FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

VOLUME (20 OF 20)

COVER LETTER

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Prepared by:

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June 2019

LEAPS | THE HYDRO COMPANY

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June 7, 2019

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

RE: **Lake Elsinore Advanced Pumped Storage Project**
FERC Project No. 14227
Submittal of Study Plans, Study Reports, and Additional Information;
Request for Expedited Acceptance of Application for Filing

Dear Secretary Bose,

The Nevada Hydro Company, (the "Company") filed an application for an original license with the Federal Energy Regulatory Commission ("Commission") for the Lake Elsinore Advanced Pumped Storage facility, FERC Project No. 14227 (the "Project") on October 2, 2017. In response to the Commission's June 15, 2018 request for additional studies, January 22, 2019 request for additional information, and May 13, 2019 letter regarding certain studies, the Company herein submits the following:

1. Study plans for Study 28 (Fire Study) and Study 29 (Recreation Use). These may be found in Section 1 of this filing.
2. Study reports for Study 8 (Aquifer Impact), Study 9 (Quino Butterfly), and Study 34B (Transformer Operation). These may be found in Section 2 of this filing.
3. Additional information related to Studies 4 and 7 (Water Quality), found in Section 3 of this filing.

The Commission's May 13, 2019 letter requested the Company to file a study report for Study 28 (Fire Study) by June 30, 2019. The Company has actively solicited the information required to complete the Fire Study Report from the U.S. Department of Agriculture, Forest Service ("USFS") and, assuming a timely response is received from the USFS, anticipates submission of the Fire Study Report to the Commission by June 30, 2019.

The Commission's May 13, 2019 letter also granted an extension of time until August 15, 2019, for the Company to submit a revised draft Historic Properties Management Plan

("HPMP") in order to allow the Pechanga Band of Luiseno Indians ("Pechanga") sufficient time to prepare and provide comments to the Company on the draft HPMP. The Company also anticipates submission of the draft HPMP to the Commission by August 15, 2019, assuming timely comments are provided by the Pechanga. The Company notes that it has already received comments on the draft HPMP from other interested tribes with cultural resources that are potentially affected by the proposed project.

1.0. Request for Expedited Acceptance of the License Application

The Company submitted a robust license application for the Project over 15 months ago on October 2, 2017. The license application is based on the substantial information that had been developed during the preceding licensing process for the exact same site under Project No. 11858, as well as additional information gathered since the termination of that proceeding.[1] Notwithstanding the large amount of information regarding potential impacts of the proposed Project on the surrounding area and resources that was included in the Company's license application, on June 15, 2018, the Commission requested that the Company perform more than 20 additional studies, most of which are redundant of information gathering efforts conducted during and after the Project No. 11858 proceeding. This filing includes the final outstanding study reports required by the Commission's June 15, 2018 letter, with the exception of Study 28 (Fire Study), which will be submitted by June 30, 2019, Study 33 (Cultural Resources), which will be submitted by August 15, 2019, and Study 29 (Recreation Use). Thus, to date, the Company has filed with the Commission an extraordinary amount of information to allow the Commission to assess the Company's proposal, including information on the Project's proposed design and operation and the effects of the proposed Project on water use and water quality; fish, wildlife, and botanical resources; historical and archaeological resources; recreational resources; aesthetics; and land use.

The Commission should expeditiously accept the Company's October 2, 2017 license application because there are currently no outstanding deficiencies associated with the application. In its January 3, 2018 letter to the Company, the Commission identified two application deficiencies pursuant to 18 C.F.R. § 4.32(e)(1) of the Commission's regulations. These deficiencies, which concerned Exhibit F drawings and the related supporting design report, were corrected by the Company in its April 3, 2018 filing. Upon the Company's correction of these deficiencies, the Commission should have immediately accepted the Company's license application for processing. The Company acknowledges that the Commission has asked for additional information and updates to studies with respect to the

[1]/ During the licensing process for Project No. 11858, the Commission accepted the license application and issued a draft and final environmental impact statement regarding the proposed project. Ultimately, the application was dismissed for non-substantive reasons associated with a dispute between the license applicants.

Project; however, this additional incremental information should not be used to delay acceptance of a complete license application and instead should be a basis to delay only the Commission's notice that the application is ready for environmental analysis.

The Commission's implementation of the President's Executive Order[2] establishing the One Federal Decision framework also supports immediate acceptance of the Company's license application. The Commission's One Federal Decision Implementation Plan anticipates uncoupling the acceptance of a license application from the finding that the application is ready for environmental analysis. As described above, because all deficiencies identified by Commission staff in the Company's license application have been corrected for more than one year, the Commission should immediately accept the license application and solicit cooperating agencies consistent with One Federal Decision.

The Company also requests that the Commission move forward with its environmental analysis of the Project without engaging in additional scoping. All interested parties have had over 15 months to file comments on the application and study requests. Numerous stakeholders and agencies have done so, and none of the comments, nor the information gathered as a result of the study requests, has identified a single new or unknown issue that was not previously raised and considered in the prior proceeding for Project No. 11858, and addressed in the October 2, 2017 license application through proposed protection, mitigation and enhancement measures or through potential alternatives. Thus, because additional scoping likewise will not raise any new or unknown issues that have not already been identified in the record, the Commission should move forward with its environmental analysis of the Project as soon as possible without engaging in additional scoping.

2.0. Transformer Study Report (Study 34B)

In its May 13, 2019 letter regarding the scope of the transformer study provided to the Commission on February 21, 2019, the Commission advised that the filed study "did not include steps to coordinate the transmission study cases with the transmission operators." As a result, the Commission directed the Company to undertake the following specific activities:

1. Convene a meeting among Southern California Edison, San Diego Gas & Electric, and the California ISO to establish agreed upon transmission study cases and associated contingencies to be studied.
2. Include the agreed upon transmission study cases and associated contingencies in the transmission study.

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[2]/ Executive Order 13807, "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects," August 15, 2017, 82 Fed. Reg. 40,463 (Aug. 24, 2017).

3. Complete the agreed upon transmission study cases and write a draft report.
4. Submit the draft report to the Commission, Southern California Edison, San Diego Gas & Electric, and the California ISO for review.
5. Resolve any concerns in the draft report expressed by the Commission, Southern California Edison, San Diego Gas & Electric, and California ISO.
6. Submit the final report to the Commission.

The following subsections describe the Company's activities undertaken and consultation that has occurred in connection with each of the above six tasks.

2.1.1. Meeting to Establish Agreed Cases and Contingencies

Rather than convening a meeting, the Company determined it more expeditious to contact and request input with each entity. See Section II.C.1 for documentation on the scope of this interchange.

The Company notes that in its original request for a transformer study (Study 34) in its June 15, 2018 letter, the Commission requested that the Company develop and file only the study plan. This Study plan was filed with the Commission on September 11, 2018. In its January 22, 2019 letter, the Commission directed the Company to further consult with the utilities and the CAISO and prepare a revised study plan, based upon comments from each entity that were provided on August 28, 2018 for the CAISO, August 29, 2018 for SDG&E and August 30, 3018 for SCE. The Study plan filed with the Commission on September 8, 2018 had incorporated these comments into the study plan without objection by the Company.

2.1.2. Include the agreed upon transmission study cases and associated contingencies

The Company was asked by the utilities and CAISO to use two specific cases, which they supplied. The selection of these two cases was intended to test the widest possible angular difference between the SCE system to SDG&E (southbound) or from the SDG&E system to SCE (northbound). These cases were selected to give the widest difference between the two systems, which would cause the greatest initial shift positions of the Case Springs phase shifting transformers. From these initial (all-in-service) system conditions, then contingency testing began.

It is important to remember that the purpose of this study was to determine whether the proposed phase shifting transformers would be able to manage the flows over the interconnection lines from LEAPS to just the amount of power going to or from the LEAPS project. The purpose of the study was not to assess the adequacy of area transmission systems under contingency tests of all kinds for any condition. That's the responsibility of the CAISO as part of its semi-annual transmission studies. Voltage problems, circuit or transformer overloads, etc., fall to the CAISO transmission studies for resolution. It is also important to

recall that the adequacy of the equipment proposed from LEAPS to the SCE and SDG&E systems has already been accepted by the utilities and the CAISO through the completion of the Interconnection Study process.[3]

There are between 500 and 600 pieces of transmission and generation equipment in the SDG&E system and SCE L.A. basin systems. Thus, there are approximately 250,000 to 360,000 possible contingency sets if one considers all possible combinations of a failure of any one or more of these. However, a vast majority of these possible combinations have from no to extremely minor impact on the ability of the transformers to manage flow because they have from no to extremely minor impact on the relative angular difference of the two systems as measured across the LEAPS tie lines.

There are two methods to winnow these potential contingencies to those having a meaningful impact on the angular difference of the two systems as measured across the LEAPS tie lines. There are software tools, like the Siemens PTI MUST software, a supplement to the PSS®E software load flow system. Knowledgeable common sense can also be applied to eliminate tens of thousands of these possible, but minimal impactful, contingencies. The objective of this winnowing process is to reduce the number of possibly impactful contingencies to a small enough number that report on the meaningful contingencies. The Company provided to the Commission roughly 20% (57) of all the total 245 power flow diagrams generated for this study in its February report, as the most meaningful.

The scope of the study agreed to was provided to all parties September 21, 2018. A copy of this Scope and Transmittal and related correspondence may be found in the Section II.C.2.

2.1.3. Complete the agreed upon transmission study cases and write a draft report.

The Company prepared the draft report of its findings, completed December 2018. While under development, the Company's consultant provided two status reports which may be found in Section II.C.3.

2.1.4. Submit the draft report to the Commission, Southern California Edison, San Diego Gas & Electric, and the California ISO for review.

The December draft report was filed with the Commission on February 14, 2019. For clarity, the Company is again submitting this report to the Commission in Section II.C.4.

Copies of the complete report were provided to the utilities on April 2, 2019 requesting comments. A follow-up request for comments was provided May 13, 3019. This report and email records of these requests may also be found in Section II.C.4.

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[3]/ The studies completed under the Commission-regulated interconnection process, and the interconnection agreements executed among these parties were provided to the Commission in Chapter 18 of Volume 3 of the FLA filed October 2017.

2.1.5. Resolve any concerns in the draft report expressed by the Commission, Southern California Edison, San Diego Gas & Electric, and California ISO.

The Company received comments on the draft report on May 29 from the CAISO, and SCE also noted that they concurred with the CAISO's comments. The Company's response to the CAISO and SCE may be found in Section II.C.5.

2.1.6. Submit the final report to the Commission.

As a result of the above, the final report fully responsive to the Commission's request consists of both the report filed with the Commission on February 14, 2019, included herein in Section II.C.4. and the reply letter to comments provided by the CAISO, found in Section II.C.5.

Please let me know if you have any questions or require clarifications to any aspect of this filing.

Sincerely,

/s/ David Kates
David Kates
On behalf of The Nevada Hydro Company
David Kates

Attachments

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

STUDY 29

RECREATIONAL STUDY PLAN

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

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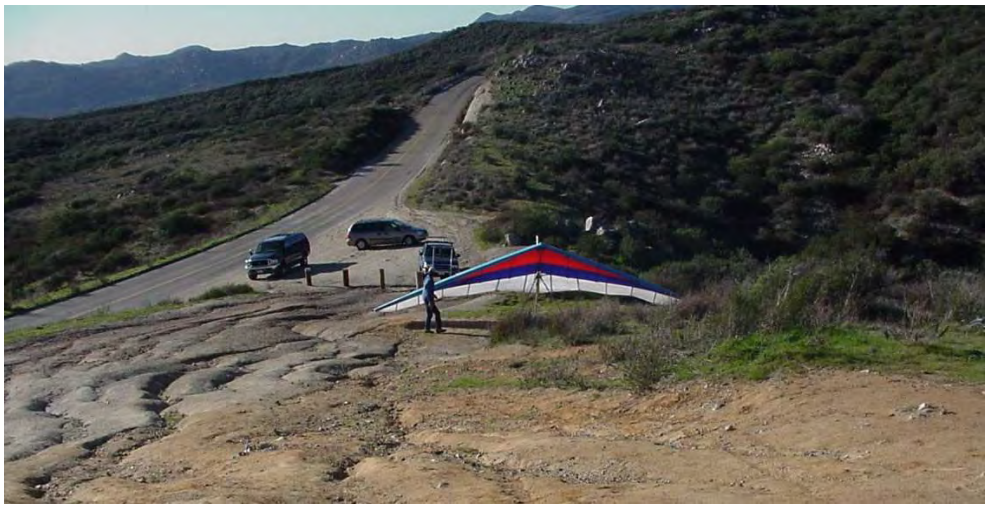
June 2019

RECREATIONAL STUDY WORK PLAN (STUDY 29)
LAKE ELSINORE ADVANCED PUMPING STORAGE PROJECT
(PROJECT NUMBER 14227-003)
RIVERSIDE COUNTY, CALIFORNIA



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ACRONYMS AND ABBREVIATIONS

CDFW	California Department of Fish and Wildlife
FERC	Federal Energy and Regulatory Commission
FLA	Final License Application
GPS	Global Positioning System
LEAPS	Lake Elsinore Advanced Pumping Storage
NHC	The Nevada Hydro Company
NOAA	National Oceanic and Atmospheric Administration
ROS	Recreation Opportunity Spectrum
RWQCB	Santa Ana Regional Water Quality Control Board
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey

1.0 INTRODUCTION

The Lake Elsinore Advanced Pumping Storage (LEAPS) Project (Project No. 14227) is in a portion of the Cleveland National Forest that includes a variety of developed and undeveloped public recreation use areas and facilities. Recreational facilities located in the vicinity of the proposed LEAPS project include camp grounds, trailheads, picnic areas, and a visitor center. Off-highway vehicle use, backcountry driving, horseback riding, hiking, mountain biking, hang-gliding, camping, and picnicking also occur in this landscape.

The project area Recreation Opportunity Spectrum (ROS) consists of all five listed spectrum classes including Rural, Roaded Natural, Semi-Primitive Motorized, Semi-Primitive non-motorized, and Primitive. The Primitive category is reserved for areas with unmodified natural environment of a large area.

In the June 15, 2018 letter from the Federal Energy Regulatory Commission (FERC), FERC staff's analysis for P-11858 was sufficient to assess the effects of the proposed project on recreation. However, since Nevada Hydro Company (NHC) proposes an alternate upper reservoir site that would remove land from public use, FERC staff requested additional information on recreation use at the proposed upper reservoir site on January 3, 2018. In its April 3, 2018, response, NHC proposes to collect this information and provide it to FERC. This Recreational Study Work Plan will provide the necessary information that FERC has requested.

2.0 PROJECT DESCRIPTION AND LOCATION

2.1 Objective

The overall objective of the Recreational Study is to assess the potential impacts to recreational use associated with the upper reservoir of the proposed LEAPS Project. Specifically, the Recreational Study will identify the type of existing recreational uses, where they are generally located, and how often they are utilized. This plan will identify the methods used to collect the recreational use data, which will be used to understand the extent of recreational use impacts that could be affected by the upper reservoir portion of the LEAPS Project. This will give FERC and the USFS the opportunity to assess the upper reservoir and provide sufficient information necessary to recommend design changes and/or mitigation measures to minimize recreational use impacts associated with the upper reservoir.

2.2 Background

After NHC filed a Final License Application (FLA) in October 2017, study requests were filed by Federal and state agencies, Native American tribes, and non-governmental organizations, including United States Forest Services (USFS), United States Fish and Wildlife Services (USFWS), California Department of Fish and Wildlife (CDFW), Santa Ana Regional Water Quality Control Board (RWQCB), Temecula Band of the Luiseño Mission Indians, the Decker Canyon Property Owners, EHOF II Lakeside, LLC, the city of Lake Elsinore, and the Center of Biological Diversity (with San Bernardino Valley Audubon Society, Endangered Habitats League, Audubon

California, and Sierra Club). Among the numerous study requests, FERC is requiring that NHC complete a recreation study.

On January 3, 2018, FERC requested additional information on recreational use at the proposed upper reservoir. On April 3, 2018, NHC proposed to collect additional information on recreational use at the proposed upper reservoir. On January 22, 2019, FERC requested NHC to submit a detailed study plan for approval regarding the upper reservoir site that includes, at a minimum, (1) a sampling schedule for the recreation use observations; (2) proposed methods to estimate recreation use in the area based on the observation data you will obtain; (3) a sample data collection sheet for the recreation use observations that allows you to record information on recreation activity type, group size, and observed length of stay; (4) proposed methods to survey the area for the presence of recreation sites, including roads, trails, campsites, day use areas, and any other location where recreation use occurs (either formally or informally); and, (5) a sample data collection sheet for recording the characteristics of the recreation sites that includes site type, length of trail or road segment(s), size, and a condition class evaluation. FERC also requested that NHC provide the USFS at least 30 days to comment and provide recommendations on the plan. The plan was originally due on April 22, 2019, but FERC granted an extension until June 30, 2019 to align the due date with that of the other study reports and study plans to allow for additional time or the USFS to respond.

2.3 Location

The LEAPS Project is located within an approximately 2,412-acre site located in Riverside County, San Diego County, and Orange County. The Upper Reservoir is located on the eastern side of the Santa Ana Mountains, just west of the Main Divide Truck Trail.

wood.

FIGURE 1

Location of the
Upper Reservoir Portion
of the LEAPS Project
Riverside County, CA

3.0 METHODOLOGY

Our proposed approach and methods for obtaining the information required to perform the recreational study is outlined in this section, as requested in the June 15, 2018 letter from FERC. Two types of data collection will be required. Available data will be collected to identify potential recreational activities in the area and identify specific elements that may reduce recreational activity such as terrain and weather conditions. This available data will be verified by on-the-ground survey methods including spot checks, camera stations, and public outreach.

3.1 Assess Available Data

Publicly-available data will be accessed and utilized to provide a complete characterization of the area in and around the LEAPS Project. Additionally, the United States Forest Service will be contacted to gather data regarding existing recreation uses in and surrounding the upper reservoir and general location. Below the discussion of each topic is a bulleted list of agencies or sources for data to be utilized.

3.1.1 Climate

National Oceanic and Atmospheric Administration (NOAA) 1981-2010 Climate Normals will be used to describe the existing climate at the Project site (NOAA 2018). This data will provide an overall context for other recreational factors that will be evaluated in the Recreational Study. Further, existing Nature Conservancy climate models (e.g., ClimateWizard) will be used to compare long-term average climate data between 1961-1990 to long-term modeled climate data in 2040-2069, and to assess long-term climate conditions as they relate to recreational use (seasonal use).

MONTH	PRECIP (IN)	AVG LOW TMP (°F)	AVG TMP (°F)	AVG HIGH TMP (°F)
January	3.04	39.3	52.6	65.9
February	2.91	40.9	54.2	67.5
March	1.77	43.4	57.9	72.3
April	0.62	46.8	62.0	77.3
May	0.14	52.4	68.1	83.9
June	0.02	56.6	73.8	91.1
July	0.21	61.9	79.8	97.7
August	0.01	62.7	80.8	98.9
September	0.24	59.1	76.4	93.6
October	0.61	52.3	67.8	83.3
November	0.86	43.5	58.4	73.3
December	2.01	38.2	51.8	65.3

- 1981-2010 Climate Normals (Elsinore Station, El Toro Station)
- ClimateWizard

3.1.2 Topography

Topography influences the type of recreational activity. For instance, slope is a key topographic feature that can greatly affect the difficulty and use of hiking trails, the feasibility of a hang-glider use area, and the location of a campground facility. The topography surrounding the upper reservoir of the LEAPs Project site is highly varied and consists of mountainous regions, large valleys, and high elevation plateaus. Useful sources of topographical data (e.g., U.S. Geological Survey [USGS] topographic maps, geotechnical studies, etc.) will be reviewed to identify areas – in particular, those beneath the transmission line – that may provide recreational use (e.g., canyons, ravines, etc.).

- USGS Topographic Maps (USGS 1997a, 1997b, 1997c, 1997d)
- Available geotechnical studies prepared for the LEAPS Project

3.1.3 Vegetation

Region 5 of the USFS encompasses the entire State of California and provides a variety of publicly available spatial data pertaining to vegetation for the South Coast (USFS 2018a). This data is provided via the USFS Geodata Clearinghouse (USFS 2018b). Under the Western Riverside County Multiple Species Habitat Conservation Plan, a regional-wide vegetation mapping effort was completed. This vegetation data was used to generate a general vegetation communities map, but was ground-truthed and revised based on numerous site visits between 2001 and 2019:

USFS

- Existing Vegetation: Region 5 South Coast (CalVeg)

MSHCP

- Vegetation Communities Map

A desktop review of vegetation mapping databases was completed in concert with an on-site vegetation mapping effort (conducted at the Project site under separate studies requested by FERC). A brief description of each vegetation community is found within the LEAPS biological resources assessment but will also be included in the recreational work plan to better understand areas of diverse habitat value and species richness.

3.1.4 Aerial Photography

Recent and historic aerial photography will be used to identify recreational use areas within the upper reservoir location. Specific recreational uses that can be identified by aerial photographs include, but are not limited to, active hiking/biking trails, off-road vehicle trails, and picnic areas. These proposed areas will be mapped and ground truthed during spot-check sampling.

3.2 Survey Methods

3.2.1 Spot Checks

Spot checks will be completed at 4 locations at high-use areas in and around the upper reservoir. The **sampling schedule** will include data collection twice a month at each location alternating a morning and afternoon spot check. Each check will last approximately 2 hours (ex. 0600-800, 0900-1100, 1200-1400, 1500-1700). The order in which the spot checks will be sampled will reverse every two weeks, so the morning and afternoon samples can be completed in the same order. Then each month, the samples will change in order, to allow for early and later sampling times for each site. A total of 24 sampling days will be taken, 12 morning-time samples and 12 afternoon-time samples. Recreation use will be identified during the 2-hour spot-check. Data will be collected on standardize data sheets and will include, but is not limited to, the time the survey starts, weather data, Global Positioning System (GPS) coordinates, site photos locations, and description of recreational activities observed and the time it was observed. Spot check days may be randomly sampled through the month and will not be conducted during inclement weather.

3.2.2 Camera Stations

Camera stations will also be set up at specific recreational use areas to document activities. Locations will be selected with USFS coordination. Approximately 10 Cameras will be set up to document recreational use. Cameras will be checked every two weeks to swap out batteries and camera data cards. Camera station locations will be selected to be hidden to reduce theft and vandalism. Data to be collected will include total number of people at each camera, average time of day the area is used, and frequency of use during the month/year.

3.2.3 Public Outreach

A public outreach will be completed to identify the type of recreational uses that occur within the Cleveland National Forest, as recommended by USFS. During the spot checks and camera station field work, Wood staff will approach those people that are actively utilizing the area in and around the upper reservoir area for recreation and ask them questions to identify what kind of recreation they are partaking in, how often they are utilizing the area, and how far they traveled to utilize the area. This information will also be collected on the standard data sheet (see Appendix A).

3.3 COMPILATION AND REPORTING OF RESULTS

Data obtained during this Recreational Study will be presented in a report for submittal to NHC, Inc. The data will be used to estimate recreational use. This will be completed by taking the total amount of daylight and evening recreational use and extrapolating those numbers based on the amount of time not sampled. We will sample a two-hour period twice a month for 12 months, that will come out to 48 hours of sampling over a period of 8,760 hours for the year (0.005%). As an

example, if we have two people identified as hiking the upper reservoir location over the entire year, that would extrapolate to 400 individuals using the upper reservoir for the entire year.

This report will contain a discussion of objectives, methods used, investigation findings, and a brief Quality Assurance/Quality Control evaluation. Documentation of data will be summarized in tables and on figures, as appropriate. The Recreational Study will provide a clear understanding of the recreational uses and frequency of use currently within the portion of the Cleveland National Forest that will be affected by construction of the proposed upper reservoir.

4.0 REFERENCES

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USGS. 1997b. 7.5-minute Series (Topographic) Quadrangle, Lake Elsinore, California.

USGS. 1997c. 7.5-minute Series (Topographic) Quadrangle, Sitton Peak, California.

USGS. 1997d. 7.5-minute Series (Topographic) Quadrangle, Wildomar, California.

Appendix A

Sample Data Sheet

Site:

Time	Date	*ROS Designation*						*Recreational Activities*									
		Rural	Roaded Natural	Semi-Private Motorized	Semi-Primitive non-Motorized	Primitive	Evidence of Fire	Camp Ground	Trailhead	Picnic Area	Visitor Center	Off-Highway Vehicle Use	Backcountry Driving	Horseback Riding	Hiking	Mountain Biking	Hang-Gliding

Incidental Plant and Wildlife Observations

Date	Observer(s)	Natural community	Precipitation	Fog	Cloud Cover	Temperature	Wind Speed	Comments/Map

***NCom=** **1**=Chaparral 2=Coastal Sage Scrub 3=Non-Native Grassland 4=Oak Woodland 5=Willow Riparian 6=Disturbed 7= Agriculture 8=Developed

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

STUDY 28

FIRE STUDY PLAN

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Applicant:

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June 2019

FINAL
FIRE STUDY PLAN
LAKE ELSINORE ADVANCED PUMPING STORAGE PROJECT
(PROJECT NUMBER 14227-003)
RIVERSIDE COUNTY, CALIFORNIA

Submitted to:
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June 5, 2019

Wood Project No.: 1855400727

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
CDFW	California Department of Fish and Wildlife
CNF	Cleveland National Forest
CWHR	California Wildlife Habitat Relationship System
EIS	Environmental Impact Statement
FEIS	Fire Effects Information System
FERC	Federal Energy and Regulatory Commission
FLA	Final License Application
FRAP	Fire and Resource Assessment Program
kV	kilovolt
LEAPS	Lake Elsinore Advanced Pumping Storage
MOU	Memorandum of Understanding
MTBS	Monitoring Trends Burn Severity
NCEP	National Centers for Environmental Prediction
NDFD	National Digital Forecast Database
NERC	North American Electric Reliability Cooperation
Nevada Hydro	The Nevada Hydro Company
NFFL	National Forest Fire Laboratory
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NVC	National Vegetation Classification
NWS	National Weather Service
ROD	Record of Decision
RRU	Riverside Unit
RWQCB	Regional Water Quality Control Board
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WFAS	Wildland Fire Assessment System
WUI	Wildland Urban Interface

1.0 INTRODUCTION

The Lake Elsinore Advanced Pumped Storage (LEAPS) Project (Project No. 14227) is located in an area that has historically been impacted by wildfires, where wind patterns can potentially exacerbate wildfires, and where recent residential development has occurred along the border of the Cleveland National Forest (CNF). These conditions, as further exemplified by the Holy Fire which occurred in Fall 2018, indicate that there may be a greater fire risk associated with the staff alternative than was originally analyzed in the 2007 Final Environmental Impact Statement (EIS). As a result, a Fire Study was requested by the U.S. Forest Service (USFS) and Decker Landowners to assess the potential impacts of the LEAPS Project on regional fire management operations. This Fire Study Plan has been prepared for the USFS and the Federal Energy Regulatory Commission (FERC) to initiate the completion of a Fire Study (Study 28) originally requested by FERC in a comment letter dated June 15, 2018 (FERC 2018).

The overall objective of this Fire Study Plan is to describe the methodologies and metrics proposed to assess the potential fire risk associated with the proposed LEAPS Project. The Fire Study Plan outlines the general approaches to characterizing: biological and physical conditions of the region; fire history and conditions that contribute to wildfire danger; and regional wildfire fighting operations and preparedness. Following approval of the Final Fire Study Plan by USFS and FERC, these approaches will be implemented to perform an analysis of the potential impacts and increased fire risk associated with the LEAPS Project

2.0 BACKGROUND

In 2004, the Elsinore Valley Municipal Water District and Nevada Hydro filed an application for an original license with FERC for the construction and operation of the LEAPS Project located in Riverside County, San Diego County, and Orange County. The LEAPS Project is an energy generation and storage project. As originally proposed, the it would occupy approximately 2,412 acres of Federal lands and would include a lined upper reservoir with a dam and dike, an underground powerhouse, and a 32-mile, 500-kilovolt (kV) transmission line linking two existing transmission lines to the north and south of the Project area. A staff alternative – consisting of modifications to the original design as requested by the USFS and FERC – was also considered in the 2007 Final EIS. The staff alternative included an alternate location for the upper reservoir, which would provide the same usable storage with a smaller total footprint, as well as an alternate alignment for the transmission line to avoid crossing private inholdings in the CNF, thereby avoiding potential conflicts with fire suppression activities. FERC granted the proposed LEAPS Project a preliminary permit to study the staff alternative on October 24, 2012.

On June 1, 2017, Nevada Hydro filed a Notice of Intent (NOI) to file a license application and a draft license application for the LEAPS Project (Project No. 14227), which had been substantially re-designed to be similar to the staff alternative that was assessed in the 2007 Final EIS. In its NOI, Nevada Hydro requested that FERC's pre-filing licensing requirements (i.e., pre-filing scoping, comments and information, or study requests, the preparation of and comments on a proposed study plan, resolution of disputes over studies, and notice of the Applicant's intent to file a draft license application) be waived to allow it to proceed directly to filing a Final License

Application (FLA). FERC staff approved Nevada Hydro's waiver request in September 2017, noting that stakeholders could comment on the adequacy of the FLA during FERC's post-filing procedures.

The project presented in the FLA proposes similar facilities and alignments as the staff alternative for Project No. 11858 considered by FERC in the 2007 Final EIS, with a few distinctions. Nevada Hydro is now proposing to develop two separate primary transmission lines. The proposed alignment of the transmission lines is substantially similar to the alignment reviewed in the 2007 Final EIS; however, FERC has also requested analysis of three alternate alignments for the northern portion of the transmission line are being considered by Nevada Hydro. Additionally, the Case Springs substation has been sited in the CNF, rather than Camp Pendleton. This new substation location was chosen in consultation with USFS after the Record of Decision (ROD) for the 2007 Final EIS for Project No. 11858 was issued.

After Nevada Hydro filed a FLA in October 2017, study requests were filed by Federal and state agencies, Native American tribes, and non-governmental organizations, including USFS, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), Santa Ana Regional Water Quality Control Board (RWQCB), Temecula Band of the Luiseño Mission Indians, the Decker Canyon Property Owners, EHOF II Lakeside, LLC, the City of Lake Elsinore, and the Center of Biological Diversity (with San Bernardino Valley Audubon Society, Endangered Habitats League, Audubon California, and Sierra Club). Among the numerous study requests, FERC, in a letter on June 15, 2018, requested that Nevada Hydro complete a Fire Study (Study 28).

3.0 METHODOLOGY

Our proposed approach for obtaining the information required to perform the analyses are outlined in this section, as requested in the June 15, 2018 letter from FERC.

Publicly accessible Federal, state, and interagency sources will be used to gather data in an effort to summarize the physical (e.g., location, population, climate, etc.) and biological (e.g., vegetation, wildfire history, etc.) characteristics of the region immediately surrounding the Project area. Additionally, the USFS will be contacted to gather data regarding response times, available equipment, water sources, etc. (Data and communications from any other local agencies [e.g., CAL FIRE] will also be incorporated, provided that CNF staff is able to facilitate communication and data sharing.) Methods for specific characteristics discussed below in Physical Setting, Biological Setting, and Fire Study Elements, are described in more detail under each heading. Below the discussion of each topic is a bulleted list of agencies or sources of data to be utilized. Sources used are provided in the bibliography or are indicated in the text as a URL.

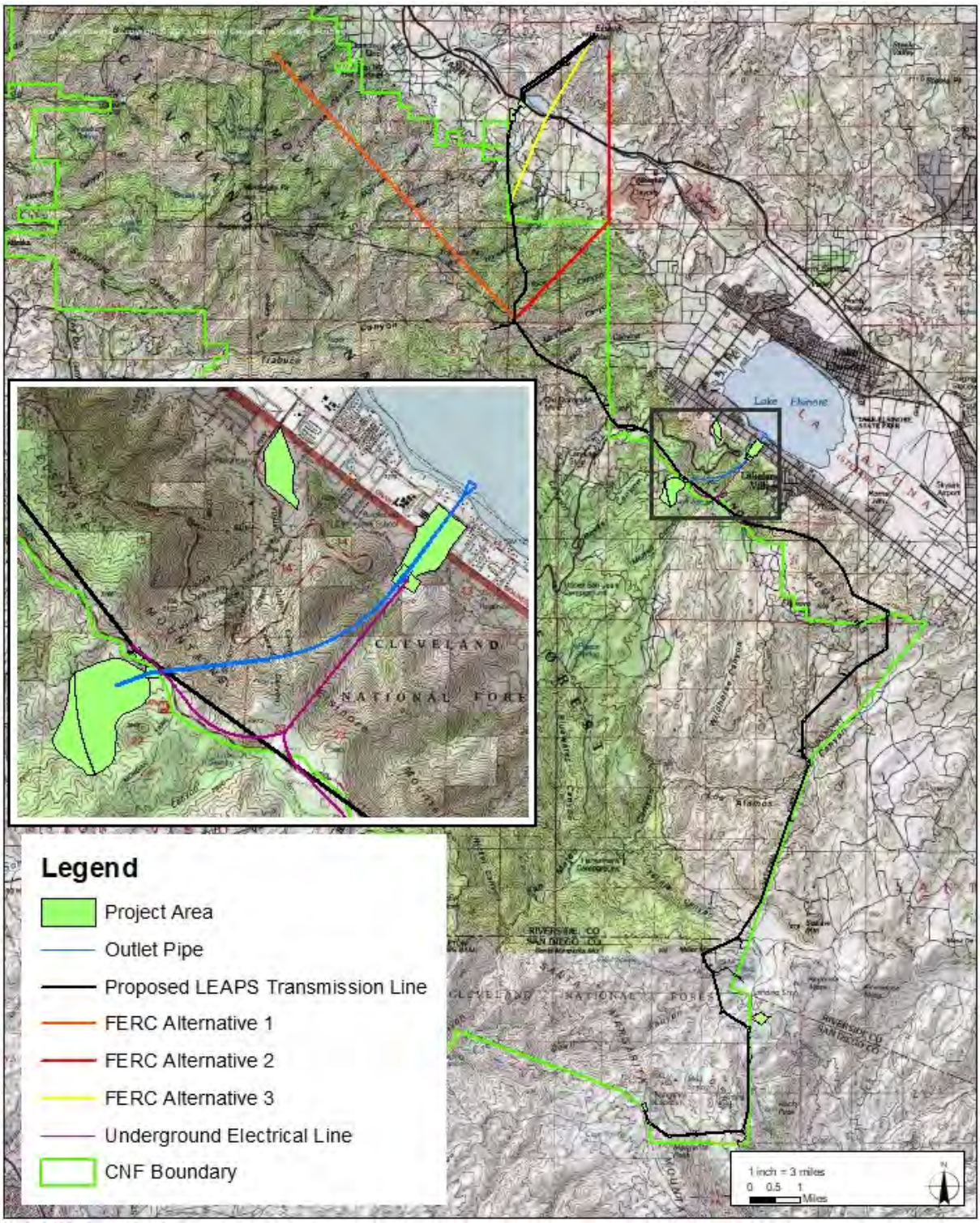

Figure 1. Location of the Lake Elsinore Advanced Pump Storage (LEAPS) Project in Riverside County, San Diego County, and Orange County, California.

4.0 PHYSICAL SETTING

4.1 Location

The LEAPS Project is located within an approximately 2,412-acre site located in Riverside County, San Diego County, and Orange County. The Project site is located in and near the CNF, a 460,000-acre parcel of USFS-managed public land situated in San Diego, Orange, and Riverside counties in Southern California. CNF is a highly dynamic environment, with rapid residential growth nearby, varied topography, and a Mediterranean climate typical of the region.

The residential growth nearby includes several communities and developments. Communities on the east-facing side of the CNF and the Project area include Lake Elsinore, El Cariso (located southwest of Lake Elsinore and west of Ortega Highway), and Lakeland Village (located south of Lake Elsinore and east of Ortega Highway). On the western portion of the Project area, a small residential community, Rancho Capistrano, is located on a private in-holding in the CNF. Therefore, this area has a high proportion of what is known as the wildland urban interface (WUI)

4.2 Regional Land Use

Federal, state, and county population data and land use plans will be referenced to accurately describe economic developments, population trends, management plans, and current land use of the area surrounding the LEAPS Project site. Relevant land use and demographics data that will be assessed in the Fire Study includes, but is not limited to, the following:

- USFS
- U.S. Census Bureau
    - U.S. Census Bureau Population Estimates
- Riverside County
    - Riverside County Center for Demographics Census Reports
    - Riverside County General Land Use Plan
    - Riverside County Economic Development Agency Annual Reports
    - Riverside County High Opportunity Area Maps
    - Existing Vegetation: Region 5 South Coast (CalVeg)
    - CNF Land Management Plan, Goal 1.1

4.3 Climate

National Oceanic and Atmospheric Administration (NOAA) 1981-2010 Climate Normals (see Table 1) will be used describe the existing climate at the Project site (NOAA 2018). This data will provide an overall context for other fire risk factors that will be evaluated in the Fire Study. Further, existing Nature Conservancy climate models (e.g., ClimateWizard) will be used to compare long-term average climate data between 1961-1990 to long-term modeled climate data in 2040-2069, and to assess long-term climate conditions as they relate to file risk.

TABLE 1. 1981-2010 TEMPERATURE NORMALS AT LAKE ELSINORE, CA (USC00042805)				
MONTH	PRECIP (IN)	AVG LOW TMP (°F)	AVG TMP (°F)	AVG HIGH TMP (°F)
January	3.04	39.3	52.6	65.9
February	2.91	40.9	54.2	67.5
March	1.77	43.4	57.9	72.3
April	0.62	46.8	62.0	77.3
May	0.14	52.4	68.1	83.9
June	0.02	56.6	73.8	91.1
July	0.21	61.9	79.8	97.7
August	0.01	62.7	80.8	98.9
September	0.24	59.1	76.4	93.6
October	0.61	52.3	67.8	83.3
November	0.86	43.5	58.4	73.3
December	2.01	38.2	51.8	65.3
Source: NOAA 2019. Notes: The Lake Elsinore National Climatic Data Center (NCDC) Station (USC00042805)				

Relevant climate data that will be assessed in the Fire Study includes, but is not limited to, the following:

- NOAA
    - 1981-2010 Climate Normals (Elsinore Station, El Toro Station)
- The Nature Conservancy
    - Climate Wizard

4.4 Topography

Topography influences the movement of air, directing a wildfire's course. Slope is a key topographic feature in fire behavior. The topography of the area in and around the LEAPs Project site is highly varied and consists of mountainous regions, large valleys, and high elevation plateaus. Useful sources of topographical data (e.g. U.S. Geological Survey [USGS] topographic maps, geotechnical studies, etc.) will be reviewed to identify areas – in particular, those beneath the proposed transmission line and alternative transmission line routes – that are at risk for extreme fire behavior (e.g., canyons, ravines, etc.). Relevant topographical data that will be assessed in the Fire Study includes, but is not limited to, the following:

- USGS Topographic Maps (USGS 1997a, 1997b, 1997c)
- Available geotechnical studies prepared for the LEAPS Project

4.5 Existing Infrastructure

As stated previously, the area around the LEAPS Project site and the CNF has developed rapidly, and infrastructure associated with electrical systems is already present in the region. A desktop review of the area in and around the LEAPS Project site will be conducted to quantify the amount and types of electrical infrastructure already in place, roads, and trails utilized for fire management operations, and with any relevant information. Data that will be assessed in the Fire Study includes, but is not limited to the following:

- California Energy Commission Electric Transmission Line Geographic Information Systems (GIS) Datasets

5.0 BIOLOGICAL SETTING

5.1 Ecological Setting

Readily available ecoregion data from the U.S. Environmental Protection Agency (USEPA) and other agencies will be utilized to better understand and describe the ecosystems surrounding the LEAPS Project site. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. USEPA Level IV Ecoregion details will be described for the area around the LEAPS Project site. Level IV is a further subdivision of level III ecoregions (USEPA 1997). Relevant ecological data that will be assessed in the Fire Study includes, but is not limited to the following:

- CalVeg Ecoregions
- EPA Level IV Ecoregion Data

5.2 Vegetation

The National Vegetation Classification (NVC) system will be used to characterize the NVC communities (classified at the Group level) dominant in the area surrounding the LEAPS Project site. Region 5 of the USFS encompasses the entire State of California and provides a variety of publicly-available spatial data pertaining to existing vegetation communities and fuels for the South Coast (USFS 2018a). This data is provided via the USFS Geodata Clearinghouse (USFS 2018b). In addition, the California Wildlife Habitat Relationship System (CWHR) provides information on the structure, composition, and natural succession of vegetation communities in the State of California. Lastly, the USFS Fire Effects Information System (FEIS) provides fire regime information for vegetation communities throughout California. These sources will be used the characterize the vegetation types in the region. Relevant vegetation data that will be assessed in the Fire Study includes, but is not limited to the following:

- USFS
    - NVC Communities: Region 5 South Coast (CalVeg)

- Ecological Sections: Potential Natural Vegetation
- CWHR Vegetation Community Data
- USFS FEIS Vegetation Community Data

A desktop review of vegetation mapping (e.g., NVC communities) data will be combined with any on-site vegetation mapping and descriptions from local fire personnel to form an accurate description of vegetation communities surrounding the LEAPS Project site. On-site vegetation mapping is to be conducted at the Project site under separate studies requested by FERC.

5.3 Fuels and Fuel Moisture

A discussion of fuel types (i.e., 1-hour fuels, 10-hour fuels, 100-hour fuels, and 1,000-hour fuels) and the Northern Forest Fire Laboratory (NFFL) 13 Standard Fuel Models for the Project area will be included. In addition to data from the USFS Geodata Clearinghouse, CAL FIRE's Fire and Resource Assessment Program (FRAP) provides a variety of publicly-available fuels and fire hazard maps GIS data for the state (CAL FIRE 2012). Relevant fuels and fuel moisture data that will be assessed in the Fire Study includes, but is not limited to, the following:

- USFS
  - Western Bark Beetle Strategy Data
  - Hazardous Fuels Treatment Reduction Areas
  - National Fuels Moisture Database
- CAL FIRE FRAP Mapping
  - Surface Fuels
  - Fuel Rank
  - Fire Threat
  - Tree Mortality Mapper

A desktop review of surface fuels data, fuels reduction projects, and tree mortality data will be combined with available fuels models and descriptions from local fire personnel to form an accurate description of existing fuel types and fuel loads surrounding the LEAPS Project site.

6.0 FIRE STUDY ELEMENTS

6.1 Fire History

The LEAPS Project is located in an area that has historically been impacted by frequent and intense wildfires. Due to a host of variables (e.g., vegetation changes, climactic factors, constructed barriers) wildfires rarely burn uniformly over large areas. As a result, when viewed at the landscape level ,fire history can often look like a patchwork or mosaic of past fire activity. Publicly-available mapping data will be used to accurately depict and describe the fire history of area surrounding the LEAPS project. Ignition sources (e.g., transmission lines, unattended campfires, WUI) will also be examined. Relevant fire history data that will be assessed in the Fire Study includes, but is not limited to, the following:

- USFS
    - Spatial Wildfire Occurrence Data for U.S. 1992-2015
    - Monitoring Trends Burn Severity (MTBS) Burn Area Boundaries
- CAL Fire FRAP Mapping
    - Fire Perimeters Database
- National Wildland Fire Coordination Group
    - Holy Fire Incident Information
    - Holy Fire Perimeter Map

6.2 Fire Season

Regional wildfire danger statistics will be derived from the Wildland Fire Assessment System (WFAS) – originally developed by the Fire Behavior unit at the Fire Sciences Laboratory in Missoula, Montana – to define the historical fire season start and end dates, as well as the historic causes of wildfire ignition. The WFAS also provides access to the National Fuels Moisture Database (USFS 2018c), which provides publicly available historical fuel moisture data from a vast network of sampling locations across the country. Additionally, CAL FIRE has a log of historical wildfire activity statistics for the entire state, Redbooks, for each year dating back to 1943 (CAL FIRE 2018). Through the National Fuels Moisture Database, graphs and tables of the fuel moisture for the LEAPS Project area can be viewed on a bimonthly basis and compared across years to develop an accurate summary of historical and projected future fuel moisture fluctuations. Relevant fire season data that will be assessed in the Fire Study includes, but is not limited to the following:

- USFS
    - WFAS
    - National Fuel Moisture Database
    - Data from CNF, as available
- CAL Fire
    - Historical Wildfire Activity Statistics (Redbooks)

6.3 Wildfire Danger

Readily accessible Federal, state, and interagency sources will be evaluated in order to characterize wildfire danger in the region of the LEAPS Project. In addition, information available from past fires in the region – including the Holy Fire – will be reviewed for the conditions present at the time of these conflagrations.

As the foundation of the National Weather Service (NWS) Digital Services Program, the National Digital Forecast Database (NDFD) consists of gridded forecasts of sensible weather elements (e.g., maximum temperature, cloud cover, wind speed, relative humidity, etc.), which can be used to make a determination regarding the level of wildfire danger (i.e., “low”, “moderate”, “high”, “very

high", and "extreme"). The NDFD contains a matrix of digital forecasts as reported by NWS field offices working in collaboration with the National Centers for Environmental Prediction (NCEP).

Since 2007, WFAS has been producing wildfire danger forecasts using data from the National Digital Forecast Database (USFS 2018c). However, overall wildfire danger throughout a region is extremely localized given the varying microclimates, fuels, and topographies that occur over large land areas. Additionally, while the WFAS maintains data on observed wildfire danger across the country, uniform reporting has not yet been achieved. Although some stations report data regularly, other stations report more sporadically, therefore it is not possible to compare wildfire danger ratings at one station or within one particularly region over large expanses of time.

In order to give the most accurate representation of wildfire danger severity, the WFAS will be reviewed for the reporting stations located closest to the LEAPS Project site (e.g., El Cariso Fire Station). Data from station(s) near the LEAPS Project site will then be compiled and analyzed to give an effective summary of wildfire danger levels for the area on an annual and monthly basis. In addition, this data will also be compared with wildfire activity statistics, provided in the Redbooks, on a regional, county, and monthly basis in order to provide a summary of the wildfire history for the area surrounding the LEAPS Project site.

In addition to WFAS, CAL FIRE has information available on multiple variables of wildfires in California, providing an overview of wildfire danger characteristics for the state as a whole. CAL FIRE's existing mapping of fire hazard severity zones, and fire threat for the State of California will be taken into consideration when developing summary of wildfire danger levels in the area. CAL FIRE defines fire threat as a combination of two factors: 1) fire frequency, or the likelihood of a given area burning; and 2) potential fire behavior (i.e., hazard). These two factors are combined to create threat classes ranging from low to extreme. Fire threat will be used to estimate the potential for impacts on various assets and values susceptible to fire. Impacts are more likely to occur and/or be of increased severity for the higher threat classes (CAL FIRE 2012).

CAL FIRE data and information will also be used to characterize wildfire danger originating from electrical infrastructure.

Relevant fire season data that will be assessed in the Fire Study includes, but is not limited to the following:

- USFS
    - Spatial Wildfire Occurrence Data for U.S. 1992-2015
    - MTBS Burn Area Boundaries
    - WFAS wildfire danger adjective class ratings
- CAL FIRE FRAP Mapping
    - Fire Hazard Severity Zones
    - Fire Threat
    - California Fire Hazard Reduction Projects

6.4 Wildfire Preparedness and Response

The LEAPS Project area and agencies are responsible for fire protection in the region will be summarized in this section. Wildfire fighting in Riverside County is undertaken by the USFS, CAL FIRE, and various local agencies including the Riverside County Fire Department. Many interagency fire groups exist in Southern California and the surrounding regions, necessitated by the high cost and technical skill required of fighting wildfires. The level of resources and personnel and equipment available at any given time fluctuates depending on the time of year, location, and wildfire danger. In addition to this, residential development near the proposed LEAPS Project complicates the properties and structures that need to be protected. The CNF, in conjunction with CAL FIRE, Bureau of Land Management (BLM), and numerous other state, county, and local control organizations, maintain a constant state of readiness in an effort to keep fire-related damage to a minimum.

The Fire Study will describe how the LEAPS Project would affect an/or support wildfire suppression efforts, serving as a basis for the preparation of a Memorandum of Understanding (MOU) to formalize responsibilities and procedures during a wildfire, including the potential availability of upper reservoir water for firefighting. Relevant data that will be assessed in the Fire Study includes, but is not limited to, the following:

- USFS
    - Existing fire plans and procedures
    - Completed hazardous fuels reduction projects
    - Firefighter safety rules/procedures (e.g., general and related to infrastructure/power lines)
    - Existing safety protocols and avoidance requirements for aircraft working near powerlines
    - Direct Communications and data received from CNF
    - Land, fuel, or fire management operation limitations due to infrastructure concerns
    - Impacts on fuel breaks or fuels reduction project effectiveness
- CAL FIRE
    - Riverside Unit (RRU) Fire Danger Operating Plan
    - Riverside Unit Strategic Fire Pan
    - Direct Protection Area Mapping
    - California Fire Hazard Reduction Projects
- Local Communities (e.g., El Cariso and Lakeland Village)
    - WUI documents and information
    - Wildfire preparedness documents
    - Local fire plans, fire drills, public training, fire detection systems, hazardous fuels reduction projects, control methods, and evacuation/escape procedures

The Fire Study will examine wildfire preparedness and response times in the Project area as outlined below.

6.4.1 Fire Plans

Existing wildfire plans (e.g., CNF Fire Plan[s], RRU Firing Danger Operating Plan, Riverside Unit Strategic Fire Plan), and associated control methods, will be identified and described in this section. Potential conflicts and/or required revisions to these plans will be thoroughly discussed.

6.4.2 Staffing

Firefighting staffing levels and assets, including peak staffing periods, for Federal, state, and interagency organizations will be summarized. Information from CNF – and other state and local agencies – will be necessary to accurate describe staffing.

6.4.3 Aviation

Aircraft are used extensively in wildland fire suppression efforts in California. Current aircraft inventory, use, and concerns associated with potential impacts to fire suppression efforts (e.g., impacts to aircraft) will be described in this section. Information from CNF – and other state and local agencies – will be necessary to accurately describe these assets and activities.

6.4.4 Safety Measures

Large fires are an inevitable part of Southern California ecosystems, with flammable vegetation, extreme fire weather, and steep topography being key factors in the area near the proposed Project Area. Ignition in these ecosystems is commonly caused by people, and residential areas around the proposed Project Area have pushed up into the foothills in many places. This has led to a large increase in the amount of WUI areas that are at risk and in need of protection from wildland fire.

Existing fire safety measures in the LEAPS Project area (e.g., CNF Fire Plan[s], CAL FIRE Fire Plan[s], fire drills, public awareness training, fire detection systems) are needed to populate this section. In addition, any regional evacuation/escape procedures available from agencies would assist in characterizing safety measures.

7.0 DISCUSSION

Empirical data and anecdotal evidence obtained during this Fire Study will be presented in this section. Section 7 will also contain a discussion of objectives, investigation findings. Documentation of data will be summarized in tables and on figures, as appropriate.

7.1 Transmission Line Alternatives

A discussion of the alternative alignments for the LEAPS Project and their potential fire risks will be included in this section. This analysis will rely heavily on descriptions of the existing physical and biological features, including vegetation and fuels, described in Section 4 and Section 5. The

risks associated with the transmission line configurations and their potential to ignite wildfire due to high winds or other impacts will be emphasized. Additional discussion will be provided regarding potential impact on wildfire preparedness and response using the metrics described in Section 6.4.

7.2 Hazardous Fuel Loading

An accurate description of existing fuel types and fuel loads surrounding the LEAPS Project site will be combined with a spatial analysis to assess the extent to which the infrastructure associated with the LEAPS Project will impact hazardous fuels, and the potential for these fuels to produce extreme fire behavior. This analysis will provide a thorough discussion of required vegetation buffers from the transmission lines. In addition, the Fire Study will discuss the effectiveness of existing and proposed fuel breaks and existing or proposed fuels reduction projects located within these areas.

7.3 Infrastructure Effects

7.3.1 Fire Management Operations

The construction of the proposed LEAPS Project, particularly the 32-mile, 500-kV transmission line, could result in potential impacts to fire suppression efforts. At the very least, the additional infrastructure would increase the number of structures and resources that would need to be protected in the event of a wildfire, which may divert firefighting resources away from perimeter control. The Fire Study will utilize information and metrics described in Section 6.4 – including existing procedures, safety protocols (especially protocols for personnel and equipment near electric infrastructure), studies, and other anecdotal information – to describe the potential effects proposed infrastructure associated with the LEAPS Project could have on fire management operations.

