March 14, 2017

Economic Planning Study Request
regionaltransmission@caiso.com
California Independent System Operator
250 Outcropping Way, Folsom, CA 95630

Smart Wires: Round Mountain – Cottonwood 230 kV Economic Planning Project

To whom it may concern:

Smart Wires appreciates the opportunity to submit an economic planning study request into the 2017-2018 CAISO Transmission Planning Process. Smart Wires offers the following economic project for CAISO consideration, titled Smart Wires: Round Mountain – Cottonwood 230 kV Economic Planning Project. Our project submission is a natural extension of the enhanced modeling of COI, developed in the '16-'17 TPP. Given the importance of this interface, it is worth revisiting the subject and considering projects that can extend the COI nomogram at low costs.

The following documentation along with the attached Request Window Submission Form should serve as the Smart Wires submission into the 2017-2018 CAISO Transmission Planning Process.

Please let me know if you have any questions or comments on this submission. Smart Wires is happy to provide additional information to aid the consideration of this project submittal.

Sincerely,

Todd Ryan

Todd Ryan, Ph.D. | Director of Regulatory Affairs
todd.ryan@smartwires.com
Smart Wires Inc.

PROJECT OVERVIEW

PROJECT NAME: Smart Wires: Round Mountain – Cottonwood 230 kV Economic Planning Project

PROJECT DESCRIPTION: Smart Wires proposes this project to relieve thermal overloads on the ROUND MT – COTWD_E and ROUND MT – COTWD_E2 230 kV circuits. These thermal overloads can occur under various scenarios when North-to-South flows on the California-Oregon Intertie (COI) are high combined with high hydro generation in Northern California.

Smart Wires powerflow analysis illustrates that thermal overloads on the Round Mountain – Cottonwood 230 kV circuits can often limit the COI below its maximum path rating. The proposed application of Smart Wires powerflow control devices on the Round Mountain – Cottonwood 230 kV circuits can eliminate these expected overloads under the studied conditions, thereby expanding the COI - Northern California Hydro nomogram.

The elimination of thermal overloads on the Round Mountain – Cottonwood 230 kV circuits will result in a more efficient generation dispatch for CAISO rate payers. The more efficient dispatch achieved through the Smart Wires application should yield a positive Cost Benefit Analysis when compared to the cost of the transmission project.

PROJECT LOCATION AND INTERCONNECTION POINTS: Install the following Smart Wires powerflow control devices on the specified circuits.

1) ROUND MT-COTWD_E [30245-30105] 230 kV = 42 Power Guardian Units
2) ROUND MT-COTWD_E2 [30245-30105] 230 kV = 15 Power Guardian Units

PROJECT IN-SERVICE DATE: 12/31/2018

ESTIMATED PROJECT COST: $9-16M

TRANSMISSION PLANNING STUDY OVERVIEW:

Smart Wires performed steady state analysis utilizing the *"CAISO 2016-2017 TPP 2021HS_final.epc"* basecase. Smart Wires used this case to study the critical outage on the California-Oregon Intertie (COI) noted in the WECC 2016 Path Rating Catalogue.

- Critical Outage = Table Mt. – Tesla 500 kV and Table Mt. – Vaca-Dixon 500 kV

Smart Wires studies found that in the 2021 High Summer case, when the COI flows are at the path rating of 4,800 MWs, the Round Mountain – Cottonwood 230 kV circuits may load to 109.7%. Thus the COI must be constrained to between 4,317 MW to 4,558 MW (depending on the Northern California Hydro generation assumptions) to manage potential post contingency overloads.

Smart Wires studied the COI in the 2021 High Summer case at its full path rating of 4,800 MWs. Under this condition, Smart Wires sized a deployment of its power flow control devices to eliminate overloads on the Round Mountain – Cottonwood 230 kV circuits, thus allowing for full utilization of the path. The Smart Wires powerflow control application will reduce the probability for pre-contingency redispatch to protect the Round Mountain – Cottonwood 230 kV lines.

