado River – Julian Hinds 230 kV line when

(a) The line current is above a desired threshold with threshold selected at the level that would overload Julian Hinds – Mirage 230 kV line.
(b) Power is flowing from Colorado River Substation towards Julian Hinds Substation, and,
(c) All the Power Guardians are engaged in the injection mode.

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Appendix B: Steady State Study Supporting Information

Attached to this submission is a zip file (not available for the public version of these comments due to CEII restrictions) containing information supporting the AltaGas performed studies illustrated in appendix A. Below is a description of the files included in the attachment.

The attachments were created with PowerGEM TARA software.

Case Files

- **S4 22SP main HighRenewables LoopIn SW.epc-** This is the Base Case illustrated in Attachment A of this document.

  Base Case: S4 Heavy Renewables w/ Blythe Loop-In and 20 Ω of Power Guardian™ on Julian Hinds - Colorado River.

- **S4 22SP main HighRenewables LoopIn SW Blythe RAS TripCR-JH ConRB-CR.epc-** Final Case 4 study results. This case is the final output Case 8 illustrated in Attachment A of this document.

  Case 8: Red Bluff – Devers DLO w/ Blythe generation added, and 1,400 MW generation drop (RAS), and Julian Hinds to Colorado River tripped.

- **S4 22SP main HighRenewables LoopIn SW Blythe RAS TripCR-JH ConRB-DEV.epc-** Final Case 4 study results. This case is the final output Case 8 illustrated in Attachment A of this document.

  Case 4: Colorado River – Red Bluff DLO w/ Blythe generation added, and 1400 MW generation drop (RAS), and Julian Hinds to Colorado River tripped.

Change Files

- **CRS-Jh off.inch –** Change file to Open Colorado River – Julian Hinds 230 kV circuit.

- **HighRenewables Blythe on 530MW.inch –** Change file to Reconnect Blythe unit as it is offline in the Base Case.

- **HighRenewables RAS CRS drop only 1399MW-** RAS Action, Drop 1,399 MW of generation at the Colorado River substation, 230 kV bus.