7.3.2 Ground Operations

Impacts to access from roads, trails, and other travel paths for firefighting from the LEAPS Project will be thoroughly discussed. This will include a thorough description of the approximately 5.2 miles of permanent access roads will be constructed to aid in access to towers substations and other various pieces of the infrastructure. Each of the proposed utility corridors would be assessed – in terms of length, existing topography, existing vegetation and fuels etc. – to determine potential impacts associated with powerline avoidance requirements for personnel safety and indirect effects on incident response times, travel times, etc.

7.3.3 Aerial Operations

Impacts to aircraft providing firefighting support will be discussed and will include an assessment of avoidance requirements for proposed towers and power lines. Each of the proposed utility corridors would be assessed to determine potential impacts associated with powerline avoidance requirements for personnel safety.

7.3.4 Water Sources

The updated design for the upper reservoir (refer to Figure 1) that is analyzed in the 2007 EIS remains lined and within the CNF as in previous designs, but it now has a smaller and deeper footprint while retaining the original storage capacity. It is proposed to be located in Decker Canyon, in CNF. In addition to the benefit of having the reservoir closer to Lake Elsinore, the upper reservoir's presence in CNF could provide a source of water to fight wildfires within the CNF. The Fire Study will utilize any available fire management protocols, studies on water sources suitable for firefighting, and direct communications with the CNF to discuss and analyze the proposed upper reservoir's potential use as a water source for fire management operations.

7.4 Wildfire Risk

Wildfires can start at transmission lines or substations for a variety of reasons. The Fire Study will identify previous regional studies on the fire risk of 500-kv transmission lines to describe the potential for project transmission lines to ignite wildfires. The Fire Study will also identify mandated fire risk reduction measures (e.g., vegetation management, powerline fire patrol, etc.) undertaken by similar facilities and describe how these measures can mitigate potential risk. Relevant data that will be assessed in the Fire Study includes, but is not limited to the following:

- Historical Wildfire Activity Statistics (Redbooks)
- North American Electric Reliability Corporation (NERC) Vegetation Management Standards
- California Fire Prevention Standards for Electrical Utilities
- Deenergizing technology for fire prevention
- Potential indirect impacts associated with service interruptions during a wildfire

8.0 RECOMMENDATIONS

Recommended actions based on the results of analysis above will be made with reference to maximizing safety and minimizing wildfire risk for the LEAPS Project.

9.0 REFERENCES

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USGS. 1997c. 7.5-minute Series (Topographic) Quadrangle, Sitto Peak, California.

Date	Page	Paragraph	Line	Sentence	Comment	Reviewer/Author Name, Title (Organization)	Receipient of Review Document Name (Organization)	Name of Responder (Organization)	Action Taken to Address the Comment AND LOCATIONS OF CHANGES IN THE DOCUMENT:
09/13/2018	-	-	-	-	Information from the recent Holy Fire, which burned in areas proposed for use by LEAPS could provide valuable insight and the opportunity to assess how fire-fighting response would have been impacted by the project.	Darrel Vance (USFS)	David Kates	Jarrod Armstrong & Kari Morehouse (Wood)	Reference to the Holy Fire was added in Section 6.1 (Fire History) and Section 6.3 (Wildfire Danger)
11/08/2018	-	-	-	-	The Cleveland National Forest is a highly dynamic and challenging environment when it comes to wildland fires. The Cleveland has experienced several large fires, most recently the Holy Fire, located on the Trabuco District. There were several unique challenges, most notably critical infrastructure within and adjacent to the fire area. These types of challenges can increase risk and exposure to firefighting personnel and divert efforts away from perimeter control, which should be included in the fire risk study.	CNF Fire Chief Brian Rhodes (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	See response to Comment 1, above. Existing infrastructure in the area is addressed in Section 4.5 (Existing Infrastructure), the surrounding communties for the proposed project area are addressed in Section 4.1 (Location), and resources and firefighter response are addressed in Section 6.4 (Wildfire Preparedness). Infrastructure additions resulting from the proposed Project and their impacts to fire management operations are addressed in Section 7.3 (Infrastructure Effects).
11/08/2018	-	-	-	-	Proposed utility corridors on the National Forest will need to include several assessments to determine their impacts. The assessments will need to investigate effects to both ground and aerial firefighting operations, given powerline avoidance requirements for personnel safety.	CNF Fire Chief Brian Rhodes (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Ground and aerial firefighting operations are addressed in Section 6. 4 (Wildfire Preparedness and Response). Analysis of impacts from the proposed transmission line route(s) are addressed in Chapter 7, specifically in Section 7.3 (Infrastructure Effects), which includes effects both to ground and aerial firefighting operations.
11/08/2018	-	-	-	-	An assessment will need to be done to include potential disruption of service to an area due to the effects of a wildfire.	CNF Fire Chief Brian Rhodes (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	These issues are addressed in Section 7.4 (Wildfire Risk), which references de-energizing proposals, schedules, and technologies. ***Additionally, Wood still awaiting information from USFS (see list of questions) to more fully understand the data available to comprehenisvely address local issues known by CNF staff.***
11/08/2018	-	-	-	-	Last but not least, an assessment will need to be conducted to address the threat and risk associated from utilities that ignite a wildfire due to high winds or other impacts.	CNF Fire Chief Brian Rhodes (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Power line and associated utilities and the threat they pose to surrounding areas through potential sources of wildland fires are addressed Sections 6.1 (Fire History), 7.1 (Transmission Line Alternatives), and 7.4 (Wildfire Risk).
04/10/2019	-	-	-	-	The Forest Service has communicated concerns regarding the Fire Plan, and provided TNHC with written comments[1], however none of of our concerns or comments appear to have been incorporated, acknowledged, or addressed in the plan recently submitted to FERC. We do not disagree or object to certain elements TNHC has proposed in the Fire Study, however the plan lacks the analysis we've requested to determine how the proposed project could impact fire risk and fire management activities within the Cleveland National Forest.	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	See response to Comments 1-5, above. The comments USFS provided on the Draft Fire Study Plan have been incorporated. ***Additionally, Wood still awaiting information from USFS (see list of questions) to more fully understand the data available to comprehenisvely address local issues known by CNF staff.***

Date	Page	Paragraph	Line	Sentence	Comment	Reviewer/Author Name, Title (Organization)	Receipient of Review Document Name (Organization)	Name of Responder (Organization)	Action Taken to Address the Comment AND LOCATIONS OF CHANGES IN THE DOCUMENT:
04/10/2019	-	-	-	-	As proposed, the transmission lines could significantly limit and impede our fire management options and operations, and increase the risk and impacts of wildland fires in this area. Such impacts could include:	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	This issue is addressed in Sections 6.4 (Wildfire Preparedness) and 7.1 (Transmission Line Alternatives). However, ***Wood is still awaiting information from USFS (see list of questions).***
04/10/2019	-	-	-	-	increasing risk and exposure of our firefighting personnel;	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Addressed in Safety, Section 6.4.4 (Safety Measures), and discussed in Section 7.3.1 (Infrastructure Effects). ***Additionally, Wood still awaiting information from USFS (see list of questions) to more fully understand the data available to comprehenisvely address local issues known by CNF staff.***
04/10/2019	-	-	-	-	reducing the effectiveness of fuel management projects within the project area;	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Plans to research and analyze impacts to fuels and fuel moisture are addressed in Sections 5.2 (Vegetation) 5.3 (Fuels and Fuel Moisture). Specifically, we have added language in Section 7.2 (Hazardous Fuel Loading), and would **welcome input from USFS to provide additional analysis to address the comment.**
04/10/2019	-	-	-	-	decreasing our ability to manage the land in accordance with our LMP direction;	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Information has been added to Section 4.2 (Regional Land Use), to more explicitly incorporate the CNF LMP text cited in this letter. Analysis and discussion is addressed Chapters 6 (Fire Study Elements) and 7 (Discussion).
04/10/2019	-	-	-	-	or increasing fire incidents and risk to the surrounding communities through project operations.	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	The potential for increased hazardous fuel loading is addressed in Section 7.2 (Hazardous Fuel Loading) and 7.4 (Wildfire Risk).
04/10/2019	-	-	-	-	In order to assess these impacts, the Forest Service requests that the LEAPS Fire Plan investigate: • Establishing a baseline analysis of existing vegetative conditions and fire recurrence intervals for the project area,	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	A spatial analysis of existing vegetative conditions is comprehensively addressed in Sections 5.2 (Vegetation) and 5.3 (Fuels & Fuel Moisture).
04/10/2019	-	-	-	-	compare: • The proposed transmission lines with alternative LEAPS transmission configurations (tower size and voltage, clearances, and corridors from the proposed) and their respective effects on: o Powerline avoidance requirements for personnel safety- including aerial limitations.	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Addressed in Sections 6.4 (Wildfire Preparedness) 7.3 (Infrastructure Effects). ***Additionally, Wood still awaiting information from USFS (see list of questions) to more fully understand the data available to comprehenisvely address local issues known by CNF staff.***
04/10/2019	-	-	-	-	Potential and frequency of disruption to services, due to the effects of wildfire or other wildfire management activities.	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Fire recurrence intervals are addressed in Sections 5.2 (Vegetation), 6.1 (Fire History), 6.2 (Fire Season), and 6.3 (Wildfire Danger).

Date	Page	Paragraph	Line	Sentence	Comment	Reviewer/Author Name, Title (Organization)	Receipient of Review Document Name (Organization)	Name of Responder (Organization)	Action Taken to Address the Comment AND LOCATIONS OF CHANGES IN THE DOCUMENT:
04/10/2019	-	-	-	-	Risks associated with various configurations, and their potential to ignite wildfire due to high winds or other impacts.	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Addressed in Section 7.1 (Transmission Line Alternatives) and Section 7.4 (Wildfire Risk).
04/10/2019	-	-	-	-	Land, fuel, or fire management operation limitations due to infrastructure concerns	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Addressed in Sections 4.5 (Existing Infrastructure) and 7.3 (Infrastructure Effects).
04/10/2019	-	-	-	-	Response time impediments or impacts on initial attack for fire and all risk incident	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Addressed in Section 6.4 (Wildfire Preparedness). ***Additionally, Wood still awaiting information from USFS (see list of questions) to more fully understand the data available to comprehenisvely address local issues known by CNF staff.***
04/10/2019	-	-	-	-	Impacts on fuelbreak or fuels reduction project effectiveness	Darrel Vance (USFS)	N/A	Jarrod Armstrong & Kari Morehouse (Wood)	Addressed in Section 7.3 (Infrastructure Effects).
5/13/2019	-	-	-	-	The study are for the fire study must include the full extent of proposed project, including the proposed transmission lines.	Timothy Konnert, Chief (FERC)	Rexford Wait (Nevada Hydro)	Jarrod Armstrong & Kari Morehouse (Wood)	Description of the proposed transmission line routing alternatives is included in the Revised Draft Fire Study Plan and is specifically discussed in Section 7.1 (Transmission Line Alternatives). See also response to Comment 7, above.
5/13/2019	-	-	-	-	On April 11, 2019, the Forest Service filed a letter outlining specific elements that sould be included in the Fire Study Plan. The Forest Service states that the Fire Study Plan should establish a baseline analysis of existing vegetation conditions and fire recurrence intervals. Additionally, the Forest Service states that the study should analyze the proposed transmission lines and alternative configurations and their effects on powerline avoidance requirements for personnel safety (including effects on aircraft), fire risk and the potential for project transmission lines to ignite wildfire due to high winds or other impacts, limitations on any fire management operations due to project infrastructure, impacts on response time for fire incidents, and impacts on fuelbreak or fuels reduction effectiveness. Commission staff agrees with the Forest Service that this information is necessary, and, therefore please modify your proposed Fire Study Plan accordingly.	Timothy Konnert, Chief (FERC)	Rexford Wait (Nevada Hydro)	Jarrod Armstrong & Kari Morehouse (Wood)	These topics are included in the Revised Draft Fire Study Plan, as outlined with reference to the same USFS letter in responses to Comments 6 - 18, above.

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

STUDY 8

AQUIFER IMPACT STUDY

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Applicant:

THE NEVADA HYDRO COMPANY, INC.
2416 Cades Way
Vista, California 92081
(760) 599-1813
(760) 599-1815 FAX

June 2019

AQUIFER STUDY REPORT
LAKE ELSINORE ADVANCED PUMPING STORAGE PROJECT
(PROJECT NUMBER 14227-003)
RIVERSIDE COUNTY, CALIFORNIA

Submitted to:
Mr. David Kates
The Nevada Hydro Company
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403

Prepared by:
Wood Environment & Infrastructure Solutions
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Riverside, California 92507
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Principal Investigator: G. Richard Rees, PG 6612, CHG 704

April 17, 2019

Wood Project No.: 1855400727

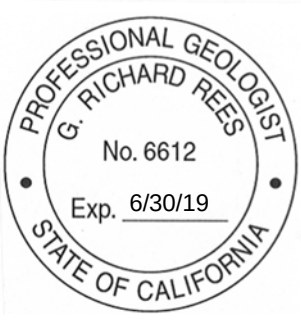
Aquifer Study Report
Lake Elsinore Advanced Pumping Storage Project
Nevada Hydro Company
Riverside County, California

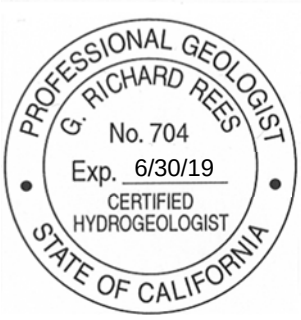
April 17, 2019

This report was prepared by the staff of Wood Environment & Infrastructure Solutions, Inc. under the supervision of the Engineer(s) and/or Geologist(s) whose seal(s) and signature(s) appear hereon.

The findings, recommendations, specifications, or professional opinions are presented within the limits described by the client, in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

Devin Politoske
Technical Professional, Hydrogeology





G. Richard Rees, PG #6612, CHg #704
Principal Hydrogeologist

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AQUIFER STUDY REPORT
Lake Elsinore Advanced Pumping Storage Project
Riverside County, California

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, Inc. (Wood) has prepared this report on behalf of The Nevada Hydro Company, Inc. (Nevada Hydro) to present the procedures followed and observations made during an evaluation of the potential presence and characteristics of springs as an aquifer study required by the Federal Energy Regulatory Commission (FERC) for the proposed upper reservoir and dam for the Lake Elsinore Advanced Pumping Storage (LEAPS) project. The proposed upper reservoir and dam area (study area or site) consists of approximately 70 acres located along the upper part of the south fork of Decker Canyon (south Decker Canyon) in Riverside County, California (Figure 1 and Figure 2). The scope of work for the aquifer study was based on the Aquifer Study Work Plan, which was submitted to the Nevada Hydro Company in August 2018. Nevada Hydro Company subsequently submitted the Aquifer Study Work Plan along with other work plans (collectively the Additional Studies) to FERC for review and comment. FERC and U.S. Forest Service (USFS) reviewed the Additional Studies and provided comments to Nevada Hydro Company in September 2018. No comments were received regarding the Aquifer Study. The following sections of this report present the aquifer study objective and scope of work, summarize relevant background information, describe the approach and methods followed for the study, document the conditions observed, and provide a recommendation for follow-up reconnaissance.

1.1 OBJECTIVE AND SCOPE OF WORK

The overall objective of the aquifer study was to assess the potential presence of springs and associated riparian areas within the site, including collecting information on the location, habitat (i.e., flora and fauna present and extent of riparian vegetation type), habitat usage, and water quality data associated with spring sites (if any) to evaluate the potential effects of reservoir construction.

The scope of work for the investigation followed the scope of work outlined in the Aquifer Study Work Plan and included the following:

- Prepared a site-specific Health and Safety Plan.
- Reviewed aerial photographs of the site area and identified areas of focus for the field reconnaissance.

- Obtained sample containers and field monitoring equipment to collect spring water samples and monitor spring water flow of springs encountered, if any, during the field reconnaissance.

- Conducted a site reconnaissance for springs and recorded flora and fauna present and extent of riparian vegetation encountered.

- prepared this report.

1.2 CURRENT CONDITIONS

The site is located along the south fork of Decker Canyon, in the upper portion of the San Juan Creek watershed, adjacent to and south of the Killen Truck Trail/South Main Divide Truck Trail (Figure 1). The site and surrounding area are undeveloped natural open space. The terrain at the site is relatively steep and the ground cover consists of sparse to dense brush and trees with scattered cobbles, boulders, and bedrock outcrops also present.

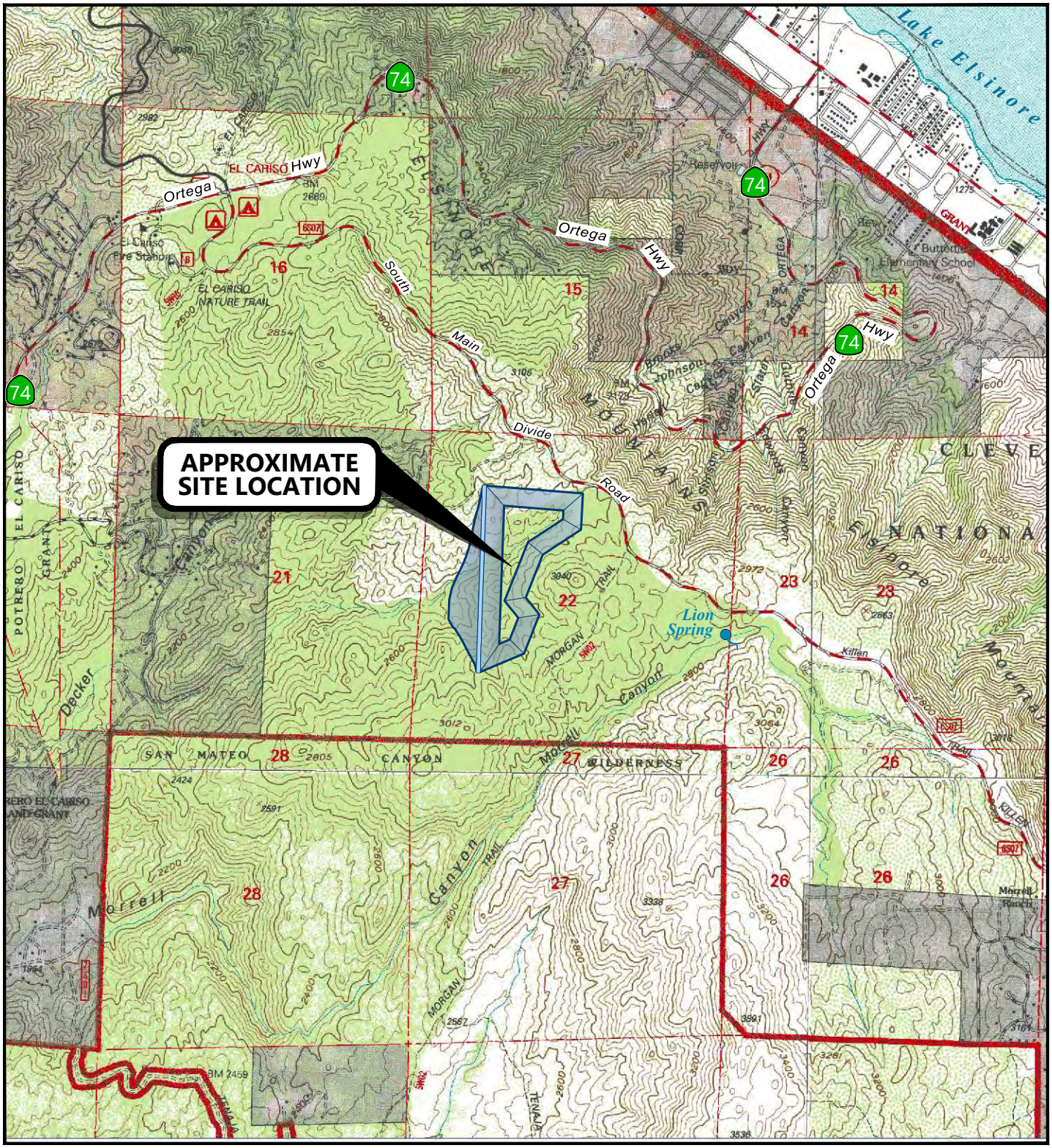
2.0 PHYSICAL SETTING

The following subsections describe the regional geologic and hydrogeologic setting.

2.1 GEOLOGIC SETTING

The site is located in the Elsinore Mountains of the Santa Ana Mountain Range, which is a prominent northwest-trending range of the Peninsular Ranges Physiographic Province of southern California. The Peninsular Ranges comprise an extensive region of linear northwest-trending mountain ranges separated by alluvial valleys and fault-bounded troughs. This region extends from the east-west-trending Transverse Ranges on the north, into Baja California on the south. The northern Peninsular Ranges span from the offshore continental borderland on the west to the Coachella Valley on the east and include the Los Angeles basin. The southern Peninsular Ranges span from the offshore continental borderland on the west to the Imperial Valley on the east (GENTERRA, 2018). The Peninsular ranges are characterized by a basement complex of igneous and metamorphic rocks that were intruded and locally altered by younger igneous rocks of the Southern California batholith during Cretaceous time. The pre-batholithic rocks vary in age from Middle Cretaceous to Paleozoic (GENTERRA, 2018).

Branches of the Elsinore fault zone, a major northwest-southeast trending fault zone, are the closest known faults to the site. The Elsinore fault zone is recognized as active and zoned by the State of California under the Alquist-Priolo Fault Zoning Act. The nearest known faults to the site are the Willard and Wildomar faults (located on the southwest side of Lake Elsinore) and the Glen Ivy North fault (located on the northeast side of Lake Elsinore) (GENTERRA, 2018 and Morton, 2004).



N

0 1,200 2,400

Approximate scale in feet

REFERENCE:

U.S.G.S. 7.5 Minute Quadrangle Maps LAKE ELSINORE, ALBERHILL, SITTON PEAK, & WILDOMAR, California, 1997.

Notes:

1. All locations are approximate.
2. Dam configuration is conceptual and subject to change.

SITE LOCATION MAP
Lake Elsinore Advanced Pumped Storage Project
The Nevada Hydro Company, Inc.
Riverside County, California

By: jrw	Date: 07/26/2018	Project No. 1855400727
wood.		Figure 1

Plot Date: 7/27/2018 12:38:49 PM, Plotted by: joanna.worker Drawing Path: W:\Projects\1855400727 (Elsinore LEAPS)\ACAD\Site Location.dwg, Site Loc

Dam Crest

Dam and Reservoir Structure

South Main Divide Road

Ortega Hwy

74

Lion Spring

MORGAN

5W02

TRAIL

Canyon

Decker

SAN MATEO CANYON

21

22

23

27

28

3106

3040

2972

2805

3012

3064

2600

2400

2200

2800

2424

2591

2679

260

0 400 800

Approximate scale in feet

Notes:

1. All locations are approximate.
2. Dam configuration is conceptual and subject to change.

Basemap modified from a drawing by Genterra Consultants, Inc., dated January 2018, and U.S.G.S. 7.5 Minute Quadrangle Maps LAKE ELSINORE, ALBERHILL, SITTON PEAK, & WILDOMAR, California, 1997.

PROJECT AREA WITH TOPOGRAPHY
Lake Elsinore Advanced Pumped Storage Project
The Nevada Hydro Company, Inc.
Riverside County, California

By: jrw	Date: 07/27/2018	Project No. 1855400727
wood.		Figure 2

Plot Date: 7/27/2018 12:19:57 PM, Plotted by: joanna.worker Drawing Path: W:\Projects\1855400727 (Elsinore LEAPS)\ACAD\Proj Area_Topography.dwg, topo

Geologic materials exposed in the site area are primarily crystalline Cretaceous-age intrusive igneous rocks. Within the site area a gradational contact is observed along an approximate north-northwest/south-southeast alignment between felsic igneous rock consisting primarily of granite and tonalite (Kgr) on the western part of the site and mafic igneous rock consisting primarily of diorite and granodiorite (Kgd) on the eastern part of the site (Figure 3). The felsic igneous rocks are characterized as well-rounded corestones and boulder terrain with inclusions of Kgd. The mafic igneous rocks are characterized as dark colored subrounded to angular corestones and boulder terrain that is jointed and in gradational contact with Kgr (GENTERRA, 2018). Alluvial deposits (silty sand, gravelly sand, and clayey sand) are present in the canyon floors in some areas and are more prevalent at lower elevations (GENTERRA, 2018).

2.2 HYDROGEOLOGIC SETTING

The site lies within the Santa Ana Mountains, south of the topographic divide separating the San Jacinto River Watershed to the northeast from the Coastal Basin Watershed to the southwest. The depth to groundwater at the site is unknown. During site reconnaissance visits by GENTERRA personnel, evidence of near-surface groundwater was not observed in south Decker Canyon (GENTERRA, 2018). However, GENTERRA noted that groundwater likely is present in fractures in the underlying bedrock and noted a potential that localized springs might be encountered during construction of the proposed reservoir. GENTERRA (2018) did not anticipate that such springs would produce significant flow of groundwater. United States Geological Survey (USGS) topographic maps of the site area (USGS, 1997) do not show any springs within the site boundary. The nearest mapped spring is Lion spring, located in Morrell Canyon approximately 3,200 feet east of the site (Figure 2). South Decker Canyon is shown as a blue-line stream through most of the proposed dam and reservoir structure on the USGS topographic map. The USGS uses solid blue lines to depict both perennial and intermittent streams. Perennial streams are rare in southern California and the blue line indicates an intermittent stream in the study area site. None of the tributary canyons feeding into south Decker Canyon in the study area site are shown as blue line streams (Figure 2).

3.0 PREFIELD ACTIVITIES

Prior to mobilization, Wood conducted the following activities.

- Prepared a site-specific health and safety plan.
- Reviewed aerial photographs from Google Earth from 2018 and 2019 to identify potential locations of springs for use in mapping the field reconnaissance route.
- Obtained containers for potential use in collection of spring water samples.

- Obtained field monitoring equipment for potential measurement of spring water flow and field water quality parameters.

- Monitored precipitation prior to scheduling the field reconnaissance and mobilizing to the field.

The field reconnaissance was scheduled to be conducted following winter precipitation but not immediately after a significant precipitation event. Precipitation amounts for the study area site were obtained from Oregon State University Prism Climate Group.[1] Prior to the field reconnaissance, precipitation in the study area site was well above normal (30-year average 1988 to 2018) of approximately 15.8 inches. From October 1, 2018 through March 15, 2019, the study area had received approximately 23.7 inches of precipitation. Before the field reconnaissance, the most significant precipitation event of the rainy season occurred February 14 through February 16 with approximately 6.2 inches of precipitation. Additional smaller precipitation events occurred March 2 through March 4 (approximately 1 inch), March 6 through March 8 (approximately 0.9 inches), and March 12 through March 13 (approximately 0.5 inches).

4.0 FIELD RECONNAISSANCE

Wood conducted a field reconnaissance on March 15, 2019 to identify, locate, describe, and sample springs, if present in the site area. The reconnaissance noted features such as tributary locations, approximate stream flow, and areas of heavy vegetation. GPS coordinates were recorded and photographs (photos) were taken at selected locations. The locations and views for each photo are noted on Figure 4 and photos are provided in the Photolog in Appendix A. The following subsections describe the observed watershed features and surface water and the observed vegetation during the field reconnaissance.

4.1 WATERSHED FEATURES AND SURFACE WATER

The south Decker Canyon portion of the site was accessed via south Main Divide Road (Figure 4). The main canyon extends along a northeast-southwest transect through the approximate dam and reservoir footprint. Side canyons entering south Decker Canyon from the southeast were relatively steep and had no surface water flow when observed. A few of the side canyons entering south Decker Canyon from the northwest had surface water flow or showed evidence of recent surface flow. Just beyond the western edge of the proposed dam and reservoir structure, a major tributary canyon feeds into south Decker Canyon from the southeast and is separated from upper portions of south Decker Canyon by a broad ridge (Figure 4). This canyon is referred to as the “south major tributary canyon” in this report.

[1] http://www.prism.oregonstate.edu

Dam Crest

Kgd

Kgr

South Main Divide Road

ELSINORE MOUNTAINS

Ortega Hwy 74

Notes:

1. All locations are approximate.
2. Dam configuration is conceptual and subject to change.

Kgr

Kgd

Trail

Decker Canyon

Kgd

Lion Spring

Canyon

Morgan

Kgr

Dam and Reservoir Structure

Kgr

Morrell

Explanation

Kgr — Cretaceous age felsic igneous rock - primarily granite and tonalite; characteristic well-rounded corestones and boulder terrain; contains inclusions of Kgb below; jointed

Kgd — Cretaceous age mafic igneous rock - primarily diorite and granodiorite; characteristic dark-colored subround to angular corestones and boulder terrain; jointed; gradational contact with Kgr above

?— Gradational contact between Kgr and Kgd (approximately located)

Main stem - Decker Canyon drainage thalweg showing flow direction

N

0 250 500

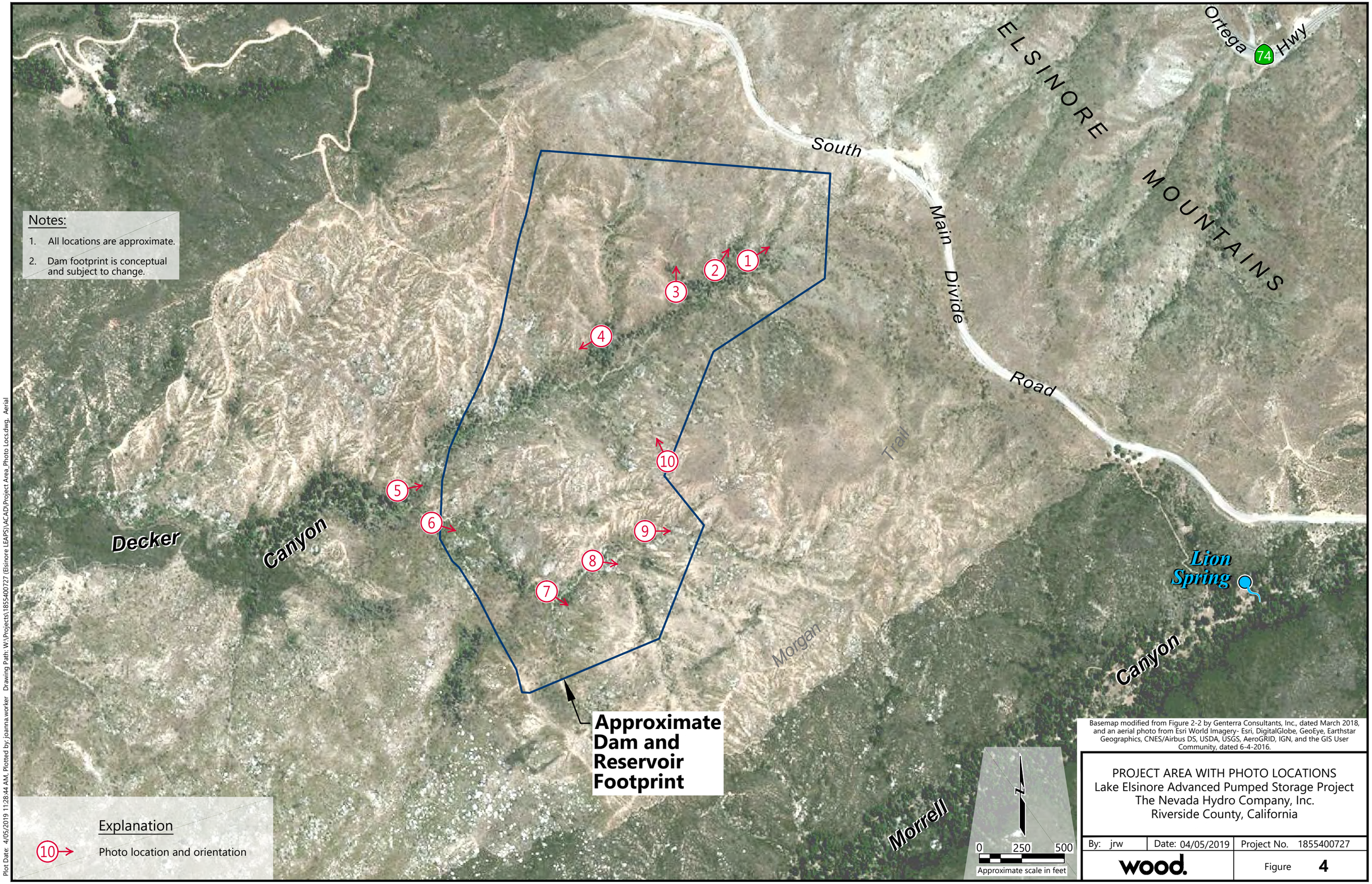
Approximate scale in feet

Basemap modified from Figure 2-2 by Genterra Consultants, Inc., dated March 2018, and an aerial photo from Esri World Imagery- Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, dated 6-4-2016.

PROJECT AREA WITH GEOLOGY
Lake Elsinore Advanced Pumped Storage Project
The Nevada Hydro Company, Inc.
Riverside County, California

By: jrw	Date: 07/27/2018	Project No. 1855400727
wood.		Figure 3

Plot Date: 7/27/2018 12:12:58 PM, Plotted by: joanna.worker Drawing Path: W:\Projects\1855400727 (Elsinore LEAPS)\ACAD\Project Area_Geology.dwg, Geology-aerial



Basemap modified from Figure 2-2 by Genterra Consultants, Inc., dated March 2018, and an aerial photo from Esri World Imagery- Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, dated 6-4-2016.

PROJECT AREA WITH PHOTO LOCATIONS
Lake Elsinore Advanced Pumped Storage Project
The Nevada Hydro Company, Inc.
Riverside County, California

By: jrw	Date: 04/05/2019	Project No. 1855400727
wood.		Figure 4

Plot Date: 4/05/2019 11:28:44 AM, Plotted by: joanna.worker Drawing Path: W:\Projects\1855400727 (Elsinore LEAPS)\ACAD\Project Area_Photo Locs.dwg, Aerial

Surface flow in the south major tributary canyon was slightly less than the flow within south Decker Canyon at the confluence of the two canyons. The south major tributary canyon extends southeast through the study area site for approximately 750 feet and then turns northeast for another approximately 1000 feet though the study area site. Field reconnaissance progressed down south Decker Canyon and up the south major tributary canyon along the pathway of increasing photo numbers shown on Figure 4. Field observations are described below.

The beginning of stream flow was observed as a trickle in the upper reaches of south Decker Canyon (photo 1, Appendix A). Moving down the canyon, stream flow increased steadily, consistent with an ephemeral stream following the above-noted rainy-season conditions, gaining flow with descending elevation and increasing watershed area contribution. No pronounced increase in stream flow at a specific location or over a short distance (such as might indicate a spring source feeding the stream) was observed. The vegetation observed was generally consistent with ephemeral stream riparian habitat (see section 4.2). Tributaries that contributed flow to the main canyon were documented and investigated for potential spring locations.

Photo 2 shows a tributary canyon to the upper reaches of the south Decker Canyon. This tributary showed evidence of recent surface flow, but no surface flow was observed during the site reconnaissance.

Photo 3 shows the confluence of south Decker Canyon and a second tributary canyon. This tributary canyon appeared to show a relatively gradual increase in flow along its downslope length, similar to the main stream in south Decker Canyon. At this point the combined flow was estimated at approximately 3 to 5 gallons per minute (gpm).[2]

Photo 4 shows flow in a third tributary above the main south Decker Canyon. Flow in this canyon began at a break in slope where the canyon transitioned downstream from a relatively lower gradient and broader cross section to a steeper gradient and narrower cross section. The break in slope and beginning of surface flow (less than 1 gpm) was also coincident with an area of recently eroded sediments in the canyon. No surface water flow was observed above the eroded section of the canyon. The general area adjacent to the first occurrence of flow had an abundance of basket rush (*Juncus textilis)* but surface water was not observed where most of the basket rush was observed. Flow increased from this eroded area downhill approximately 30 feet to the main south Decker Canyon stream. The occurrence of flow along a relatively short length of canyon, along with the vegetation present, suggested this location as a potential spring. The observed start of flow, however, may not have occurred without the

[2] Stream flow measurement here and throughout this report are based on visual estimates.

above-noted recent erosion, and the low rate of flow suggested that it may occur only under similar rainy-season conditions and likely would not continue into the dryer months.

Photo 5 shows the confluence of stream flow from south Decker Canyon west of the study area site and stream flow out of the south major tributary canyon. Surface flow in south Decker Canyon below this confluence was estimated at approximately 25 to 30 gpm. Of this total, the south major tributary contributed approximately 7 to 10 gpm.

Photo 6 shows streamflow in the south major tributary canyon just above its confluence with south Decker Canyon. The vegetation in the south major tributary canyon was dense and the field team moved up the side of the canyon and descended to observe flow in the stream in places where it could be accessed. The observed progressive decrease in flow moving up topographic gradient was consistent with an ephemeral stream during rainy-season conditions. No sudden change in flow was observed that would suggest that the stream flow was supplemented by spring flow.

Photo 7 shows the confluence of the south major tributary canyon (northeast trending with a relatively gentle gradient at this point) and a steeper tributary canyon from the south. Flow from the steeper southern tributary canyon was less than 1 gpm and flow from the northeast trending south major tributary canyon at this point was estimated at 2 to 3 gpm.

Photo 8 shows the stream in the south major tributary canyon near the mouth of another southern tributary canyon. No flow was observed in this tributary canyon. Flow in the south major tributary canyon at this point was estimated at 1 to 2 gpm.

Photo 9 shows the stream in rocky terrain of the upper reaches of the south major tributary canyon. Flow at this location was estimated at less than 1 gpm.

Photo 10 shows a view of south Decker Canyon from the ridge between south Decker Canyon and the south major tributary canyon.

4.2 FIELD DOCUMENTATION OF VEGETATION

During the field reconnaissance, Wood's biologist surveyed the site and recorded the observed plant and wildlife species. In general, dominant upland vegetation communities present within the study area site include chamise chaparral and coastal sage scrub. Coast live oak woodland occurs intermittently along south Decker Canyon and within some of the tributaries as do small, sparse and intermittent patches of riparian scrub. The entire study area site burned in September 2014. As a result, the vegetation present within the study area site is in a relatively early stage of succession. This was evident by the scorched, blackened trunks of the coast live oaks (*Quercus agrifolia*) and some of the other trees and shrubs present as

well as by the relative, uniformly small size of the perennial riparian and chaparral vegetation present throughout the study area site. Several plant species associated with wetlands were observed. These species were observed in or near stream channels, however, and did not positively identify spring locations.

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATION

Field reconnaissance was conducted at the site in areas identified as most likely potential spring locations based on a review of aerial photographs. During the field reconnaissance stream flow was observed in south Decker Canyon and in several tributaries. Stream flow was likely greater than normal based on higher than average rainfall that had occurred during late 2018 and early 2019. No clear evidence of springs was identified from the field reconnaissance and, as a result, no water samples were collected. One potential spring location was identified in a tributary canyon. The surface water flow observed at this location may, however, have been a result of temporary seepage associated with antecedent seasonal rainfall rather than spring flow. Based on the above, Wood recommends that a follow-up reconnaissance of the above-noted potential spring area be conducted under other seasonal conditions. The reconnaissance could be completed with other scheduled field work at the site in late May or June. If the area is identified as a spring, water samples and other field data could be collected from the spring at that time.

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United States Geological Survey, 1997, 7.5-minute Series (topographic) Quadrangle, Lake Elsinore, California.

United States Geological Survey, 1997, 7.5-minute Series (topographic) Quadrangle, Sitton Peak, California.

Appendix A

Photolog

Photo 1

View northeast up south Decker Canyon. Furthest upstream flowing water observed in the canyon.

Photo 2

View north-northeast up a tributary canyon with evidence of recent flow but no flow at the time this photo was taken.

Photo 3

View north of a tributary canyon.

Photo 4

View west-southwest down a tributary canyon. Location of potential spring.

Photo 5

View northeast of stream confluence of south Decker Canyon and south major tributary canyon.

Photo 6

View southeast up the south major tributary canyon.

Photo 7

View southeast in the south major tributary canyon.

Photo 8

View east-southeast in the south major tributary canyon.

Photo 9

View east in the south major tributary canyon.

Photo 10

View north-northwest from the southeastern ridge overlooking south Decker Canyon.

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

STUDY 9

QUIÑO BUTTERFLY SPRING SURVEY

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Applicant:

THE NEVADA HYDRO COMPANY, INC.
2416 Cades Way
Vista, California 92081
(760) 599-1813
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June 2019

FOCUSED SURVEY FOR THE QUINO CHECKERSPOT BUTTERFLY
LAKE ELSINORE ADVANCED PUMPING STORAGE PROJECT (LEAPS)
(PROJECT NUMBER 1855400727-010)
RIVERSIDE COUNTY, CALIFORNIA

Submitted to:
Mr. David Kates
The Nevada Hydro Company
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403

Prepared by:
Wood Environment & Infrastructure, Inc.
1845 Chicago Avenue, Suite D
Riverside, California 92507
Tel: (951) 369-8060
Principal Investigator: Nathan T. Moorhatch

May 2019

Amec Foster Wheeler Project No.: 1855400727-010

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1.0 INTRODUCTION

Wood Environment & Infrastructure, Inc. ("Wood," formerly Amec Foster Wheeler) was contracted to conduct focused surveys for the Quino checkerspot butterfly (*Euphydryas editha quino*) (QCB), a federally endangered species. The survey was in support of the proposed Lake Elsinore Advanced Pumped Storage (LEAPS) Project (project), see Figure 1, in sections of unincorporated Riverside County, near the town of Alberhill, California. The Study Area was deteremined based on a preliminary habitat assessment conducted in September 2018 and is limited to the proposed electrical transmission line alignment north of Interstate 15 (I-15). QCB surveys were performed at locations determined to be suitable habitat based on the findings of the QCB habitat assessment. The purpose of the focused surveys was to determine presence or absence of the QCB the Study Area.

2.0 PROJECT LOCATION AND DESCRIPTION

The project originates in the city of Lake Elsinore (see Exhibit 1). The pump station and reservoir locations are generally located southwest of Lake Elsinore and Highway 15. The proposed project also involves several alternative transmission routes (TE/VS Interconnet) associated within the dispersal of electricity within the regional grid system. FERC has dissignated a perferred transmission line location that runs north of the pump station and an alignment that runs to the south.

For the purpose of this study, all QCB surveys were contained to accessible suitable habitat within the parallel transmission lines, north of the Lake Substation (Exhibit 2). The Study Area is located within portions of Sections 5, 6, 7, 10, 15, and 16 of Township 5 South and Range 5 West, as depicted on the Alberhill and Lake Mathews United States Geological Survey (USGS) 7.5 minute series topographic map. The Study Area is located in the rolling hills north of I-15. The parallel transmission lines travel in a northeast direction from the western side of Corona Lake. The existing Southern California Edison (SCE) transmission line identifies the northern Study Area boundary.

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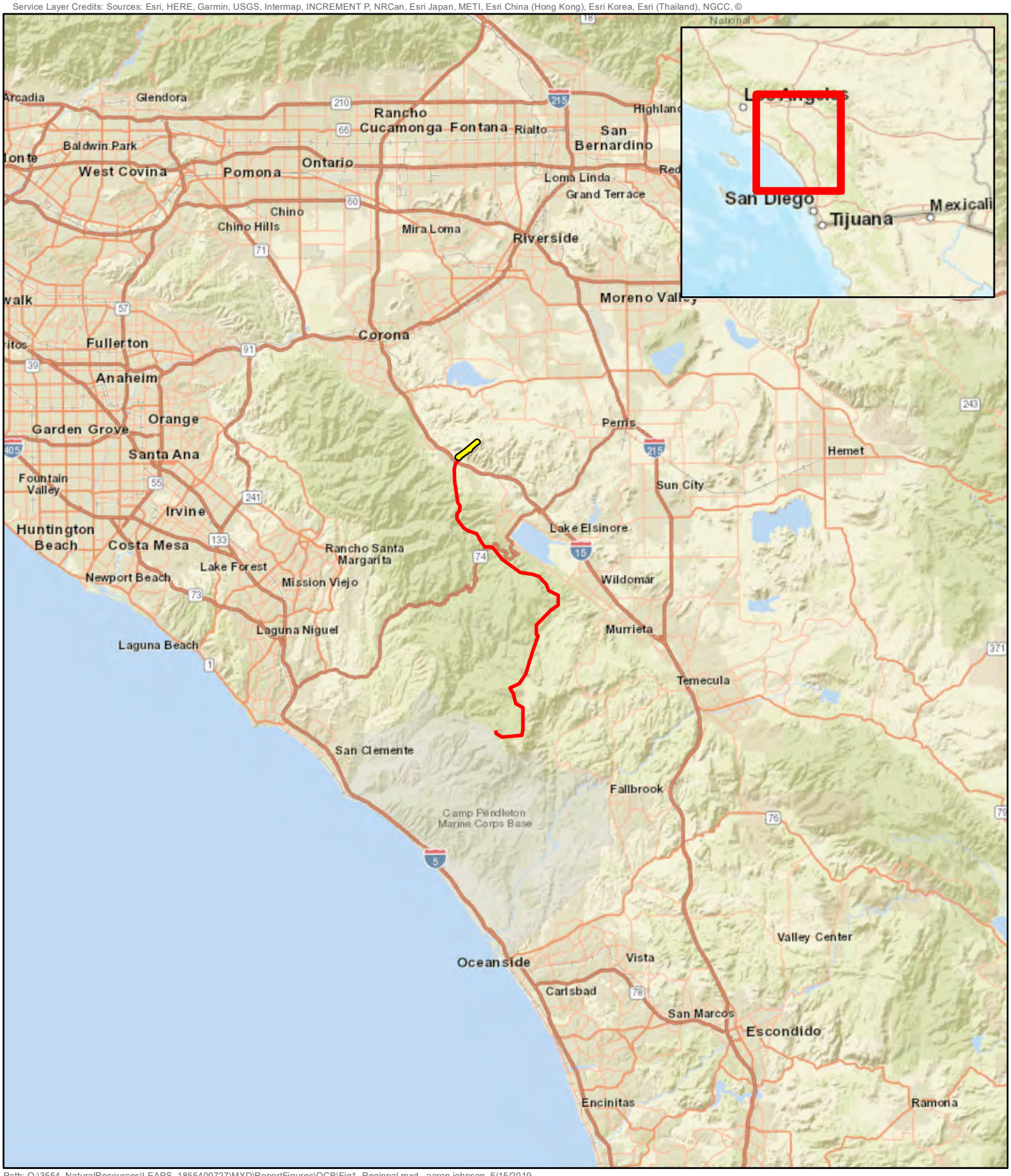

wood.

FIGURE 1

Regional Location
QCB Surveys
LEAPS Project
Riverside County, CA

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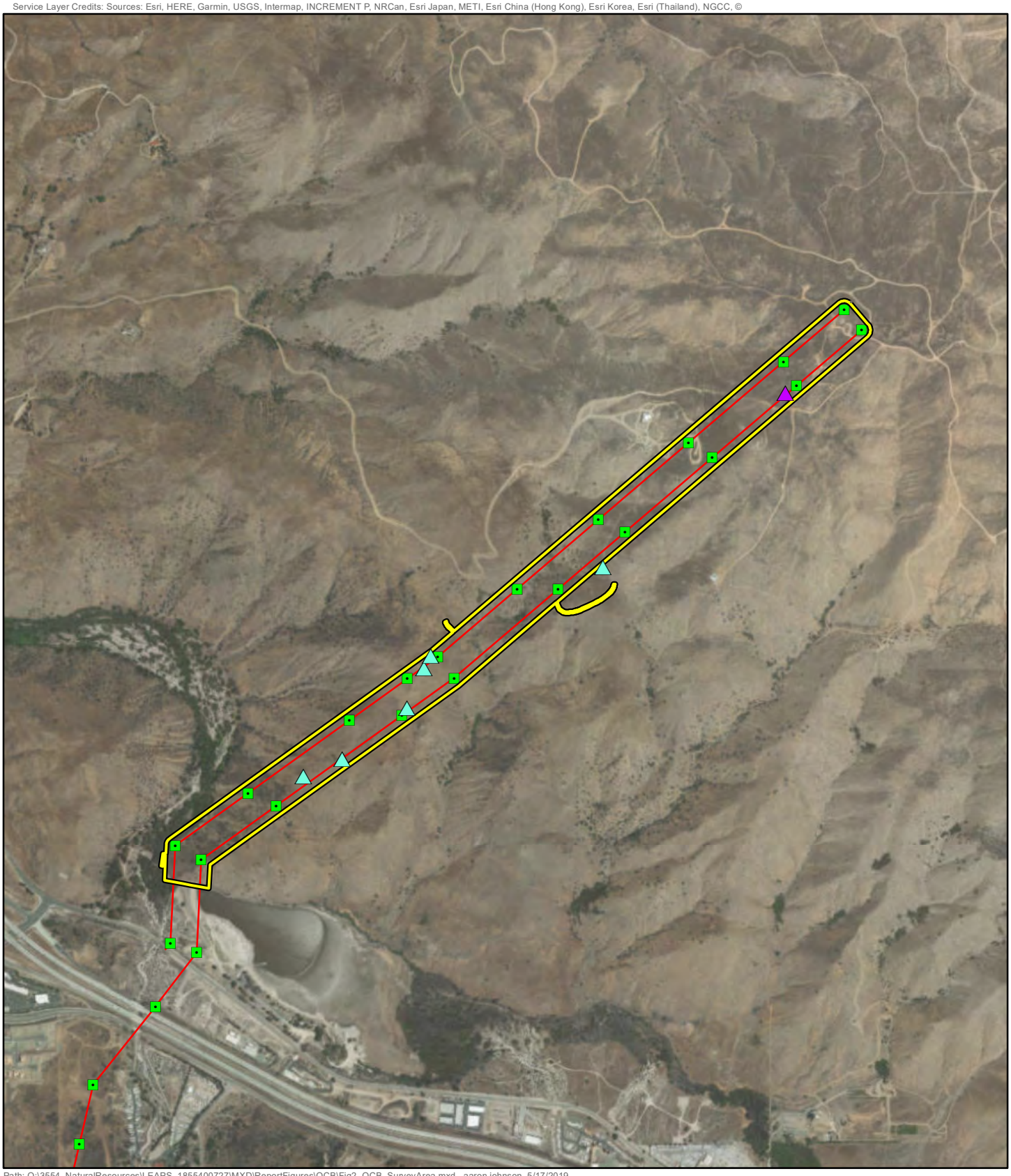

wood.

FIGURE 2

Survey Area and Results
QCB Surveys
LEAPS Project
Riverside County, CA

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3.0 BACKGROUND ON THE QUINO CHECKERSPOT BUTTERFLY

The QCB is a medium sized butterfly with colorful checkerboard dorsal wings of brown, red and cream spots native to southern California and northwestern Mexico, primarily in areas with patchy shrubs and small tree landscapes with openings known as “scrublands” (Mattoni et al. 1997 p. 112). In Riverside and San Diego counties, dwarf plantain (*Plantago erecta*), patagonian plantain (*Plantago patagonica*), white snapdragon (*Anterrhinum coulterianum*), Chinese houses (*Collinsia concolor*), thread-leaved bird’s beak (*Cordylanthus rigidus*), and purple owl’s clover (*Castilleja exserta*)are known as QCB’s larval host plants. This butterfly is not associated with a single plant community, instead it is associated with open spaces within several communities. Sufficient foodplant density has yet to be determined; at Lake Skinner, QCB have occupied areas with foodplant densities as low as one plant per square meter (Mattoni et al. 1997).

The QCB was listed as a federally endangered species by the United States Fish and Wildlife Service (USFWS) (USFWS 1993) on January 16, 1997, and protected under the provisions of the Endangered Species Act of 1973.

Previous quino surveys were conducted in the study area in 2003, 2004, and 2005 by Michael Brandmand Associates. All three years of surveys resulted in negative findings.