Below is a figure illustrating the transmission system around the Round Mountain – Cottonwood 230 kV circuits

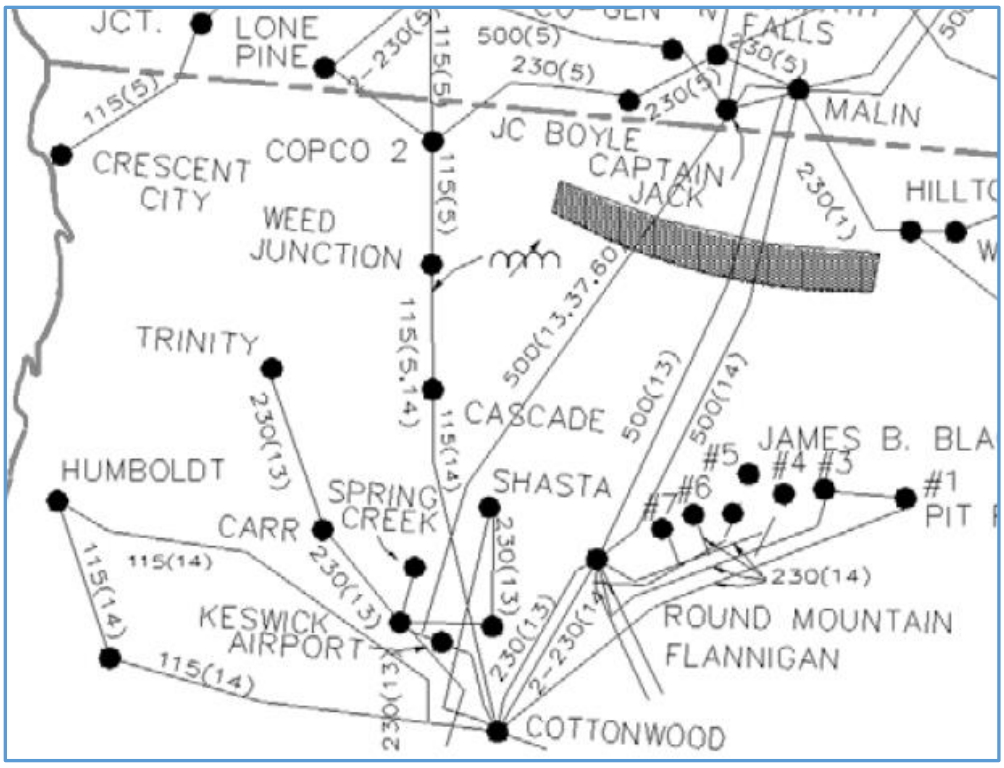


Figure 1: Round Mountain – Cottonwood 230 kV circuit.

STEADY STATE STUDY PROCESS:

Smart Wires performed analysis on two separate scenarios. These scenarios are used to illustrate the benefit of the Smart Wires powerflow control deployment to the CAISO ratepayers.

- Scenario 1: 2016-2017 TPP 2021HS Basecase dispatch
  - COI flow at 4,800 MWs basecase
  - Generation assumptions unchanged from basecase
- Scenario 2: 2016-2017 TPP 2021HS High N. California Hydro dispatch
  - COI flow at 4,796 MWs basecase
  - Increase Northern California Hydro Generation at the hydro plants on the following river systems by 384 MWs

Name	P old (MW)	P new (MW)	Increase (MW)
Generation (Pit River)	717.58	733.8	16.22
Generation (CVP)	1414.9	1530	115.1
Generation (N. Feather River)	707.45	738.7	31.25
Generation (S. Feather River)	827	948.27	121.27
Generation (Yuba/Bear River)	446.19	513.34	67.15

Generation (Mokelumne River)	223.8	256.8	33
sum	4336.92	4720.91	383.99

- Decrease Generation outside study region by 384 MWs

Name	P old (MW)	P new (MW)	Decrease (MW)
LAPLM_G1	234	135	99
LAPLM_G2	231	135	96
LAPLM_G3	229	136	93
LAPLM_G4	232	136	96
sum	926	542	384

Study Steps:

Smart Wires performed the following analysis on each scenario

Step 1: Open Scenario Case
Step 2: Perform Critical Outage of Table Mt. – Tesla 500kV and Table Mt. – Vaca-Dixon 500 kV, including the COI RAS procedure following the critical outage
Step 3: Identify thermal overloads caused by Critical Outage which cannot be relieved by the COI RAS procedure
Step 4: Reduce COI flows to relieve overloads identified in Step 3.
Step 5: Size Smart Wires powerflow control solution to relieve overloads identified in Step 3.
Step 6: Apply Smart Wires powerflow control solution to Scenario Case in Step 1. Verify that all circuits in the area are within their thermal limits.