4.0 METHODS

QCB surveys were conducted in appropriate habitat within the Study Area in accordance with the survey protocol for this species (USFWS 2014). The site was surveyed each day by two biologists in a single morning. No more than 10-15 acres per hour were surveyed. Survey transects consisted of zigzag patterns within the proposed right-of-way in order to cover all suitable habitat. In accordance with the survey protocol, surveys were scheduled once per week during the flight season (February to May). Surveys were conducted by Wood biologists John F. Green, Michael D. Wilcox, and Nathan T. Moorhatch under the authority of recovery permits TE054011-7 (Green), TE836491-7 (Wilcox), and TE029414-4 (Moorhatch). Wood biologists Dale Hameister and Carla Sanchez assisted with the survey efforts. Surveys were conducted by slowly walking over the entire habitat area, with special emphasis on searching for perching females, hill-topping males, and typical host plants such as dwarf plantain (*Plantago erecta*) and purple owl’s clover (*Castilleja exserta*). During several weeks, weather conditions were not favorable and did not meet the survey protocol requirmenets. In those cases, surveys were doubled up the following week when weather conditions met protocol requirements. Table 1 contains date, surveyors, time, and weather conditions during the QCB surveys.

Table 1. Survey Variables

Date (2019)	Biologist	Time (PST)	Temperature (° Fahrenheit)	Wind Speed (miles per hour)	% Cloud Cover
15 Mar	Moorhatch & Green	1000-1349	61-75	1-4	20
18 Mar	Wilcox & Green	0650-15151	61-76	2-10	0
25 Mar	Wilcox & Green	0845-1500	64-76	1-2	0
29 Mar	Wilcox & Moorhatch	0942-1345	67-72	0-5	0
8 April	Moorhatch & Sanchez	0930-1536	75-85	0-2	40
10 April	Moorhatch & Hameister	0906-1440	64-74	2-7	0
17 April	Wilcox & Green	0855-1500	65-74	0-3	0
23 April	Wilcox & Sanchez	0705-12:43	67-84	0-5	0
26 April	Moorhatch & Sanchez	0750-1205	67-85	0-2	0
3 May	Wilcox & Hameister	0800-1535	67-84	0-7	10

All butterfly species, as well as vertebrate species, detected during Wood visits were recorded in field notes and are listed in Appendix B below.

5.0 RESULTS

No QCBs were detected during the focused surveys of the Study Area. Elevations of the surveyed areas ranged from approximately 1,420 to 2,735 feet above sea level. Based on the negative findings of the 2019 surveys as well as the negative findings in the 2003-2005 surveys, this species is absent from the project site at this time. Dwarf plantain, purple owls clover was observed in several locations within both survey rights-of-way (Exhibit 2). The plantago patches were limited to the southwestern portion of the Survey Area on relatively flat areas located on the west facing slopes just north of Corona Lakes. This host plant is also very abundant along the southern side of the dirt road leading from the brickyard to the proposed right-of-way.

All butterfly species detected during the 2019 QCB survey are included in Appendix B. Among the most commonly detected buttefly species were the painted lady (*Vanessa cardui*), Behr's metalmark (*Apodemia virgulti*), sara orangetip (*Anthocharis sara*), and Mormon metalmark (*Apodemia mormo*).

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APPENDIX A

SPECIES LIST

SPECIES LIST

This list reports only vertebrates observed during Wood's site visits. Other species may have been overlooked or undetectable due to their activity patterns. Nomenclature and taxonomy for fauna observed on site follows the California Bird Records Committee Official California Checklist (2018) for avifauna, and CDFW (2016) for herpetofauna and mammals.

SYMBOLS AND ABBREVIATIONS:

* Non native species

** Sensitive species (State or federally listed as endangered or threatened; state species of special concern/watch list/tracked; USFWS bird of conservation concern; U.S. Forest Service sensitive, Bureau of Land Management sensitive, [CDFW 2018])

Wildlife Species Compendia

Scientific Name	Common Name
Papilionidae	**Swallowtail Butterflies**
Papilio rutulus	western tiger swallowtail
Pieridae	**Whites, Sulphurs, and Orangetips**
Pontia protodice	common white
Pontia sp.	unknown white species
Anthocharis sara	sara orangetip
Nathalis iole	dainty sulphur
Lycaenidae	**Blues and Hairstreaks**
Icaricia acmon	acmon blue
Callophrys perplexa dumetorum	perplexing hairstreak
Leptotes marina	marine blue
Strymon melinus	gray hairstreak
Nymphalidae	**Brush-Footed Butterflies**
Nymphalis antiopa	mourning cloak
Nymphalis californica	California tortoiseshell
Vanessa cardui	painted lady
Vanessa annabella	west coast lady
Junonia coenia	buckeye
Danaidae	**Milkweed Butterflies**
Danaus gilippus	queen
Hesperiidae	**Skippers**
Erynnis funeralis	funereal dusky wing
Sphingidae	**Sphinx Moths**
Hyles lineata	white-lined sphinx
Riodinidae	**Metalmarks**
Apodemia mormo	Mormon metalmark
Apodemia mormo virgulti	Behr's metalmark
Bufonidae	**True Toads**
Anaxyrus boreas	western toad
Hylidae	**Treefrogs**
Pseudacris hypochondriaca	Baja California treefrog
Anguidae	**Alligator Lizards**
Elgaria multicarinata	southern alligator lizard

Phrynosomatidae	**Lizards**
Sceloporus occidentalis	western fence lizard
Sceloporus orcutti	granite spiny lizard
Uta stansburiana	side-blotched lizard
Teiidae	**Whiptails**
Aspidoscelis hyperythra	orange-throated whiptail
Aspidoscelis tigris	western whiptail
Colubridae	**Egg-laying snakes**
Lampropeltis getula californiae	California kingsnake
Masticophis lateralis	California whipsnake (striped racer)
Pituophis cantenifer annectens	San Diego gopher snake
Crotalidae	**Pit Vipers**
Crotalus ruber	red diamond rattlesnake
Viperidae	**Vipers**
Crotalus mitchelli ipyrrhus	southwestern speckled rattlesnake
Pelecanidae	**Pelicans**
Pelecanus erythrorhynchos	American white pelican
Cathartidae	**Vultures**
Cathartes aura	turkey vulture
Accipitridae	**Hawks**
Buteo jamaicensis	red-tailed hawk
Falconidae	**Falcons**
Falco sparverius	American kestrel
Charadriidae	**Plovers**
Charadrius vociferous	killdeer
Columbidae	**Pigeons/Doves**
Zenaida macroura	mourning dove
Apodidae	**Swifts**
Aeronautes saxatalis	white-throated swift
Trochilidae	**Hummingbirds**
Calypte anna	Anna's hummingbird
Calypte costae	Costa's hummingbird
Picidae	**Woodpeckers**
Melanerpes formicivorus	acorn woodpecker
Picoides nuttallii	Nuttall's woodpecker
Tyrannidae	**Flycatchers**
Sayornis nigricans	black phoebe
Myiarchus cinerascens	ash-throated flycatcher
Vireonidae	**Vireos**
Vireo bellii pusillus	least Bell's vireo**
Corvidae	**Jays/Crows**
Aphelocoma californica	western scrub-jay
Corvus corax	common raven
Alaudidae	**Larks**
Eremophila alpestris	horned lark
Hirundinidae	**Swallows**
Tachycineta thalassina	violet-green swallow
Stelgidopteryx serripennis	northern rough-winged swallow
Hirundo rustica	barn swallow
Aegithalidae	**Bushtits**
Psaltriparus minimus	bushtit

Troglodytidae	**Wrens**
Salpinctes obsoletus	rock wren
Thryomanes bewickii	Bewick's wren
Sylviidae	**Old world warblers**
Polioptila californica	California gnatcatcher**
Mimidae	**Mockingbirds/Thrashers**
Toxostoma redivivum	California thrasher
Sturnidae	**Starlings**
Sturnus vulgaris	European starling*
Ptilogonatidae	**Silky-flycatchers**
Phainopepla nitens	phainopepla
Parulidae	**New world warblers**
Dendroica petechia	yellow warbler
Dendroica coronata	yellow-rumped warbler
Emberizidae	**Warblers, sparrow, etc.**
Pipilo crissalis	California towhee
Aimophila ruficeps	rufous-crowned sparrow
Spizella atrogularis	black-chinned sparrow
Pooecetes gramineus	vesper sparrow
Passerculus sandwichensis	savannah sparrow
Cardinalidae	**Cardinals**
Passerina amoena	lazuli bunting
Icteridae	**New world blackbirds**
Sturnella neglecta	western meadowlark
Quiscalus mexicanus	great-tailed grackle
Icterus cucullatus	hooded oriole
Talpidae	**Moles**
Scapanus latimanus	broad-footed mole
Muridae	**Mice, Rates, and Voles**
Neotoma lepida	desert woodrat
Canidae	**Wolves and Foxes**
Canis latrans	coyote
Cervidae	**Elk, Moose, Caribou, and Deer**
Odocoileus hemionus	mule deer

APPENDIX B

USFWS CERTIFICATION

“CERTIFICATION We hereby certify that the statements furnished in the attached exhibits present dat and information required for this biological ervaluation and that the facts, statements, and information presented are true and correct to the bet of our knowledge and belief.

Nathan Moorhatch
Senior Biologist
USFWS Permit TE-029414-4

John Green
Senior Biologist
USFWS Permit TE-054011-7 (Green),

Mike Wilcox
Senior Biologist
USFWS Permit TE-836491-7

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

STUDY 34B

PHASE SHIFTING TRANSFORMER RANGE CONTROL STUDY

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Applicant:

THE NEVADA HYDRO COMPANY, INC.
2416 Cades Way
Vista, California 92081
(760) 599-1813
(760) 599-1815 FAX

June 2019

The Nevada Hydro Company

Lake Elsinore Advanced Pumped Storage Project
Project No. 14227-003

Case Springs Substation
Phase Shifting Transformer Range Control Study

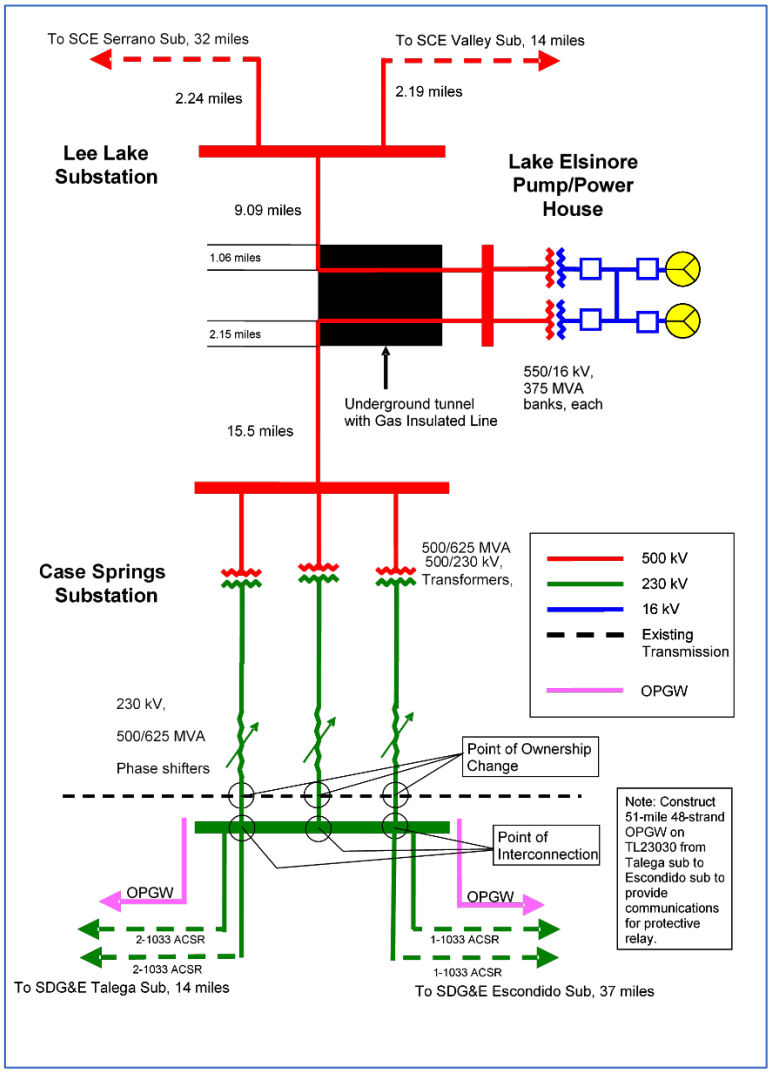
Produced in Response to
The Federal Energy Regulatory Commission's
Study Request No. 34

December 14, 2018

1.0. Introduction

This study was conducted in response to Study Request 34 in the June 15, 2018 letter of the Federal Energy Regulatory Commission (FERC) in connection with the application of the Nevada Hydro Company application for a license to construct and operate the Lake Elsinore Advanced Pumped Storage (LEAPS) Project (Project No. 14227). This 500 MW facility would interconnect to the Southern California Edison (SCE) system via a 500 kV transmission line to the proposed Lake or Alberhill Substations. It would also connect to the San Diego Electric and Gas (SDG&E) Company electric system via a 500 kV line to a new substation, the Case Springs Substation, which would have three 500/230 kV transformers and three 230 kV phase shifting transformers. The arrangement of this substation is shown in the single-line diagram shown in Figure 1. To complete the interconnection to the rest of the SDG&E system, two 230 kV lines would be extended from Case Springs to the Talega 230 kV Substation, and two more 230 kV lines would connect Case Springs to the Escondido 230 kV Substation. These lines would use (and replace the existing 230 kV line on) the right-of-way between Talega and Escondido.

Figure 1: Diagram of LEAPS Project and associated Transmission



Since LEAPS is connected in such a fashion that it could either generate or pump-to-store in either the direction of SCE or SDG&E, it is necessary to use the phase shifting transformers to act as flow control devices. Otherwise the means of interconnecting in both directions could allow the potential through-flow of power from SCE's system to Case Springs, or vice-versa, beyond just the supply or withdrawal of power from LEAPS.

This study has been undertaken to document guidance from the utilities and the CAISO and to show that the phase shifting transformers at Case Springs have adequate control capability to limit the flow on the interconnecting system to what is intended to be used or produced by the LEAPS facility. First, phase shifting transformers have discrete phase shift positions. They are not linearly continuous but move step-wise. Their control range is broad, but not linear. In addition, the response of phase shifters to changing conditions is not instantaneous. While a contingency event, such as a line outage may have an immediate effect on system flows, it may take up to several minutes to reposition the phase shift angles of the three devices to bring the net flows back into line with the desired output/input to LEAPS.

2.0. Study Process Description

The intention of this study is to determine the ability of the phase shifters at Case Springs to manage the flows on the 500 kV lines interconnecting LEAPS such that they cause the sum of the flows to match the intended power from/to LEAPS. All the base condition flow diagrams (see attachments) show the pre-contingency flows on the LEAPS interconnection lines, and then the post-contingency diagrams show the flows after the phase shifters have changed their tap positions to bring the desired net flows at LEAPS back into as near a zero net through power flow as possible.

The study analysis was conducted using the Siemens PTI PSS®E Version 33 load flow software.

As suggested by FERC, Nevada Hydro has dialogued with a group of advisors from the California Independent System Operator (CAISO), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE) to determine what timeframe and system conditions would be most appropriate for testing. See Attachment 1 for copies of emails from representatives of each consulting entity. Nevada Hydro has included all suggestions in this final study.

The process of the collaboration was for Nevada Hydro (NH) to prepare and submit a proposed study plan to the three others involved. NH received back comments from all three participants. The original proposed study time frame was winter conditions in 2021 and summer conditions in 2022. A collection of various types of contingency tests were also proposed by NH. These were mostly 500 kV transmission line outages. They covered

- Base cases (no contingency),
- Single contingencies (N-1; single line or transformer outage),

- Generator outages followed by transmission outages (G-1, N-1; single generator outage, a period for system adjustment, and followed by single line outage),
- Two-line outages with a time for system adjustment between (N-1-1).

These are fully accepted testing standards, but did not include such contingencies as might cause transient stability issues, such as a line outage with a circuit breaker failure requiring immediate further outages, since phase shifting transformers cannot respond in the very short time reaction needed for these types of failures. Also, initial tests of the most severe contingency type, the simultaneous loss of two transmission lines with no opportunity to adjust between their occurrence (N-2), and the most severe cases of this type mostly resulted in an immediate system collapse. Thus, these types of contingencies were deemed by Hydro to be systemic problems that the phase shifters neither caused nor could affect. So, N-2 testing was not used.

There were questions from the participants concerning how the phase shifters would be controlled (automatic, manual). They also suggested that an operating study for the phase shifters should be performed about a year before they were operational. Hydro agrees with this perception. Thus, the operations-related issues raised by the participants were seen to something to be dealt with during that study of their operation.

It was agreed that the most appropriate testing would be with two system cases having the maximum north-to-south and south-to-north power flow over the former WECC transmission path extending south from the San Onofre Nuclear Generating Station's 230 kV substation. The underlying reason for this set of choices was to find system conditions that would have the largest reasonable power angular difference between the two points of interconnection of LEAPS. These are the Alberhill 500 kV Substation at the northern end and the Case Springs 230 kV Substation, near the Talega 230 kV Substation, at the southern end.

The two power system load flow (steady state) models used for the study were supplied by CAISO. The models provided included the entire interconnected system of the Western Electricity Coordinating Council (WECC). The two cases were developed to represent the southern California system as planned for the year 2023. One case had high generation levels from renewable energy sources in the area around San Diego and east to the Imperial Valley. The other case had essentially no renewable energy generation operating in that area.

Thus, the high renewables case has significant power flows from south to north on the transmission line grouping that used to be called Path 44 (with the retirement of San Onofre, the path rating has largely lost its significance, and WECC has deleted it from its Path Rating Catalog). The low renewables case has high flows from north to south on the old Path 44 lines. The important issue in this process was to find as wide an angular difference between the two opposite ends of the interconnection lines. This was deemed by all to be successful.

The load level of the two cases is about 75% of estimated real power peak demand in San Diego in 2023. It was not deemed necessary to use a peak demand condition, since the purpose of the study was to evaluate the performance of the Case Springs phase shifters, not to test system reliability in steady state and dynamic analyses, as would be carried out by CAISO in its bi-annual transmission plan.

The angular differences between the Alberhill 500 kV bus, the north end of the LEAPS interconnection, and the Talega 230 kV bus, the nearest existing bus to the new Case Springs 230 kV bus, at the southern end are shown in the table below.

	Case	
	High Renewables	**Low Renewables**
Alberhill 500 kV Bus Angle	79.4°	-16.3°
Talega 230 kV Bus Angle	76.1	-40.0°
Difference	- 3.3°	-23.7°
Path 44 (South of SONGS) Flow	S-N 1,596 MW	N-S 1,301 MW

3.0. Project Description

The Lake Elsinore Advanced Pumped Storage Project (LEAPS) is to be located on the west side of Lake Elsinore in southern California, using the lake as its lower reservoir and a new lake to be built in the area to the west of the city. The Project is planned to be able to produce up to 500 MW in the generating mode and will use up to 600 MW in its pumping mode.

The Project will interconnect to the existing southern California system as shown on figure 1. This interconnection includes a 500 kV transmission line from the Valley-Serrano area of SCE to the Project and a set of 500 kV and 230 kV lines to the south into the SDG&E service area. The northern terminus of the interconnecting transmission is to be at the proposed SCE Lake 500 kV bus, as described in the final license application (FLA).[1] The southern terminus is the be at the proposed Case Springs site, also as described in the FLA.

4.0. System Status Tests Process Description

Included in the System Diagrams section of this report are two diagrams showing the system conditions in the Area of Interest before the LEAPS project and associated transmission are added. Then there are a set of diagrams showing the base system conditions with LEAPS installed. For each of the two base cases the diagrams with LEAPS added show the following conditions:

a) LEAPS out of service, all transmission in service

b) LEAPS generating 500 MW and delivered north to SCE

[1]/ Although the cases being used in this modeling, as supplied by CAISO to the Project staff designate the proposed Alberhill substation, the California Public Utility Commission has not approved this proposed project. As a result, this study uses the interconnection point to SCE as described in the FLA at a new substation, to be called Lake, rather than at Alberhill. Since this new interconnection point is only a mile from Alberhill in an east-west direction along the Valley-Serrano 500 kV corridor, and the interconnection line will be essentially the same length, it was agreed that there was no need to change the models for this study. The results will vary only minutely.

c) LEAPS generating 500 MW and delivered south to SDG&E

d) LEAPS pumping at 600 MW and received from SCE

e) LEAPS pumping at 600 MW and received from SDG&E

In all these cases the phase shifting transformers have been set to the tap position that will minimize the non-LEAPS flow.

As was agreed between the Nevada Hydro project team and the advisors from CAISO, SCE and SDG&E, all possible contingency patterns were to be considered for their impact on how to manage the phase shifter use. These included what are considered the standard tests of N-1, G-1-N-1, and N-1-1. These abbreviations mean:

N-1	Any single failure or disfunction on any transmission element
G-1-N-1	Loss of any single generator, and, after system adjustment, any N-1 contingency as noted above
N-1-1	Any N-1 contingency, and after system adjustment, a second N-1 Contingency

In considering G-1 contingencies, combined cycle generators without stack dampers on the outlet of the gas turbines would be seen as totally out of service for failure of the steam turbine-generator. This is considered relevant for this study for the Palomar Energy Center and the Otay Mesa combined cycle plants in SDG&E.

The most severe contingency test, which was not included in this study, is the N-2 test, which assumes the simultaneous loss of two transmission elements. Because of the severity of this test, and that it is strongly a system reliability concern (i.e. loss of both 500 kV lines west of SDG&E's Imperial Valley Substation) which may require severe remedial action such as load shedding, it was not considered something in which phase shifter performance would be involved.

The initial screening examination of the multitude of possible contingencies in the study area showed there to be a limited collection of the "worst of the worst" contingencies that affect LEAPS phase shifter performance. These were found to be exclusively 500 kV line outages, either singly or in a few combinations. No G-1-N-1 conditions made this list, largely because the size of the generators is small compared to the transfer capability of the 500 kV transmission lines.

The N-1 contingencies that rose to the level of serious consideration included SCE 500 kV lines in the immediate vicinity of the LEAPS Project interconnection. These were the 500 kV lines from the interconnection point to Serrano and the interconnection point to Valley. The only other 500 kV line that came to show trouble is the ECO-Miguel line in SDG&E.

The most relevant N-1-1 contingency was the loss of the Eco-Miguel 500 kV line and then loss of the Ocotillo-Suncrest 500 kV line. As part of the adjustment step after the initial N-1 it was found necessary to not have LEAPS pumping. Also, in the Low Renewables case, the option to have LEAPS generate for delivery north was still available, but not considered wise unless circumstances before the system operators made that choice useful. Having LEAPS generate for delivery south was seen as useful as anticipation for a second contingency.

The only observable limitation on the operation of the LEAPS Project came in the N-1 situation for loss of the Serrano-Alberhill 500 kV line. It was not possible to deliver all 600 MW of pumping power from the south. The limit, with all phase shifters at their maximum position, was slightly more than 400 MW. This appears to be caused by the significant push from the east on the SCE 500 kV lines all the way back to Hassayampa and Palo Verde, including the 700+ MW combined cycle plant interconnecting at Valley. Also, it would seem odd to have LEAPS pumping in the area of a major contingency, regardless of the direction from which the pumping power comes.

The charts in Attachment 2 summarize the base case with LEAPS installed and various "worst case" conditions found for the two system models used in the analysis.

Table 1: Phase Shifter Angular Positions for System Operating Conditions - High Renewables

SYSTEM CONDITION	LEAPS STATUS	DELIVERY DIRECTION	PHASE SHIFT ANGLE (°)
Base Case (No Contingency)	Off		0
	Generating 500 MW	To North	2
		To South	-12
	Pumping 600 MW	From North	-2
		From South	16
N-1 (Serrano-Alberhill 500 kV Line)	Off		14
	Generating 500 MW	To North	20
		To South	2
	Pumping 600 MW	From North	6
		From South	30
N-1 (Valley-Alberhill 500 kV Line)	Off		-10
	Generating 500 MW	To North	-6
		To South	-22
	Pumping 600 MW	From North	-14
		From South	6
N-1 (ECO-Miguel 500 kV Line)	Off		6
	Generating 500 MW	To North	8
		To South	-8
	Pumping 600 MW	From North	2
		From South	20
N-1-1 (ECO-Miguel 500 kV Line	Off		20
	Generating 500 MW	To North	20

+ Ocotillo-Suncrest500 kV Line)		To South	6
	Pumping 600 MW	From North	N/A
		From South	N/A

Table 2: Phase Shifter Angular Positions for System Operating Conditions - Low Renewables

System Condition	LEAPS Status	Delivery Direction	Phase Shift Angle (°)
Base Case (No Contingency)	Off	-	24
	Generating 500 MW	To North	26
		To South	12
	Pumping 600 MW	From North	22
		From South	32
N-1 (Serrano-Alberhill 500 kV Line)	Off		32
	Generating 500 MW	To North	32
		To South	18
	Pumping 600 MW	From North	24
	Pumping 600 MW	From South	32
	Pumping 400 MW	From South	32
N-1 (Valley-Alberhill 500 kV Line)	Off		6
	Generating 500 MW	To North	12
		To South	-2
	Pumping 600 MW	From North	2
		From South	22
N-1 (ECO-Miguel 500 kV Line)	Off		22
	Generating 500 MW	To North	22
		To South	8
	Pumping 600 MW	From North	18
		From South	32
N-1-1 (ECO-Miguel 500 kV Line + Ocotillo-Suncrest 500 kV Line	Off		26
	Generating 500 MW	To North	N/A
		To South	10
	Pumping 600 MW	From North	N/A
		From South	N/A

5.0. System Diagrams

The load flow system diagrams for the “Area of Interest” at the interface between SCE and SDG&E provide detail of system conditions for the several modeled base and contingency situations. There are a total of 48 diagrams for this area. Not included, but available upon request, are a total of 192 diagrams for parts of the system other than the “Area of Interest”. These are diagrams for the 500 kV system around Imperial Valley Substation, the 230 kV system around Imperial Valley, the CFE system between Imperial Valley and Otay Mesa, and the area around Otay Mesa.

Other than the Pre-LEAPS diagrams, the rest are grouped to follow the order seen in the above two tables showing the angular positions of the Case Springs phase shifting transformers.

ATTACHMENT 1

COMMUNICATION WITH CONSULTING ENTITIES

Comments of the Southern California Edison Company

on

"Proposed Study Plan for Use of
Phase-Shifting Transformers at Case Springs"
Lake Elsinore Advanced Pumped Storage
FERC Project No. 14227

August 30, 2018

Introduction

Southern California Edison Company (SCE) appreciates the opportunity to respond to the Nevada Hydro Company's (Nevada Hydro) request for comments regarding the Proposed Study Plan for Use of Phase-Shifting Transformers at the proposed Case Springs Substation, sent by Nevada Hydro to SCE on July 30, 2018. We understand that the purpose of the proposed study is to demonstrate that the use of Phase Shifters will limit non-project power flowing through the Lake Elsinore Advanced Pumped Storage (LEAPS) transmission lines. The following represents SCE's initial comments and recommendations:

System Conditions to be Used in the Study:

Nevada Hydro proposed using the WECC 2021 Spring Light Load Case and the 2022 Summer Heavy Load Case to evaluate the adequacy of the Phase Shifters. The selection of these cases may not reflect realistic timing for the LEAPS Project or the most critical system conditions. To more accurately model the LEAPS project, it should be modeled using a base case that accurately reflects queued generation in both SCE and SDG&E's electrical system. Such queued generation is not shown accurately in the WECC load cases. Therefore, we invite Nevada Hydro to discuss alternative base cases that could be used in lieu of the 2021 and 2022 base cases listed above.

Study of the Case Springs Phase-Shifter Operations under Normal System Operations

SCE strongly recommends that the Normal system operation study includes the following scenarios with the LEAPS Project pumping, generating, and idling:

- High queued generation dispatch in SCE's Electrical system, including, but not limited to, the Devers area and high generation in SDG&E area.
- High north-to-south flow and south-to-north flow at SONGS switchrack. The flow should be adjusted to achieve approximately 1500 MW south-to-north in the Spring off – peak case and approximately 1200 MW on the north-to-south Summer peak case.
- Maximum flow on Path 46
- Maximum flow on Path 42

Study of the Case Springs Phase-shifter Operations under Contingency Conditions

SCE recommends that the proposed study be consistent with NERC, WECC, and CAISO planning criteria for contingency scenarios, and consistent with CAISO generation interconnection study procedures. Accordingly, SCE recommends that Nevada Hydro go beyond the small pool of N-1 scenarios identified in the proposed study and, instead, expand the contingency list to include all N-1, G-1-N-1, N-1-1 and N-2 scenarios[1] with their corresponding RAS operations.

In addition, the following specific N-1s should be monitored for potential system performance impacts:

- N-1 of Serrano to Loop-In 500 kV Sub transmission line
- N-1 of Loop-In 500 kV Sub to Valley Substation transmission line
- N-1 of Devers No.1AA or No.2AA 500/220 kV transformer banks
- N-1 of Devers-Valley No.1 and/or No.2 500 kV transmission lines (for pumping scenario)
- N-1 of the proposed Phase Shifters
- N-1 Delaney – Colorado River 500 kV Transmission Line
- N-1 Colorado River - Palo Verde 500 kV Transmission Line
- N-1 Devers – Red Bluff No.1 or No. 2 500 kV transmission lines

Future Studies

SCE notes that an operational study will be required one year prior to the interconnection of the LEAPS Project, to account for changes in the generation interconnection queue and the transmission system since the Interconnection Facilities Study was completed. This operational study may identify Participating TO's Reliability Network Upgrades and Participating TO's Delivery Network Upgrades that are different from those included in the LEAPS TOT132 (Q#72) LGIA.

Please contact Ayman Samaan of SCE should you have further questions. He may be reached at Ayman.Samaan@sce.com.

[1] https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=TPL-001-4&title=Transmission%20System%20Planning%20Performance%20Requirements&jurisdiction=United%20States

SDG&E Comments

on

"Proposed Study Plan for Use of
Phase-Shifting Transformers at Case Springs"
Lake Elsinore Advanced Pumped Storage
FERC Project No. 11427
July 30, 2018 draft

SDG&E understands the focus of the study requested by FERC is to evaluate the operation of the phase-shifting transformers installed at the Case Springs substation. Their purpose is to prevent non-project power to flow between the Case Springs substation (SDG&E system) and the Lake switchyard (SCE system). There are areas of the study plan SDG&E believes deserve additional attention and clarifications. These areas are listed below:

Selection of Power Flow Cases

As an alternative to WECC cases, SDG&E recommends using the 2023 power flow cases from the CAISO 2018-2019 Transmission Planning process. These cases are more recent and have also been reviewed by the CAISO, SCE, and SDG&E. At a minimum, cases should be selected based on a potential realistic in-service date of the project.

System Conditions to be Used in Study

It is not clear what is meant by "normal conditions" in the study plan. Although SONGS has retired, the increase of renewable generation is causing flows south-to-north (SDG&E to SCE) to go as high as 1500 MW. Flows north-to-south (SCE to SDG&E) as high as 1000 MW have also been observed. for these reasons, SDG&E believes at least two additional baseline cases with no phase shifters should be modeled to identify the natural flow of MW when either high south-to-north or north-to-south flows occur. These cases should be used to benchmark cases where the phase-shifting transformers will be actively controlling the flows. Furthermore, typical stressed system scenarios are already identified in the CAISO 2018-2019 study plan. SDG&E encourages their inclusion in the study plan.

The study plan does not define the "minimum net through-flow" term and the "SDG&E internal generation" term. These terms can have different meanings and impact the results. SDG&E recommends specifying upfront what would be an acceptable range for the "minimum net through-flow" and the "SDG&E internal generation" cut plane.

Contingency Conditions:

The assessment of multiple contingencies is part of NERC, WECC, and CAISO planning criteria. At a minimum, contingencies should include all major contingencies (230 kV and above) the CAISO and SDG&E plan to and operate to. These contingencies include N-1-1, G-1-N-1, and N-2 with their corresponding RAS operations.

Also, SDG&E is not aware of any planning standard that supports the following statement: "Contingency tests beyond the "N-1" tests would be beyond reasonable design planning for net through-flow on the LEAPS tie lines and may have more serious issues for other reasons."

Finally, the N-1 contingencies listed in the study plan should reflect today's system configuration and substation names. For example, the "Imperial Valley-Miguel 500 kV line" and the "Imperial Valley-Central South (formerly Sycamore) 500 kV line" N-1 contingencies should be replaced with the "Imperial Valley-East County 500 kV line", "Imperial Valley-Ocotillo 500 kV line", "East County-Miguel 500 kV line", "Ocotillo - Suncrest 500 kV line".

Timeline:

The study plan does not include a timeline and milestone dates when potential preliminary results could be shared with the CAISO, SDG&E, and SCE. This practice is customary in studies that impact several entities.

Setting of Phase-Shifting Transformers (PST)

Since this is a study focused on the operation of the PSTs, typical technical data for PSTs are essential for proper evaluation. These include angle range, impedance, impedance table, continuous rating, emergency rating (with length of time for the rating specified).

To prevent non-project power to flow in the study, operation of the pump storage project will rely heavily on the operation of the PSTs. SDG&E recommends setting the phase shifters in the study the same way they would be operated in the field. Also, additional information should be provided, including but not limiting to:

1. Clarification should be given on whether the PSTs are expected to be operated manually or automatically (automatic angle control or MW flow control modes).
2. how will the PSTs be set pre-contingency (flow control mode, at specified tap position)?
3. How would the PSTs operate post-contingency?
    a. maintaining the same flow as that pre-contingency?
    b. If so, how long does it take to move a tap position?
    c. If not, what are the PSTs designed to do (freeze at the same tap as that in pre-contingency?)
4. If bypass operation is needed, how will it be implemented, for instance, move to neutral tap position then close bypass switch?

David Kates

From: Sparks, Robert <RSparks@caiso.com>
Sent: Tuesday, August 28, 2018 9:25 AM
To: David Kates
Cc: Millar, Neil; Strack (Sempra Energy Utilities), Jan; 'Maiga, Habibou A'; Chinn (Southern California Edison), Garry; Ayman Samaan; Chen, Frank
Subject: RE: Request for comments on Study Plan for LEAPS facility

David,

In response to Nevada Hydro's request for comments regarding the Proposed Study Plan for Use of Phase-Shifting Transformers at Case Springs ("Study Plan"), the following comments are provided. The comments focus on the assumptions that could impact the operational performance of the Case Springs phase shifters that are proposed to limit non-project power through the project's interconnection transmission lines.

The ISO understands that the objective of the Study Plan is to meet the study requirement of FERC's Study 34 that focuses on the operation of the proposed transformers. The Study Plan relies too narrowly on nominal power flow base cases (i.e. WECC 2021 Spring Light Load Case and the 2022 Summer Heavy Load Case) to adequately evaluate the performance of the phase shifting transformers. The selection of system conditions in those cases is not consistent with critical system conditions in actual transmission operations and planning assumptions used in recent California ISO transmission planning process cases. The Study Plan falls short in its approach to identifying the study scenarios even though five generation scenarios are identified in the Study Plan to evaluate what the impact would be on the phase shifter operation with LEAPS either pumping or generating. Although it is not easy to identify the most critical study scenarios to examine the impact, it is the ISO viewpoint that the study should be performed for a wide range of operating conditions in terms of the angular difference between the 500 kV bus at Lake Switchyard and the 230 kV bus at Case Springs. Based on the ISO study experience, the angular difference has a close correlation to the power flow loading conditions on the 230 kV path south of the SONGS switchyard. The power flows on this path should be adjusted to achieve 1400 to 1600 MW south-to-north in at least one scenario case and 1000 to 1300 MW north-to-south in other scenario cases. In addition, it appears that the contingencies listed are based on an outdated system configuration assumption. Therefore, the contingencies should be modified to reflect the planned system configuration as shown below.

1. One Case Springs phase shifter and associated 500/230 kV transformer
2. Lee Lake-Alberhill or Serrano 500 kV line (corrected)
3. Lee Lake-Valley 500 kV line (corrected)
4. Case Springs-Talega Tap-Capistrano 230 kV three-terminal line (corrected)
5. Case Springs-Escondido 230 kV line
6. Miguel-ECO 500 kV line with TL23040 IV 500 kV +RAS (corrected)
7. Ocotillo-Suncrest 500 kV line with TL23040 IV 500 kV +RAS (corrected)
8. Imperial Valley-North Gila 500 kV line
9. One of Suncrest-Sycamore 230 kV lines with TL23054/23055 +RAS (added)
10. SONGS-Talega 230 kV line
11. SONGS-Capistrano 230 kV line (added)

12. SONGS-Serrano 230 kV line (added)
13. SONGS-Viejo 230 kV line
14. One SONGS-Santiago 230 kV line

Note: For purposes of this study, the RAS can be assumed to consist of dropping generation connected to Imperial Valley substation as needed to alleviate overloads observed after taking the contingency.

One final comment is that recently completed or future generation interconnection studies of the LEAPS Project are intended to identify reliability impacts caused by the interconnection of the LEAPS Project to the ISO Controlled Grid, and this Study Plan is not intended to be an interconnection study.

Thank you,

Robert Sparks

Manager, Regional Transmission – South

California ISO

From: David Kates <David@leapshydro.com>
Sent: Monday, July 30, 2018 6:03 PM
To: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; dana.cabbell@sce.com
Cc: 'rwait@controltechnology.org' <rwait@controltechnology.org>
Subject: [EXTERNAL] Request for comments on Study Plan for LEAPS facility

Jan, Neil and Dana,

As you may be aware, Nevada Hydro is developing the LEAPS pumped storage project under FERC's licensing authority as their Project No. 14227.

In its June 15, 2018 letter to us, the FERC directed us to prepare a study plan regarding the use of phase shifting transformers as an element of the facility's operation. FERC directed that we request comments on this study plan from each of your organizations.

A copy of the draft plan is attached, including a copy of FERC's letter to us. For your convenience, I have also included copies of the executed interconnection agreements among our organizations.

FERC has directed that we allow 30 days for any response or comments you care to provide.

Please direct any questions or comments you may have to me. We are to file your comments along with our plan with FERC by mid-September.

Thank you in advance.

David

David Kates
The Nevada Hydro Company
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403

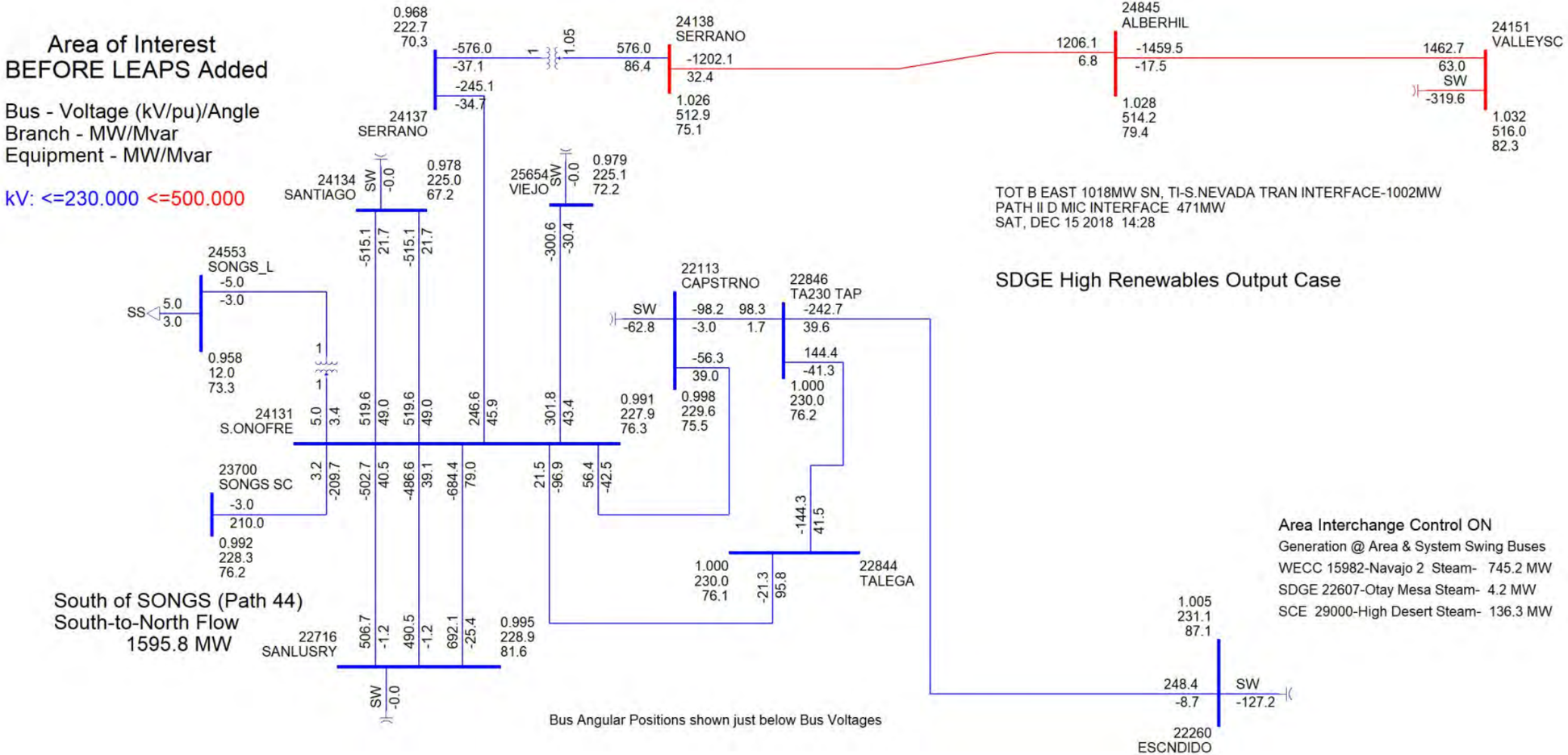
(707) 570-1866

ATTACHMENT 2

SYSTEM FLOW DIAGRAMS

SYSTEM CONDITIONS BEFORE LEAPS

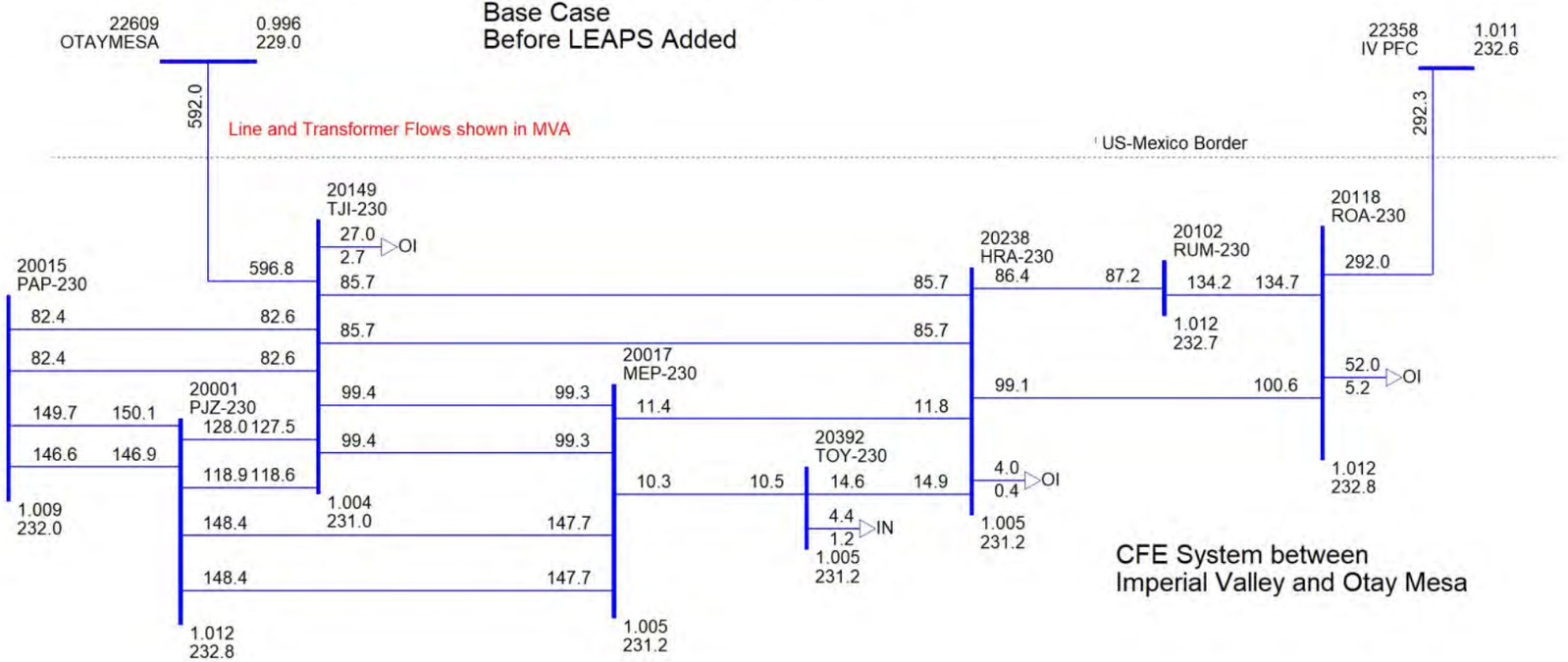
PRE-LEAPS HIGH RENEWABLES BASE CASE DETAILS

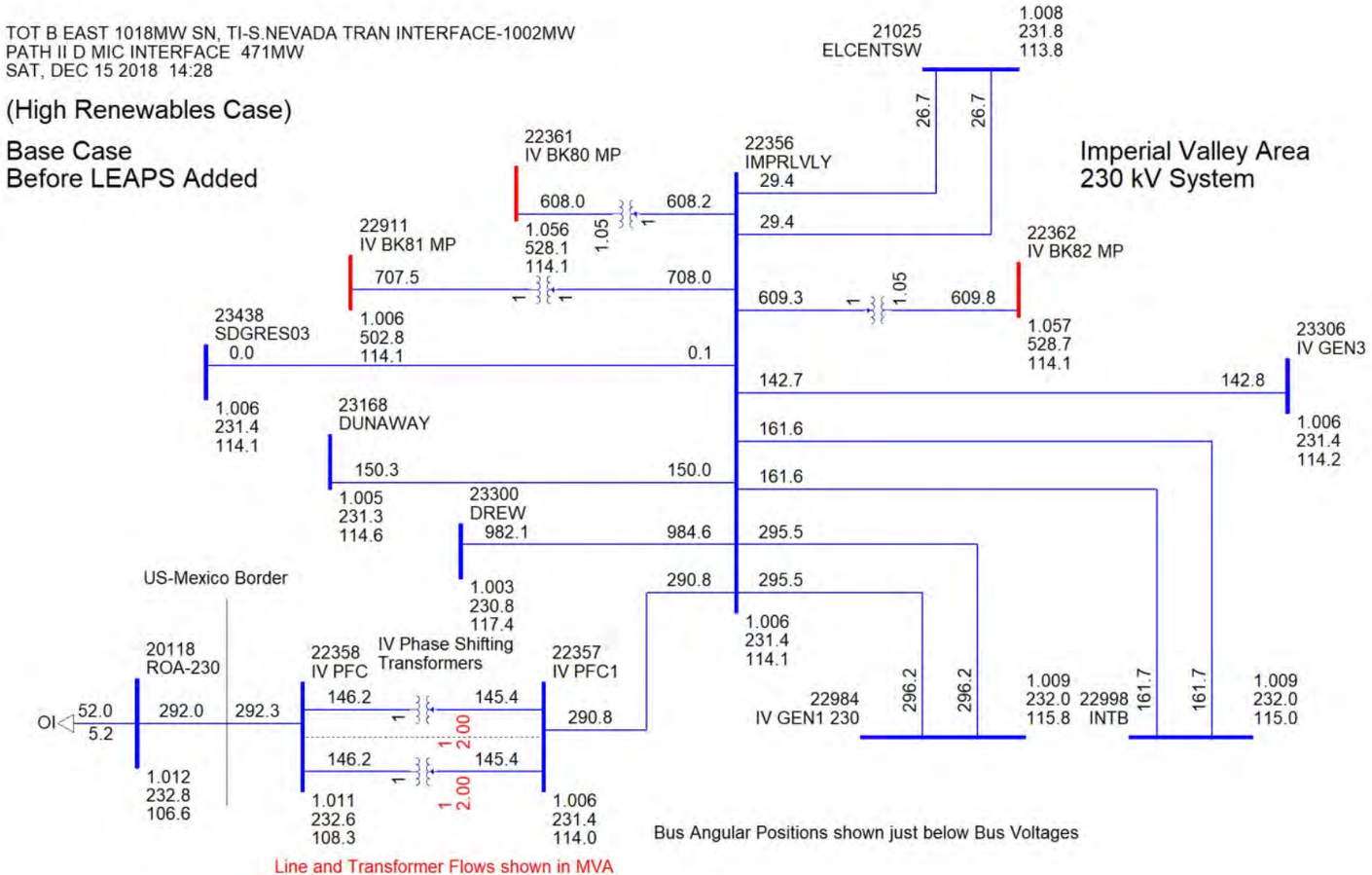

Area of Interest
BEFORE LEAPS Added
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
0.968
222.7
70.3
-576.0
-37.1
-245.1
-34.7
1
1.05
576.0
86.4
24138
SERRANO
-1202.1
32.4
1.026
512.9
75.1
24137
SERRANO
24845
ALBERHIL
1206.1
6.8
-1459.5
-17.5
1.028
514.2
79.4
1462.7
63.0
SW
-319.6
24151
VALLEYSC
1.032
516.0
82.3
TOT B EAST 1018MW SN, TI-S.NEVADA TRAN INTERFACE-1002MW
PATH II D MIC INTERFACE 471MW
SAT, DEC 15 2018 14:28
SDGE High Renewables Output Case
24134
SANTIAGO
SW
-0.0
0.978
225.0
67.2
25654
VIEJO
SW
-0.0
0.979
225.1
72.2
24553
SONGS_L
-5.0
-3.0
SS
5.0
3.0
0.958
12.0
73.3
1
1
-515.1
21.7
-515.1
21.7
-300.6
-30.4
22113
CAPSTRNO
SW
-62.8
-98.2
-3.0
98.3
1.7
22846
TA230 TAP
-242.7
39.6
-56.3
39.0
144.4
-41.3
1.000
230.0
76.2
0.998
229.6
75.5
0.991
227.9
76.3
24131
S.ONOFRE
5.0
3.4
519.6
49.0
519.6
49.0
246.6
45.9
301.8
43.4
23700
SONGS SC
-3.0
210.0
0.992
228.3
76.2
3.2
-209.7
-502.7
40.5
-486.6
39.1
-684.4
79.0
21.5
-96.9
56.4
-42.5
-144.3
41.5
1.000
230.0
76.1
-21.3
95.8
22844
TALEGA
South of SONGS (Path 44)
South-to-North Flow
1595.8 MW
22716
SANLUSRY
506.7
-1.2
490.5
-1.2
692.1
-25.4
0.995
228.9
81.6
SW
-0.0
Bus Angular Positions shown just below Bus Voltages
Area Interchange Control ON
Generation @ Area & System Swing Buses
WECC 15982-Navajo 2 Steam- 745.2 MW
SDGE 22607-Otay Mesa Steam- 4.2 MW
SCE 29000-High Desert Steam- 136.3 MW
1.005
231.1
87.1
248.4
-8.7
SW
-127.2
22260
ESCNDIDO

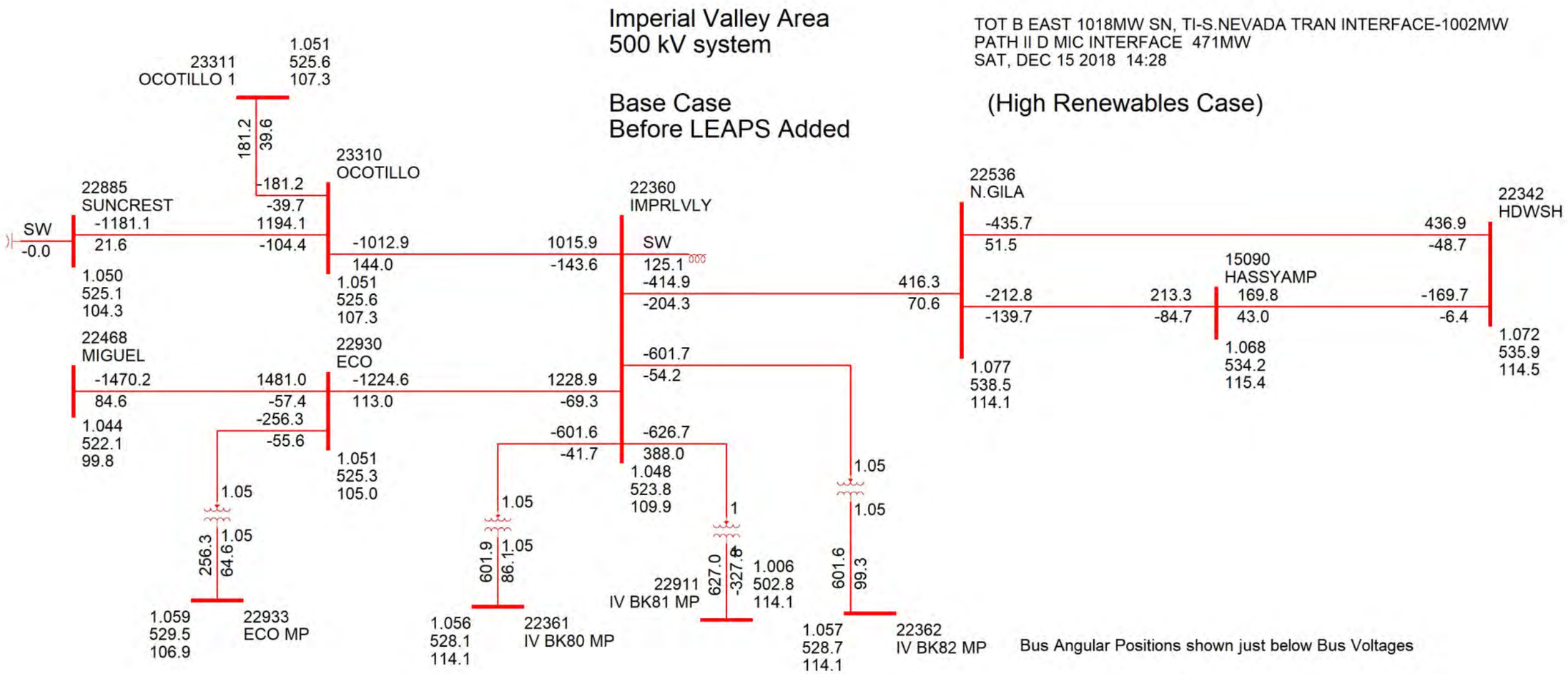
TOT B EAST 1018MW SN, TI-S.NEVADA TRAN INTERFACE-1002MW
PATH II D MIC INTERFACE 471MW
SAT, DEC 15 2018 14:28

SDGE High Renewables Output Case

Base Case
Before LEAPS Added



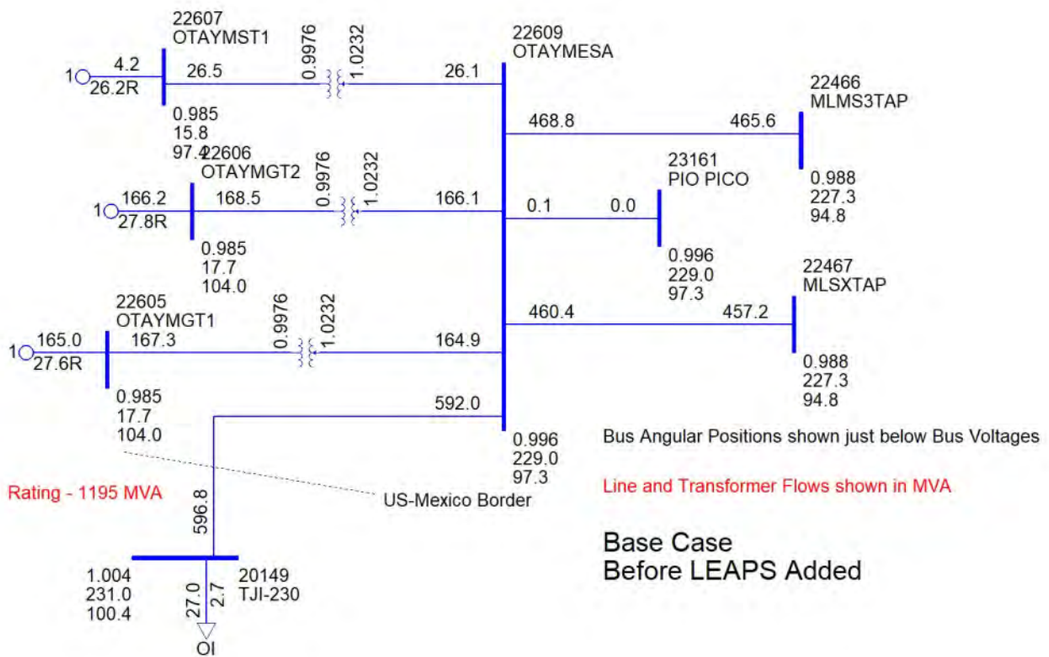

TOT B EAST 1018MW SN, TI-S.NEVADA TRAN INTERFACE-1002MW
PATH II D MIC INTERFACE 471MW
SAT, DEC 15 2018 14:28
(High Renewables Case)
Base Case
Before LEAPS Added
Imperial Valley Area
230 kV System
21025
ELCENTSW
1.008
231.8
113.8
22361
IV BK80 MP
608.0
608.2
1.056
528.1
114.1
22911
IV BK81 MP
707.5
708.0
1.006
502.8
114.1
22356
IMPRLVLY
29.4
22362
IV BK82 MP
609.3
609.8
1.057
528.7
114.1
23438
SDGRES03
0.0
0.1
1.006
231.4
114.1
23306
IV GEN3
142.7
142.8
1.006
231.4
114.2
23168
DUNAWAY
150.3
150.0
1.005
231.3
114.6
23300
DREW
982.1
984.6
1.003
230.8
117.4
161.6
295.5
290.8
1.006
231.4
114.1
US-Mexico Border
20118
ROA-230
22358
IV PFC
IV Phase Shifting
Transformers
22357
IV PFC1
OI
52.0
5.2
292.0
292.3
146.2
145.4
290.8
2.00
1.012
232.8
106.6
1.011
232.6
108.3
1.006
231.4
114.0
22984
IV GEN1 230
296.2
1.009
232.0
115.8
22998
INTB
161.7
1.009
232.0
115.0
Bus Angular Positions shown just below Bus Voltages
Line and Transformer Flows shown in MVA


Imperial Valley Area
500 kV system
Base Case
Before LEAPS Added
TOT B EAST 1018MW SN, TI-S.NEVADA TRAN INTERFACE-1002MW
PATH II D MIC INTERFACE 471MW
SAT, DEC 15 2018 14:28
(High Renewables Case)
23311
OCOTILLO 1
1.051
525.6
107.3
181.2
39.6
23310
OCOTILLO
-181.2
-39.7
1194.1
-104.4
22885
SUNCREST
-1181.1
21.6
SW
-0.0
1.050
525.1
104.3
-1012.9
144.0
1.051
525.6
107.3
1015.9
-143.6
22360
IMPRLVLY
SW
125.1
-414.9
-204.3
416.3
70.6
22536
N.GILA
-435.7
51.5
436.9
-48.7
22342
HDWSH
15090
HASSYAMP
-212.8
-139.7
213.3
-84.7
169.8
43.0
-169.7
-6.4
1.077
538.5
114.1
1.068
534.2
115.4
1.072
535.9
114.5
22468
MIGUEL
-1470.2
84.6
1481.0
-57.4
22930
ECO
-1224.6
113.0
1228.9
-69.3
-256.3
-55.6
1.044
522.1
99.8
1.051
525.3
105.0
-601.7
-54.2
-601.6
-41.7
-626.7
388.0
1.048
523.8
109.9
1.05
1.05
256.3
64.6
1.05
1.059
529.5
106.9
22933
ECO MP
1.05
601.9
86.1
1.05
1.056
528.1
114.1
22361
IV BK80 MP
1
627.0
-327.8
22911
IV BK81 MP
1.006
502.8
114.1
1.05
1.05
601.6
99.3
1.057
528.7
114.1
22362
IV BK82 MP
Bus Angular Positions shown just below Bus Voltages

TOT B EAST 1018MW SN, TI-S.NEVADA TRAN INTERFACE-1002MW
PATH II D MIC INTERFACE 471MW
SAT, DEC 15 2018 14:28

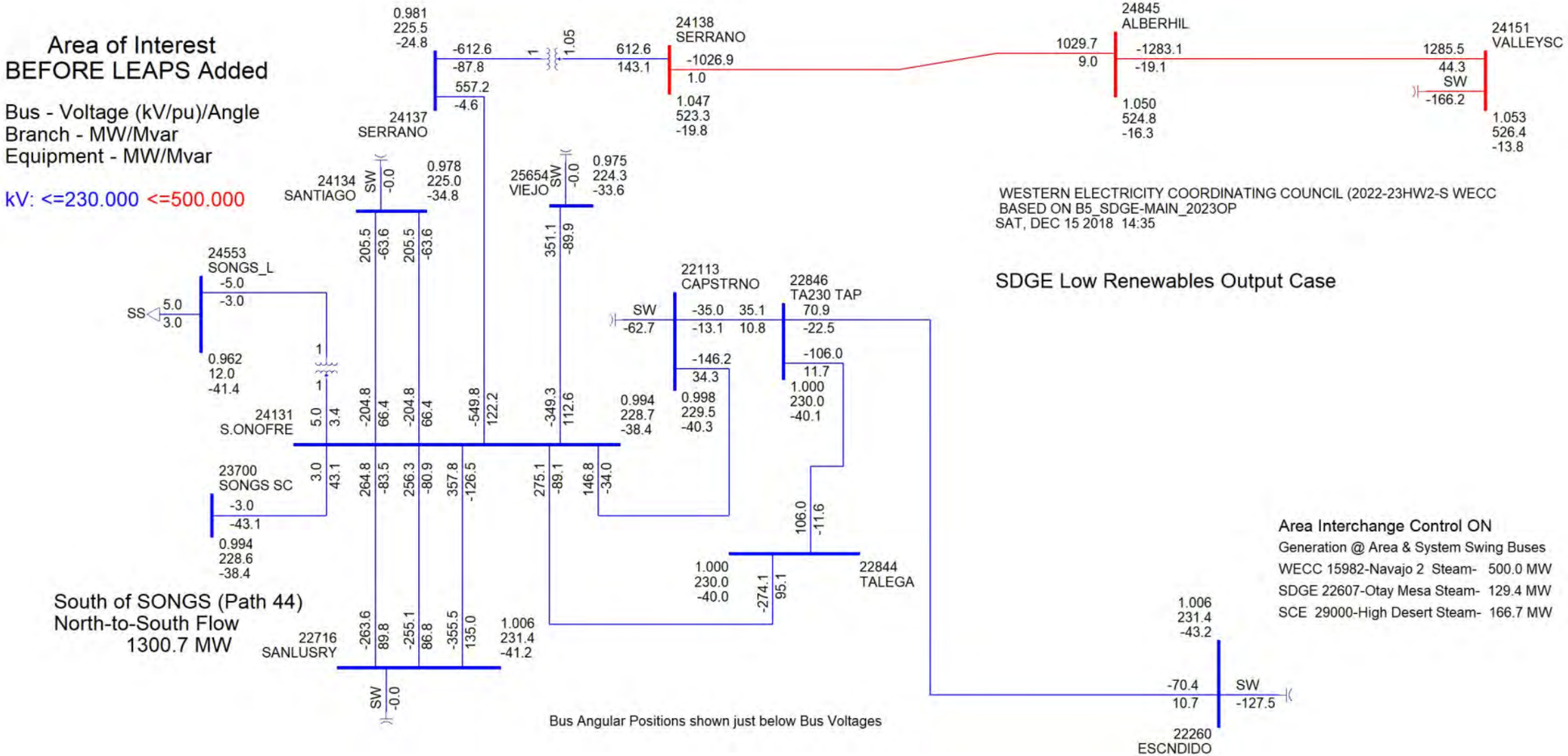
SDGE High Renewables Case

Otay Mesa - Tijuana 230 kV Area



Base Case
Before LEAPS Added

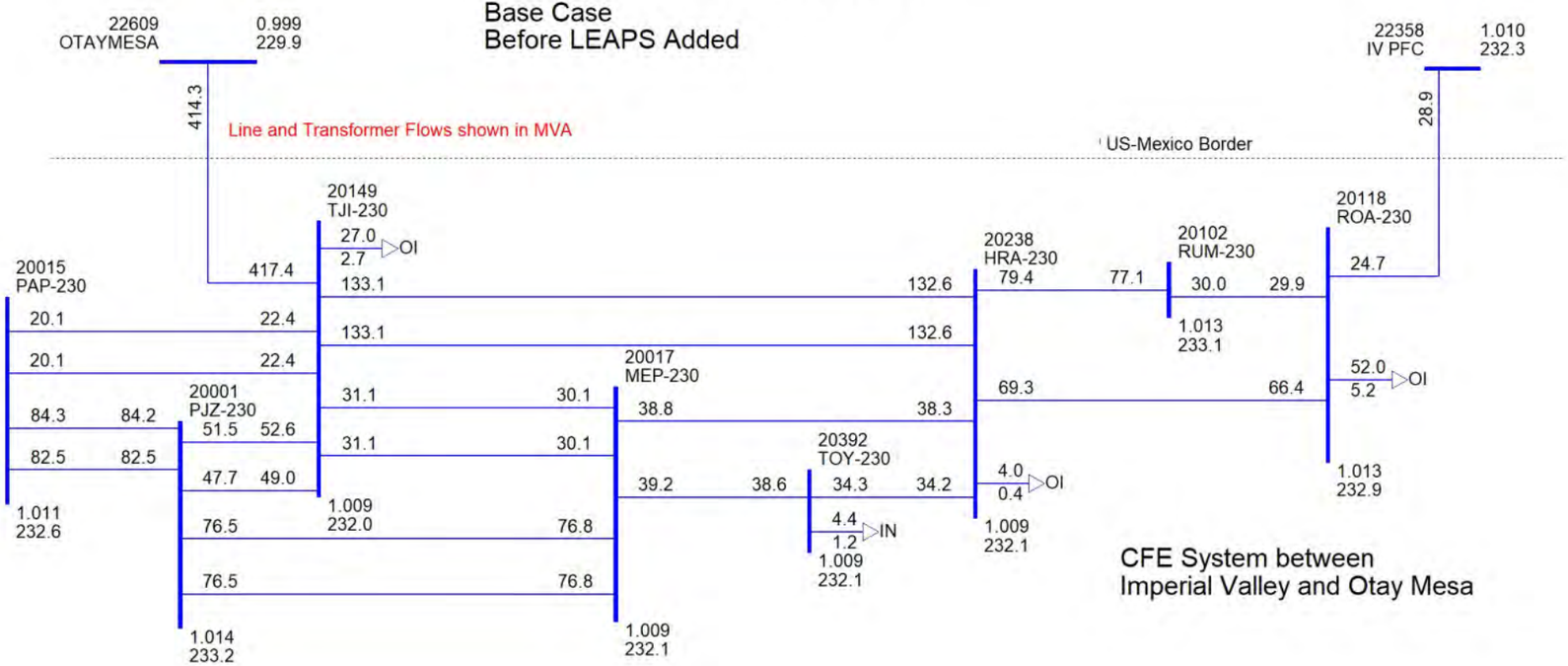
PRE-LEAPS LOW RENEWABLES BASE CASE DETAILS

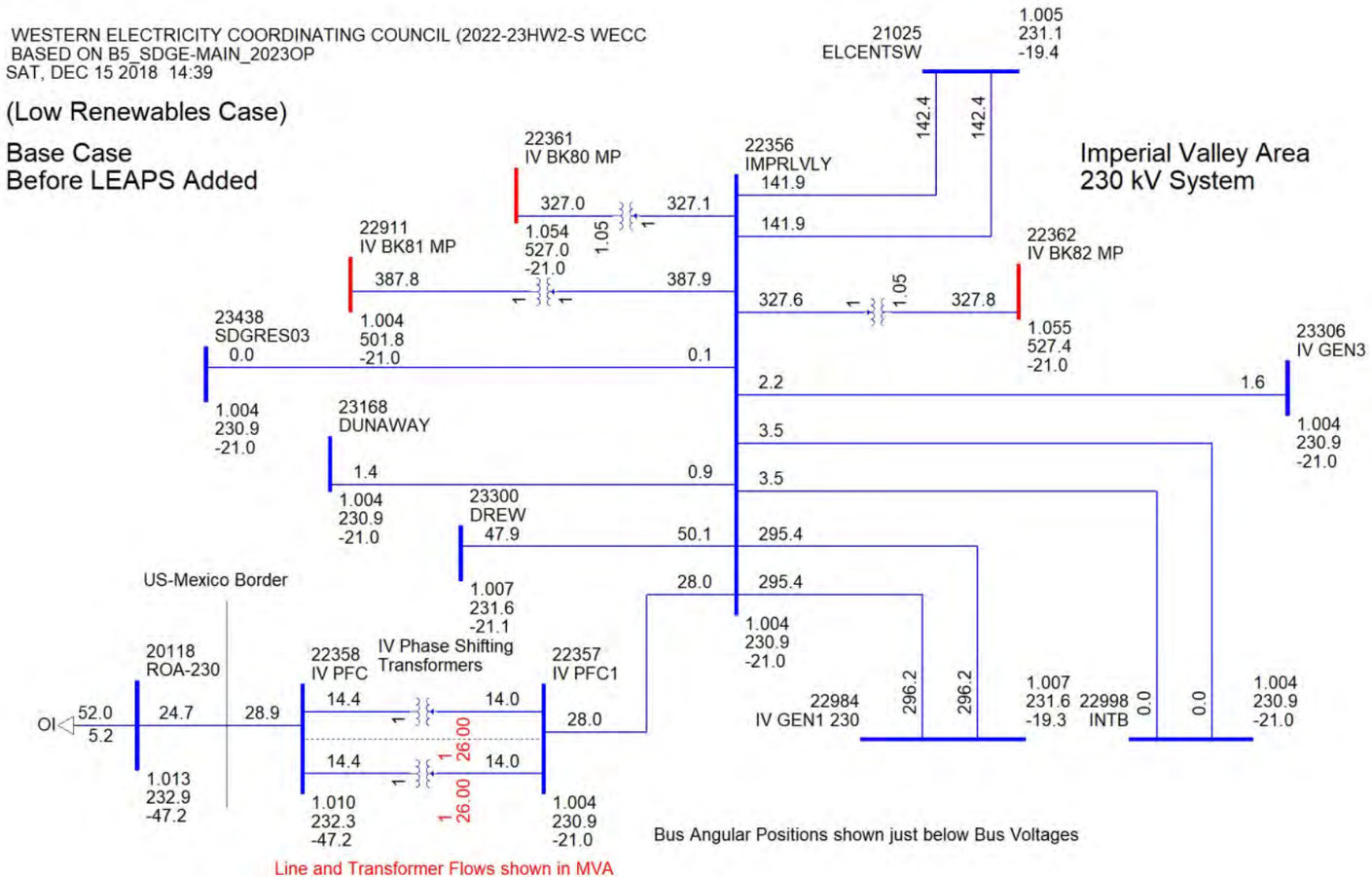

Area of Interest
BEFORE LEAPS Added
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S WECC
BASED ON B5_SDGE-MAIN_2023OP
SAT, DEC 15 2018 14:35
SDGE Low Renewables Output Case
South of SONGS (Path 44)
North-to-South Flow
1300.7 MW
Area Interchange Control ON
Generation @ Area & System Swing Buses
WECC 15982-Navajo 2 Steam- 500.0 MW
SDGE 22607-Otay Mesa Steam- 129.4 MW
SCE 29000-High Desert Steam- 166.7 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
22260 ESCNDIDO
24845 ALBERHIL
24151 VALLEYSC

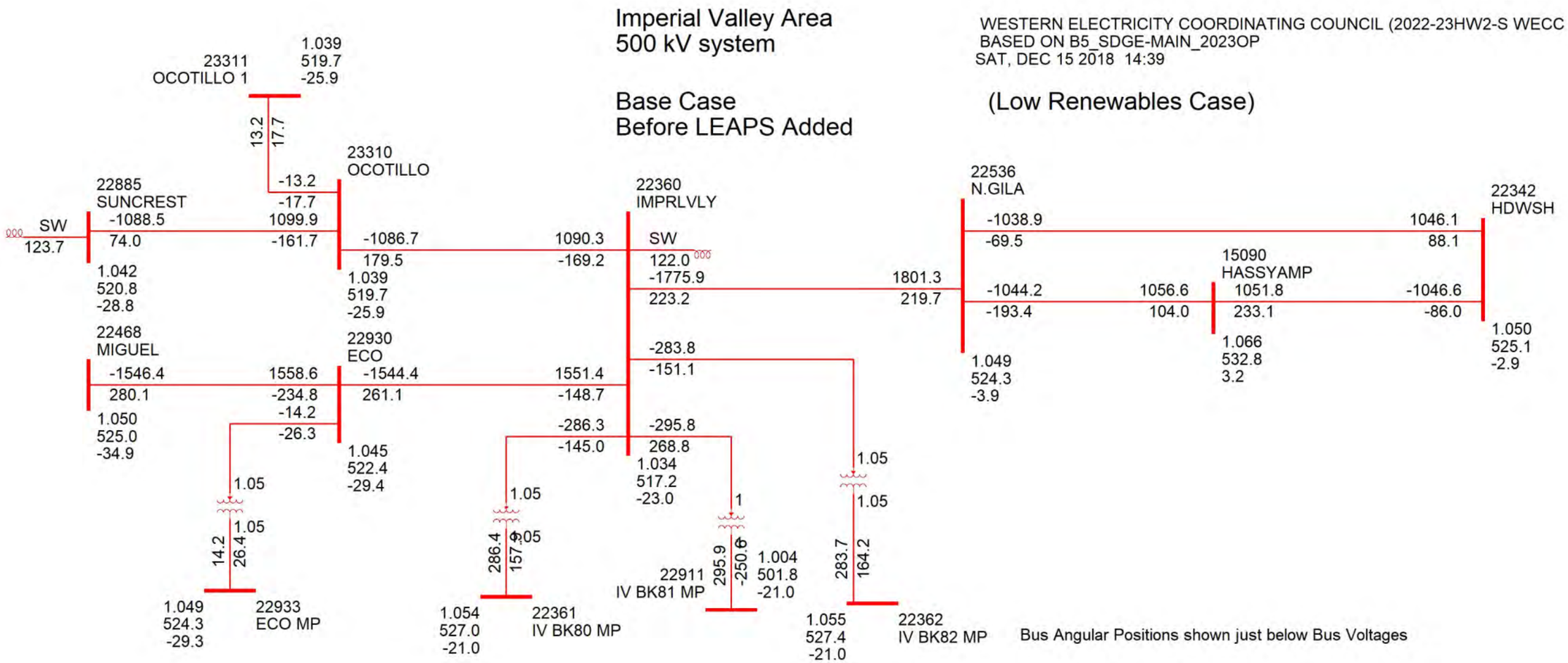
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S WECC
BASED ON B5_SDGE-MAIN_2023OP
SAT, DEC 15 2018 14:40

SDGE Low Renewables Output Case

Base Case
Before LEAPS Added



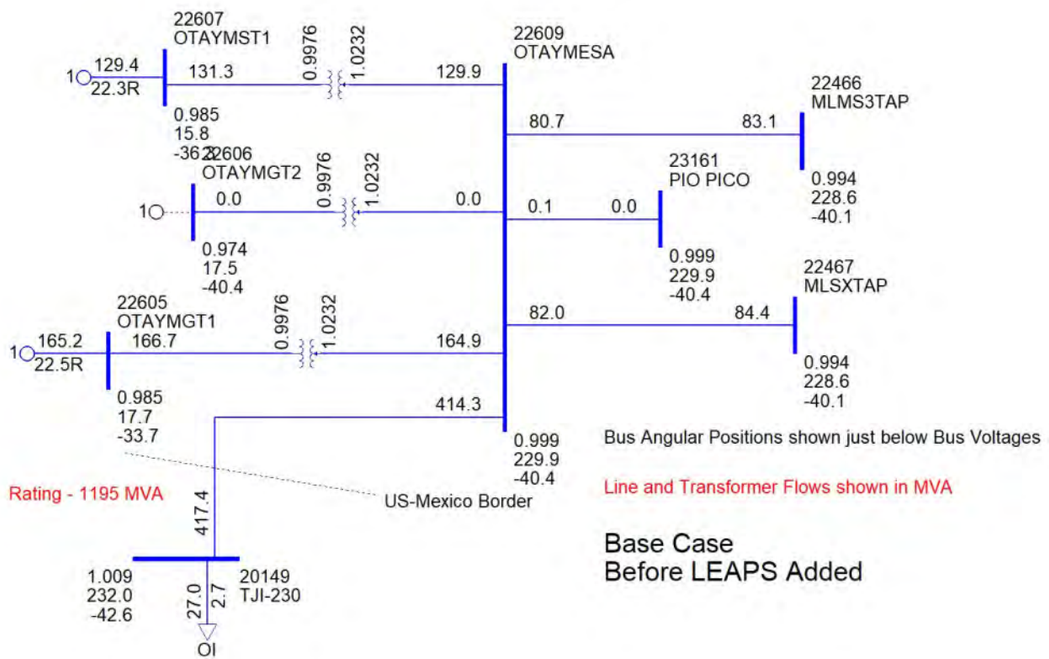

WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S WECC
BASED ON B5_SDGE-MAIN_2023OP
SAT, DEC 15 2018 14:39
(Low Renewables Case)
Base Case
Before LEAPS Added
Imperial Valley Area
230 kV System
21025
ELCENTSW
1.005
231.1
-19.4
142.4
142.4
22361
IV BK80 MP
327.0
327.1
1.054
527.0
-21.0
1.05
1
22356
IMPRLVLY
141.9
141.9
22911
IV BK81 MP
387.8
387.9
1.004
501.8
-21.0
1
1
22362
IV BK82 MP
327.6
1
1.05
327.8
1.055
527.4
-21.0
23438
SDGRES03
0.0
0.1
1.004
230.9
-21.0
23306
IV GEN3
2.2
1.6
1.004
230.9
-21.0
23168
DUNAWAY
3.5
1.4
0.9
1.004
230.9
-21.0
3.5
23300
DREW
47.9
50.1
295.4
US-Mexico Border
28.0
295.4
1.007
231.6
-21.1
1.004
230.9
-21.0
20118
ROA-230
22358
IV PFC
IV Phase Shifting
Transformers
22357
IV PFC1
22984
IV GEN1 230
296.2
296.2
1.007
231.6
-19.3
22998
INTB
0.0
0.0
1.004
230.9
-21.0
OI
52.0
5.2
24.7
28.9
14.4
14.0
28.0
1
26.00
14.4
14.0
1
26.00
1.013
232.9
-47.2
1.010
232.3
-47.2
1.004
230.9
-21.0
Bus Angular Positions shown just below Bus Voltages
Line and Transformer Flows shown in MVA


Imperial Valley Area
500 kV system
Base Case
Before LEAPS Added
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S WECC
BASED ON B5_SDGE-MAIN_2023OP
SAT, DEC 15 2018 14:39
(Low Renewables Case)
23311
OCOTILLO 1
1.039
519.7
-25.9
13.2
17.7
23310
OCOTILLO
-13.2
-17.7
22885
SUNCREST
SW
123.7
-1088.5
74.0
1099.9
-161.7
-1086.7
179.5
1090.3
-169.2
22360
IMPRLVLY
SW
122.0
-1775.9
223.2
1801.3
219.7
22536
N.GILA
-1038.9
-69.5
1046.1
88.1
22342
HDWSH
15090
HASSYAMP
-1044.2
-193.4
1056.6
104.0
1051.8
233.1
-1046.6
-86.0
1.042
520.8
-28.8
1.039
519.7
-25.9
1.049
524.3
-3.9
1.066
532.8
3.2
1.050
525.1
-2.9
22468
MIGUEL
-1546.4
280.1
1558.6
-234.8
22930
ECO
-1544.4
261.1
1551.4
-148.7
-283.8
-151.1
-14.2
-26.3
-286.3
-145.0
-295.8
268.8
1.050
525.0
-34.9
1.045
522.4
-29.4
1.034
517.2
-23.0
1.05
1.05
14.2
26.4
1.05
286.4
157.9
1.05
1
295.9
-250.6
1.05
1.05
283.7
164.2
1.049
524.3
-29.3
22933
ECO MP
1.054
527.0
-21.0
22361
IV BK80 MP
22911
IV BK81 MP
1.004
501.8
-21.0
1.055
527.4
-21.0
22362
IV BK82 MP
Bus Angular Positions shown just below Bus Voltages

WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S WECC
BASED ON B5_SDGE-MAIN_2023OP
SAT, DEC 15 2018 14:40

SDGE Low Renewables Case

Otay Mesa - Tijuana 230 kV Area

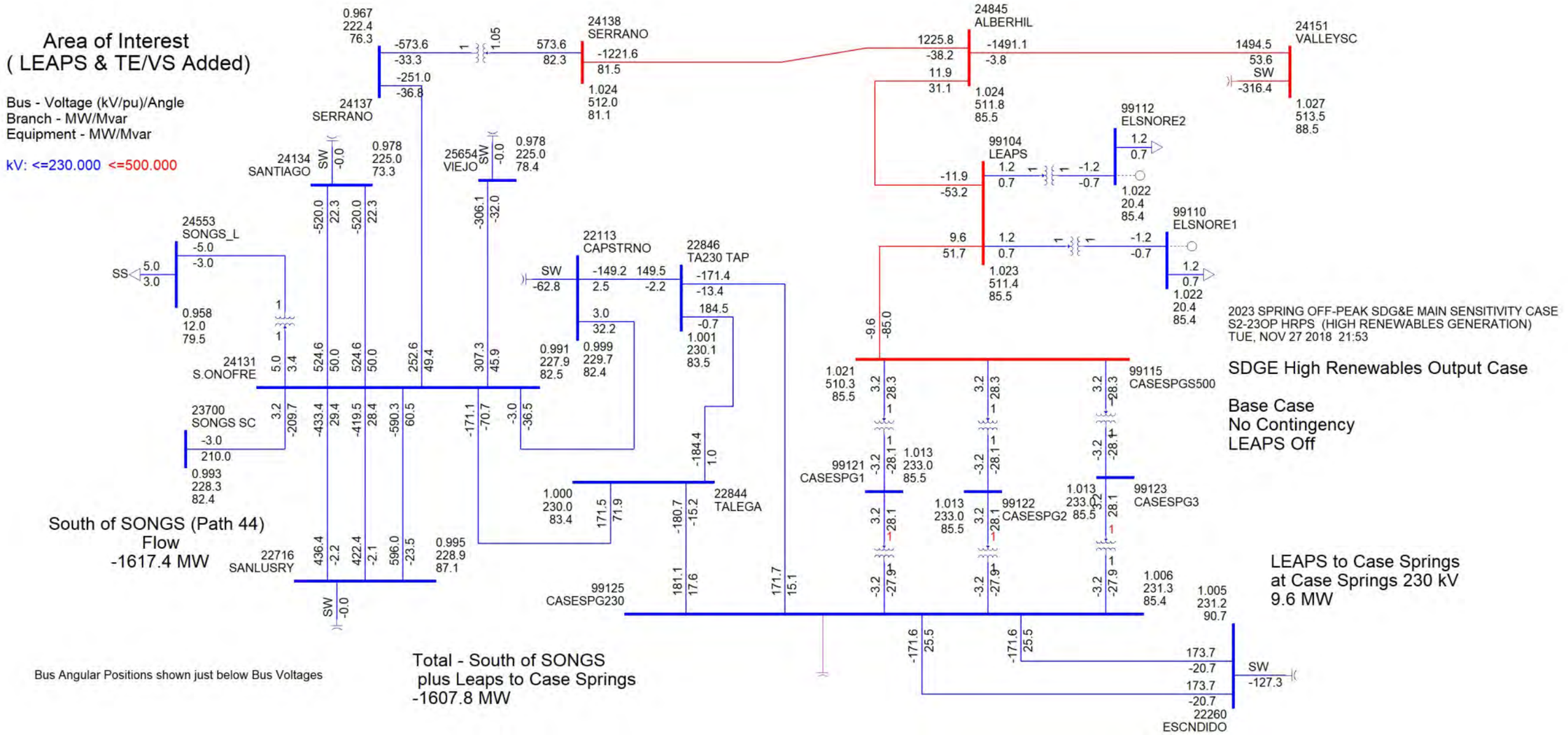


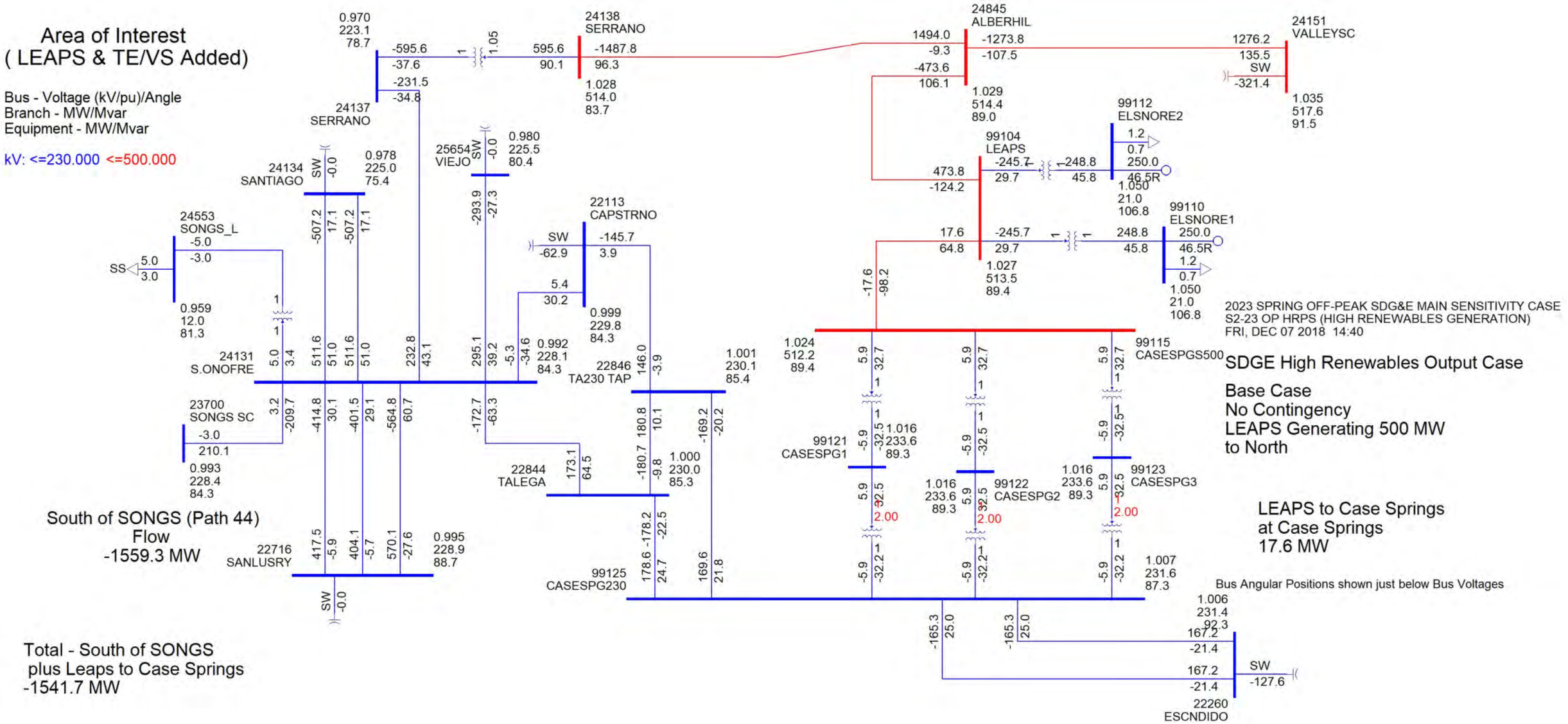
Base Case
Before LEAPS Added

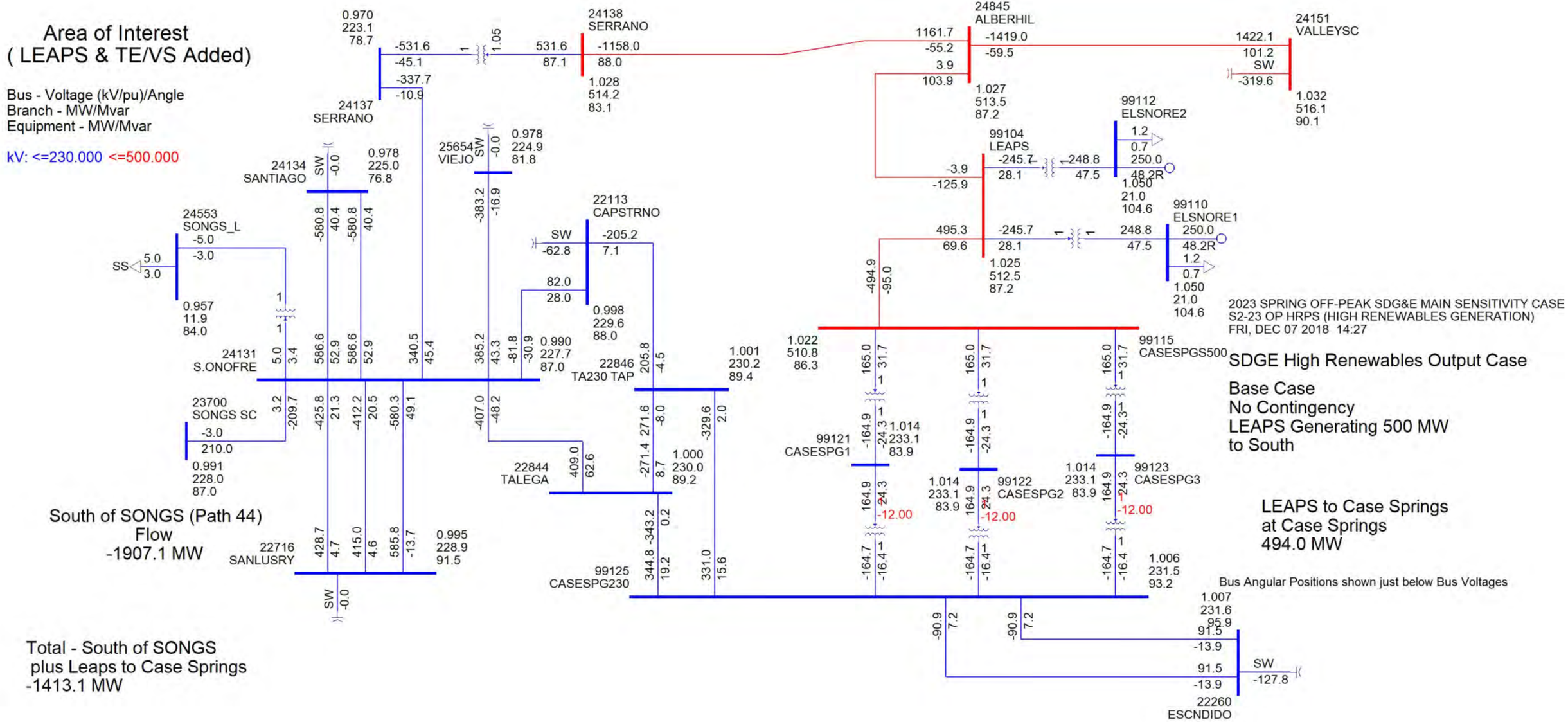
LEAPS INSTALLED AREA OF INTEREST DIAGRAMS

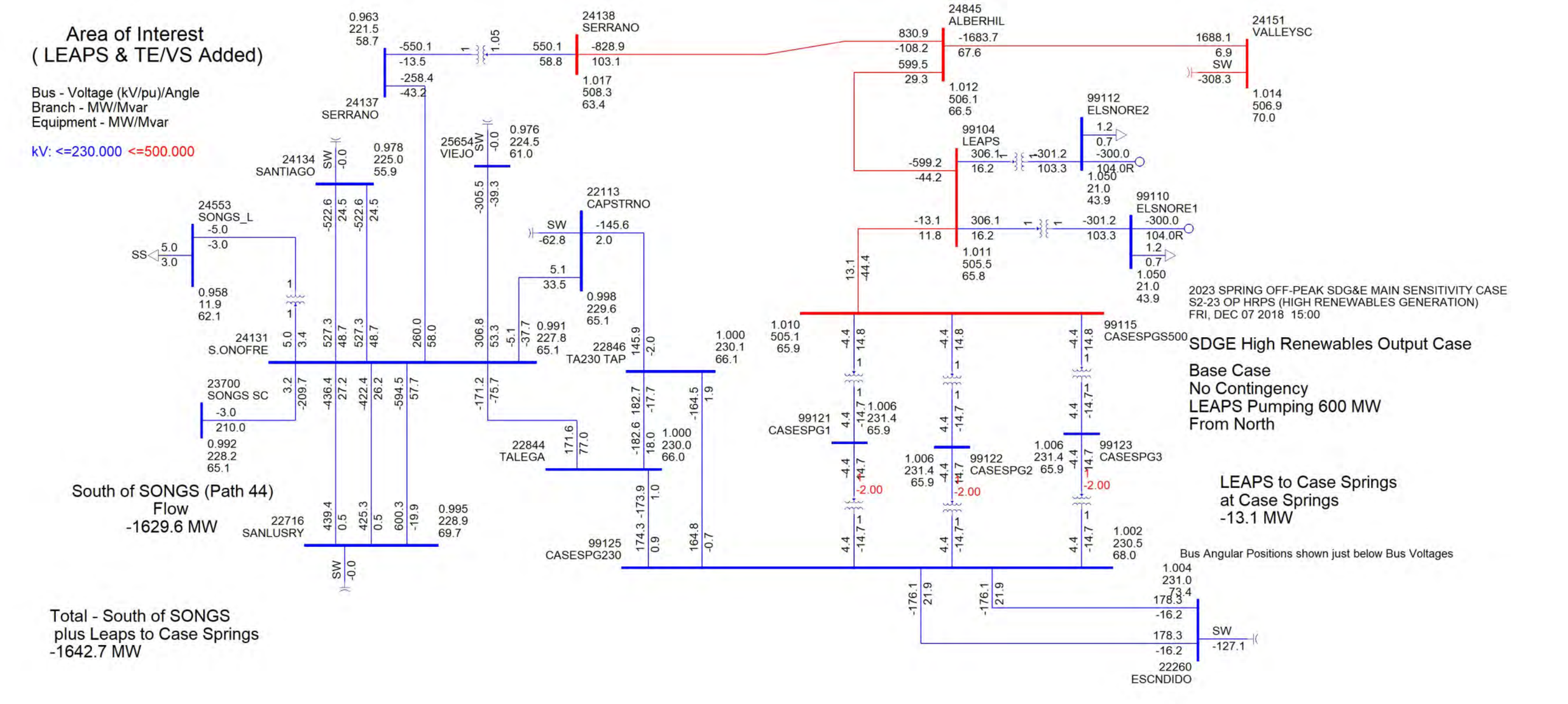
HIGH RENEWABLES CASES

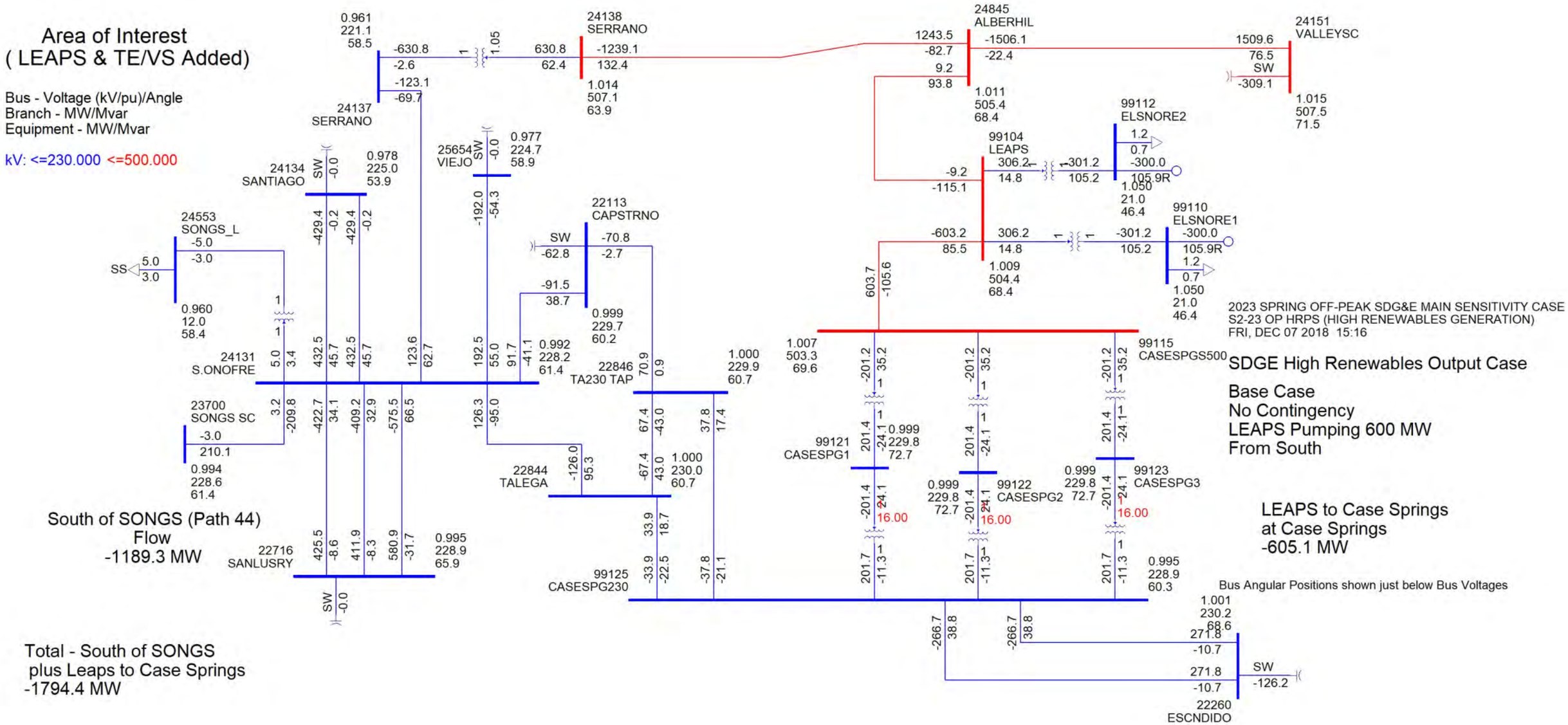
BASE CASES (NO CONTINGENCY)


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1617.4 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
-1607.8 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
TUE, NOV 27 2018 21:53
SDGE High Renewables Output Case
Base Case
No Contingency
LEAPS Off
LEAPS to Case Springs
at Case Springs 230 kV
9.6 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

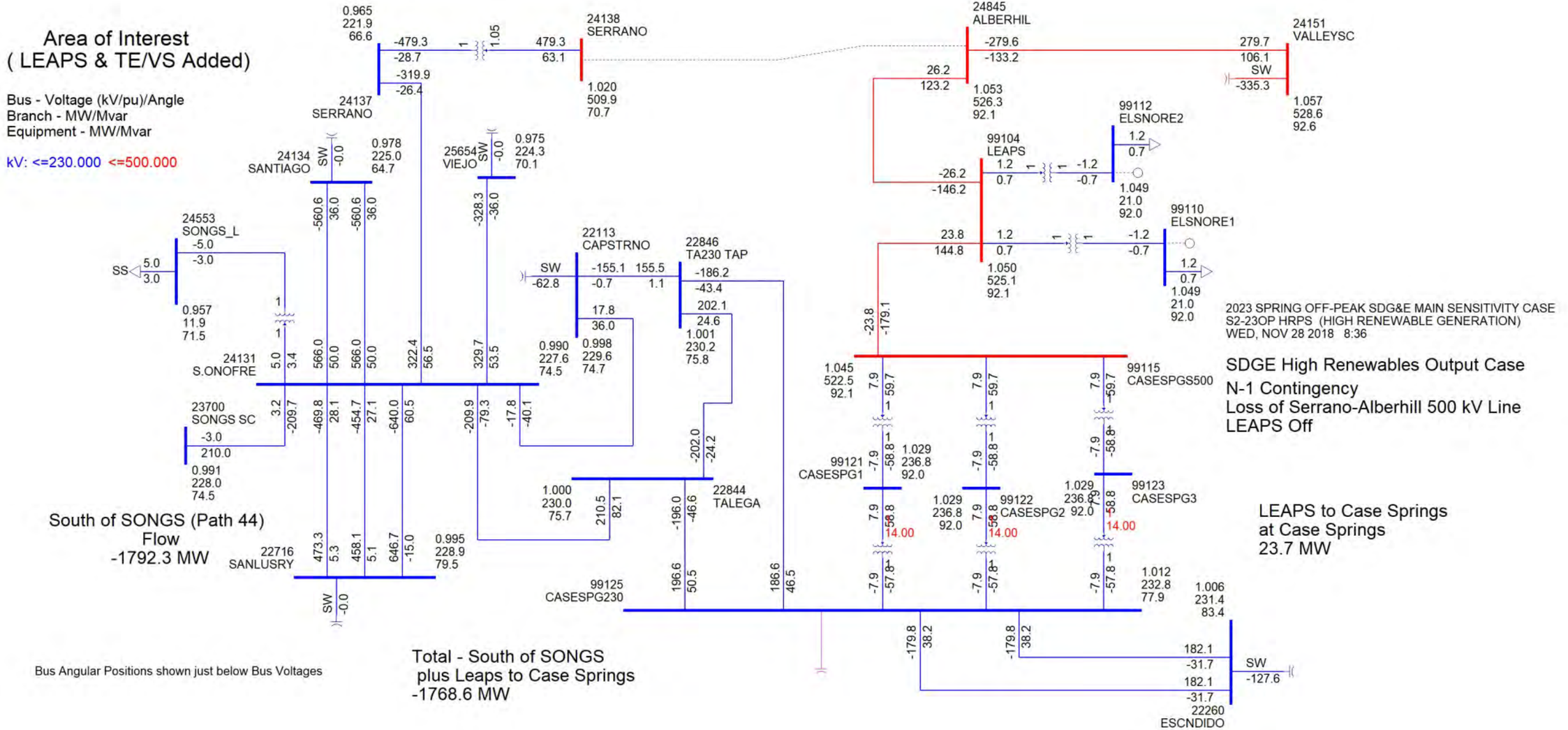

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1559.3 MW
Total - South of SONGS
plus Leaps to Case Springs
-1541.7 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23 OP HRPS (HIGH RENEWABLES GENERATION)
FRI, DEC 07 2018 14:40
SDGE High Renewables Output Case
Base Case
No Contingency
LEAPS Generating 500 MW
to North
LEAPS to Case Springs
at Case Springs
17.6 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