Study Results:

Scenario 1: Under the 2016-2017 TPP 2021HS case COI flows are at 4,800 MWs. This condition causes a 109.7% post contingency loading on the ROUND MT-COTWD_E 230 kV line.

Scenario 1: Reduced COI Solution

In order to relieve this overload the COI needs to be limited to 4,558 MWs through generation redispatch.

Line	Loading % (COI = 4,800 MW)	Loading % (COI = 4,558MW)	Loading % (COI = 4,800) w/Smart Wires
ROUND MT-COTWD_E	109.7	99.7	97.5
ROUND MT-COTWD_E2	99.8	91.1	98.1

Scenario 1: Smart Wires Solution

Smart Wires devices can be deployed on the Round Mountain – Cottonwood 230 kV circuits to provide the same loading relief without the need for pre-contingency redispatch. The following deployments will keep the loading on the circuits below their thermal ratings

1) ROUND MT-COTWD_E [30245-30105] 230 kV = 42 Power Guardian 390 Units
2) ROUND MT-COTWD_E2 [30245-30105] 230 kV = 15 Power Guardian 390 Units

Scenario 2:
Under the 2016-2017 TPP 2021HS case with high Northern California Hydro generation the COI flows are at 4,796 MWs. This condition causes a 109.3% loading on the ROUND MT-COTWD_E 230 kV line.

Scenario 2: Reduced COI Solution

In order to relieve this overload the COI needs to be limited to 4,317 MWs through generation redispatch.

Line	Loading % (COI = 4,796 MW)	Loading % (COI = 4,317 MW)	Loading % (COI = 4,796) w/Smart Wires
ROUND MT-COTWD_E	109.3	99.9	97.2
ROUND MT-COTWD_E2	99.7	91.4	98.0