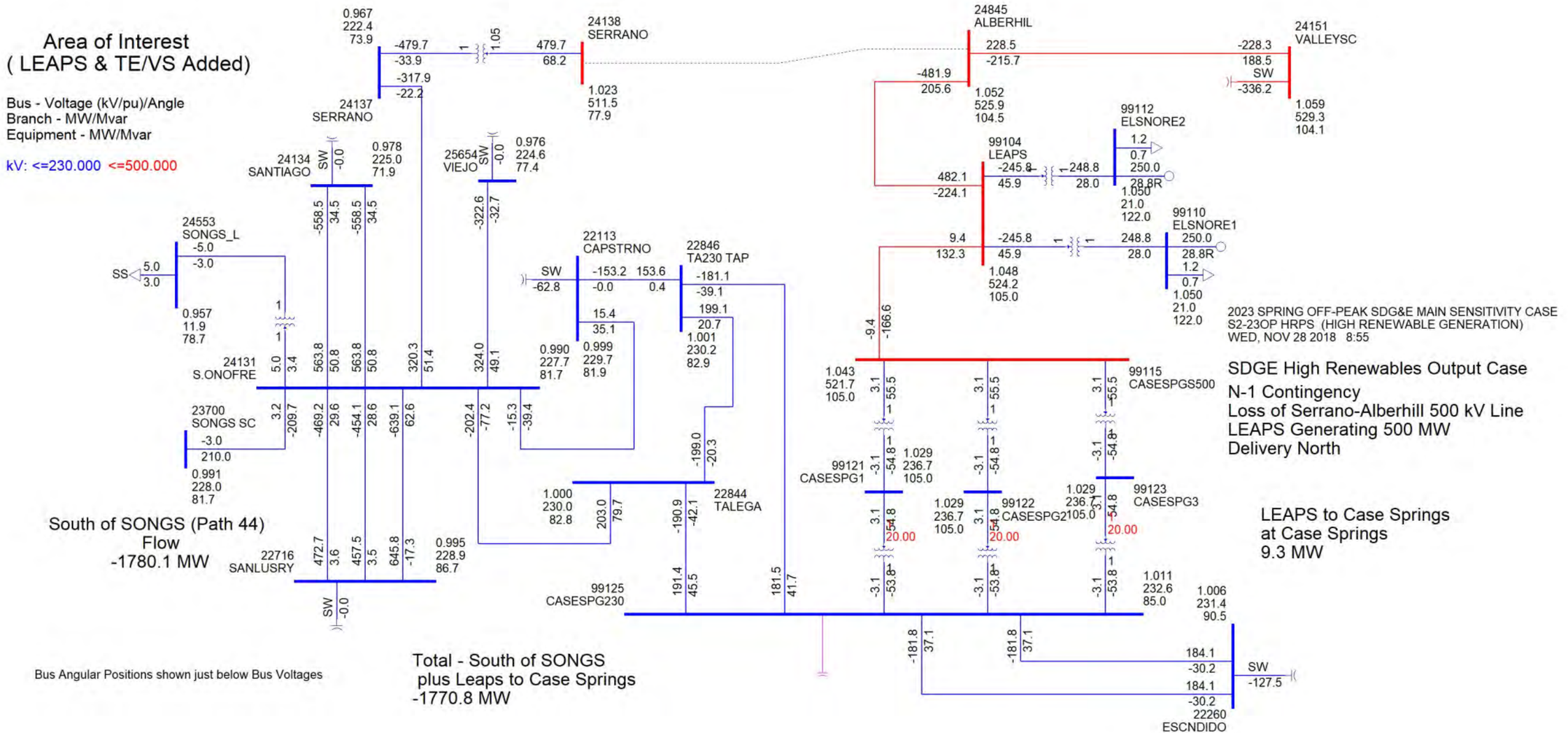

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23 OP HRPS (HIGH RENEWABLES GENERATION)
FRI, DEC 07 2018 14:27
SDGE High Renewables Output Case
Base Case
No Contingency
LEAPS Generating 500 MW
to South
South of SONGS (Path 44)
Flow
-1907.1 MW
LEAPS to Case Springs
at Case Springs
494.0 MW
Total - South of SONGS
plus Leaps to Case Springs
-1413.1 MW
Bus Angular Positions shown just below Bus Voltages

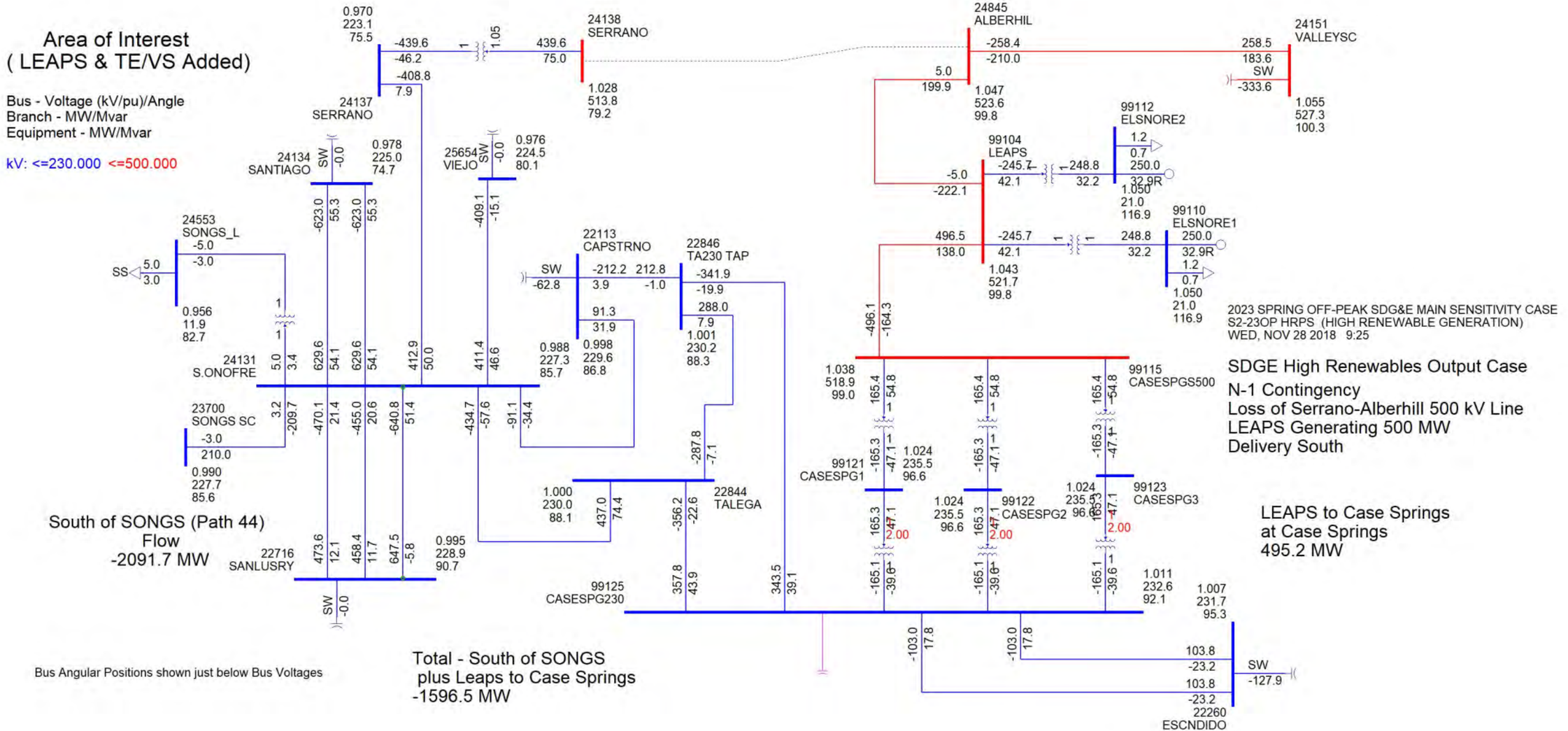

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1629.6 MW
Total - South of SONGS
plus Leaps to Case Springs
-1642.7 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23 OP HRPS (HIGH RENEWABLES GENERATION)
FRI, DEC 07 2018 15:00
SDGE High Renewables Output Case
Base Case
No Contingency
LEAPS Pumping 600 MW
From North
LEAPS to Case Springs
at Case Springs
-13.1 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
99115 CASESPGS500
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
22260 ESCNDIDO

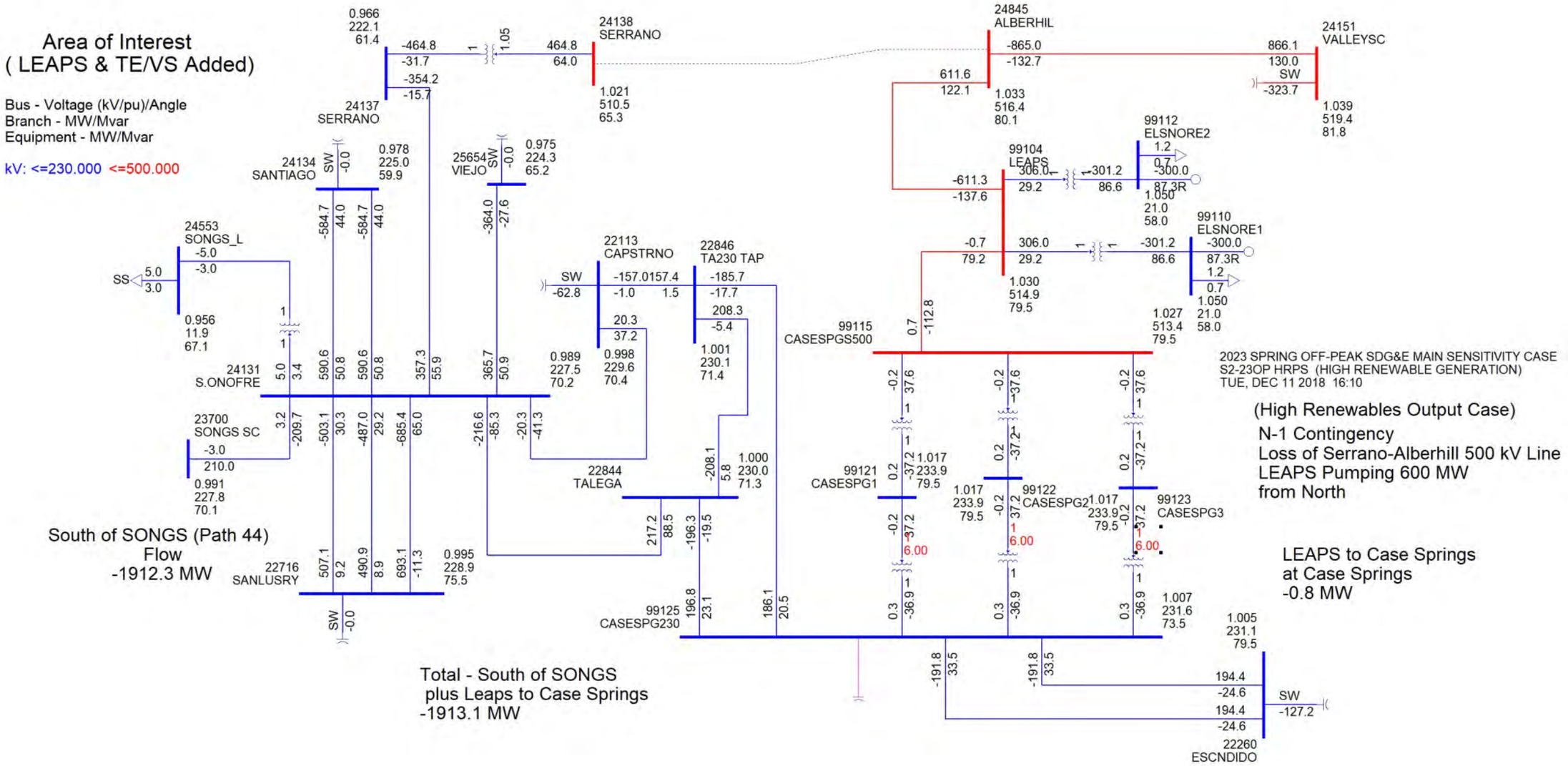

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1189.3 MW
Total - South of SONGS
plus Leaps to Case Springs
-1794.4 MW
LEAPS to Case Springs
at Case Springs
-605.1 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23 OP HRPS (HIGH RENEWABLES GENERATION)
FRI, DEC 07 2018 15:16
SDGE High Renewables Output Case
Base Case
No Contingency
LEAPS Pumping 600 MW
From South
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
22846 TA230 TAP
99115 CASESPGS500
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
16.00
16.00

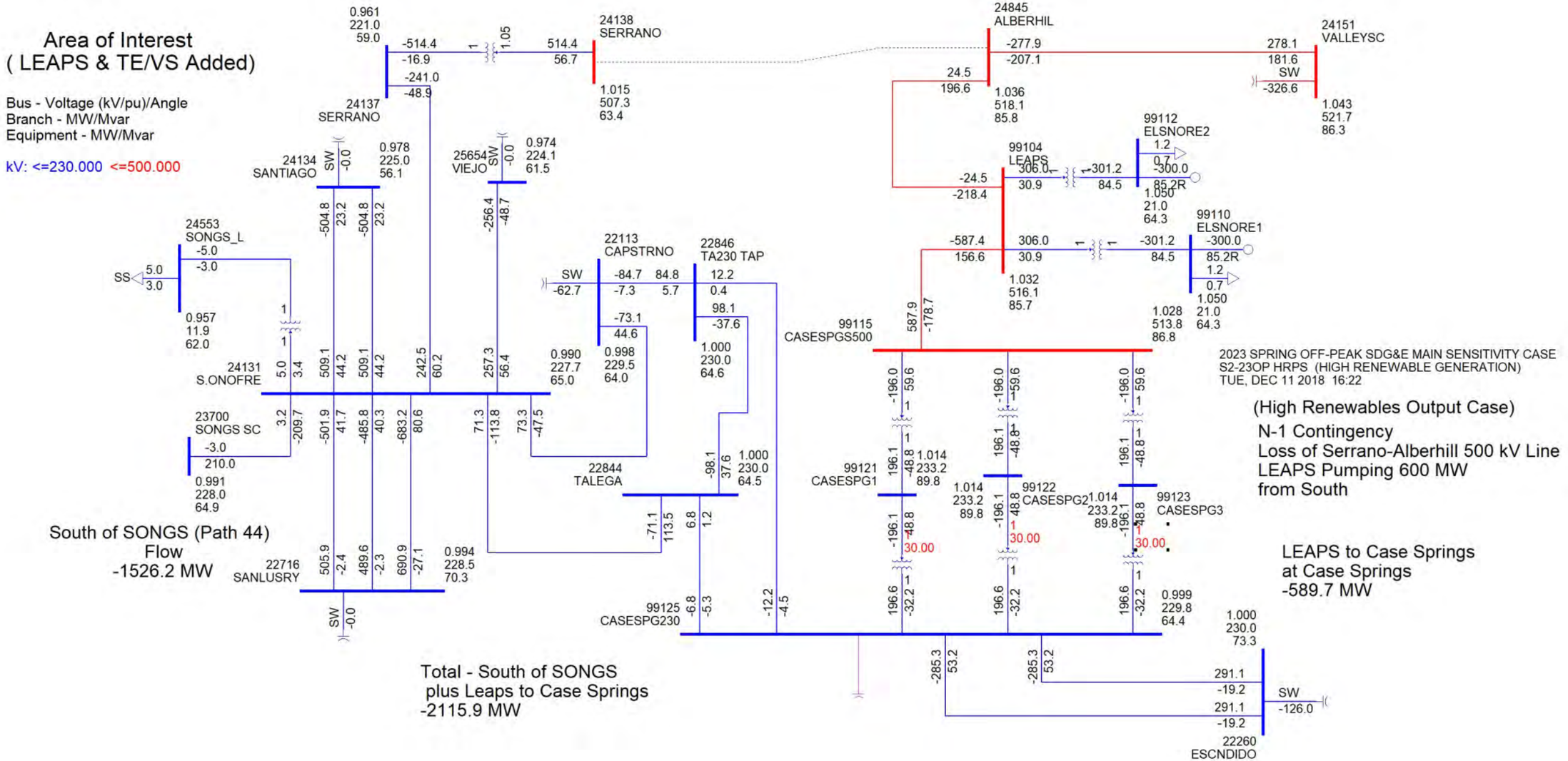
N-1 CONTINGENCY SERRANO-ALBERHILL 500Kv LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
SW
SS
South of SONGS (Path 44)
Flow
-1792.3 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
-1768.6 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLE GENERATION)
WED, NOV 28 2018 8:36
SDGE High Renewables Output Case
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Off
LEAPS to Case Springs
at Case Springs
23.7 MW

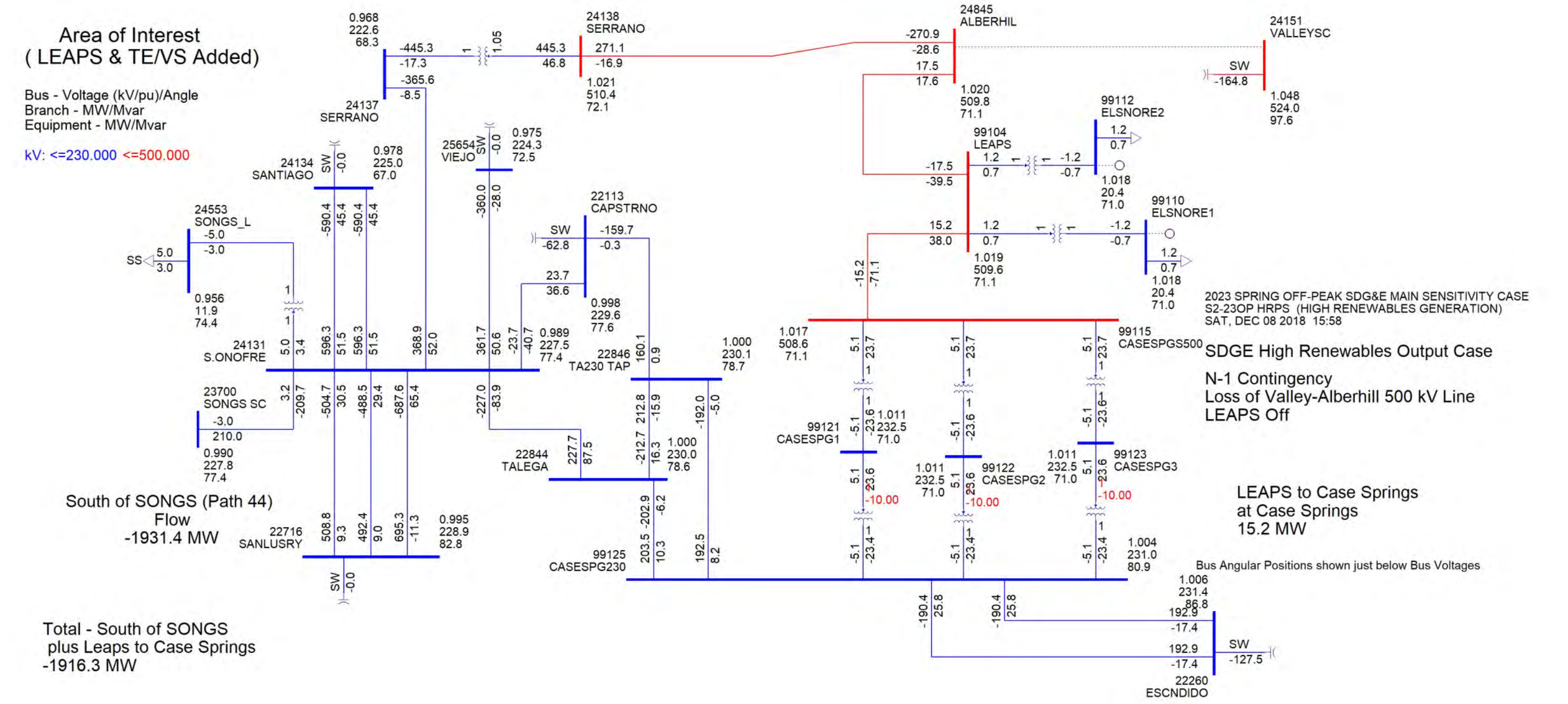

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1780.1 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
-1770.8 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLE GENERATION)
WED, NOV 28 2018 8:55
SDGE High Renewables Output Case
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Generating 500 MW
Delivery North
LEAPS to Case Springs
at Case Springs
9.3 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

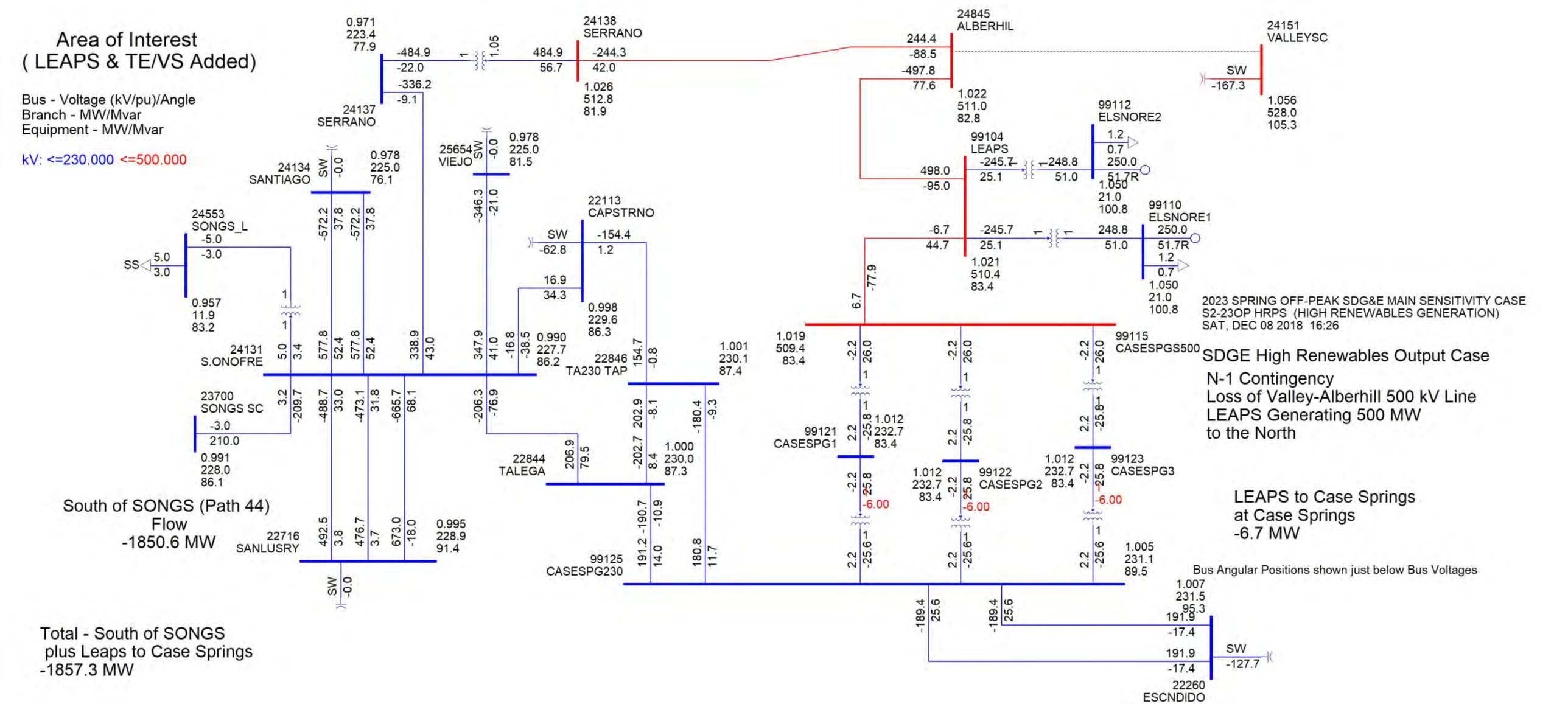

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLE GENERATION)
WED, NOV 28 2018 9:25
SDGE High Renewables Output Case
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Generating 500 MW
Delivery South
LEAPS to Case Springs
at Case Springs
495.2 MW
South of SONGS (Path 44)
Flow
-2091.7 MW
Total - South of SONGS
plus Leaps to Case Springs
-1596.5 MW
Bus Angular Positions shown just below Bus Voltages

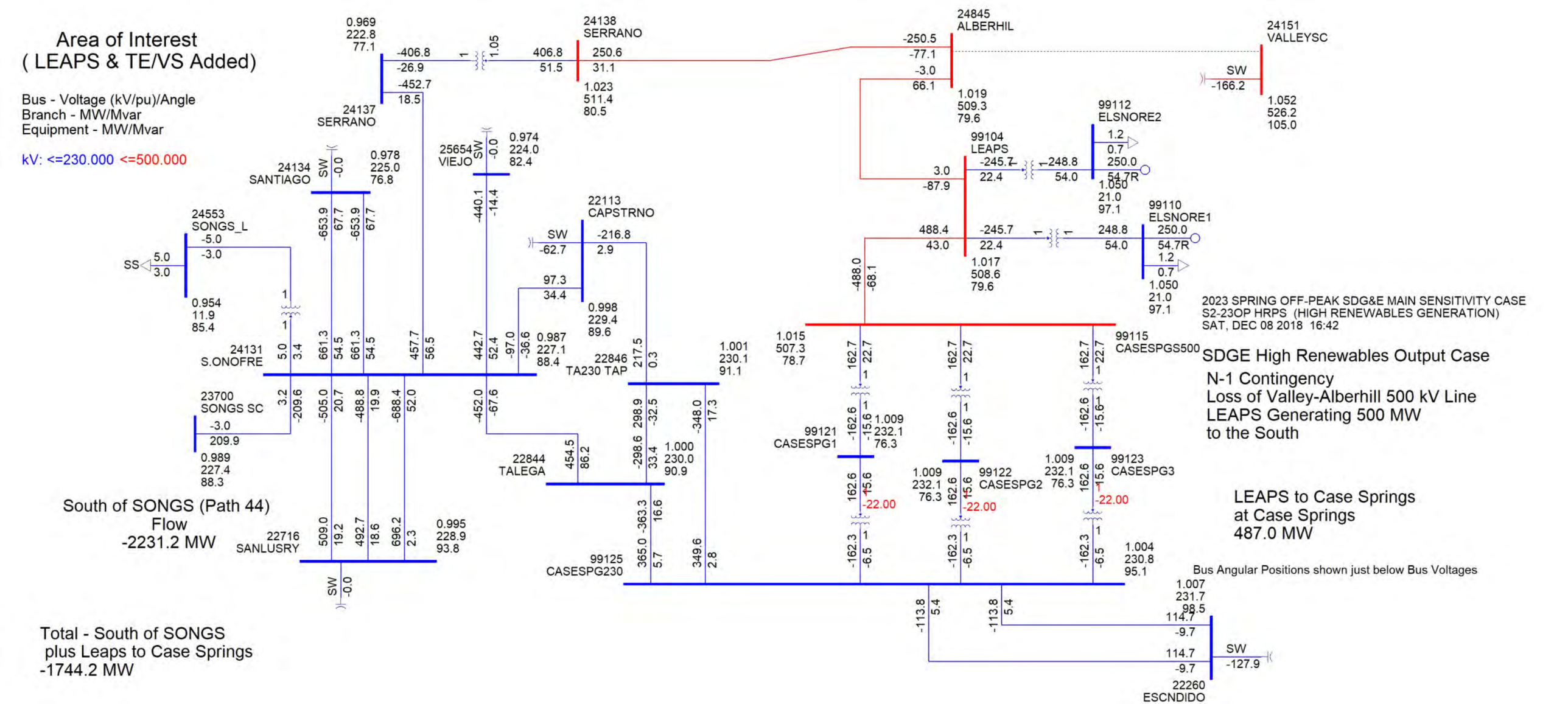

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLE GENERATION)
TUE, DEC 11 2018 16:10
(High Renewables Output Case)
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from North
South of SONGS (Path 44)
Flow
-1912.3 MW
Total - South of SONGS
plus Leaps to Case Springs
-1913.1 MW
LEAPS to Case Springs
at Case Springs
-0.8 MW

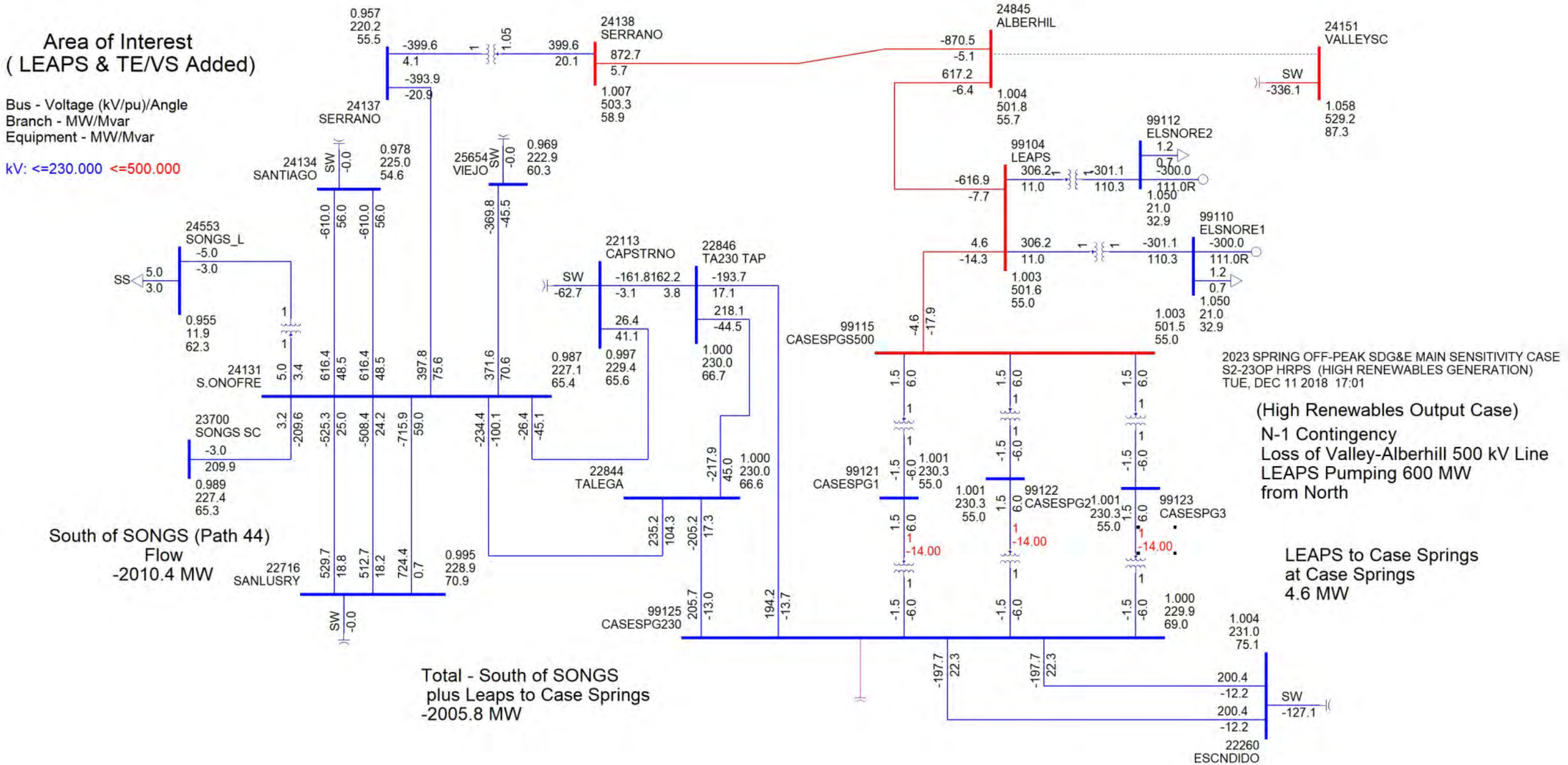

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1526.2 MW
Total - South of SONGS
plus Leaps to Case Springs
-2115.9 MW
LEAPS to Case Springs
at Case Springs
-589.7 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLE GENERATION)
TUE, DEC 11 2018 16:22
(High Renewables Output Case)
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from South
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO

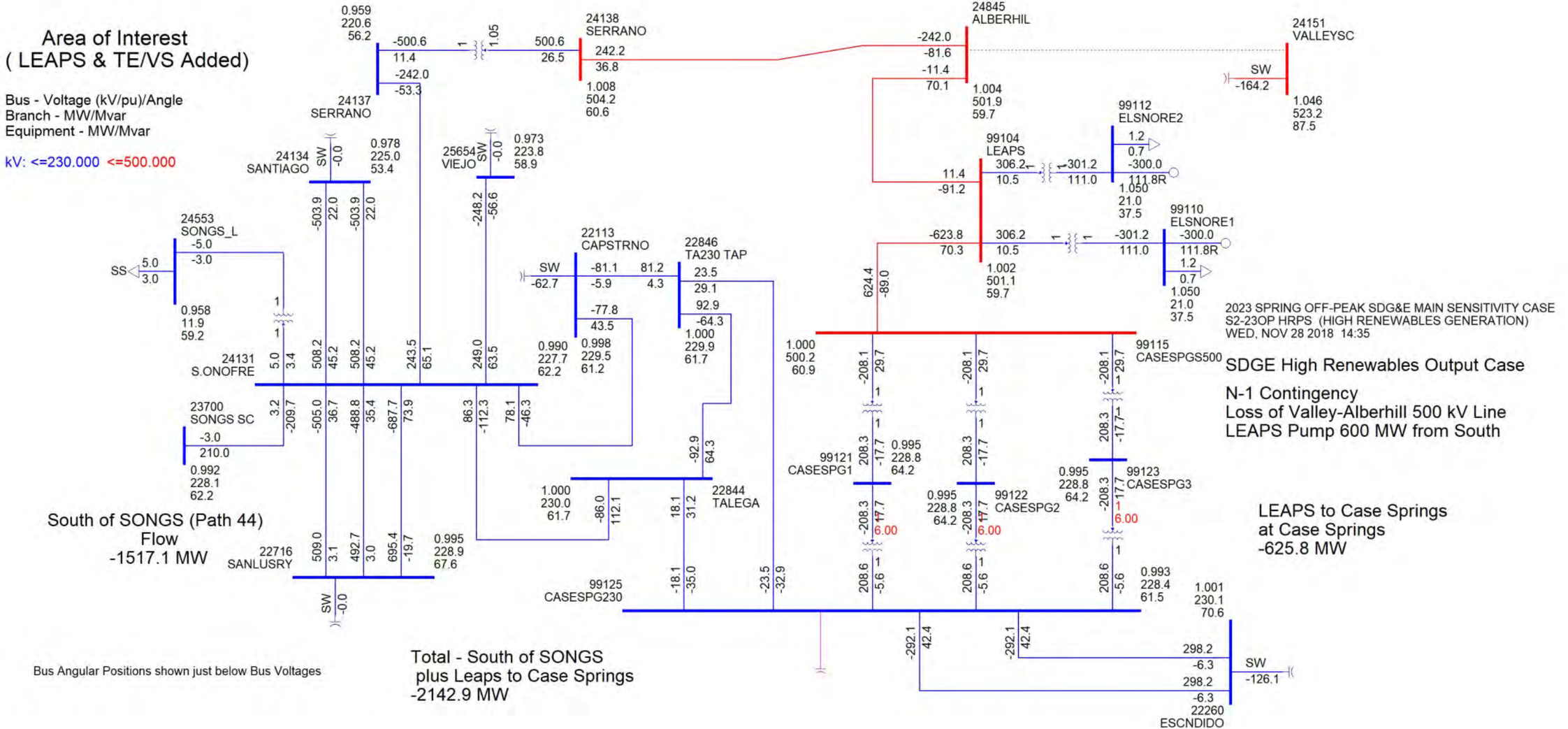
N-1 CONTINGENCY VALLEY-ALBERHILL 500Kv LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1931.4 MW
Total - South of SONGS
plus Leaps to Case Springs
-1916.3 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
SAT, DEC 08 2018 15:58
SDGE High Renewables Output Case
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Off
LEAPS to Case Springs
at Case Springs
15.2 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
22846 TA230 TAP
99115 CASESPGS500
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO

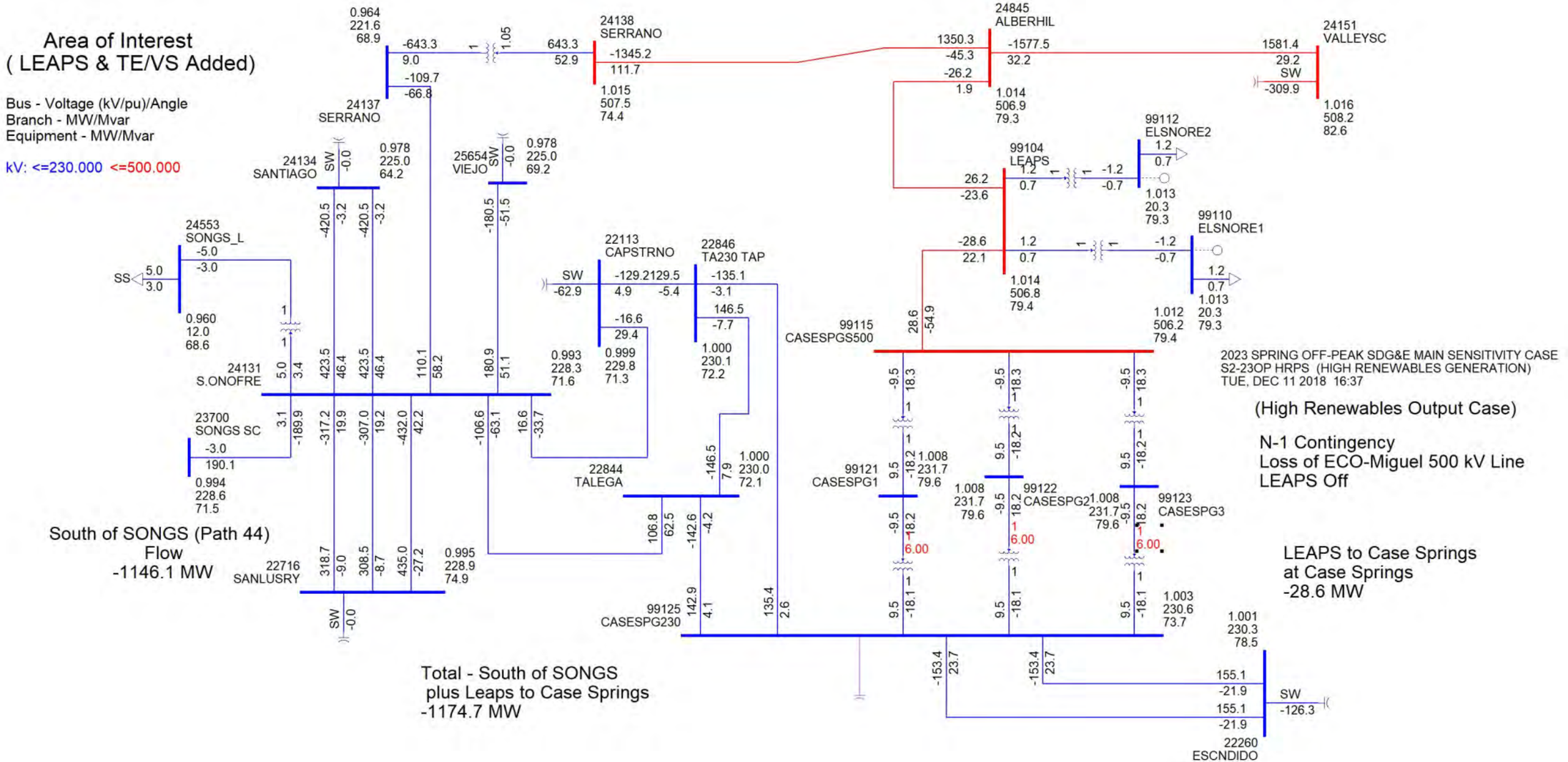

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1850.6 MW
Total - South of SONGS
plus Leaps to Case Springs
-1857.3 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
SAT, DEC 08 2018 16:26
SDGE High Renewables Output Case
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Generating 500 MW
to the North
LEAPS to Case Springs
at Case Springs
-6.7 MW
Bus Angular Positions shown just below Bus Voltages
24137 SERRANO
24138 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
22846 TA230 TAP
23700 SONGS SC
22844 TALEGA
22716 SANLUSRY
99125 CASESPG230
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

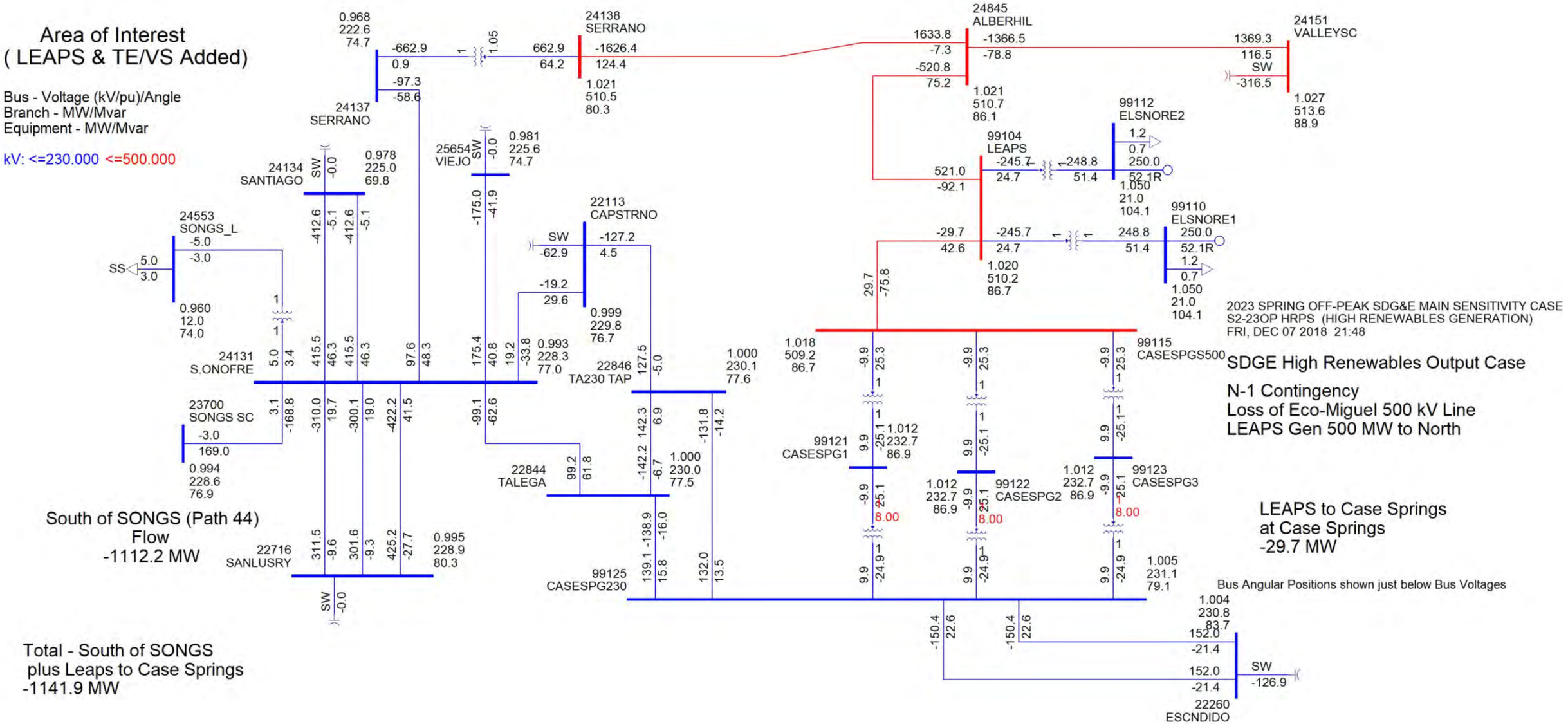

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-2231.2 MW
Total - South of SONGS
plus Leaps to Case Springs
-1744.2 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
SAT, DEC 08 2018 16:42
SDGE High Renewables Output Case
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Generating 500 MW
to the South
LEAPS to Case Springs
at Case Springs
487.0 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

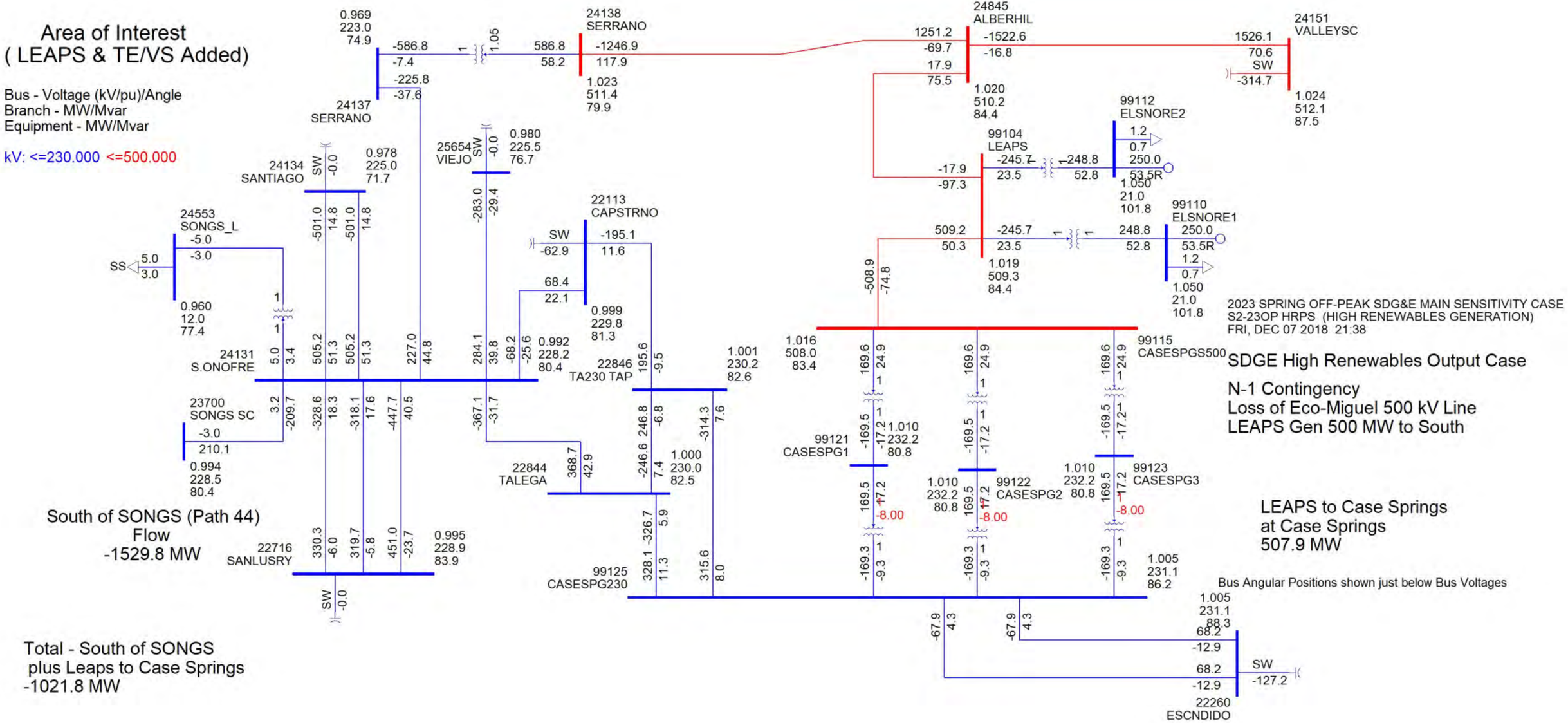

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
TUE, DEC 11 2018 17:01
(High Renewables Output Case)
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from North
South of SONGS (Path 44)
Flow
-2010.4 MW
Total - South of SONGS
plus Leaps to Case Springs
-2005.8 MW
LEAPS to Case Springs
at Case Springs
4.6 MW

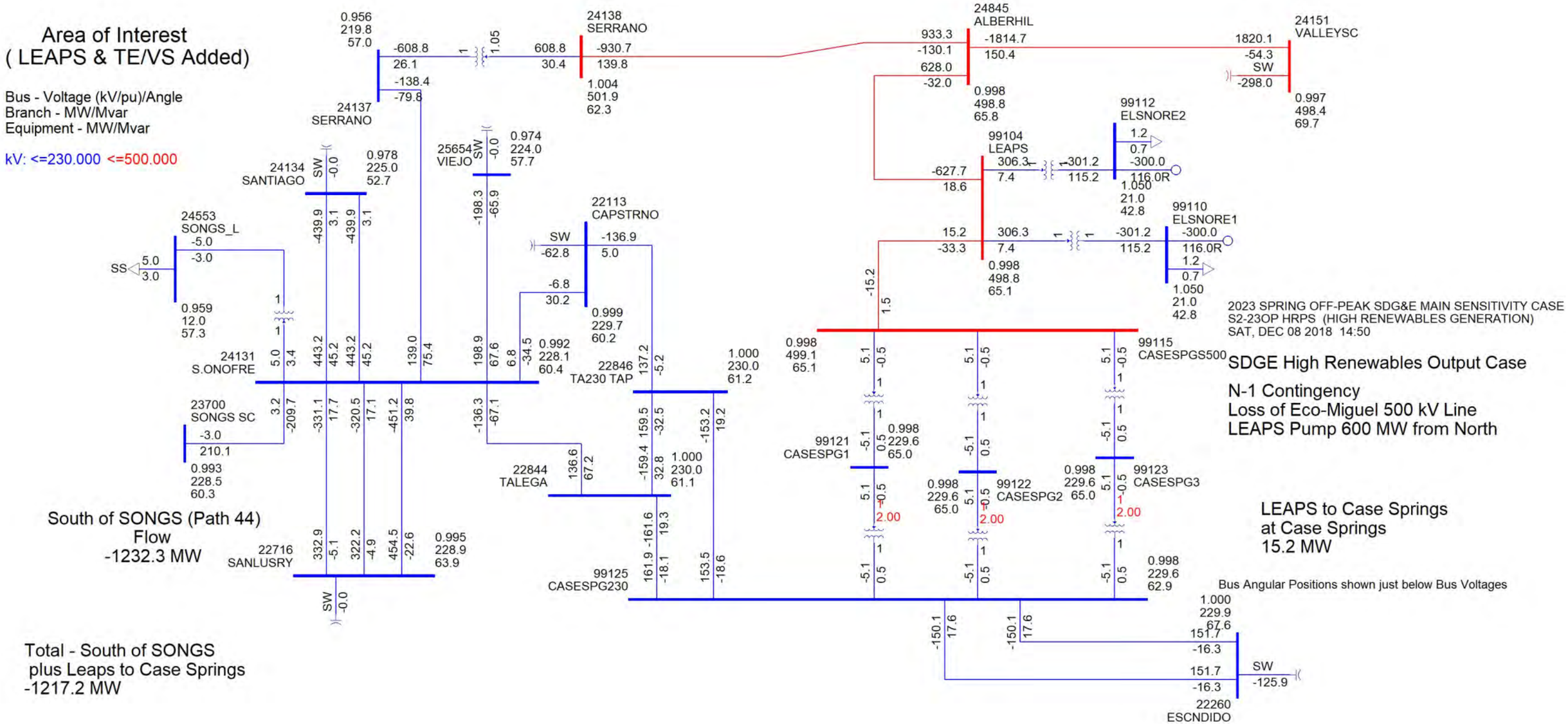

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
WED, NOV 28 2018 14:35
SDGE High Renewables Output Case
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Pump 600 MW from South
South of SONGS (Path 44)
Flow
-1517.1 MW
LEAPS to Case Springs
at Case Springs
-625.8 MW
Total - South of SONGS
plus Leaps to Case Springs
-2142.9 MW
Bus Angular Positions shown just below Bus Voltages

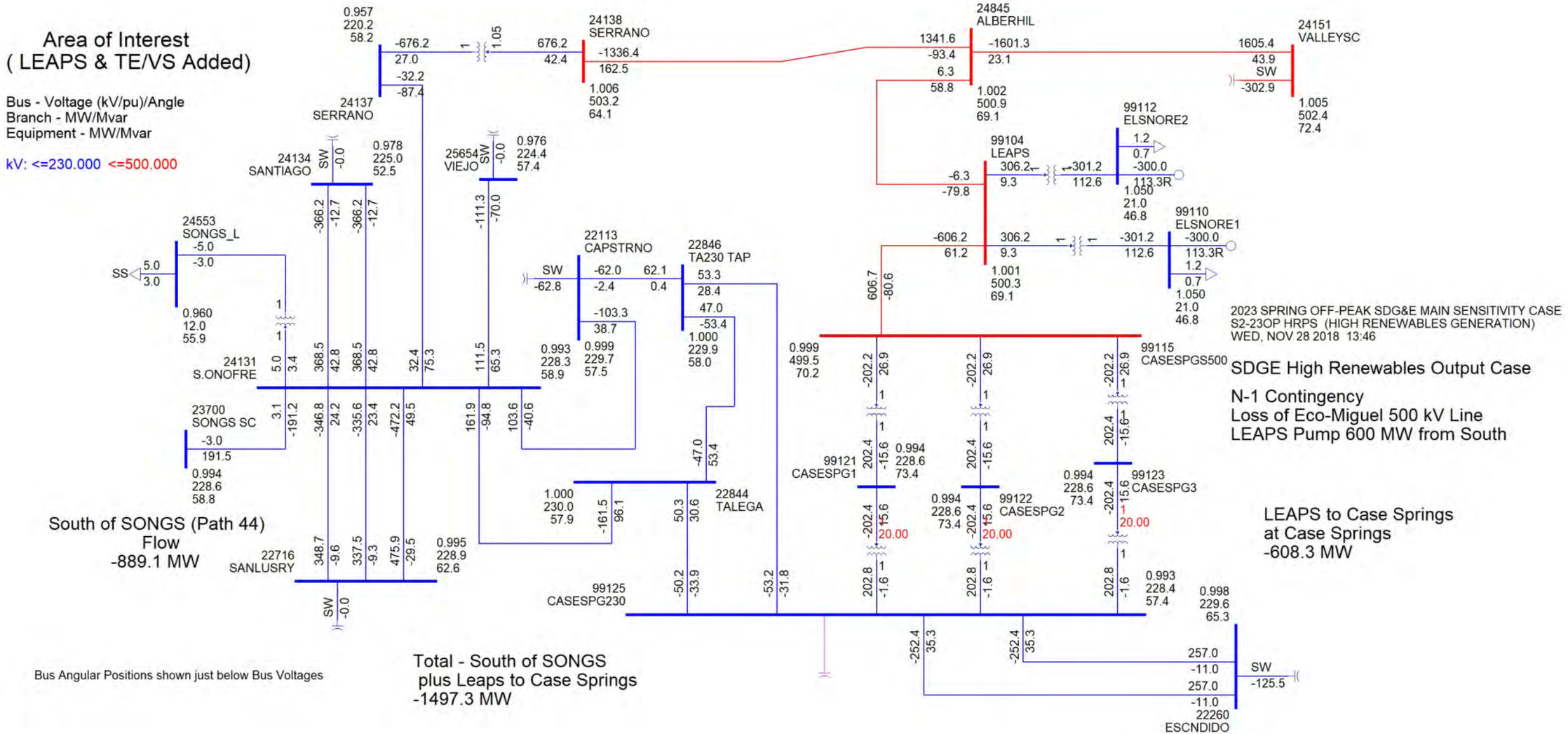
N-1 CONTINGENCY ECO-MIGUEL 500Kv LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
TUE, DEC 11 2018 16:37
(High Renewables Output Case)
N-1 Contingency
Loss of ECO-Miguel 500 kV Line
LEAPS Off
South of SONGS (Path 44)
Flow
-1146.1 MW
Total - South of SONGS
plus Leaps to Case Springs
-1174.7 MW
LEAPS to Case Springs
at Case Springs
-28.6 MW


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1112.2 MW
Total - South of SONGS
plus Leaps to Case Springs
-1141.9 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
FRI, DEC 07 2018 21:48
SDGE High Renewables Output Case
N-1 Contingency
Loss of Eco-Miguel 500 kV Line
LEAPS Gen 500 MW to North
LEAPS to Case Springs
at Case Springs
-29.7 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
22846 TA230 TAP
99115 CASESPGS500
23700 SONGS SC
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22844 TALEGA
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1529.8 MW
Total - South of SONGS
plus Leaps to Case Springs
-1021.8 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
FRI, DEC 07 2018 21:38
SDGE High Renewables Output Case
N-1 Contingency
Loss of Eco-Miguel 500 kV Line
LEAPS Gen 500 MW to South
LEAPS to Case Springs
at Case Springs
507.9 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
99115 CASESPGS500
24131 S.ONOFRE
22846 TA230 TAP
23700 SONGS SC
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22844 TALEGA
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO

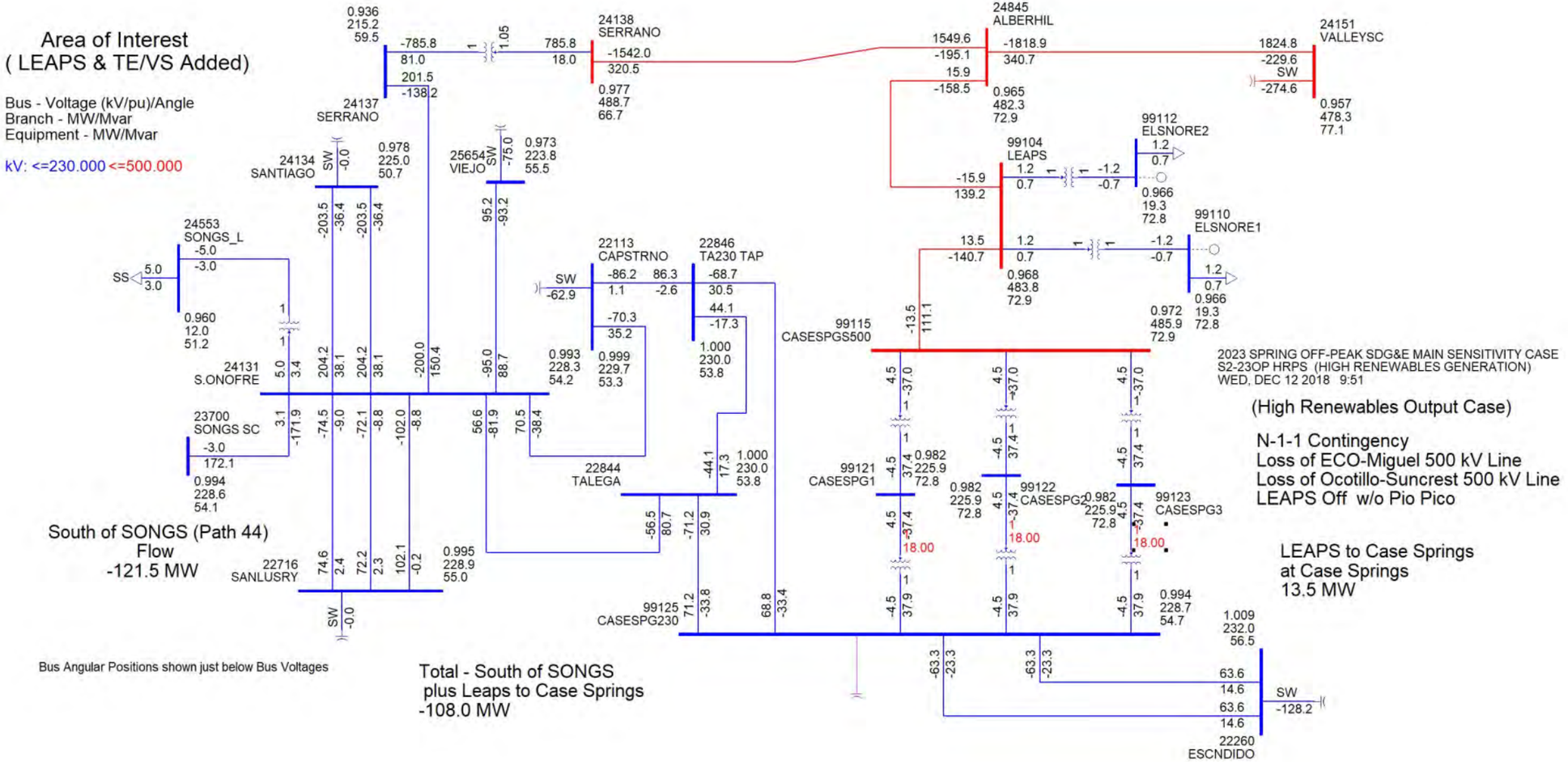

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
-1232.3 MW
Total - South of SONGS
plus Leaps to Case Springs
-1217.2 MW
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
SAT, DEC 08 2018 14:50
SDGE High Renewables Output Case
N-1 Contingency
Loss of Eco-Miguel 500 kV Line
LEAPS Pump 600 MW from North
LEAPS to Case Springs
at Case Springs
15.2 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
25654 VIEJO
24134 SANTIAGO
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
22846 TA230 TAP
23700 SONGS SC
22844 TALEGA
22716 SANLUSRY
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
99125 CASESPG230
22260 ESCNDIDO

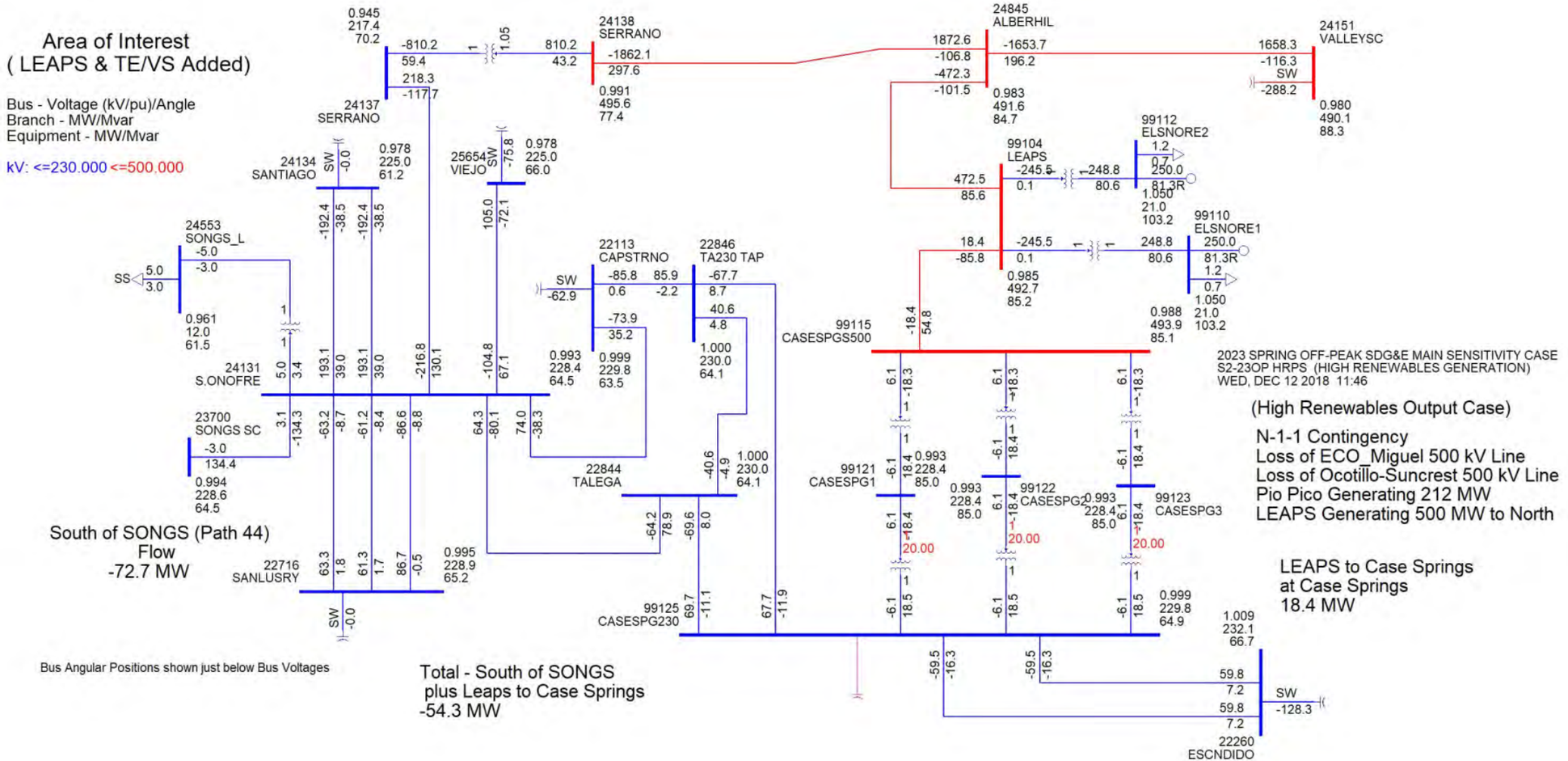

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
WED, NOV 28 2018 13:46
SDGE High Renewables Output Case
N-1 Contingency
Loss of Eco-Miguel 500 kV Line
LEAPS Pump 600 MW from South
South of SONGS (Path 44)
Flow
-889.1 MW
LEAPS to Case Springs
at Case Springs
-608.3 MW
Total - South of SONGS
plus Leaps to Case Springs
-1497.3 MW
Bus Angular Positions shown just below Bus Voltages

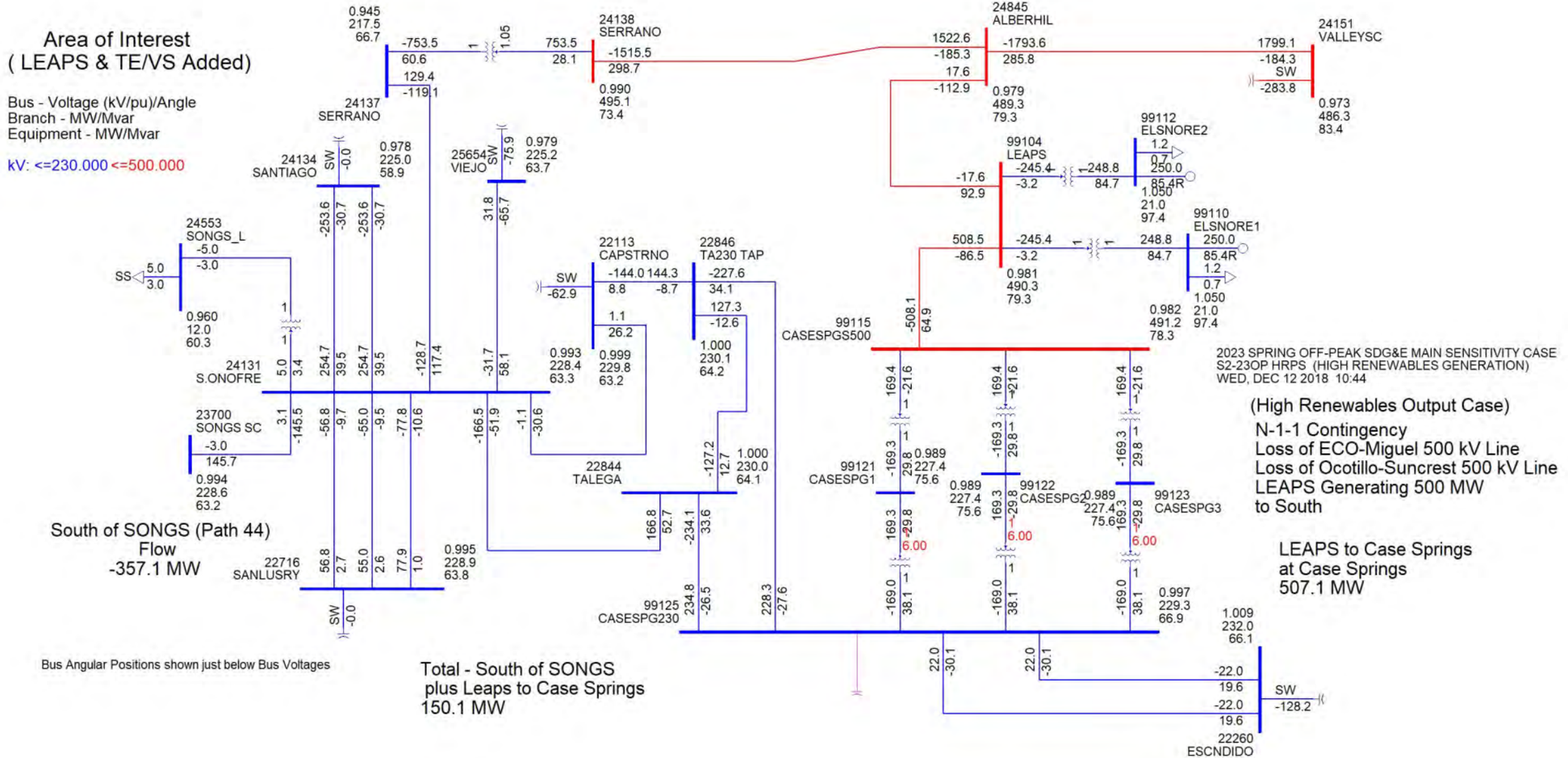
N-1-1 CONTINGENCY ECO-MIGUEL 500kV LINE,

THEN

OCOTILLO-SUNCREST 500kV LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
WED, DEC 12 2018 9:51
(High Renewables Output Case)
N-1-1 Contingency
Loss of ECO-Miguel 500 kV Line
Loss of Ocotillo-Suncrest 500 kV Line
LEAPS Off w/o Pio Pico
LEAPS to Case Springs
at Case Springs
13.5 MW
South of SONGS (Path 44)
Flow
-121.5 MW
Total - South of SONGS
plus Leaps to Case Springs
-108.0 MW
Bus Angular Positions shown just below Bus Voltages

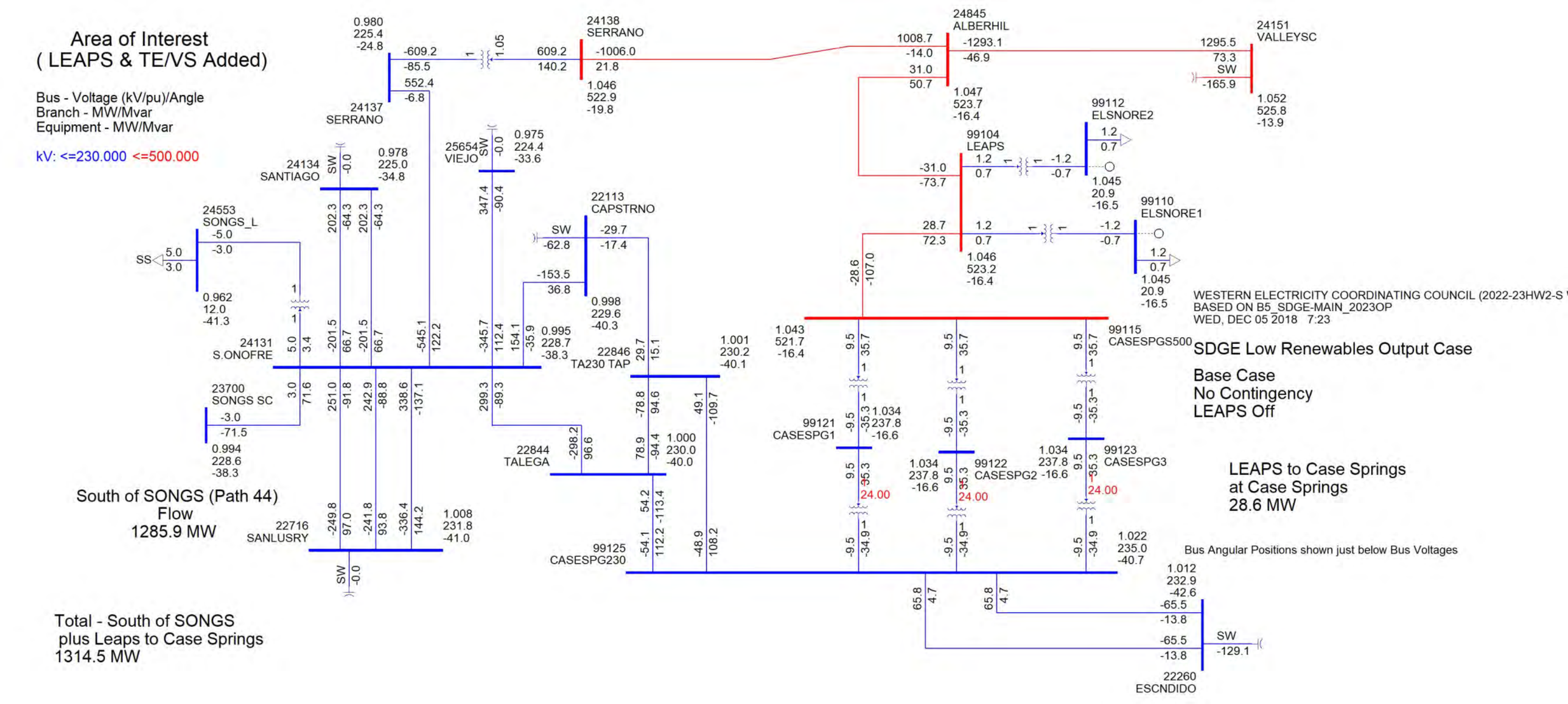

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
WED, DEC 12 2018 11:46
(High Renewables Output Case)
N-1-1 Contingency
Loss of ECO_Miguel 500 kV Line
Loss of Ocotillo-Suncrest 500 kV Line
Pio Pico Generating 212 MW
LEAPS Generating 500 MW to North
LEAPS to Case Springs
at Case Springs
18.4 MW
South of SONGS (Path 44)
Flow
-72.7 MW
Total - South of SONGS
plus Leaps to Case Springs
-54.3 MW
Bus Angular Positions shown just below Bus Voltages

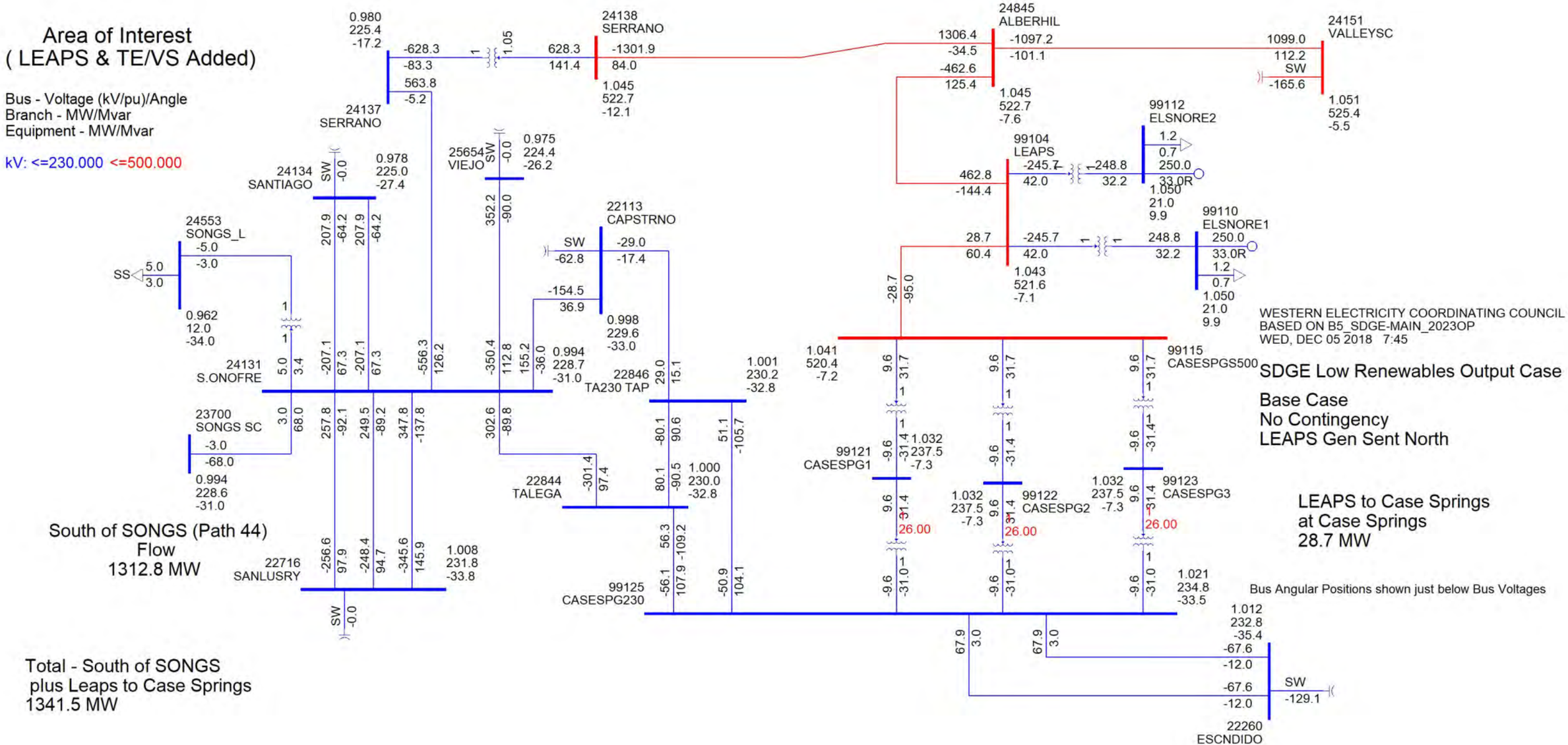

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
2023 SPRING OFF-PEAK SDG&E MAIN SENSITIVITY CASE
S2-23OP HRPS (HIGH RENEWABLES GENERATION)
WED, DEC 12 2018 10:44
(High Renewables Output Case)
N-1-1 Contingency
Loss of ECO-Miguel 500 kV Line
Loss of Ocotillo-Suncrest 500 kV Line
LEAPS Generating 500 MW
to South
LEAPS to Case Springs
at Case Springs
507.1 MW
South of SONGS (Path 44)
Flow
-357.1 MW
Total - South of SONGS
plus Leaps to Case Springs
150.1 MW
Bus Angular Positions shown just below Bus Voltages

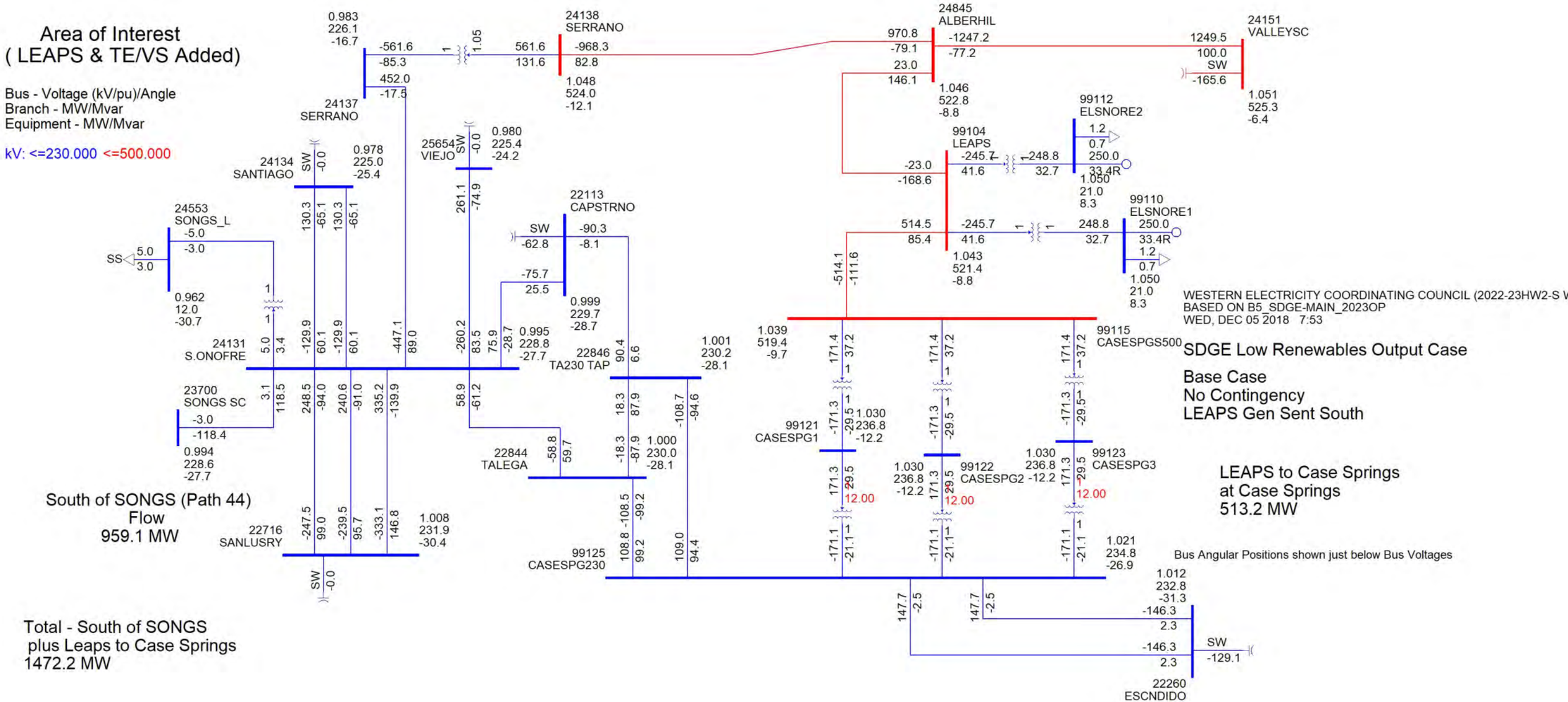
LEAPS INSTALLED AREA OF INTEREST DIAGRAMS

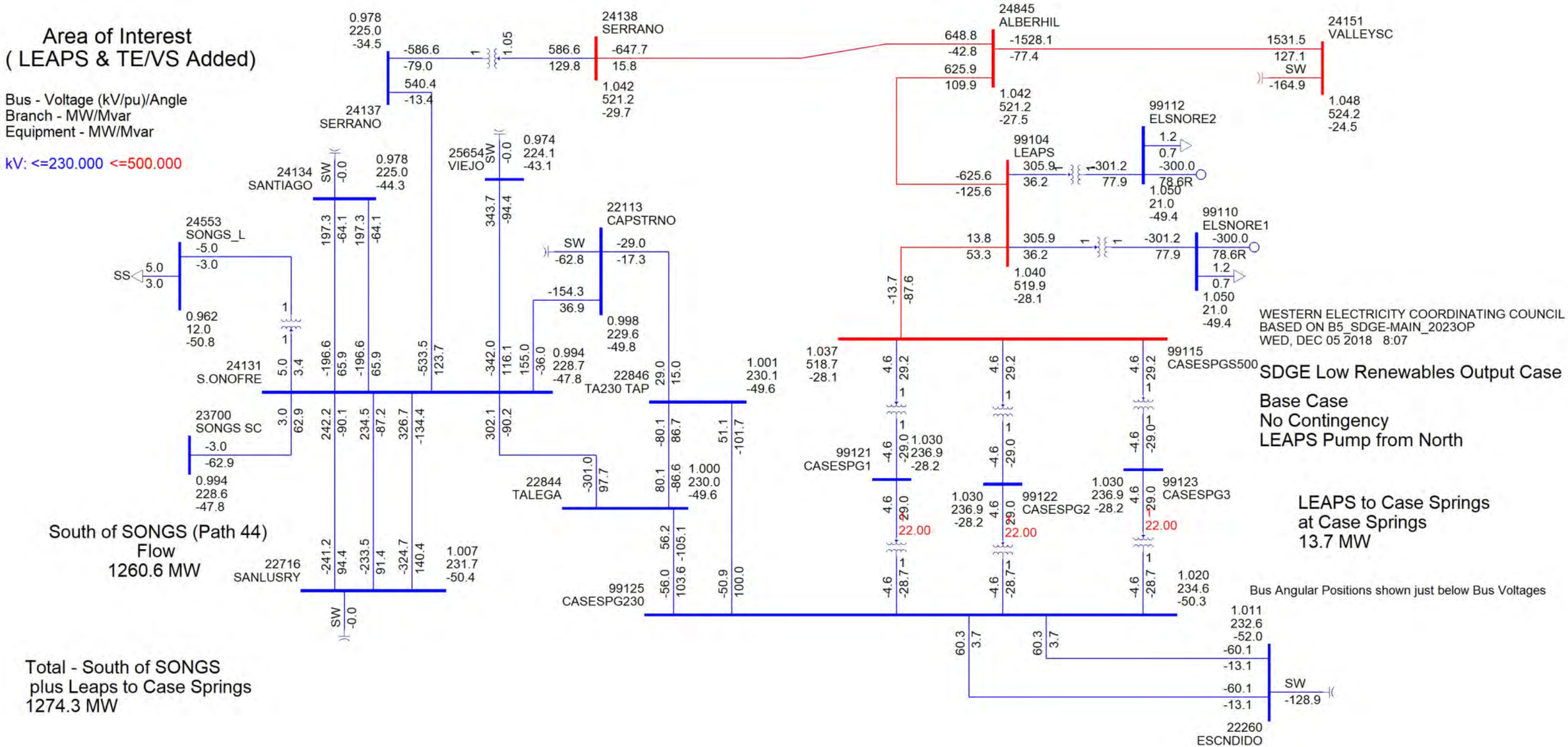
LOW RENEWABLES CASES

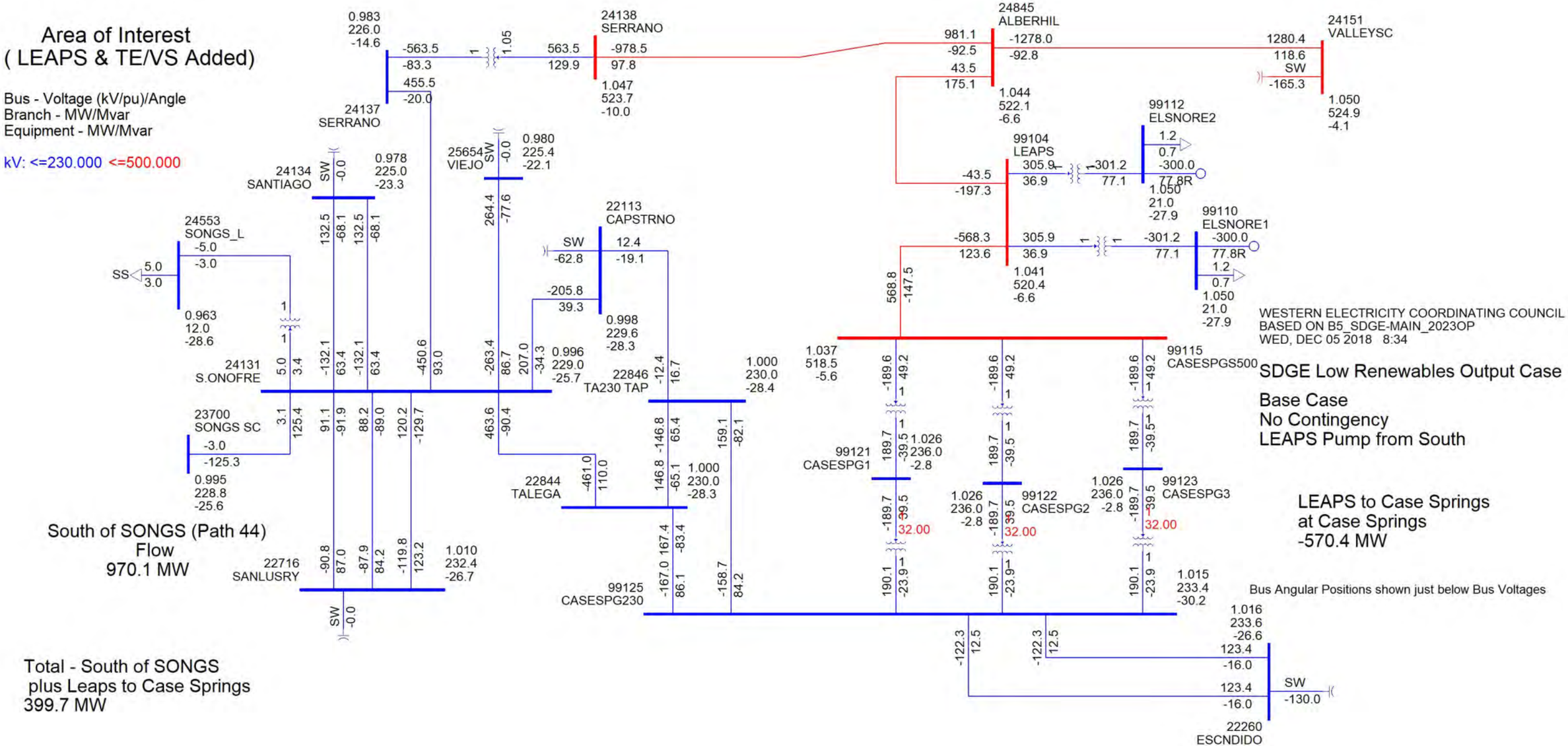
BASE CASES (NO CONTINGENCY)


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
1285.9 MW
Total - South of SONGS
plus Leaps to Case Springs
1314.5 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 7:23
SDGE Low Renewables Output Case
Base Case
No Contingency
LEAPS Off
LEAPS to Case Springs
at Case Springs
28.6 MW
Bus Angular Positions shown just below Bus Voltages

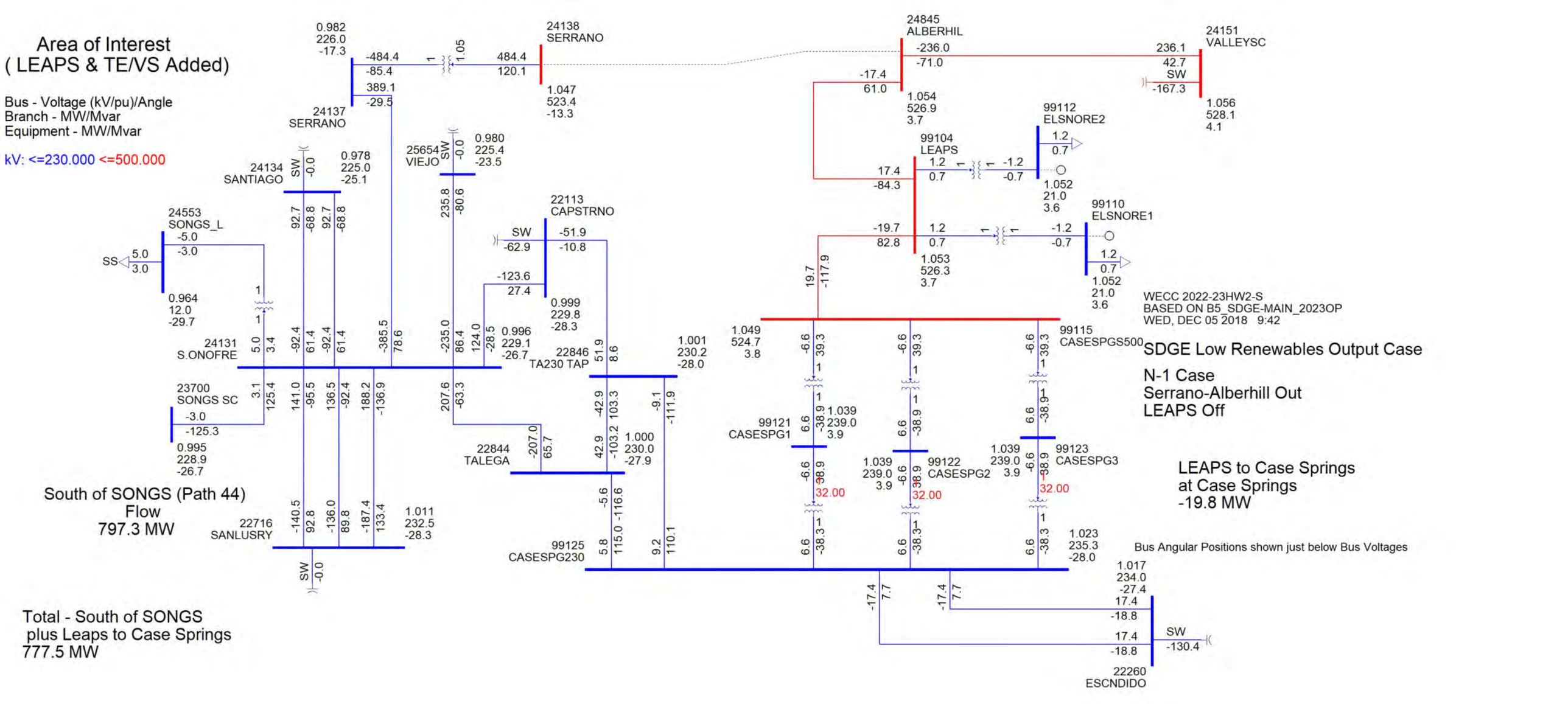

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
1312.8 MW
Total - South of SONGS
plus Leaps to Case Springs
1341.5 MW
LEAPS to Case Springs
at Case Springs
28.7 MW
SDGE Low Renewables Output Case
Base Case
No Contingency
LEAPS Gen Sent North
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S V
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 7:45
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24134 SANTIAGO
25654 VIEJO
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22846 TA230 TAP
22844 TALEGA
22716 SANLUSRY
99125 CASESPG230
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
SS
SW

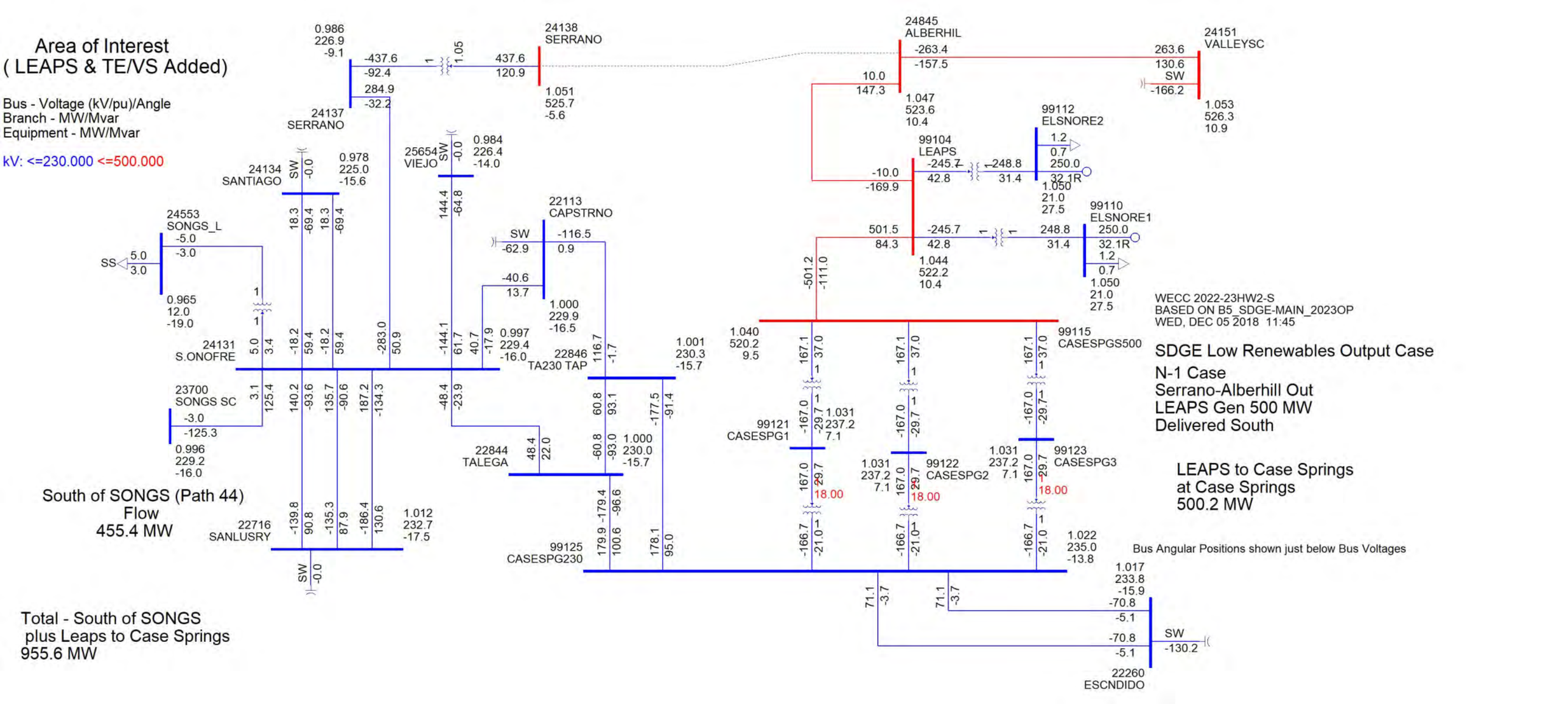

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S V
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 7:53
SDGE Low Renewables Output Case
Base Case
No Contingency
LEAPS Gen Sent South
LEAPS to Case Springs
at Case Springs
513.2 MW
South of SONGS (Path 44)
Flow
959.1 MW
Total - South of SONGS
plus Leaps to Case Springs
1472.2 MW
Bus Angular Positions shown just below Bus Voltages

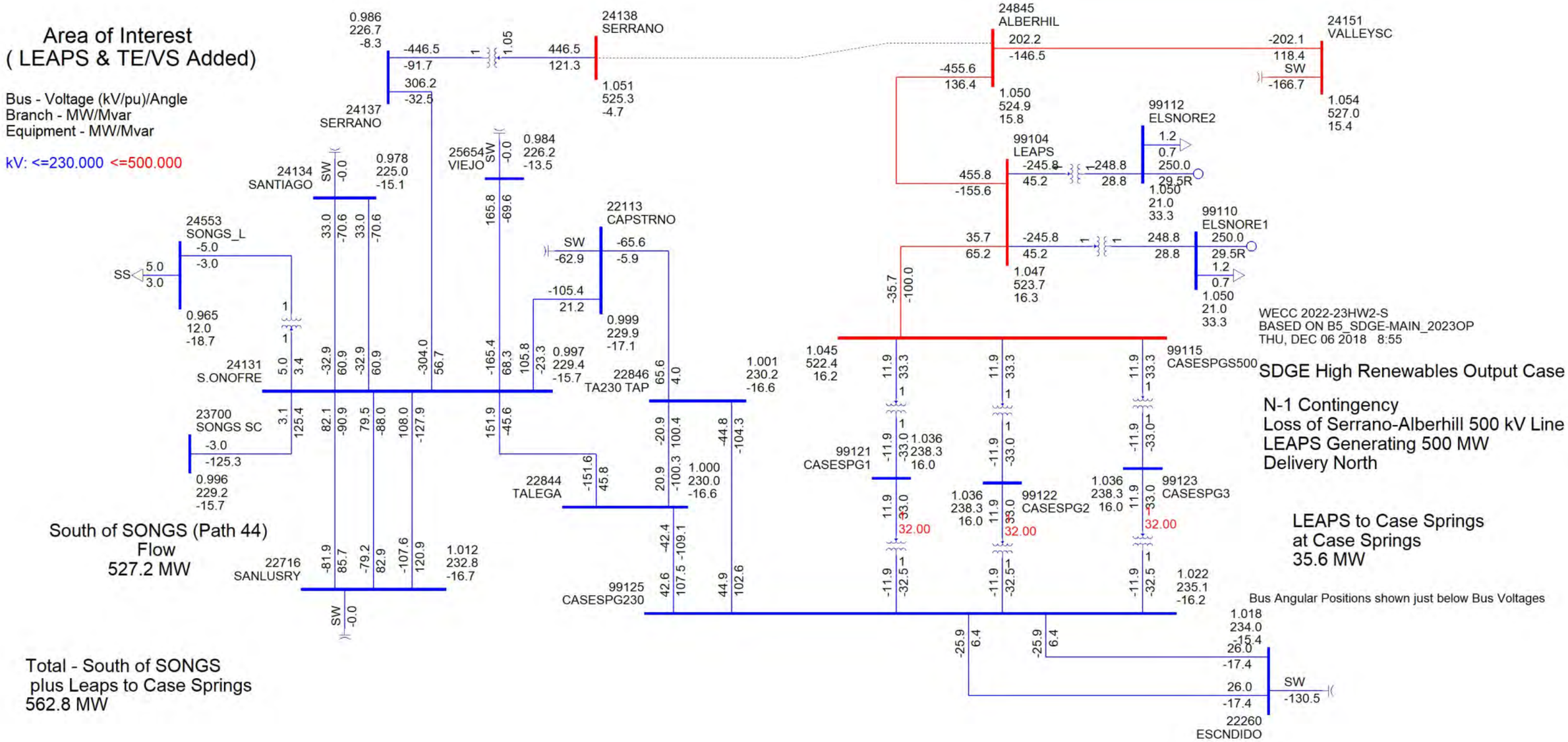

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
SS
SW
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S V
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 8:07
SDGE Low Renewables Output Case
Base Case
No Contingency
LEAPS Pump from North
LEAPS to Case Springs
at Case Springs
13.7 MW
South of SONGS (Path 44)
Flow
1260.6 MW
Total - South of SONGS
plus Leaps to Case Springs
1274.3 MW
Bus Angular Positions shown just below Bus Voltages

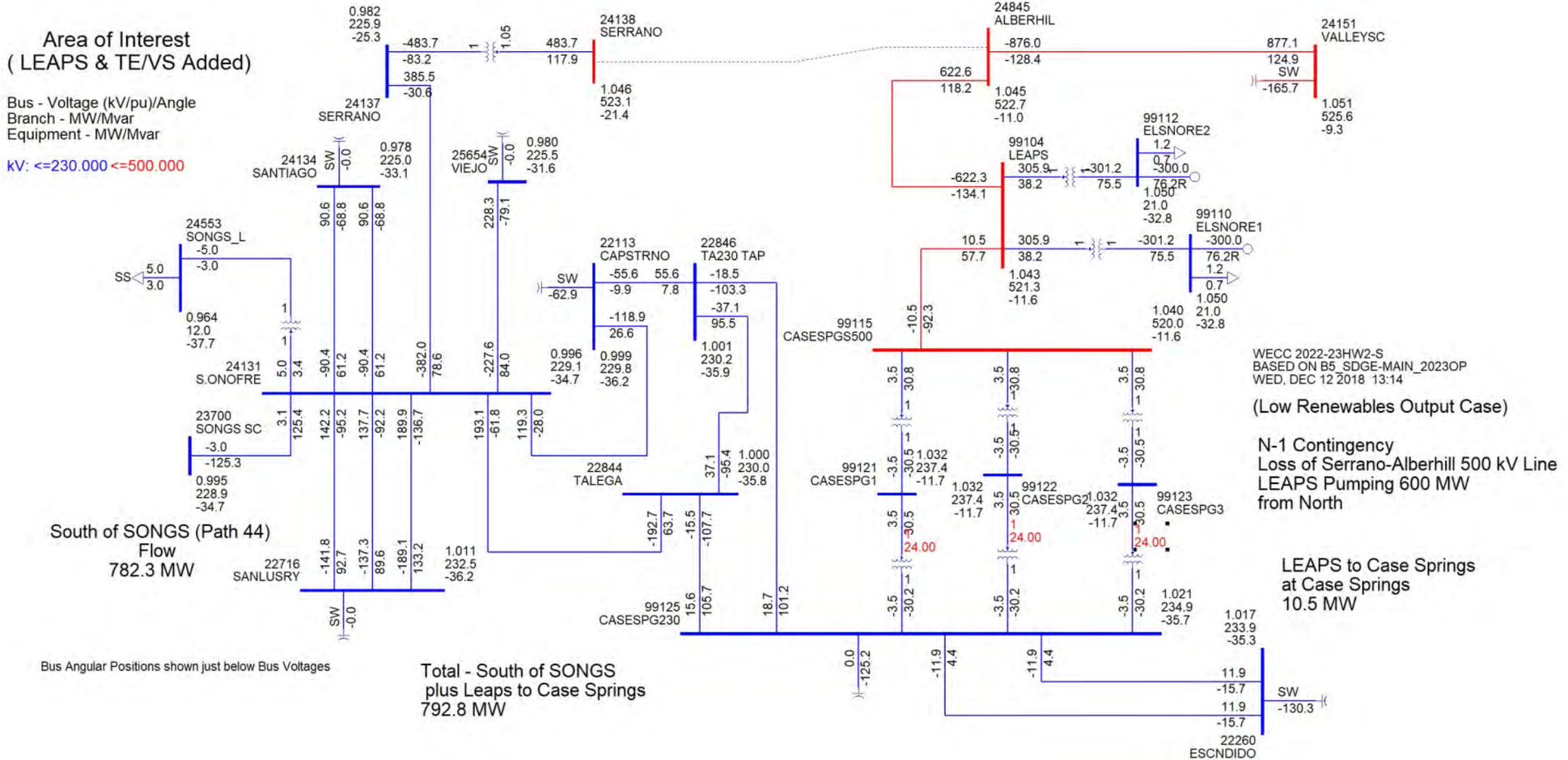

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22844 TALEGA
22113 CAPSTRNO
22846 TA230 TAP
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WESTERN ELECTRICITY COORDINATING COUNCIL (2022-23HW2-S V
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 8:34
SDGE Low Renewables Output Case
Base Case
No Contingency
LEAPS Pump from South
LEAPS to Case Springs
at Case Springs
-570.4 MW
South of SONGS (Path 44)
Flow
970.1 MW
Total - South of SONGS
plus Leaps to Case Springs
399.7 MW
Bus Angular Positions shown just below Bus Voltages