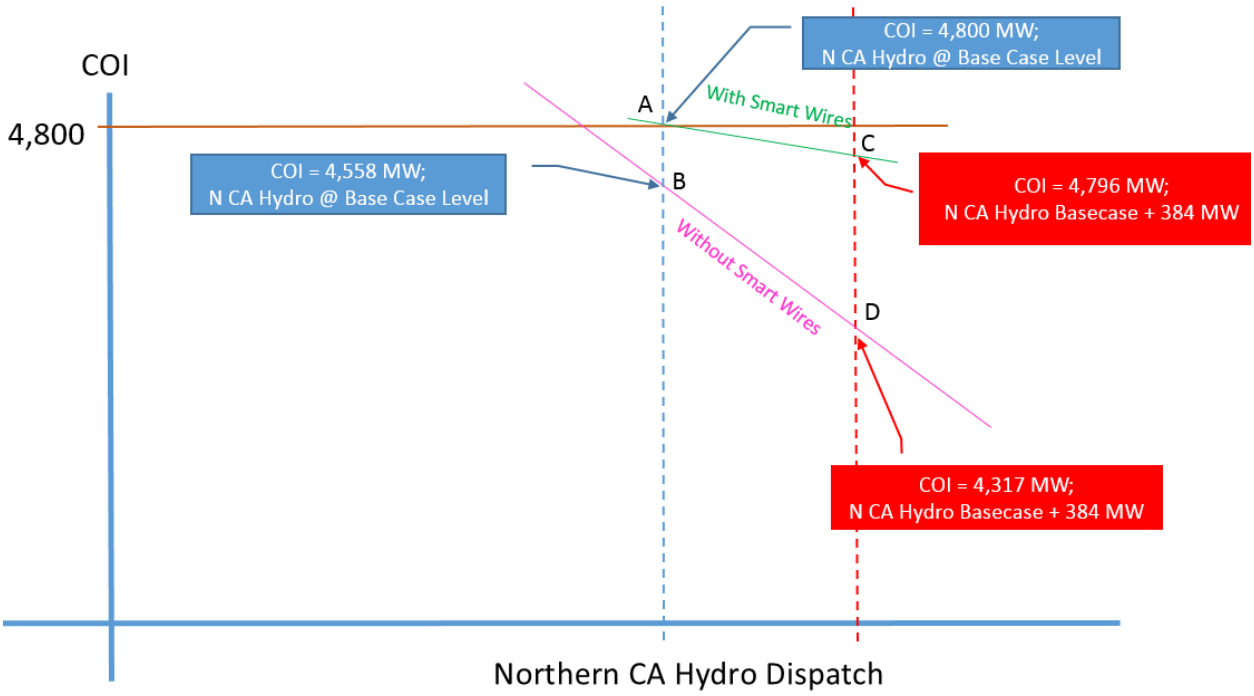
Scenario 2: Smart Wires Solution

Smart Wires devices can be deployed on the Round Mountain – Cottonwood 230 kV circuits to provide the same loading relief without the need for pre-contingency redispatch. The following deployments will keep the loading on the circuits below their thermal ratings

1) ROUND MT-COTWD_E [30245-30105] 230 kV = 42 Power Guardian Units
2) ROUND MT-COTWD_E2 [30245-30105] 230 kV = 15 Power Guardian Units

Results Summary

The following nomogram represents the increased utilization of the COI that can be actualized by a Smart Wires powerflow control application on two of the Round Mountain – Cottonwood 230 kV circuits.



Project Evaluation:

Smart Wires studies illustrate that a deployment of 57 total Power Guardian 390 units across two of the Round Mountain – Cottonwood 230 kV circuits can eliminate thermal overloads on the elements. The application of Smart Wires powerflow control can reduce the need to apply operational limits to the COI in order to protect the Round Mountain – Cottonwood 230 kV circuits.

Smart Wires recommends that CAISO analize this project based upon the cost savings it will provide to the CAISO rate payers. This project would limit the magnitude and number of hours redispatch must occur to protect the Round Mountain – Cottonwood 230 kV circuits as well as the COI

Case Files

Please find the following transmission planning cases in the associsated zip file. Inside the file titled “SW ROUND_MT-Cottonwood Project Filles.zip” you will find the following cases.

1) “2021HS_final_scenario1.sav”
   - Scenario 1: 2016-2017 TPP 2021HS Basecase dispatch
     - Generation assumptions unchanged from basecase
     - COI flow at 4,800 MWs basecase
2) “2021HS_final_scenario2.sav”
   - Scenario 2: 2016-2017 TPP 2021HS High N. California Hydro dispatch
     - COI flow at 4,796 MWs basecase

- Increase Northern California Hydro Generation at the hydro plants on the following river systems by 384 MWs

Name	P old (MW)	P new (MW)	Increase (MW)
Generation (Pit River)	717.58	733.8	16.22
Generation (CVP)	1414.9	1530	115.1
Generation (N. Feather River)	707.45	738.7	31.25
Generation (S. Feather River)	827	948.27	121.27
Generation (Yuba/Bear River)	446.19	513.34	67.15
Generation (Mokelumne River)	223.8	256.8	33
sum	4336.92	4720.91	383.99

- Decrease Generation outside study region by 384 MWs

Name	P old (MW)	P new (MW)	Decrease (MW)
LAPLM_G1	234	135	99
LAPLM_G2	231	135	96
LAPLM_G3	229	136	93
LAPLM_G4	232	136	96
sum	926	542	384

3) "SW_infection.p"
   - Smart Wires application to be applied to each scenario. This change file represents the Smart Wires deployment proposed in the Smart Wires: Round Mountain – Cottonwood 230 kV Economic Planning Project

REQUEST WINDOW SUBMISSION FORM

Please complete this submission form and the Attachment A (technical data) and send the documentation to the ISO contact listed in section 2. Please note that this form should be used for the purpose of submitting information that applies to the scope of Request Window that is a part of the ISO Transmission Planning Process only. For more information on the Request Window, please refer to the Business Practice Manual (BPM) for the Transmission Planning Process which is available at: http://www.caiso.com/planning/Pages/TransmissionPlanning/Default.aspx.