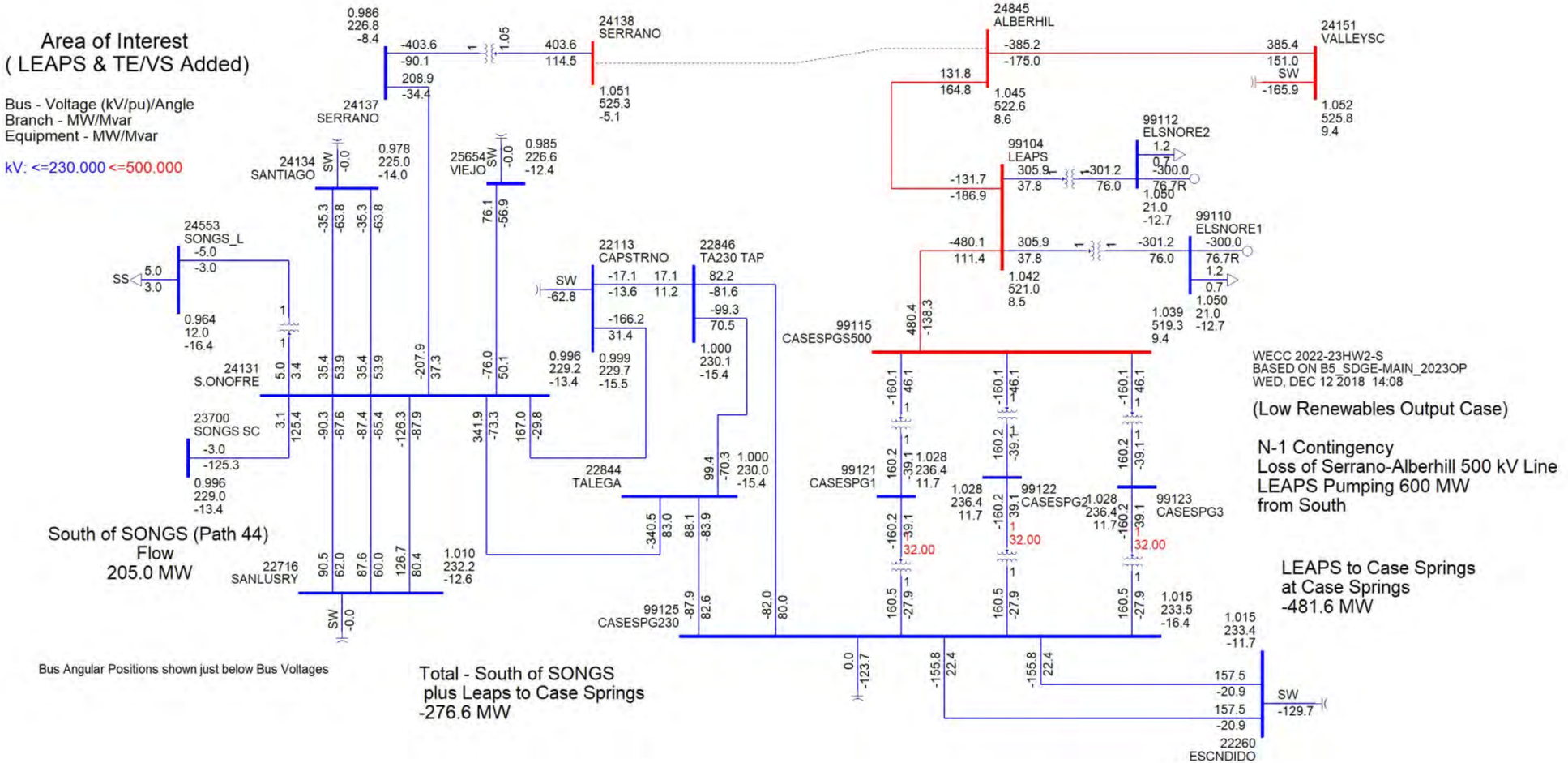
N-1 CONTINGENCY SERRANO-ALBERHILL 500kV LINE

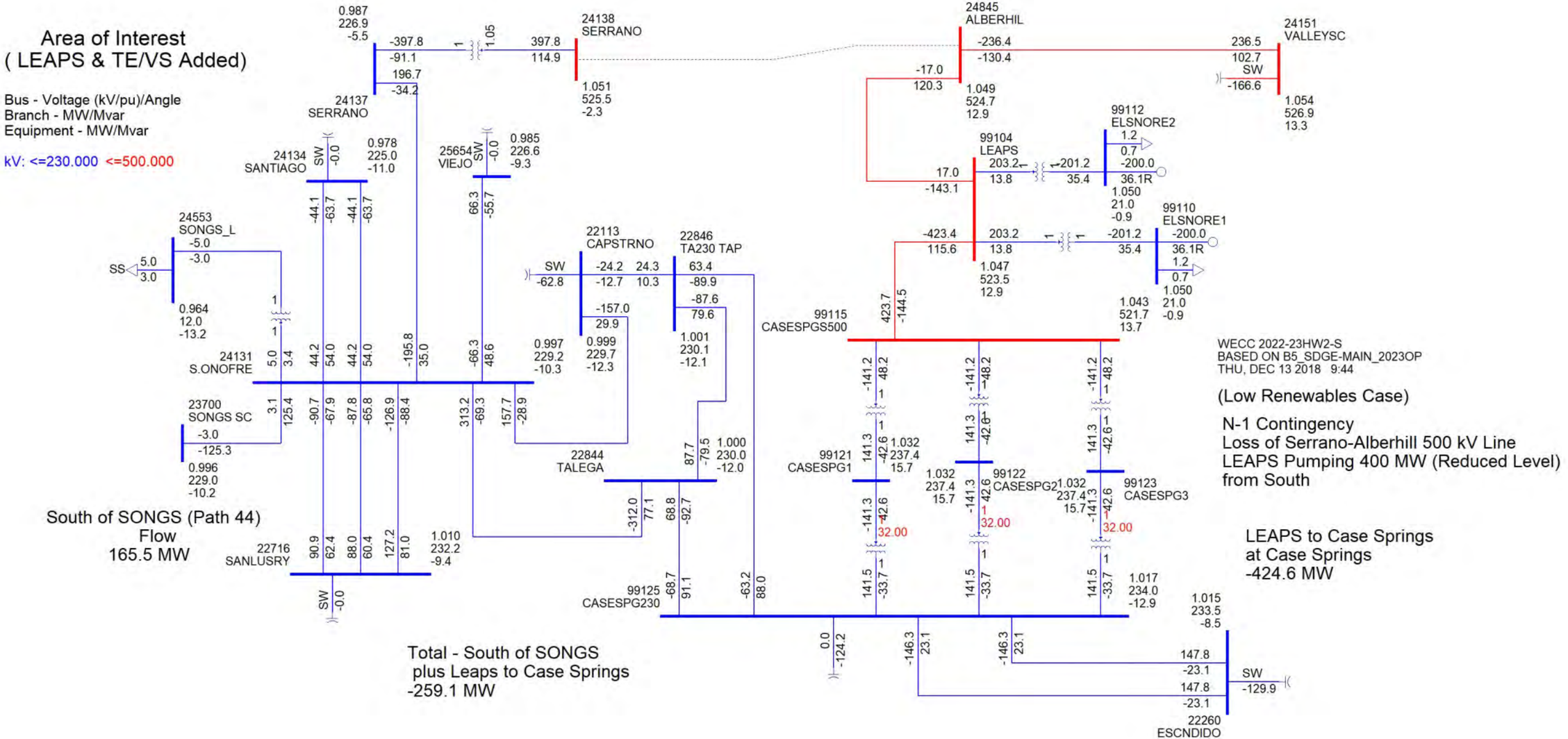

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24134 SANTIAGO
25654 VIEJO
22113 CAPSTRNO
24553 SONGS_L
24131 S.ONOFRE
22846 TA230 TAP
99115 CASESPGS500
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 9:42
SDGE Low Renewables Output Case
N-1 Case
Serrano-Alberhill Out
LEAPS Off
LEAPS to Case Springs
at Case Springs
-19.8 MW
South of SONGS (Path 44)
Flow
797.3 MW
Total - South of SONGS
plus Leaps to Case Springs
777.5 MW
Bus Angular Positions shown just below Bus Voltages


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
455.4 MW
Total - South of SONGS
plus Leaps to Case Springs
955.6 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 05 2018 11:45
SDGE Low Renewables Output Case
N-1 Case
Serrano-Alberhill Out
LEAPS Gen 500 MW
Delivered South
LEAPS to Case Springs
at Case Springs
500.2 MW
Bus Angular Positions shown just below Bus Voltages

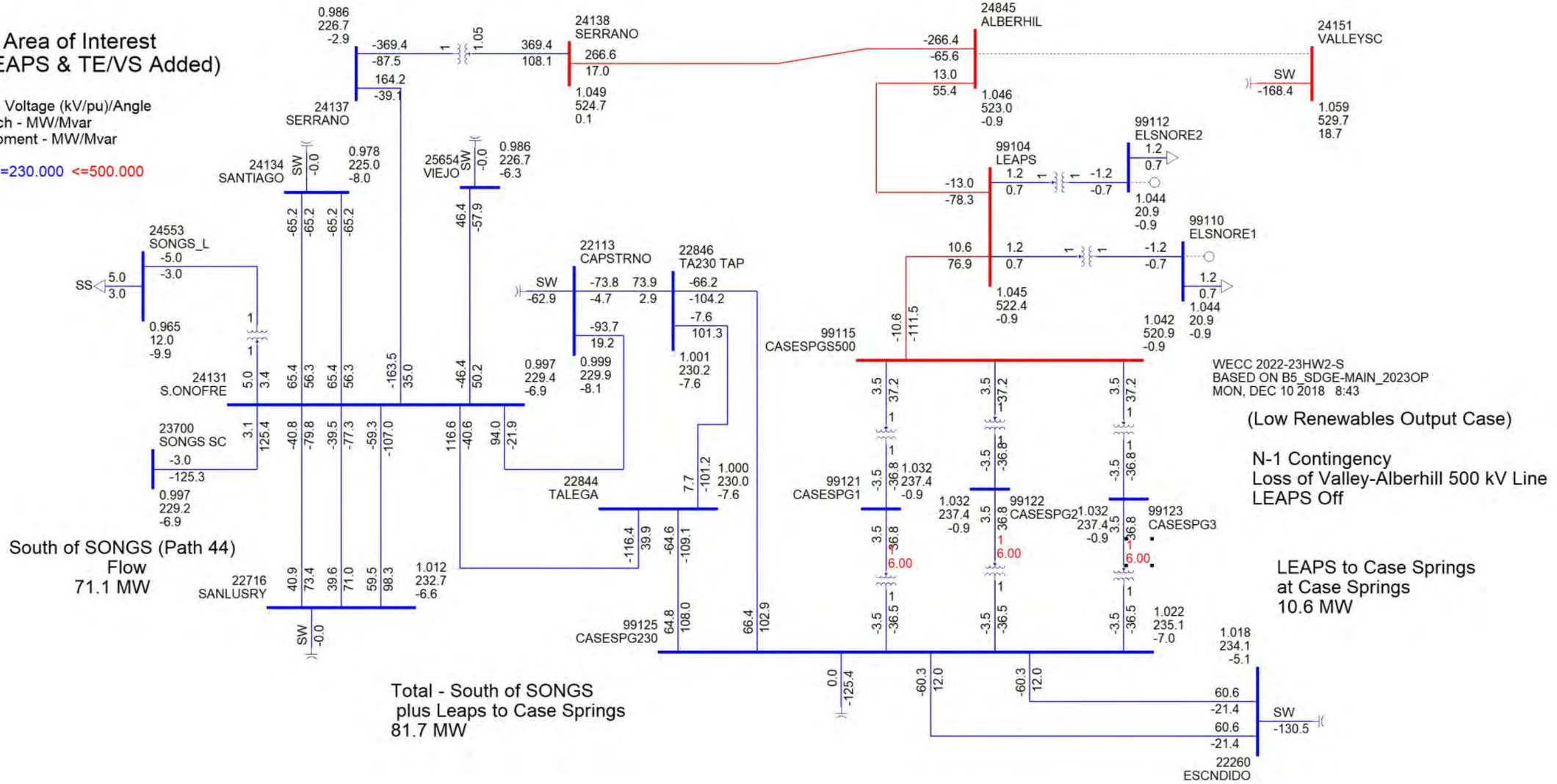

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
527.2 MW
Total - South of SONGS
plus Leaps to Case Springs
562.8 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
THU, DEC 06 2018 8:55
SDGE High Renewables Output Case
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Generating 500 MW
Delivery North
LEAPS to Case Springs
at Case Springs
35.6 MW
Bus Angular Positions shown just below Bus Voltages

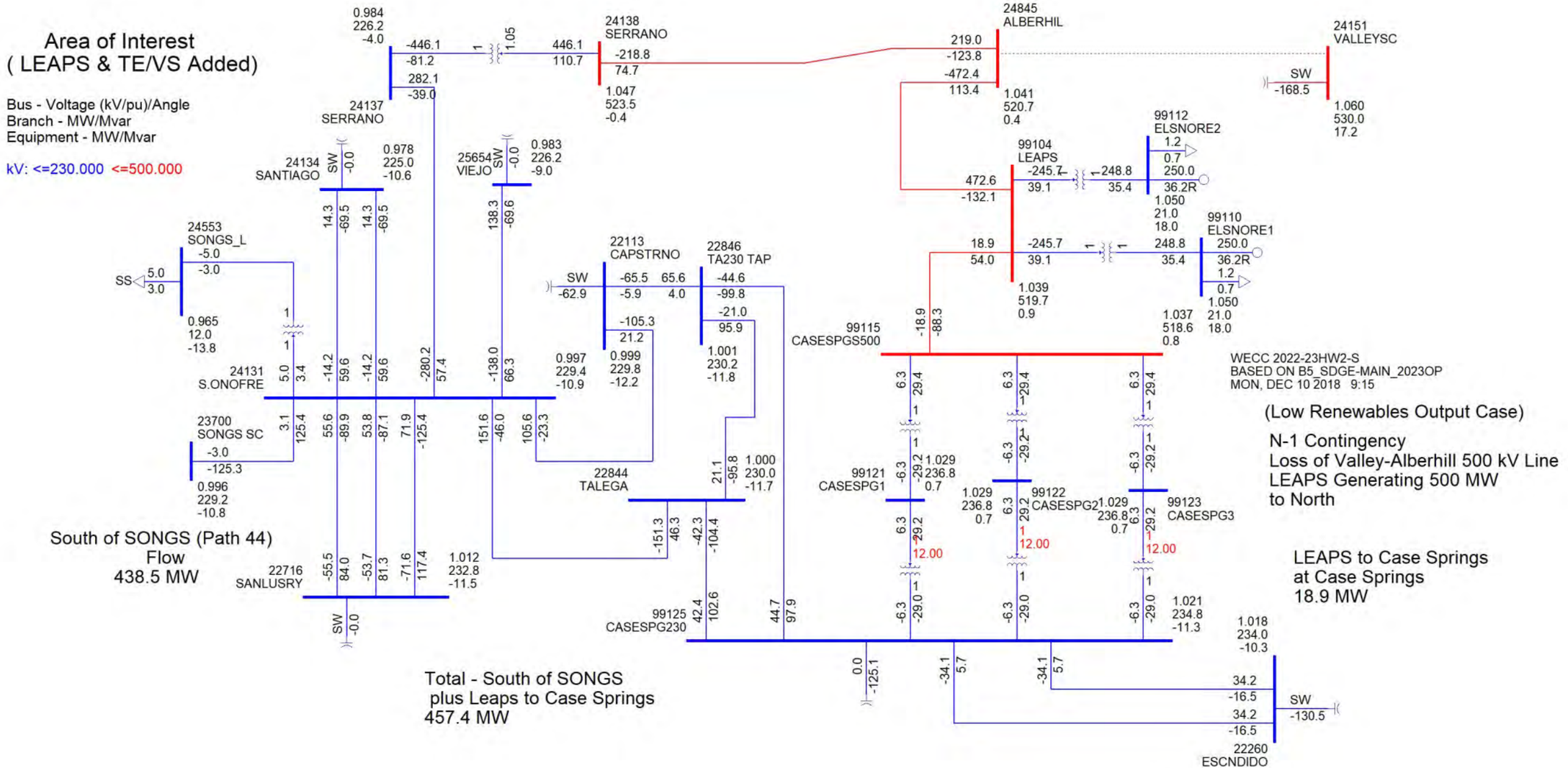

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
782.3 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
792.8 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 12 2018 13:14
(Low Renewables Output Case)
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from North
LEAPS to Case Springs
at Case Springs
10.5 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

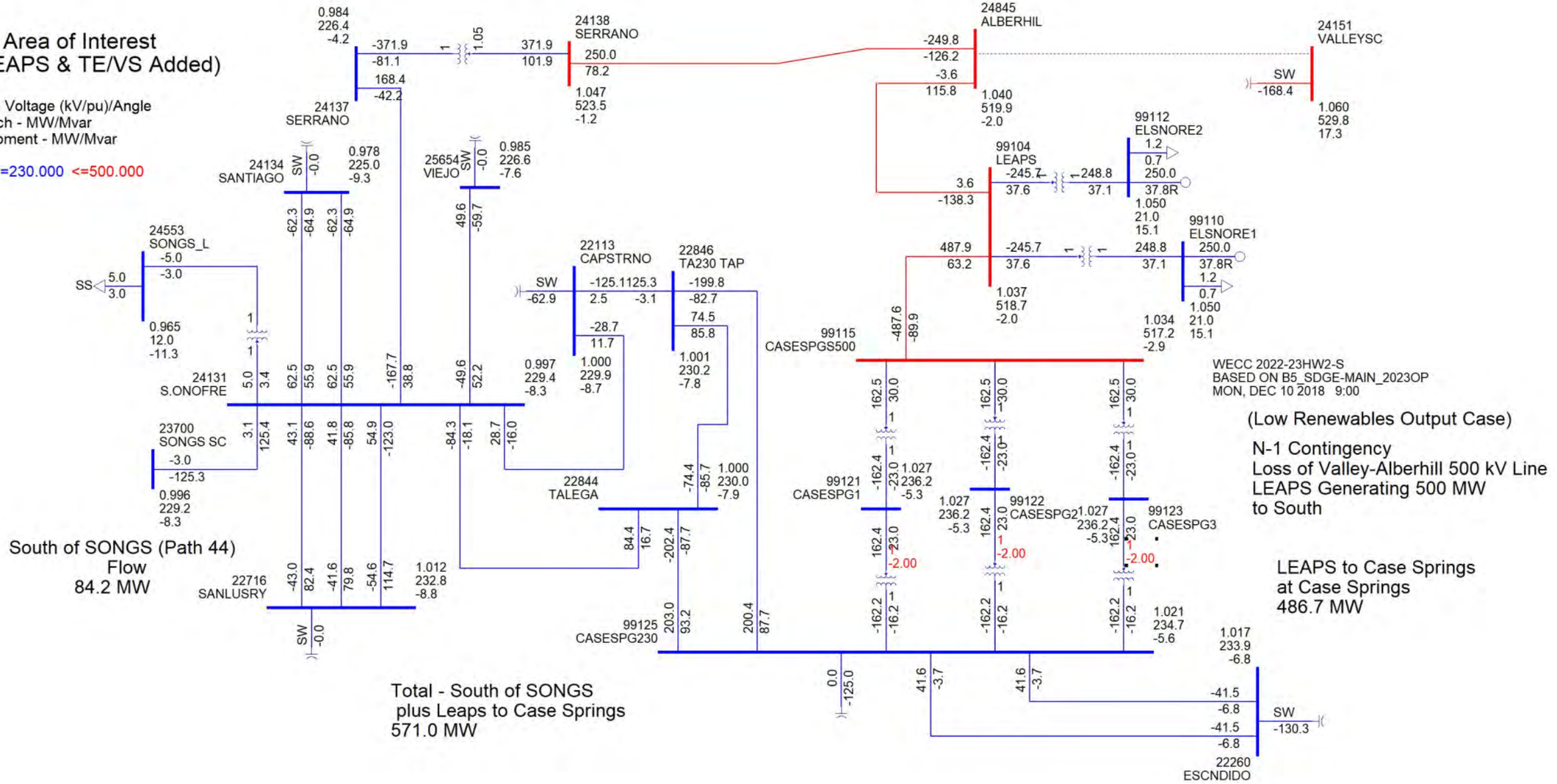

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
205.0 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
-276.6 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 12 2018 14:08
(Low Renewables Output Case)
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from South
LEAPS to Case Springs
at Case Springs
-481.6 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
SS
SW

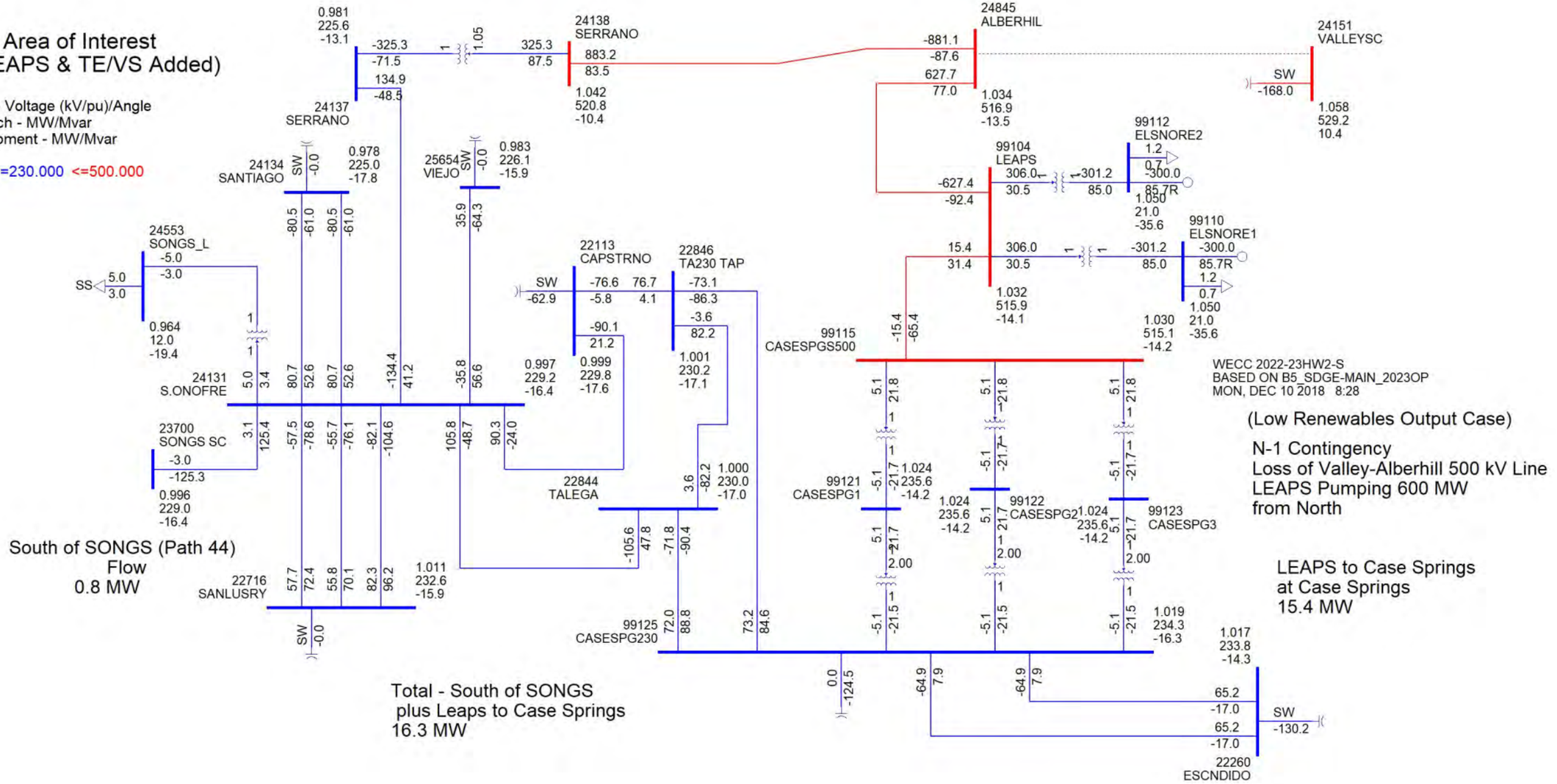

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
165.5 MW
Total - South of SONGS
plus Leaps to Case Springs
-259.1 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
THU, DEC 13 2018 9:44
(Low Renewables Case)
N-1 Contingency
Loss of Serrano-Alberhill 500 kV Line
LEAPS Pumping 400 MW (Reduced Level)
from South
LEAPS to Case Springs
at Case Springs
-424.6 MW
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
22260 ESCNDIDO

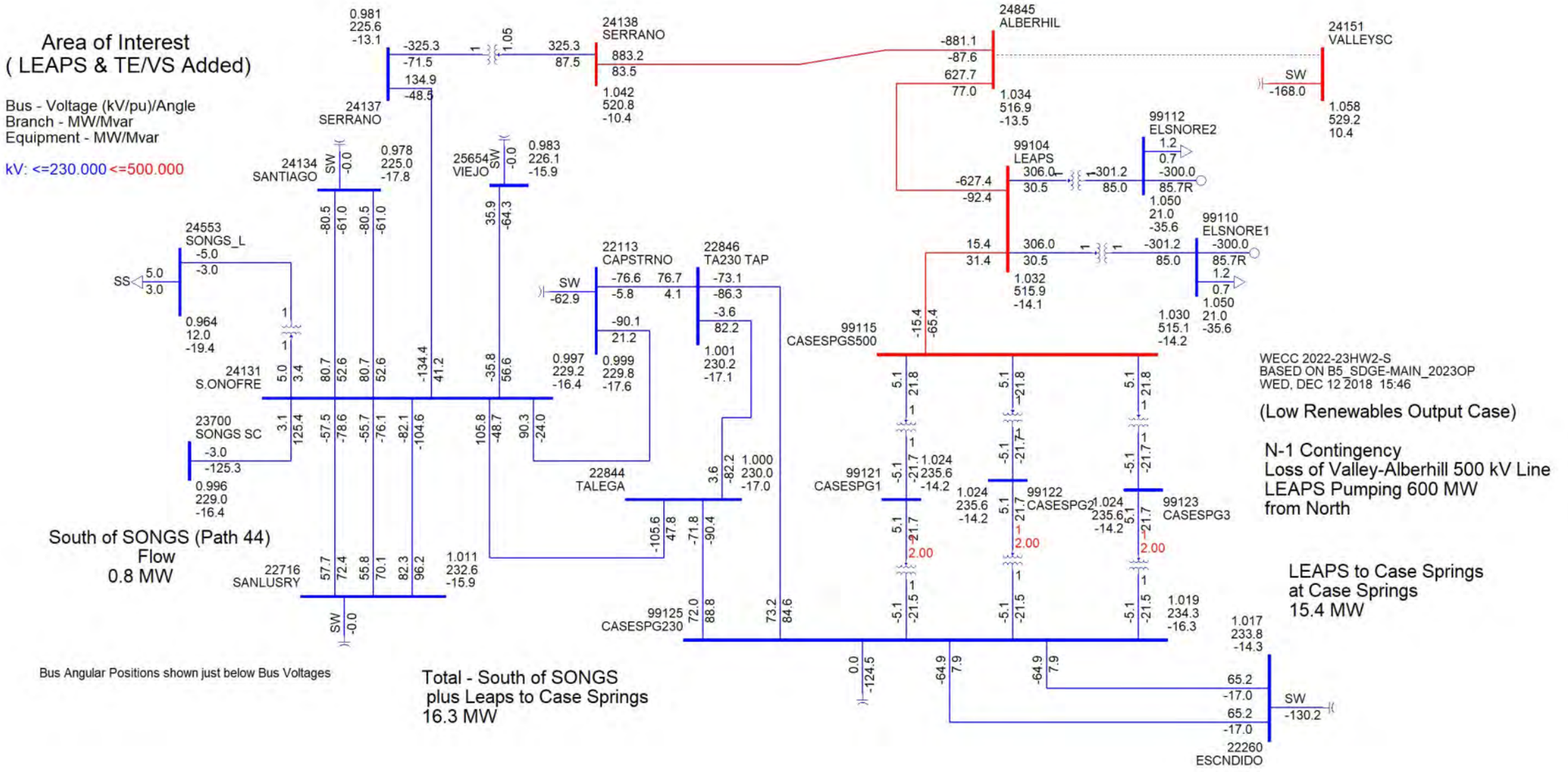
N-1 CONTINGENCY VALLEY-ALBERHILL 500kV LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
71.1 MW
Total - South of SONGS
plus Leaps to Case Springs
81.7 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
MON, DEC 10 2018 8:43
(Low Renewables Output Case)
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Off
LEAPS to Case Springs
at Case Springs
10.6 MW
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO

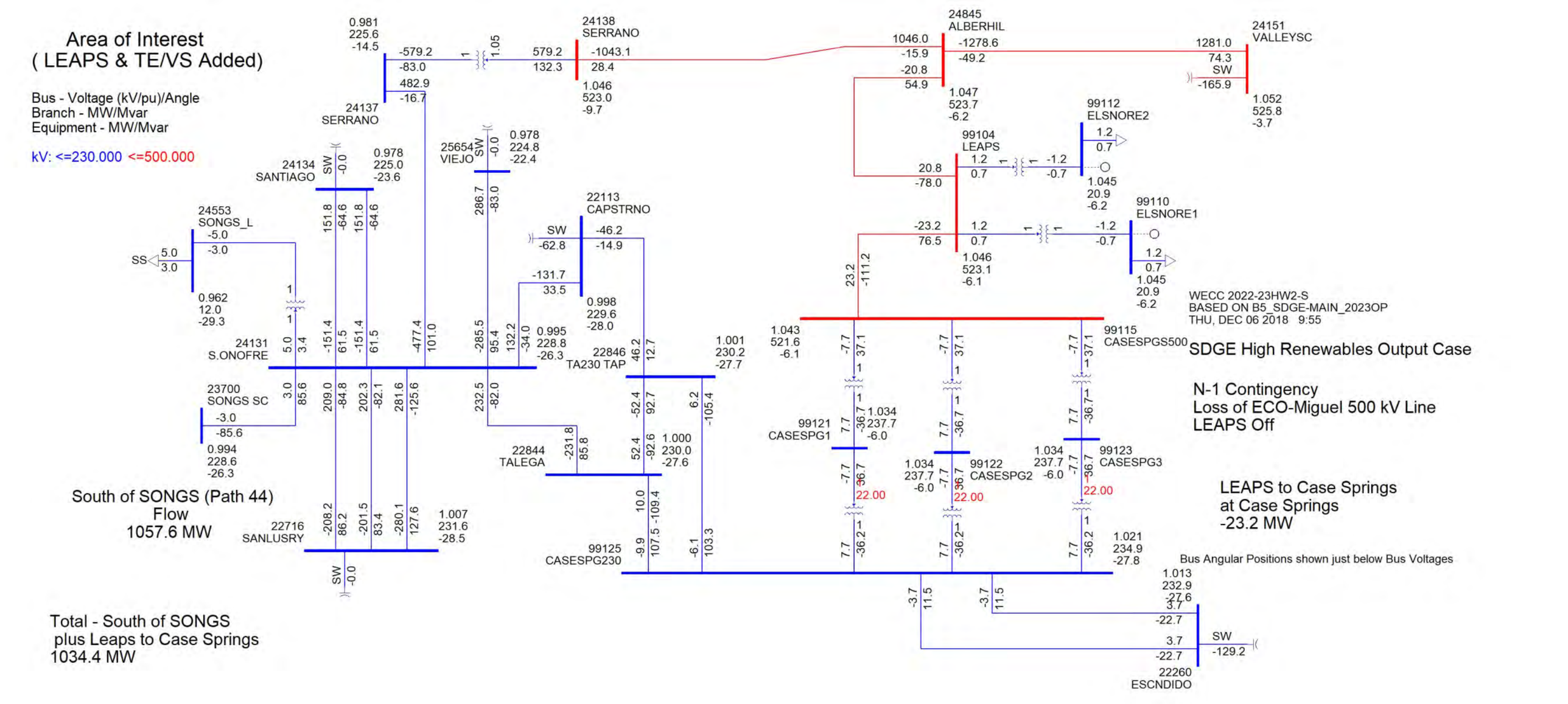

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
MON, DEC 10 2018 9:15
(Low Renewables Output Case)
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Generating 500 MW
to North
LEAPS to Case Springs
at Case Springs
18.9 MW
South of SONGS (Path 44)
Flow
438.5 MW
Total - South of SONGS
plus Leaps to Case Springs
457.4 MW

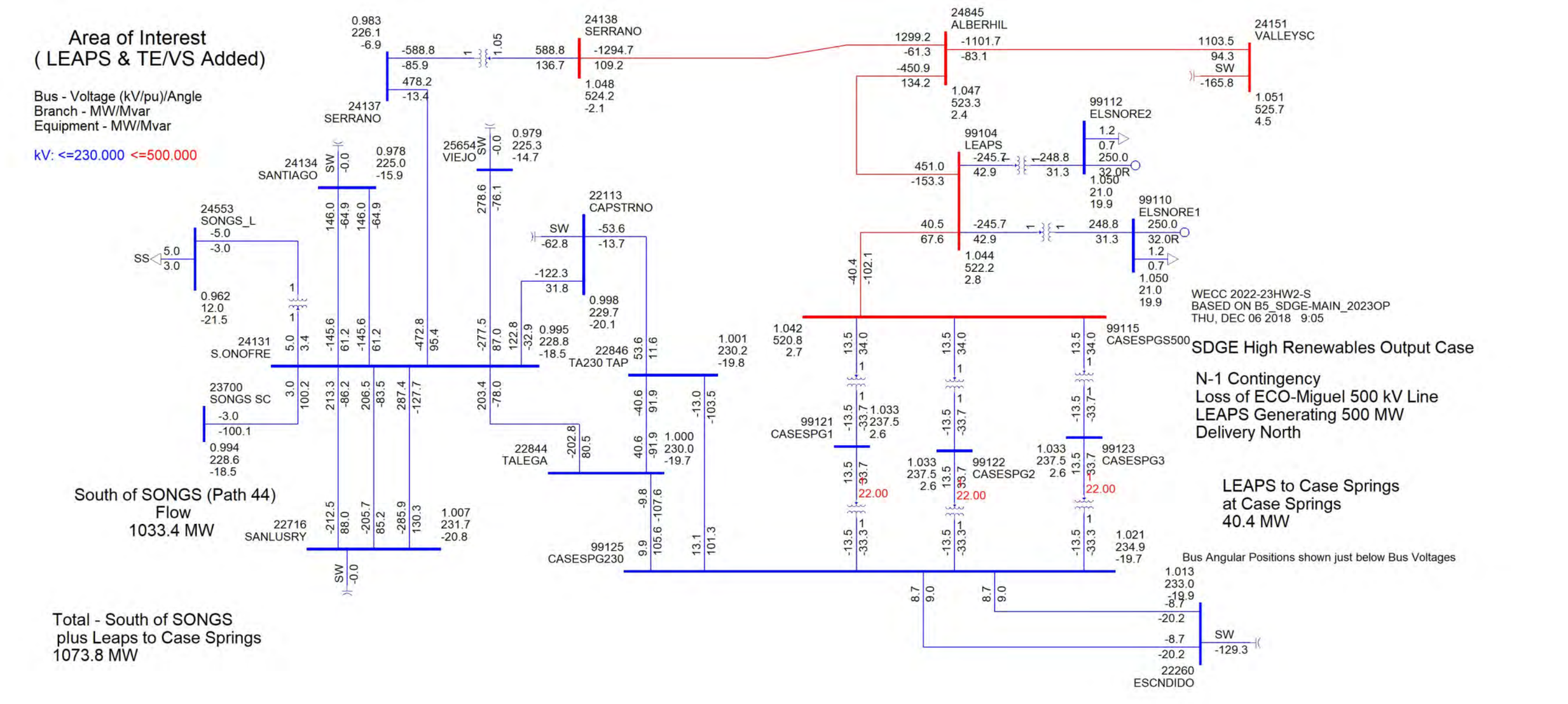

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
MON, DEC 10 2018 9:00
(Low Renewables Output Case)
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Generating 500 MW
to South
LEAPS to Case Springs
at Case Springs
486.7 MW
South of SONGS (Path 44)
Flow
84.2 MW
Total - South of SONGS
plus Leaps to Case Springs
571.0 MW

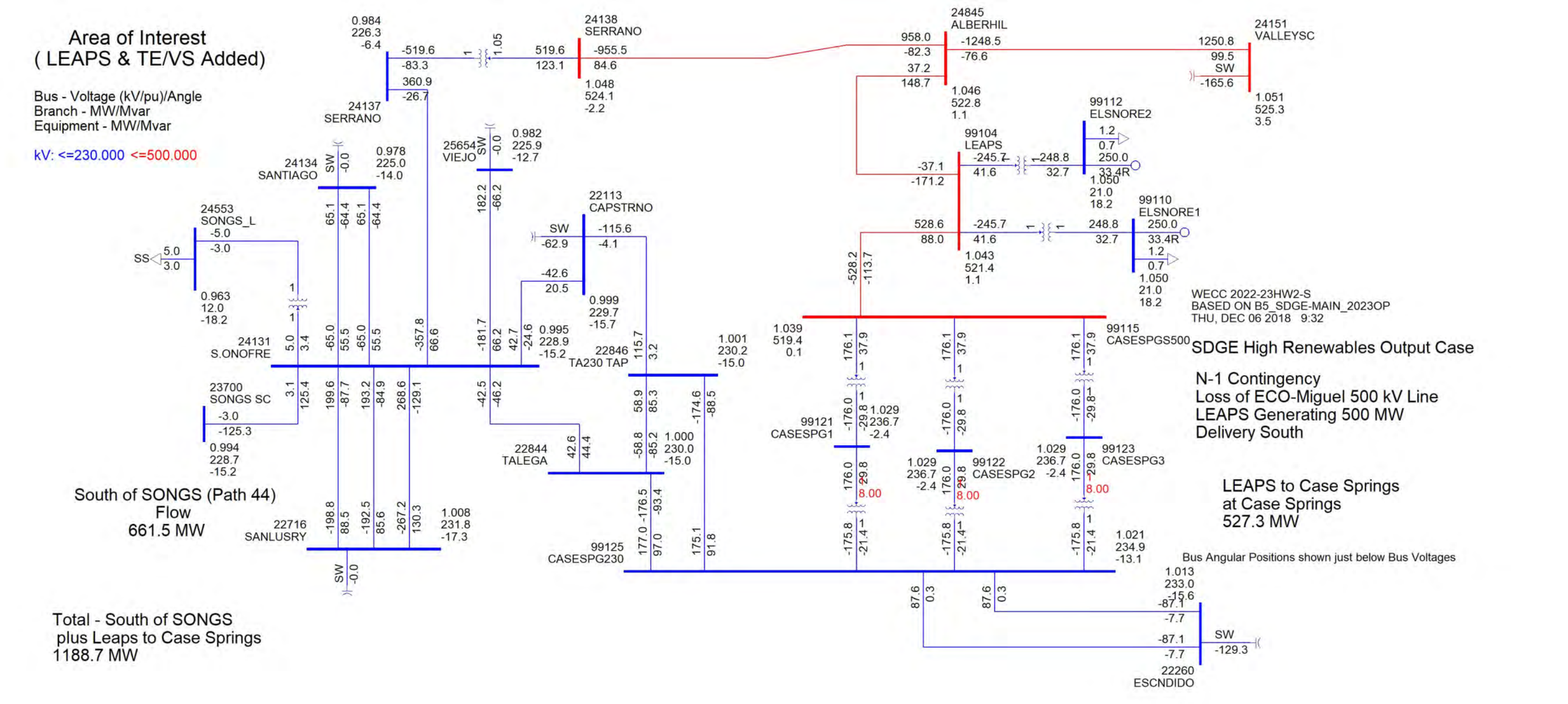

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
MON, DEC 10 2018 8:28
(Low Renewables Output Case)
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from North
South of SONGS (Path 44)
Flow
0.8 MW
Total - South of SONGS
plus Leaps to Case Springs
16.3 MW
LEAPS to Case Springs
at Case Springs
15.4 MW

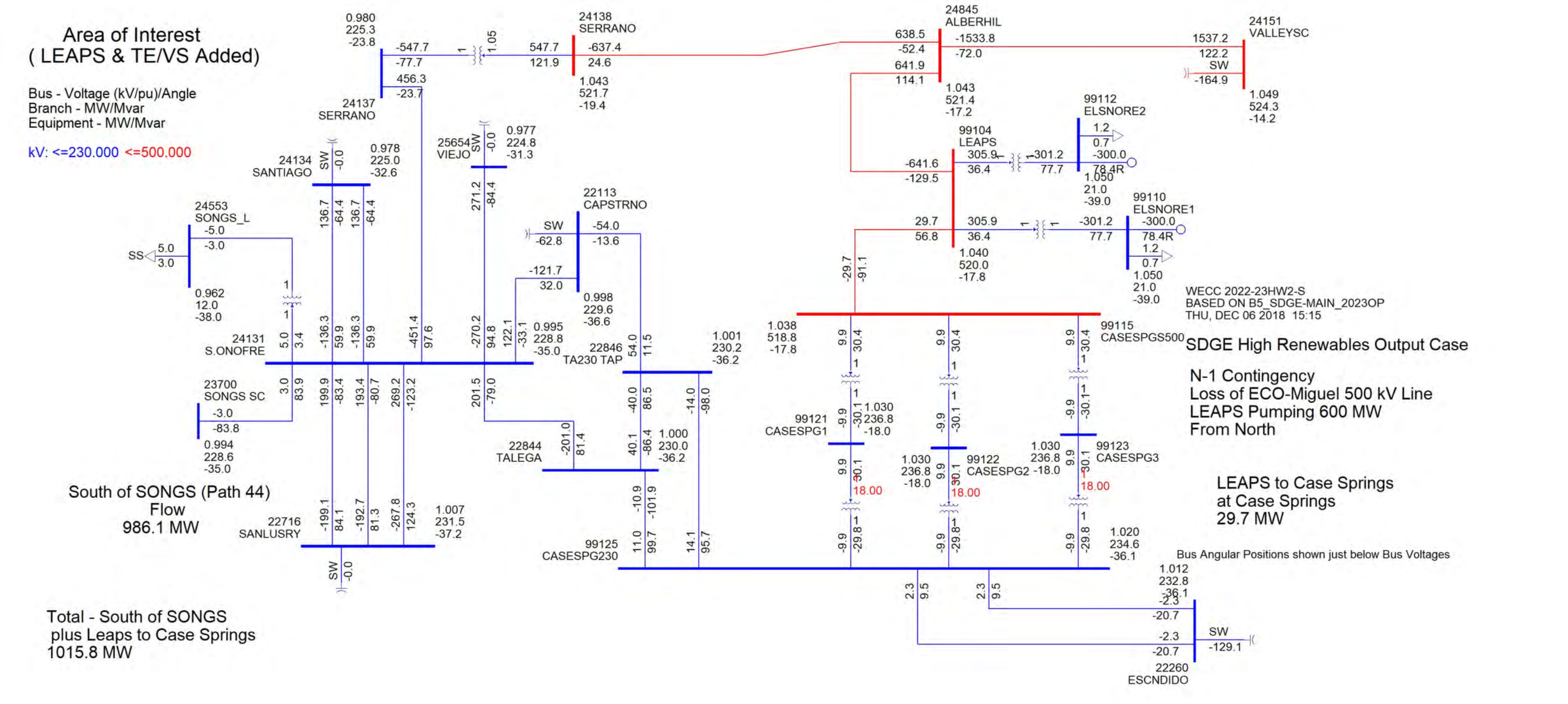

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
0.8 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
16.3 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 12 2018 15:46
(Low Renewables Output Case)
N-1 Contingency
Loss of Valley-Alberhill 500 kV Line
LEAPS Pumping 600 MW
from North
LEAPS to Case Springs
at Case Springs
15.4 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO

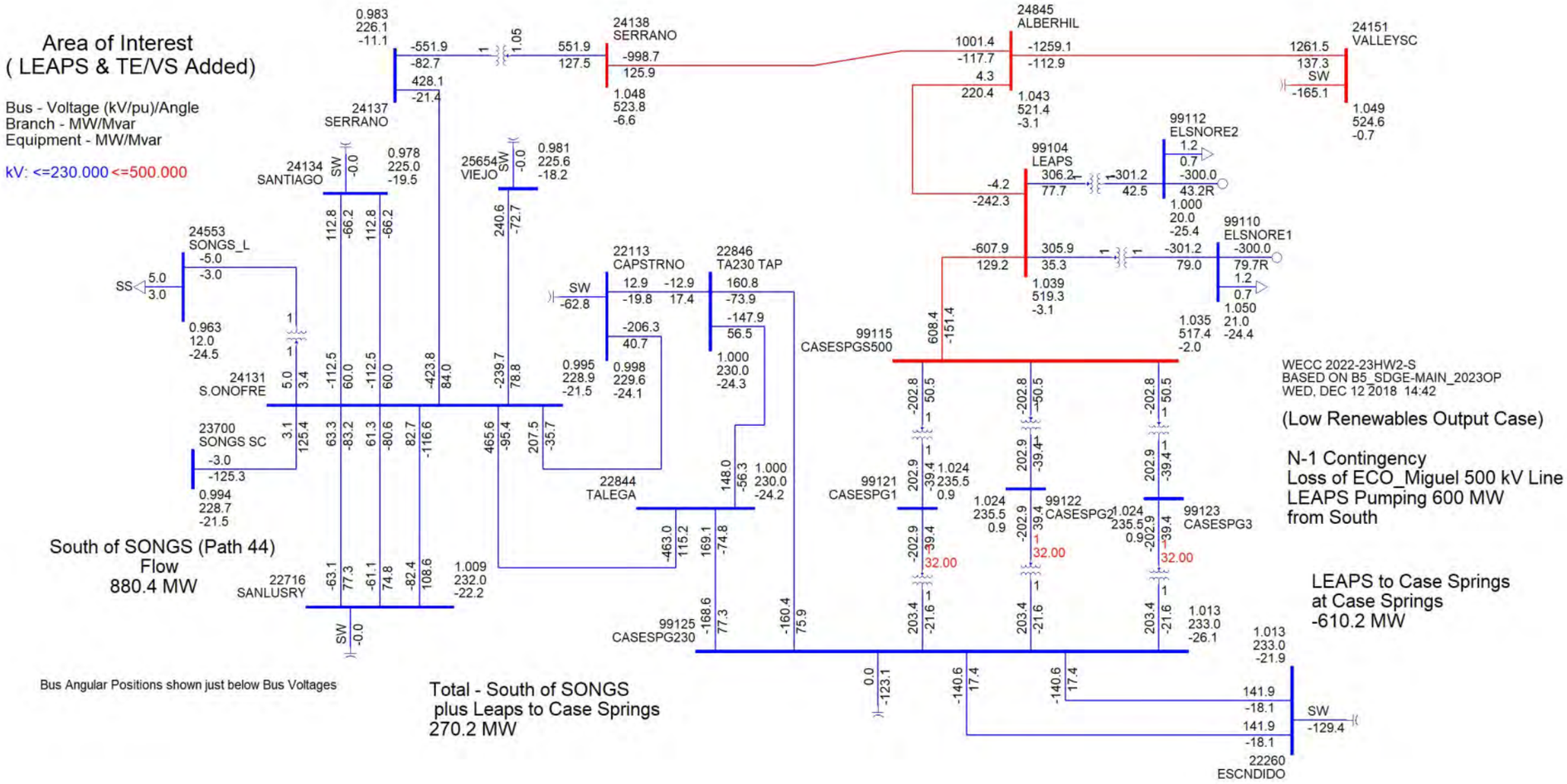
N-1 CONTINGENCY ECO-MIGUEL 500kV LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
1057.6 MW
Total - South of SONGS
plus Leaps to Case Springs
1034.4 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
THU, DEC 06 2018 9:55
SDGE High Renewables Output Case
N-1 Contingency
Loss of ECO-Miguel 500 kV Line
LEAPS Off
LEAPS to Case Springs
at Case Springs
-23.2 MW
Bus Angular Positions shown just below Bus Voltages


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
1033.4 MW
Total - South of SONGS
plus Leaps to Case Springs
1073.8 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
THU, DEC 06 2018 9:05
SDGE High Renewables Output Case
N-1 Contingency
Loss of ECO-Miguel 500 kV Line
LEAPS Generating 500 MW
Delivery North
LEAPS to Case Springs
at Case Springs
40.4 MW
Bus Angular Positions shown just below Bus Voltages
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
25654 VIEJO
24134 SANTIAGO
22113 CAPSTRNO
24553 SONGS_L
99115 CASESPGS500
24131 S.ONOFRE
22846 TA230 TAP
23700 SONGS SC
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22844 TALEGA
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO
SS
SW


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
661.5 MW
Total - South of SONGS
plus Leaps to Case Springs
1188.7 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22844 TALEGA
22113 CAPSTRNO
22846 TA230 TAP
99125 CASESPG230
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
99115 CASESPGS500
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
THU, DEC 06 2018 9:32
SDGE High Renewables Output Case
N-1 Contingency
Loss of ECO-Miguel 500 kV Line
LEAPS Generating 500 MW
Delivery South
LEAPS to Case Springs
at Case Springs
527.3 MW
Bus Angular Positions shown just below Bus Voltages

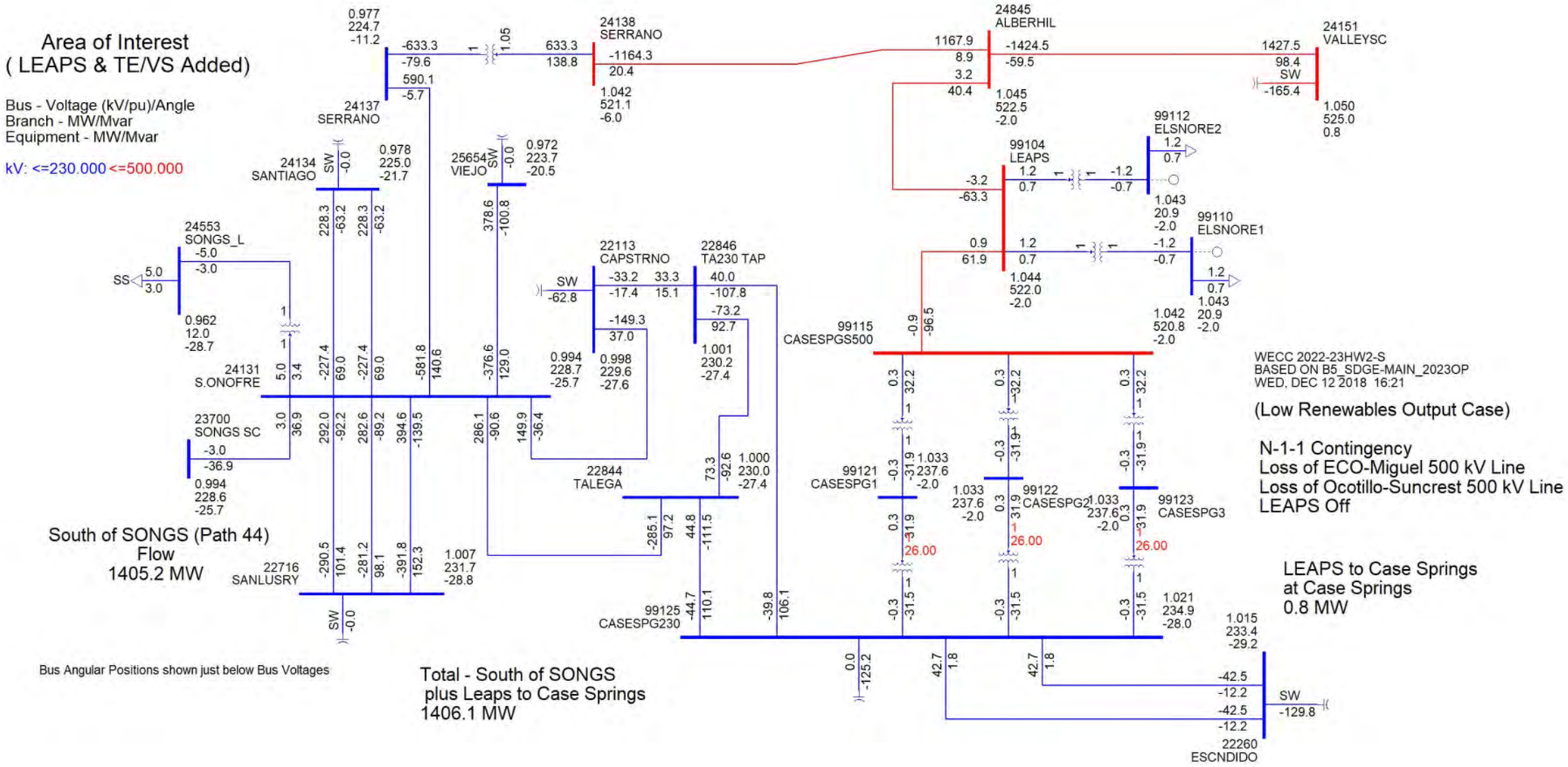

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
986.1 MW
Total - South of SONGS
plus Leaps to Case Springs
1015.8 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
THU, DEC 06 2018 15:15
SDGE High Renewables Output Case
N-1 Contingency
Loss of ECO-Miguel 500 kV Line
LEAPS Pumping 600 MW
From North
LEAPS to Case Springs
at Case Springs
29.7 MW
Bus Angular Positions shown just below Bus Voltages