The undersigned ISO Stakeholder Customer submits this request to be considered in the CAISO Transmission Plan. This submission is for (check one)[1]:

- ☐ Reliability Transmission Project (refer to section 1 of Attachment A)
  - ☐ Submission is requested by a PTO with a PTO service territory
  - ☐ Submission is requested by a non-PTO, a PTO without a PTO service territory or a PTO outside its PTO service territory.
- ☒ Economic Transmission Project
- ☐ Merchant Transmission Facility (refer to section 1 of Attachment A)
- ☐ Location Constrained Resource Interconnection Facility (LCRIF) (refer to sections 1 & 2 of Attachment A)
- ☐ Project to preserve Long-term Congestion Revenue Rights (CRR) (refer to section 1 of Attachment A)
- ☐ Demand Response Alternatives (refer to section 3 of Attachment A)
- ☐ Generation Alternatives (refer to section 4 of Attachment A)

1. Please provide the following basic information of the submission:
   a. Please provide the project name and the date you are submitting the project proposal to the ISO. It is preferred that the name of the project reflects the scope and location of the project:

      Project Name: **Smart Wires: Round Mountain – Cottonwood 230 kV Economic Planning Project**

      Submission Date: **3/14/2017**

   b. Project location and interconnection point(s): **ROUND MT-COTWD_E [30245-30105] and ROUND MT-COTWD_E2 [30245-30104]**

   c. Description of the project. Please provide the overview of the proposed project (e.g. overall scope, project objectives, estimated costs, etc.): **Please see the attached document for Project Description**

[1] Please contact the ISO staff at requestwindow@caiso.com for any questions regarding the definitions of these submission categories in this form.

d. Proposed In-Service Date, Trial Operation Date and Commercial Operation Date by month, day, and year and Term of Service.

Proposed In-Service date: **12 / 31 / 2018**

Proposed Trial Operation date (if applicable): **/ /**

Proposed Commercial Operation date (if applicable): **/ /**

Proposed Term of Service (if applicable):

e. Contact Information for the Project Sponsor:

Name:	**Todd Ryan**
Title:	**Director of Regulatory Affairs**
Company Name:	**Smart Wires Inc.**
Street Address:	**201 Spear Street (Suite 1350)**
City, State:	**San Francisco, CA**
Zip Code:	**94105**
Phone Number:	**617-784-5342**
Fax Number:	
Email Address:	**Todd.Ryan@smartwires.com**

2. This Request Window Submission Form shall be submitted to the following ISO representative:

Name: Dana Young

Email Address: requestwindow@caiso.com

Note: The ISO will send an email confirming receipt of the request window submission within three business days of receiving it.

3. This Request Window Submission Form is submitted by:

Check here if the information is the same as the Project Sponsor information in 1 (f) of this submission: ☒

Name:

Title:

Company Name:

Street Address:

City, State:

Zip Code:

Phone Number:

Fax Number:

Email Address:

CAISO TRANSMISSION PLANNING PROCESS

Attachment A: Required Technical Data for Request Window Submissions

All information must be provided that applies to each type of submission. For any questions regarding the required technical data, please contact the ISO for more information.

1. Transmission Projects

This section applies to all transmission project submissions.

Any transmission project (reliability project, merchant project, LCRIF or a project to preserve long-term CRRs), whether submitted by a PTO or a non-PTO, must submit the following project information in accordance with Section 4.4.3.1 of the CAISO Transmission Planning Process BPM, which includes, but is not limited to[2]:

General Data

- Description of the proposal such as the scope, interconnection points, proposed route, the nature of alternative (AC/DC) or and project objectives.
- Needs identification. The proposal must provide the specific need(s) being addressed by the project, in accordance with the criteria specified in the tariff. For example, a reliability project should identify specific reliability criteria concerns that the project proposal will mitigate.
- Demonstrate the proposed transmission alternative mitigates the identified need. Provide pre-project and post-project results demonstrating the project mitigates the identified need.
- A diagram showing the geographical location and preliminary project route.
- A one-line diagram showing all major proposed elements (e.g. substation, line, circuit breaker, transformer, and interconnection points).
- Project proposals may include alternatives that have been studied by the project proponent but the submission package must clearly state which alternative is preferred. Submitting alternatives is not necessary for Merchant projects.
- The cost of mitigating short circuit and/or transient issues, shall be provided as part of the cost of the project.
- Merchant project proposals must include a demonstration of financial capability to pay the full cost and operation of the project.
- Merchant projects must engage the PTO in whose service territory the facility will be located to conduct a system impact analysis as well as a reliability study, and the project sponsor must agree to mitigate all reliability concerns, as well as impacts on allocated long-term CRRs, caused by the project interconnection.

[2] This appendix lists the minimum of data required by the ISO for the first screening purposes, additional data may be requested by the ISO later during the course of project evaluation

Technical Data

- Network model for power flow study in GE-PSLF format must be provided. In some cases, Dynamic models for stability study in GE-PSLF format may also be required.

Planning Level Cost Data

- Project construction costs estimate, schedule, anticipated operations, and other data necessary for the study. Cost data is not necessary for Merchant projects.

Miscellaneous Data

- Proposed entity to construct, own, and finance the project.
- Planned operator of the project.
- Construction schedule with expected online date.
- Reliability project proposals need to specify the necessary approval date (month/year).

2. Location Constrained Resource Interconnection Facilities (LCRIFs)

Along with submitting the required information in 1 of this Attachment A, any party proposing an LCRIF shall include the following information in accordance with Section 24.4.6.3 of the CAISO Tariff and Section 4.4.3.2 of the CAISO Transmission Planning Process BPM:

A description of the proposed facility, including the following information:

- Transmission study results demonstrating that the proposed transmission facility meets Applicable Reliability Requirements and CAISO Planning Standards.
- Identification of the most feasible and cost-effective alternative transmission additions, which may include network upgrades that would accomplish the objectives of the proposal.
- A planning level cost estimate for the proposed facility and all proposed alternatives.
- An assessment of the potential for the future connection of further transmission additions that would convert the proposed facility into a network transmission facility, including conceptual plans.
- A conceptual plan for connecting potential LCRIGs, if known, to the proposed facility.

Information showing that the proposal meets the criteria outlined in Section 24.4.6.3.2 of the CAISO Tariff and Section 4.4.3.2 of the CAISO Transmission Planning Process BPM permits the ISO to conditionally approve the LCRIF as follows:

- The facility is to be constructed for the primary purpose of connecting two or more Location Constrained Resource Interconnection Generators (LCRIG) in an Energy Resource Area, and at least one of the LCRIG is to be owned by an entity or entities not an Affiliate of the owner(s) of another LCRIG in that Energy Resource Area.
- The facility will be a High Voltage Transmission Facility.
- At the time of its in-service date, the transmission facility will not be a network facility and would not be eligible for inclusion in a PTO's TRR other than as an LCRIF.

- The facility meets Applicable Reliability Criteria and CAISO Planning Standards.

3. Demand Response Alternatives

Any party proposing demand response alternatives (*e.g.*, amount of load impact, location, and cost of the program) shall include the following information in accordance with Section 4.4.3.3 of the CAISO Transmission Planning Process BPM:

- Bus-level model of demand response for power flow or stability studies.
- Associated planning level costs.
- Satisfactory evidence showing that the proposed demand response will be reliably operated and controllable by the ISO.
- Project capacity (Net MW).

4. Generation Alternatives

Any party proposing generation alternatives shall include the following information in accordance with Section 4.4.3.3 of the CAISO Transmission Planning Process BPM:

- Basic description of the project, such as fuel type, size, geographical location, etc.
- Project scope and detailed descriptions of the characteristics or how it will be operated.
- Description of the issue sought to be resolved by the generating facility, including any reference to results of prior technical studies included in published Transmission Plans.
- Generation alternative proposals must include the network model of the project for the power flow study, dynamic models for the stability study, short circuit data and protection data.
- Other technical data that may be required for specific types of resources, such as wind generation.
- Detailed project costs, project construction, heat rate, and operation costs.
- Project capacity (Net MW).
- Any additional miscellaneous data that may be applicable.

Please note this submission does not establish an ISO GIP queue position. New resources seeking interconnection to the ISO grid must be submitted into the ISO's generation interconnection process (GIP).