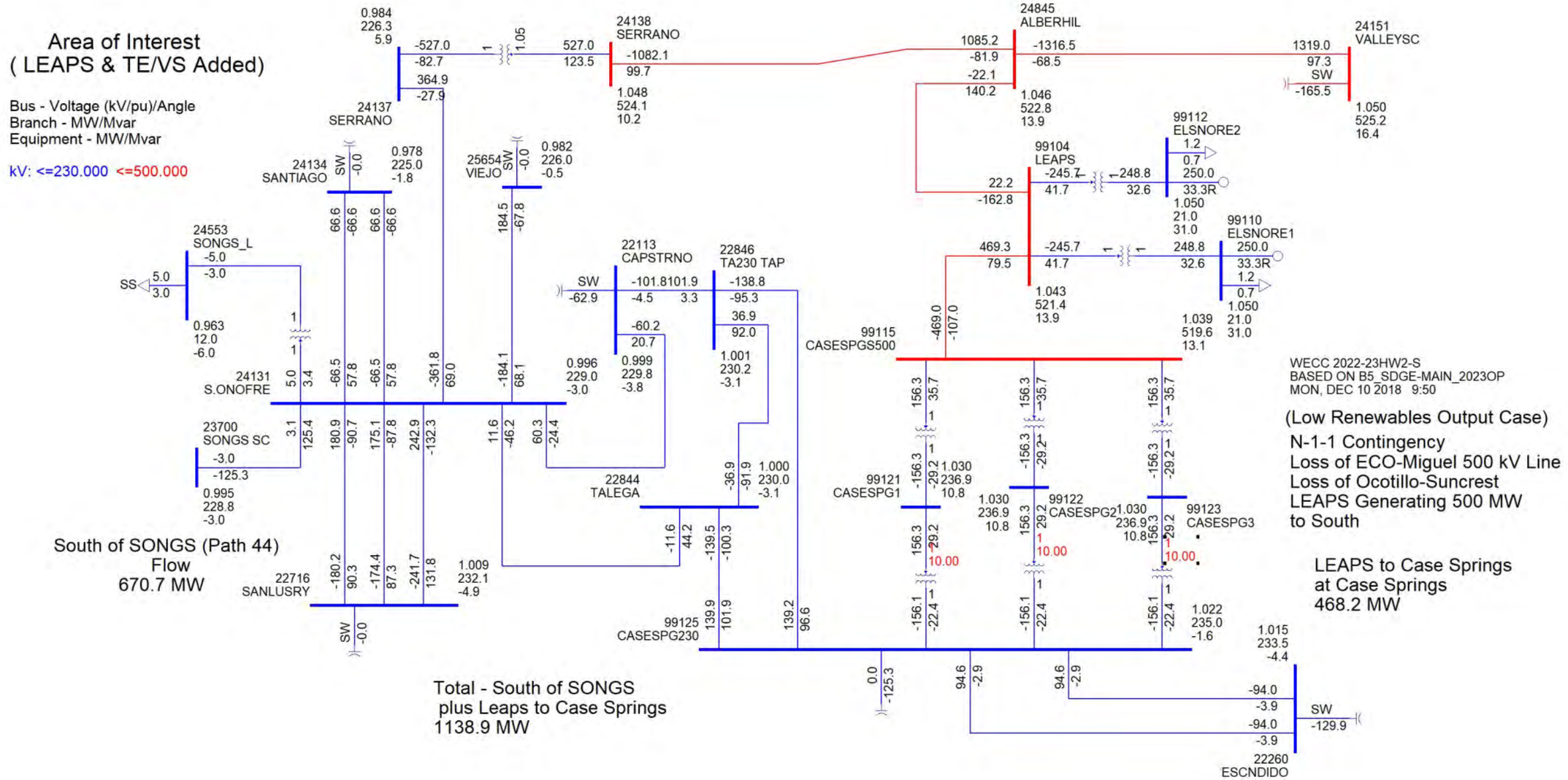

Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
880.4 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
270.2 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 12 2018 14:42
(Low Renewables Output Case)
N-1 Contingency
Loss of ECO_Miguel 500 kV Line
LEAPS Pumping 600 MW
from South
LEAPS to Case Springs
at Case Springs
-610.2 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
22260 ESCNDIDO
SS
SW

N-1-1 CONTINGENCY ECO-MIGUEL 500kV LINE

THEN

OCOTILLO-SUNCREST 500kV LINE


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
1405.2 MW
Bus Angular Positions shown just below Bus Voltages
Total - South of SONGS
plus Leaps to Case Springs
1406.1 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
WED, DEC 12 2018 16:21
(Low Renewables Output Case)
N-1-1 Contingency
Loss of ECO-Miguel 500 kV Line
Loss of Ocotillo-Suncrest 500 kV Line
LEAPS Off
LEAPS to Case Springs
at Case Springs
0.8 MW
24138 SERRANO
24137 SERRANO
24134 SANTIAGO
25654 VIEJO
24553 SONGS_L
24131 S.ONOFRE
23700 SONGS SC
22716 SANLUSRY
22113 CAPSTRNO
22846 TA230 TAP
22844 TALEGA
99125 CASESPG230
24845 ALBERHIL
24151 VALLEYSC
99104 LEAPS
99112 ELSNORE2
99110 ELSNORE1
99115 CASESPGS500
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22260 ESCNDIDO


Area of Interest
(LEAPS & TE/VS Added)
Bus - Voltage (kV/pu)/Angle
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=230.000 <=500.000
South of SONGS (Path 44)
Flow
670.7 MW
Total - South of SONGS
plus Leaps to Case Springs
1138.9 MW
LEAPS to Case Springs
at Case Springs
468.2 MW
WECC 2022-23HW2-S
BASED ON B5_SDGE-MAIN_2023OP
MON, DEC 10 2018 9:50
(Low Renewables Output Case)
N-1-1 Contingency
Loss of ECO-Miguel 500 kV Line
Loss of Ocotillo-Suncrest
LEAPS Generating 500 MW
to South
24138 SERRANO
24137 SERRANO
24845 ALBERHIL
24151 VALLEYSC
24134 SANTIAGO
25654 VIEJO
99112 ELSNORE2
99104 LEAPS
99110 ELSNORE1
24553 SONGS_L
22113 CAPSTRNO
22846 TA230 TAP
99115 CASESPGS500
24131 S.ONOFRE
23700 SONGS SC
22844 TALEGA
99121 CASESPG1
99122 CASESPG2
99123 CASESPG3
22716 SANLUSRY
99125 CASESPG230
22260 ESCNDIDO

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

VOLUME (20 OF 20)

STUDY 34B: TRANSFORMER STUDY CONSULTATION

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Prepared by:

THE NEVADA HYDRO COMPANY, INC.
2416 Cades Way
Vista, California 92081
(760) 599-1813
(760) 599-1815 FAX

June 2019

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SECTION 1

CONVENE A MEETING AMONG SOUTHERN CALIFORNIA EDISON, SAN DIEGO GAS & ELECTRIC, AND THE CALIFORNIA ISO TO ESTABLISH AGREED UPON TRANSMISSION STUDY CASES AND ASSOCIATED CONTINGENCIES TO BE STUDIED

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dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Thursday, May 30, 2019 7:01 AM
To: rsparks@caiso.com
Cc: dkates@sonic.net
Subject: Followup on request for t/l identification

Robert,

On December 3, 2018 I sent you an e-mail requesting the identification of two transmission lines identified by number. They are:

TL23054 and TL23055 (mentioned in the 9th of the 14 contingencies you requested be studied)

Since I have not heard back from you I have had to assume which 230 kV lines they were.

I'm reasonably confident that TL23040 (mentioned in the 6th and 7th of the 14 contingencies) is the Tijuana-Otay Mesa 230 kV line. But that should be confirmed.

I have also informed you that I have been denied access by WECC to the RAS definitions information because I am not working for a utility member, and that I need you to supply me with the RAS schemes for the contingencies you want me to investigate for their effect on phase shifter operation. I have not received those identifications from you, so for this study I have had to use a reasonably informed estimate of their content. It would be helpful for the assurance that what I am reporting is entirely in compliance if you were to provide me with those three RAS definitions.

I have previously conducted those contingency tests with my estimates of what they meant, and since you didn't respond to my requests, I have had to assume you didn't consider them sufficiently important to warrant providing the requested information.

Since you have now responded with the requirement that I report my findings, we have moved to the point where an exact definition of what you mean by these items above is required for assurance of a proper analysis.

Please respond with the requested information as soon as possible so we can conclude this matter promptly.

Regards,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: Ayman Samaan <Ayman.Samaan@sce.com>
Sent: Wednesday, May 29, 2019 3:37 PM
To: Sparks, Robert; Depenbrock (Power Technologies), Fred; hmaiga@semprautilities.com
Cc: Millar, Neil; Strack (Sempra Energy Utilities), Jan; Garry Chinn; dkates@sonic.net; Rex Wait
Subject: RE: (External):RE: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Fred,
SCE concurs with the CAISO's comments. We also would like to get the base cases for further review.

Thank you
Ayman S.

From: Sparks, Robert [mailto:RSparks@caiso.com]
Sent: Wednesday, May 29, 2019 2:54 PM
To: Depenbrock (Power Technologies), Fred <fdepenbrock@aol.com>; hmaiga@semprautilities.com; Ayman Samaan <Ayman.Samaan@sce.com>
Cc: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; Garry Chinn <Garry.Chinn@sce.com>; dkates@sonic.net; Rex Wait <rwait@controltechnology.org>
Subject: (External):RE: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Fred,

In response to the Nevada Hydro Company's request for comment on its "Phase Shifting Transformer Range Control Study" report, the ISO has reviewed the report and provides the following comments.

1. The CAISO comments on the proposed study plan specified the evaluation of the operational impact on the CAISO system of the PSTs for fourteen P1 contingencies based on the planned system configuration, but the study reported power flow results on only the LEAPS interconnection facilities and for only for three of the fourteen P1 contingencies.

2. It appears that the post-contingency power flow results on the LEAPS facilities were reported after automatic phase shifter angle adjustment. From the ISO viewpoint, the post-contingency power flows in the LEAPS interconnection facilities, the ISO, and other neighboring facilities should be monitored and evaluated both before and after the phase angle adjustment. The post-contingency power flow results prior to the operational actions that include re-dispatching generation and adjusting phase angles are essential to evaluating the system performance.

3. The ISO notes that the case with 1300 MW of north to south flow on the south of SONGS path was not studied with LEAPS pumping at 600 MW from the southern tie-line. It appears that an alternative case was studied with a total of approximately 400 MW of north to south flow on the south of SONGS path and the PSTs with LEAPS pumping at 600 MW from the southern tie-line. Under this less stressed operating condition, it appears that the PSTs failed to limit non-project power through the LEAPS interconnection facilities for the loss of the ECO-Miguel 500 kV line (P1). However, the ISO was unable to duplicate these results.

4. Please provide the ISO with all of the study base cases for further review since it is difficult to understand some of the results without looking into the study base cases.

Robert Sparks
Regional Transmission

1

California ISO
916-351-4416

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Tuesday, April 2, 2019 6:25 AM
To: Sparks, Robert <RSparks@caiso.com>; hmaiga@semprautilities.com; ayman.samaan@sce.com
Cc: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; Chinn (Southern California Edison), Garry <Garry.Chinn@sce.com>; dkates@sonic.net; rwait@controltechnology.org
Subject: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

The Nevada Hydro Company is herewith asking for your comments, suggestions, and requests on its "Phase Shifting Transformer Range Control Study". The draft report can be downloaded using the link below.

http://leapshydro.com/wp-content/uploads/2019/02/V18-SB-2-Study-34b-Proposed-Transformer-Operation.pdf

We would appreciate receiving your responses as soon as reasonably possible. We will include whatever you may request that we agree with immediately. Where there are items that require further discussion, we will initiate that discussion with you promptly. Where there are remaining issues that can't be resolved, we will include those issues as such and their sources in our report to the FERC.

We have already found a few typographical errors which we will repair. Also, Section 3 of the report should have included a description of the physical characteristics of the phase shifting transformers (normal and emergency ratings, number of tap steps, control range in degrees, etc.) A draft of this missing piece will be sent to you shortly for your review, also.

There is a question that it would be helpful if you,collectively, could resolve the language to be used to describe contingencies. We recognize that NERC has developed a new nomenclature on this matter with the leading letter being "P". Yet, most of the discussion already exchanged between us has used the style of N-1, G-1-N-1, N-1-1, etc. We will follow whichever abbreviation naming style you select jointly in the final report to FERC.

We have noticed that there are a number of your comments that appear to us to be almost entirely operational in nature (i.e., automatic vs manual control). We are planning to have dialogue on this type of issue when the project is preparing to enter operation. Insofar as there may be the need to include awareness of some of these operational issues in this design phase (inclusion of control technology that can communicate with the CAISO or regional dispatch, instrumentation, maintenance process, etc.) your comments are important to us at this stage of the development process for LEAPS.

Thank you for your assistance and support in this development of the LEAPS project, which we see filling an important role in the renewable energy future.

On behalf of the Nevada Hydro Project team,

Fred

Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)
fdepenbrock@aol.com

****

2

David Kates

From: Sparks, Robert <RSparks@caiso.com>
Sent: Tuesday, August 28, 2018 9:25 AM
To: David Kates
Cc: Millar, Neil; Strack (Sempra Energy Utilities), Jan; 'Maiga, Habibou A'; Chinn (Southern California Edison), Garry; Ayman Samaan; Chen, Frank
Subject: RE: Request for comments on Study Plan for LEAPS facility

David,

In response to Nevada Hydro's request for comments regarding the Proposed Study Plan for Use of Phase-Shifting Transformers at Case Springs ("Study Plan"), the following comments are provided. The comments focus on the assumptions that could impact the operational performance of the Case Springs phase shifters that are proposed to limit non-project power through the project's interconnection transmission lines.

The ISO understands that the objective of the Study Plan is to meet the study requirement of FERC's Study 34 that focuses on the operation of the proposed transformers. The Study Plan relies too narrowly on nominal power flow base cases (i.e. WECC 2021 Spring Light Load Case and the 2022 Summer Heavy Load Case) to adequately evaluate the performance of the phase shifting transformers. The selection of system conditions in those cases is not consistent with critical system conditions in actual transmission operations and planning assumptions used in recent California ISO transmission planning process cases. The Study Plan falls short in its approach to identifying the study scenarios even though five generation scenarios are identified in the Study Plan to evaluate what the impact would be on the phase shifter operation with LEAPS either pumping or generating. Although it is not easy to identify the most critical study scenarios to examine the impact, it is the ISO viewpoint that the study should be performed for a wide range of operating conditions in terms of the angular difference between the 500 kV bus at Lake Switchyard and the 230 kV bus at Case Springs. Based on the ISO study experience, the angular difference has a close correlation to the power flow loading conditions on the 230 kV path south of the SONGS switchyard. The power flows on this path should be adjusted to achieve 1400 to 1600 MW south-to-north in at least one scenario case and 1000 to 1300 MW north-to-south in other scenario cases. In addition, it appears that the contingencies listed are based on an outdated system configuration assumption. Therefore, the contingencies should be modified to reflect the planned system configuration as shown below.

1. One Case Springs phase shifter and associated 500/230 kV transformer
2. Lee Lake-Alberhill or Serrano 500 kV line (corrected)
3. Lee Lake-Valley 500 kV line (corrected)
4. Case Springs-Talega Tap-Capistrano 230 kV three-terminal line (corrected)
5. Case Springs-Escondido 230 kV line
6. Miguel-ECO 500 kV line with TL23040 IV 500 kV +RAS (corrected)
7. Ocotillo-Suncrest 500 kV line with TL23040 IV 500 kV +RAS (corrected)
8. Imperial Valley-North Gila 500 kV line
9. One of Suncrest-Sycamore 230 kV lines with TL23054/23055 +RAS (added)
10. SONGS-Talega 230 kV line
11. SONGS-Capistrano 230 kV line (added)
12. SONGS-Serrano 230 kV line (added)
13. SONGS-Viejo 230 kV line

David Kates

From: Maiga, Habibou A <HMaiga@semprautilities.com>
Sent: Wednesday, August 29, 2018 1:47 PM
To: David Kates
Cc: Millar, Neil; Strack, Jan; Chinn (Southern California Edison), Garry; Ayman Samaan; Chen, Frank; Mills, Pamela; Sparks, Robert
Subject: RE: Request for comments on Study Plan for LEAPS facility
Attachments: 2018_08_29_SDGE_Comments_LEAPS.PDF

David,

Please find attached SDG&E's response to Nevada Hydro's request for comments.

Best regards,
Habib

From: Sparks, Robert <RSparks@caiso.com>
Sent: Tuesday, August 28, 2018 9:25 AM
To: 'David Kates' <David@leapshydro.com>
Cc: Millar, Neil <nmillar@caiso.com>; Strack, Jan <JStrack@semprautilities.com>; Maiga, Habibou A <HMaiga@semprautilities.com>; Chinn (Southern California Edison), Garry <Garry.Chinn@sce.com>; Ayman Samaan <Ayman.Samaan@sce.com>; Chen, Frank <fchen@caiso.com>
Subject: [EXTERNAL] RE: Request for comments on Study Plan for LEAPS facility

David,

In response to Nevada Hydro's request for comments regarding the Proposed Study Plan for Use of Phase-Shifting Transformers at Case Springs ("Study Plan"), the following comments are provided. The comments focus on the assumptions that could impact the operational performance of the Case Springs phase shifters that are proposed to limit non-project power through the project's interconnection transmission lines.

The ISO understands that the objective of the Study Plan is to meet the study requirement of FERC's Study 34 that focuses on the operation of the proposed transformers. The Study Plan relies too narrowly on nominal power flow base cases (i.e. WECC 2021 Spring Light Load Case and the 2022 Summer Heavy Load Case) to adequately evaluate the performance of the phase shifting transformers. The selection of system conditions in those cases is not consistent with critical system conditions in actual transmission operations and planning assumptions used in recent California ISO transmission planning process cases. The Study Plan falls short in its approach to identifying the study scenarios even though five generation scenarios are identified in the Study Plan to evaluate what the impact would be on the phase shifter operation with LEAPS either pumping or generating. Although it is not easy to identify the most critical study scenarios to examine the impact, it is the ISO viewpoint that the study should be performed for a wide range of operating conditions in terms of the angular difference between the 500 kV bus at Lake Switchyard and the 230 kV bus at Case Springs. Based on the ISO study experience, the angular difference has a close correlation to the power flow loading conditions on the 230 kV path south of the SONGS switchyard. The power flows on this path should be adjusted to achieve 1400 to 1600 MW south-to-north in at least one scenario case and 1000 to 1300 MW north-to-south in other scenario cases. In addition, it appears that the contingencies listed are based on an outdated system configuration assumption. Therefore, the contingencies should be modified to reflect the planned system configuration as shown below.

1

14. One SONGS-Santiago 230 kV line

Note: For purposes of this study, the RAS can be assumed to consist of dropping generation connected to Imperial Valley substation as needed to alleviate overloads observed after taking the contingency.

One final comment is that recently completed or future generation interconnection studies of the LEAPS Project are intended to identify reliability impacts caused by the interconnection of the LEAPS Project to the ISO Controlled Grid, and this Study Plan is not intended to be an interconnection study.

Thank you,

Robert Sparks

Manager, Regional Transmission – South

California ISO

From: David Kates <David@leapshydro.com>
Sent: Monday, July 30, 2018 6:03 PM
To: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; dana.cabbell@sce.com
Cc: 'rwait@controltechnology.org' <rwait@controltechnology.org>
Subject: [EXTERNAL] Request for comments on Study Plan for LEAPS facility

Jan, Neil and Dana,

As you may be aware, Nevada Hydro is developing the LEAPS pumped storage project under FERC's licensing authority as their Project No. 14227.

In its June 15, 2018 letter to us, the FERC directed us to prepare a study plan regarding the use of phase shifting transformers as an element of the facility's operation. FERC directed that we request comments on this study plan from each of your organizations.

A copy of the draft plan is attached, including a copy of FERC's letter to us. For your convenience, I have also included copies of the executed interconnection agreements among our organizations.

FERC has directed that we allow 30 days for any response or comments you care to provide.

Please direct any questions or comments you may have to me. We are to file your comments along with our plan with FERC by mid-September.

Thank you in advance.

David

David Kates
The Nevada Hydro Company
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403

(707) 570-1866

2

1. One Case Springs phase shifter and associated 500/230 kV transformer
2. Lee Lake-Alberhill or Serrano 500 kV line (corrected)
3. Lee Lake-Valley 500 kV line (corrected)
4. Case Springs-Talega Tap-Capistrano 230 kV three-terminal line (corrected)
5. Case Springs-Escondido 230 kV line
6. Miguel-ECO 500 kV line with TL23040 IV 500 kV +RAS (corrected)
7. Ocotillo-Suncrest 500 kV line with TL23040 IV 500 kV +RAS (corrected)
8. Imperial Valley-North Gila 500 kV line
9. One of Suncrest-Sycamore 230 kV lines with TL23054/23055 +RAS (added)
10. SONGS-Talega 230 kV line
11. SONGS-Capistrano 230 kV line (added)
12. SONGS-Serrano 230 kV line (added)
13. SONGS-Viejo 230 kV line
14. One SONGS-Santiago 230 kV line

Note: For purposes of this study, the RAS can be assumed to consist of dropping generation connected to Imperial Valley substation as needed to alleviate overloads observed after taking the contingency.

One final comment is that recently completed or future generation interconnection studies of the LEAPS Project are intended to identify reliability impacts caused by the interconnection of the LEAPS Project to the ISO Controlled Grid, and this Study Plan is not intended to be an interconnection study.

Thank you,

Robert Sparks

Manager, Regional Transmission – South

California ISO

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Sent: Monday, July 30, 2018 6:03 PM
To: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; dana.cabbell@sce.com
Cc: 'rwait@controltechnology.org' <rwait@controltechnology.org>
Subject: [EXTERNAL] Request for comments on Study Plan for LEAPS facility

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2

A copy of the draft plan is attached, including a copy of FERC's letter to us. For your convenience, I have also included copies of the executed interconnection agreements among our organizations.

FERC has directed that we allow 30 days for any response or comments you care to provide.

Please direct any questions or comments you may have to me. We are to file your comments along with our plan with FERC by mid-September.

Thank you in advance.

David

David Kates
The Nevada Hydro Company
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403

(707) 570-1866

3

Contingency Conditions:

The assessment of multiple contingencies is part of NERC, WECC, and CAISO planning criteria. At a minimum, contingencies should include all major contingencies (230 kV and above) the CAISO and SDG&E plan to and operate to. These contingencies include N-1-1, G-1-N-1, and N-2 with their corresponding RAS operations.

Also, SDG&E is not aware of any planning standard that supports the following statement: "Contingency tests beyond the "N-1" tests would be beyond reasonable design planning for net through-flow on the LEAPS tie lines and may have more serious issues for other reasons."

Finally, the N-1 contingencies listed in the study plan should reflect today's system configuration and substation names. For example, the "Imperial Valley-Miguel 500 kV line" and the "Imperial Valley-Central South (formerly Sycamore) 500 kV line" N-1 contingencies should be replaced with the "Imperial Valley-East County 500 kV line", "Imperial Valley-Ocotillo 500 kV line", "East County-Miguel 500 kV line", "Ocotillo - Suncrest 500 kV line".

Timeline:

The study plan does not include a timeline and milestone dates when potential preliminary results could be shared with the CAISO, SDG&E, and SCE. This practice is customary in studies that impact several entities.

Setting of Phase-Shifting Transformers (PST)

Since this is a study focused on the operation of the PSTs, typical technical data for PSTs are essential for proper evaluation. These include angle range, impedance, impedance table, continuous rating, emergency rating (with length of time for the rating specified).

To prevent non-project power to flow in the study, operation of the pump storage project will rely heavily on the operation of the PSTs. SDG&E recommends setting the phase shifters in the study the same way they would be operated in the field. Also, additional information should be provided, including but not limiting to:

1. Clarification should be given on whether the PSTs are expected to be operated manually or automatically (automatic angle control or MW flow control modes).
2. how will the PSTs be set pre-contingency (flow control mode, at specified tap position)?
3. How would the PSTs operate post-contingency?
    a. maintaining the same flow as that pre-contingency?
    b. If so, how long does it take to move a tap position?
    c. If not, what are the PSTs designed to do (freeze at the same tap as that in pre-contingency?)
4. If bypass operation is needed, how will it be implemented, for instance, move to neutral tap position then close bypass switch?

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SDG&E Comments

on

"Proposed Study Plan for Use of Phase-Shifting Transformers at Case Springs"
Lake Elsinore Advanced Pumped Storage
FERC Project No. 11427
July 30, 2018 draft

SDG&E understands the focus of the study requested by FERC is to evaluate the operation of the phase-shifting transformers installed at the Case Springs substation. Their purpose is to prevent non-project power to flow between the Case Springs substation (SDG&E system) and the Lake switchyard (SCE system). There are areas of the study plan SDG&E believes deserve additional attention and clarifications. These areas are listed below:

Selection of Power Flow Cases

As an alternative to WECC cases, SDG&E recommends using the 2023 power flow cases from the CAISO 2018-2019 Transmission Planning process. These cases are more recent and have also been reviewed by the CAISO, SCE, and SDG&E. At a minimum, cases should be selected based on a potential realistic in-service date of the project.

System Conditions to be Used in Study

It is not clear what is meant by "normal conditions" in the study plan. Although SONGS has retired, the increase of renewable generation is causing flows south-to-north (SDG&E to SCE) to go as high as 1500 MW. Flows north-to-south (SCE to SDG&E) as high as 1000 MW have also been observed. for these reasons, SDG&E believes at least two additional baseline cases with no phase shifters should be modeled to identify the natural flow of MW when either high south-to-north or north-to-south flows occur. These cases should be used to benchmark cases where the phase-shifting transformers will be actively controlling the flows. Furthermore, typical stressed system scenarios are already identified in the CAISO 2018-2019 study plan. SDG&E encourages their inclusion in the study plan.

The study plan does not define the "minimum net through-flow" term and the "SDG&E internal generation" term. These terms can have different meanings and impact the results. SDG&E recommends specifying upfront what would be an acceptable range for the "minimum net through-flow" and the "SDG&E internal generation" cut plane.

David Kates

From: Ayman Samaan <Ayman.Samaan@sce.com>
Sent: Thursday, August 30, 2018 12:52 PM
To: David Kates
Cc: Millar, Neil; Strack, Jan; Garry Chinn; Chen, Frank; Mills, Pamela; Sparks, Robert; Maiga, Habibou A; Lawren Minor; Godofredo De Vera; Robert Kang
Subject: RE: (External):RE: Request for comments on Study Plan for LEAPS facility
Attachments: SCE Comments - NH Proposed LEAPS study.pdf

Mr. Kates,

Attached is SCE's response to Nevada Hydro's request for comments.

Thank you

Ayman Samaan, P.E.
Transmission Planning
Southern California Edison
3 Innovation Way
Pomona, CA 91768
Office: 909-274-1603
Cell: 626-589-6501

From: Maiga, Habibou A [mailto:HMaiga@semprautilities.com]
Sent: Wednesday, August 29, 2018 1:47 PM
To: 'David Kates' <David@leapshydro.com>
Cc: Millar, Neil <nmillar@caiso.com>; Strack, Jan <JStrack@semprautilities.com>; Garry Chinn <Garry.Chinn@sce.com>; Ayman Samaan <Ayman.Samaan@sce.com>; Chen, Frank <fchen@caiso.com>; Mills, Pamela <PMills@semprautilities.com>; Sparks, Robert <RSparks@caiso.com>
Subject: (External):RE: Request for comments on Study Plan for LEAPS facility

David,

Please find attached SDG&E's response to Nevada Hydro's request for comments.

Best regards,
Habib

From: Sparks, Robert <RSparks@caiso.com>
Sent: Tuesday, August 28, 2018 9:25 AM
To: 'David Kates' <David@leapshydro.com>
Cc: Millar, Neil <nmillar@caiso.com>; Strack, Jan <JStrack@semprautilities.com>; Maiga, Habibou A <HMaiga@semprautilities.com>; Chinn (Southern California Edison), Garry <Garry.Chinn@sce.com>; Ayman Samaan <Ayman.Samaan@sce.com>; Chen, Frank <fchen@caiso.com>
Subject: [EXTERNAL] RE: Request for comments on Study Plan for LEAPS facility

David,

In response to Nevada Hydro's request for comments regarding the Proposed Study Plan for Use of Phase-Shifting Transformers at Case Springs ("Study Plan"), the following comments are provided. The comments focus on the

1

assumptions that could impact the operational performance of the Case Springs phase shifters that are proposed to limit non-project power through the project's interconnection transmission lines.

The ISO understands that the objective of the Study Plan is to meet the study requirement of FERC's Study 34 that focuses on the operation of the proposed transformers. The Study Plan relies too narrowly on nominal power flow base cases (i.e. WECC 2021 Spring Light Load Case and the 2022 Summer Heavy Load Case) to adequately evaluate the performance of the phase shifting transformers. The selection of system conditions in those cases is not consistent with critical system conditions in actual transmission operations and planning assumptions used in recent California ISO transmission planning process cases. The Study Plan falls short in its approach to identifying the study scenarios even though five generation scenarios are identified in the Study Plan to evaluate what the impact would be on the phase shifter operation with LEAPS either pumping or generating. Although it is not easy to identify the most critical study scenarios to examine the impact, it is the ISO viewpoint that the study should be performed for a wide range of operating conditions in terms of the angular difference between the 500 kV bus at Lake Switchyard and the 230 kV bus at Case Springs. Based on the ISO study experience, the angular difference has a close correlation to the power flow loading conditions on the 230 kV path south of the SONGS switchyard. The power flows on this path should be adjusted to achieve 1400 to 1600 MW south-to-north in at least one scenario case and 1000 to 1300 MW north-to-south in other scenario cases. In addition, it appears that the contingencies listed are based on an outdated system configuration assumption. Therefore, the contingencies should be modified to reflect the planned system configuration as shown below.

1. One Case Springs phase shifter and associated 500/230 kV transformer
2. Lee Lake-Alberhill or Serrano 500 kV line (corrected)
3. Lee Lake-Valley 500 kV line (corrected)
4. Case Springs-Talega Tap-Capistrano 230 kV three-terminal line (corrected)
5. Case Springs-Escondido 230 kV line
6. Miguel-ECO 500 kV line with TL23040 IV 500 kV +RAS (corrected)
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12. SONGS-Serrano 230 kV line (added)
13. SONGS-Viejo 230 kV line
14. One SONGS-Santiago 230 kV line

Note: For purposes of this study, the RAS can be assumed to consist of dropping generation connected to Imperial Valley substation as needed to alleviate overloads observed after taking the contingency.

One final comment is that recently completed or future generation interconnection studies of the LEAPS Project are intended to identify reliability impacts caused by the interconnection of the LEAPS Project to the ISO Controlled Grid, and this Study Plan is not intended to be an interconnection study.

Thank you,

Robert Sparks

2

Manager, Regional Transmission – South

California ISO

From: David Kates <David@leapshydro.com>
Sent: Monday, July 30, 2018 6:03 PM
To: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; dana.cabbell@sce.com
Cc: 'rwait@controltechnology.org' <rwait@controltechnology.org>
Subject: [EXTERNAL] Request for comments on Study Plan for LEAPS facility

Jan, Neil and Dana,

As you may be aware, Nevada Hydro is developing the LEAPS pumped storage project under FERC's licensing authority as their Project No. 14227.

In its June 15, 2018 letter to us, the FERC directed us to prepare a study plan regarding the use of phase shifting transformers as an element of the facility's operation. FERC directed that we request comments on this study plan from each of your organizations.

A copy of the draft plan is attached, including a copy of FERC's letter to us. For your convenience, I have also included copies of the executed interconnection agreements among our organizations.

FERC has directed that we allow 30 days for any response or comments you care to provide.

Please direct any questions or comments you may have to me. We are to file your comments along with our plan with FERC by mid-September.

Thank you in advance.

David

David Kates
The Nevada Hydro Company
3510 Unocal Place, Suite 200
Santa Rosa, CA 95403

(707) 570-1866

3

Comments of the Southern California Edison Company

on

"Proposed Study Plan for Use of Phase-Shifting Transformers at Case Springs"
Lake Elsinore Advanced Pumped Storage
FERC Project No. 14227

August 30, 2018

Introduction

Southern California Edison Company (SCE) appreciates the opportunity to respond to the Nevada Hydro Company's (Nevada Hydro) request for comments regarding the Proposed Study Plan for Use of Phase-Shifting Transformers at the proposed Case Springs Substation, sent by Nevada Hydro to SCE on July 30, 2018. We understand that the purpose of the proposed study is to demonstrate that the use of Phase Shifters will limit non-project power flowing through the Lake Elsinore Advanced Pumped Storage (LEAPS) transmission lines. The following represents SCE's initial comments and recommendations:

System Conditions to be Used in the Study:

Nevada Hydro proposed using the WECC 2021 Spring Light Load Case and the 2022 Summer Heavy Load Case to evaluate the adequacy of the Phase Shifters. The selection of these cases may not reflect realistic timing for the LEAPS Project or the most critical system conditions. To more accurately model the LEAPS project, it should be modeled using a base case that accurately reflects queued generation in both SCE and SDG&E's electrical system. Such queued generation is not shown accurately in the WECC load cases. Therefore, we invite Nevada Hydro to discuss alternative base cases that could be used in lieu of the 2021 and 2022 base cases listed above.

Study of the Case Springs Phase-Shifter Operations under Normal System Operations

SCE strongly recommends that the Normal system operation study includes the following scenarios with the LEAPS Project pumping, generating, and idling:

- High queued generation dispatch in SCE's Electrical system, including, but not limited to, the Devers area and high generation in SDG&E area.
- High north-to-south flow and south-to-north flow at SONGS switchrack. The flow should be adjusted to achieve approximately 1500 MW south-to-north in the Spring off – peak case and approximately 1200 MW on the north-to-south Summer peak case.
- Maximum flow on Path 46
- Maximum flow on Path 42

1

Study of the Case Springs Phase-shifter Operations under Contingency Conditions

SCE recommends that the proposed study be consistent with NERC, WECC, and CAISO planning criteria for contingency scenarios, and consistent with CAISO generation interconnection study procedures. Accordingly, SCE recommends that Nevada Hydro go beyond the small pool of N-1 scenarios identified in the proposed study and, instead, expand the contingency list to include all N-1, G-1-N-1, N-1-1 and N-2 scenarios[1] with their corresponding RAS operations.

In addition, the following specific N-1s should be monitored for potential system performance impacts:

- N-1 of Serrano to Loop-In 500 kV Sub transmission line
- N-1 of Loop-In 500 kV Sub to Valley Substation transmission line
- N-1 of Devers No.1AA or No.2AA 500/220 kV transformer banks
- N-1 of Devers-Valley No.1 and/or No.2 500 kV transmission lines (for pumping scenario)
- N-1 of the proposed Phase Shifters
- N-1 Delaney – Colorado River 500 kV Transmission Line
- N-1 Colorado River - Palo Verde 500 kV Transmission Line
- N-1 Devers – Red Bluff No.1 or No. 2 500 kV transmission lines

Future Studies

SCE notes that an operational study will be required one year prior to the interconnection of the LEAPS Project, to account for changes in the generation interconnection queue and the transmission system since the Interconnection Facilities Study was completed. This operational study may identify Participating TO's Reliability Network Upgrades and Participating TO's Delivery Network Upgrades that are different from those included in the LEAPS TOT132 (Q#72) LGIA.

Please contact Ayman Samaan of SCE should you have further questions. He may be reached at Ayman.Samaan@sce.com.

[1] https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=TPL-001-4&title=Transmission%20System%20Planning%20Performance%20Requirements&jurisdiction=United%20States

2

dkates@sonic.net

From: Sparks, Robert <RSparks@caiso.com>
Sent: Monday, October 15, 2018 10:18 AM
To: Depenbrock (Power Technologies), Fred; ayman.samaan@sce.com; hmaiga@semprautilities.com
Cc: dkates@sonic.net
Subject: RE: [EXTERNAL] Information Request Re: FERC Study 34 (Nevada Hydro)

Fred,

The two power flow cases described below have been posted to the ISO Market Participant Portal under [Transmission Planning]/[2018/2019 Transmission Planning Process]/[Reliability Assessment Base Cases] with the following name:

CAISO_2023OP_Cases_EPC

Robert Sparks
CAISO

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Thursday, September 27, 2018 12:32 PM
To: Sparks, Robert <RSparks@caiso.com>; ayman.samaan@sce.com; hmaiga@semprautilities.com
Cc: dkates@sonic.net
Subject: Re: [EXTERNAL] Information Request Re: FERC Study 34 (Nevada Hydro)

Robert,

I've had an NDA with CAISO for a decade or more, if I recall correctly. I don't know if they expire or not. So, I will attempt to move forward with getting the cases already available through the ISO Market Participant Portal. Thank you. And, yes, I do concur with this approach to the two high-stress cases. I'll use the existing cases from the portal for the first steps of the study, and will gratefully receive the high-stress cases when they are available.

Thanks,

Fred
Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)
fdepenbrock@aol.com
Standard Time, RSparks@caiso.com writes:

> Fred,
>
> Thank you for considering our comments in the required Study No. 34 and sharing your study methodology and process. We agree that 2023 is an appropriate study year based on our understanding of the Study. The 2023 power flow cases from the ISO's 2018-2019 Transmission Planning Process can be used as the starting point for your study cases. In addition to the power flow cases that are currently posted on the ISO Market Participant Portal (which requires an executed NDA), the ISO is offering to develop additional power flow cases reflecting

1

the high stress operation conditions on the south of San Onofre path. The high north-to-south flow case would be produced based on the 2023 off-peak baseline scenario by adjusting the generation dispatch in the SCE and SDG&E service areas. Similarly, the high south-to-north flow case can be produced based on the 2023 off-peak sensitivity study case with heavy renewable generation output in the San Diego and Imperial Valley areas and reduced gas generation output in the SCE area. Once you concur with this approach, the ISO will begin preparing these two cases and post them on the MPP in PSLF EPC format in about two weeks.

For your information, below are an instruction for accessing the ISO Market Participant Portal (MPP).

http://www.caiso.com/Documents/RegionalTransmissionNonDisclosureAgreementSubmissionInstructions.pdf

Please let us know if you have any questions. For the ISO, please provide progress updates to rsparks@caiso.com.

Thanks You,

Robert Sparks

Manager, Regional Transmission – South

California ISO

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Friday, September 21, 2018 12:49 PM
To: Sparks, Robert <RSparks@caiso.com>; ayman.samaan@sce.com; hmaiga@semprautilities.com
Cc: dkates@sonic.net
Subject: [EXTERNAL] Information Request Re: FERC Study 34 (Nevada Hydro)

To: Robert Sparks,

Ayman Samaan, and

Habibou A. Maiga

2

Thank you for your comments regarding the initial study plan submitted for your review and suggestions on the LEAPS generation tie line phase shifter range requirements initiated by FERC . I have prepared the attached Information Request on behalf of Nevada Hydro in order to begin the study. This also includes a summary of the study process. We appreciate you input already given, and look forward to followup discussions once we have been able to get under way. As noted in the attachment, we have included almost all of your suggestions to the best of our understanding of them.

Since we would like to get the study under way ASAP, I hope you will be able to supply me with the requested information at your earliest convenience. For the load flow cases, it would be a help to me if you could supply them in PSS/E format. Also, raw data files, rather than saved cases would be helpful. Although it is likely that all three of you have the cases requested, please decide among yourselves who will forward them to me.

Best regards,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

3

dkates@sonic.net

From: Sparks, Robert <RSparks@caiso.com>
Sent: Thursday, November 15, 2018 3:20 PM
To: Depenbrock (Power Technologies), Fred; hmaiga@semprautilities.com; 'Ayman Samaan'
Cc: rwait@controltechnology.org; dkates@sonic.net
Subject: RE: [EXTERNAL] Help in Understanding the High Renewables Case Title

Fred,

The case with N-S flow into SDG&E was built from the 2023 Spring Off-Peak SDG&E main transmission case described in Table 4.11-1 in the study plan. It is also identified as B5-23OP in the presentation below.

The case with S-N flow from SDG&E was built from the 2023 Spring Off-Peak SDG&E Main sensitivity case described in Table 4.11-2 in the study plan. It is also identified as S2-23OP HRPS in the presentation.

Starting from these cases, the gas generation was the primary adjustment to meet the target path flow.

Here is our study plan.

http://www.caiso.com/Documents/Final2018-2019StudyPlan.pdf

See SDG&E Main System Preliminary Reliability Assessment Results presentation section:

http://www.caiso.com/Documents/Day1-Presentations-2018-2019TPPMeeting-Sep20-21-2018.pdf

Robert

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Thursday, November 15, 2018 1:48 PM
To: hmaiga@semprautilities.com; aymen.samaan@sce.com; Sparks, Robert <RSparks@caiso.com>
Cc: rwait@controltechnology.org; dkates@sonic.net
Subject: [EXTERNAL] Help in Understanding the High Renewables Case Title

Dear Advisors and Commenters,

I've begun to work on the High Renewables Case you sent me. I don't understand much of anything contained in the case title. From the file name I get a pretty good idea. It would be a big help if you could unpack the meaning of the Case Title. Also, what year and season is presented in the case. I guess it's pretty obvious that it's full daylight.

Thanks for the help.

Best regards,

Fred
Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)

1

352-256-4475 (Cell)
fdepenbrock@aol.com

dkates@sonic.net

From: Sparks, Robert <RSparks@caiso.com>
Sent: Thursday, November 15, 2018 4:36 PM
To: Depenbrock (Power Technologies), Fred; 'hmaiga@semprautilities.com'; 'Ayman Samaan'
Cc: 'rwait@controltechnology.org'; 'dkates@sonic.net'
Subject: RE: [EXTERNAL] Help in Understanding the High Renewables Case Title

Please see corrections below.

From: Sparks, Robert
Sent: Thursday, November 15, 2018 3:20 PM
To: Depenbrock (Power Technologies), Fred <fdepenbrock@aol.com>; hmaiga@semprautilities.com; 'Ayman Samaan' <Ayman.Samaan@sce.com>
Cc: rwait@controltechnology.org; dkates@sonic.net
Subject: RE: [EXTERNAL] Help in Understanding the High Renewables Case Title

Fred,

The case with N-S flow into SDG&E was built from the 2023 Spring Off-Peak SDG&E main transmission case described in Table 4.11-1 in the study plan. It is also identified as B5-23OP in the presentation below.

The case with S-N flow from SDG&E was built from the 2023 Spring Off-Peak SCE Metro sensitivity case described in Table 4.11-2 in the study plan. It is also identified as S2 in the presentation.

Starting from these cases, the gas generation was the primary adjustment to meet the target path flow.

Here is our study plan.

http://www.caiso.com/Documents/Final2018-2019StudyPlan.pdf

See SDG&E Main System Preliminary Reliability Assessment Results and SCE Metro Area Preliminary Reliability Assessment Results presentation sections:

http://www.caiso.com/Documents/Day1-Presentations-2018-2019TPPMeeting-Sep20-21-2018.pdf

Robert

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Sent: Thursday, November 15, 2018 1:48 PM
To: hmaiga@semprautilities.com; aymen.samaan@sce.com; Sparks, Robert <RSparks@caiso.com>
Cc: rwait@controltechnology.org; dkates@sonic.net
Subject: [EXTERNAL] Help in Understanding the High Renewables Case Title

Dear Advisors and Commenters,

1

I've begun to work on the High Renewables Case you sent me. I don't understand much of anything contained in the case title. From the file name I get a pretty good idea. It would be a big help if you could unpack the meaning of the Case Title. Also, what year and season is presented in the case. I guess it's pretty obvious that it's full daylight.

Thanks for the help.

Best regards,

Fred
Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)
fdepenbrock@aol.com

2

dkates@sonic.net

From: Sparks, Robert <RSparks@caiso.com>
Sent: Thursday, November 15, 2018 9:48 AM
To: Depenbrock (Power Technologies), Fred; hmaiga@semprautilities.com; 'Ayman Samaan'
Cc: dkates@sonic.net; rwait@controltechnology.org
Subject: RE: [EXTERNAL] Change in Net Ties Policy between SDG&E and CFE?

Fred,

The base cases that were recently provided to Nevada Hydro for purposes of your FERC "Study 34" reflect energy transfers between CENACE (CFE) and the CAISO (400 MW N-S and 300 MW S-N) that are based on recent historical flow data.

Robert Sparks
CAISO

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Thursday, November 15, 2018 7:10 AM
To: aymen.samaan@sce.com; hmaiga@semprautilities.com; Sparks, Robert <RSparks@caiso.com>
Cc: dkates@sonic.net; rwait@controltechnology.org
Subject: [EXTERNAL] Change in Net Ties Policy between SDG&E and CFE?

Dear Advisors and Commenters,

It was my long-standing sense that the net tie flows between SDG&E and CFE should be zero MW. This would be measured at the Imperial Valley 230 kV substation on the CFE side of the phase shifters and the Otay Mesa 230 kV bus (Rosita and Tijuana on the CFE ends). Has this policy been changed? And, if so, to what? Please let me have your comments ASAP.

With thanks,

Fred
Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)
fdepenbrock@aol.com

1

SECTION 2

INCLUDE THE AGREED UPON TRANSMISSION STUDY CASES AND ASSOCIATED CONTINGENCIES IN THE TRANSMISSION STUDY

This page is intentionally left blank.

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Friday, September 21, 2018 12:49 PM
To: rsparks@caiso.com; ayman.samaan@sce.com; hmaiga@semprautilities.com
Cc: dkates@sonic.net
Subject: Information Request Re: FERC Study 34 (Nevada Hydro)
Attachments: Data Request for Study 34.docx

To: Robert Sparks,
Ayman Samaan, and
Habibou A. Maiga

Thank you for your comments regarding the initial study plan submitted for your review and suggestions on the LEAPS generation tie line phase shifter range requirements initiated by FERC . I have prepared the attached Information Request on behalf of Nevada Hydro in order to begin the study. This also includes a summary of the study process. We appreciate you input already given, and look forward to followup discussions once we have been able to get under way. As noted in the attachment, we have included almost all of your suggestions to the best of our understanding of them.

Since we would like to get the study under way ASAP, I hope you will be able to supply me with the requested information at your earliest convenience. For the load flow cases, it would be a help to me if you could supply them in PSS/E format. Also, raw data files, rather than saved cases would be helpful. Although it is likely that all three of you have the cases requested, please decide among yourselves who will forward them to me.

Best regards,

Fred

Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)
fdepenbrock@aol.com

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Nevada Hydro Company
Lake Elsinore Advanced Pumped Storage (LEAPS) Project
FERC Required Study No. 34
Information Request from Nevada Hydro

The Nevada Hydro Company (NH) appreciates the several comments received from the California Independent System Operator (CAISO), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE), and wishes to implement the required Study No. 34 using those comments as fully as possible.

Study Period Choices

All three commenting entities recommended that the study period be pushed further into the future from the 2021 and 2022 period initially proposed by NH. SDG&E suggested in its comments a specific time period, namely the 2023 power flow cases from the CAISO 2018-2019 Transmission Planning Process. NH believes this is an appropriate package of cases for a prospective in-service date of 2023 or slightly earlier, given the rapidly changing system conditions in the California electricity market. This is seen as a good balance between not catching changes in the system already under study and a set of less assured configuration changes yet to be devised or understood to be needed.

Since NH has no known direct access to these cases, we request that they be made available to NH as soon as reasonably possible, or that a pathway to them be provided.

Normal and Contingency Analysis

For system normal conditions (no contingencies) the provided load flow cases will have an existing set of generating schemes. There may be variations of these generating schemes that could also be applied, assuming that such variations were used and approved by the participants. NH would appreciate receiving any such reasonable generation shift schedules as they may apply to the specific cases received. All three of the commenters spoke of the need to stress the South of SONGS Path in both directions. NH would use such changes that were needed to produce those stress conditions. Also, it would be helpful to identify the system conditions that caused these high stress conditions on the Path.

All cases would be produced for LEAPS in full generation mode, full pumping mode, and out of service, and with varying sources of pumping power and delivery recipient. It would be efficacious for the commenting entities to supply NH with their estimates of generation changes needed to either pump LEAPS or receive output from it. Otherwise, NH will have to make its own estimate of pumping power sources and generation recipient internal generation reductions.

The full range of contingency testing would be conducted (N-1, N-1-1, N-1,G-1, and N-2 with RAS) once NH is able to establish a range of normal operating cases. These tests would be applied to all the normal operating (pre-contingency) cases, and will include the specific contingencies mentioned in the commentor's submittals. These tests will provide a layered set by base case of the phase shifter original positions and the position changes caused by the contingencies needed to minimize non-LEAPS through-flow. These results would be placed in a table to show the range of phase shifter positions needed to maintain the minimum non-LEAPS flow on the LEAPS generator leads.

Other matters

It is anticipated that a study on operating issues will be required, but is not included here. That study may be outside the interest of the FERC in its Required Study No. 34.

Once having received the case files and begun the analysis, NC will provide updates on progress to the appropriate staff members within the three commenting entities. NH requests the names and e-mail addresses of those designated to receive these progress updates.

dkates@sonic.net

Subject: FW: Statur Report on Study 34

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Friday, September 28, 2018 12:54 PM
To: dkates@sonic.net
Cc: rwait@controltechnology.org
Subject: Statur Report on Study 34

David, Rex,

As of this afternoon a representative of CAISO e-mailed me that he had spoken with Robert Sparks about our using the CAISO 2023 load flow cases for our Study 34. Mr. Sparks has agreed, in fact concurs with such use. So, the CAISO rep will be sending me the cases "soon".

Best regards,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Wednesday, October 10, 2018 9:18 AM
To: rsparks@caiso.com
Subject: Request for 2023 Cases

Mr. Sparks,

Over two weeks ago we talked about our using the CAISO 2023 cases for the study we are conducting on phase shifter use for the LEAPS project. It was my understanding that CAISO was willing to supply me with those cases, and that I had the necessary quals to receive them. So far I have not received them and am writing to continue my request for you to provide them to me. I would appreciate your action on this request ASAP.

Regards,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Wednesday, October 17, 2018 1:28 PM
To: uaarequests@caiso.com
Cc: sdainard@caiso.com; rsparks@caiso.com; dkates@sonic.net
Subject: Next Steps for Obtaining power flow cases

I want to thank Marli Sherlock and Steve Dainard for their support in helping me become qualified to receive the two power flow cases Robert Sparks has proposed I use to conduct a study. I believe I have correctly completed the "User Access Administrator Requirements" form. That was yesterday. So far today I have no idea about what I must do next to move forward with this process. Please give me the guidance I need to move ahead.

With thanks,

Fred

Fred Depenbrock

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Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Monday, October 22, 2018 12:36 PM
To: rsparks@caiso.com; dkates@sonic.net
Subject: Re: [EXTERNAL] rsparks@caiso.com has added you to Secure Workspace: LEAPS

Robert,

I have been able to download the two cases in EPC format, one for high south flow on Path South-of-SONGS, and one for high north flow on South-of-SONGS.

Thanks,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

In a message dated 10/22/2018 12:21:49 PM Eastern Standard Time, rsparks@caiso.com writes:

> caiso-hc21.accellion.net

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Friday, November 9, 2018 1:04 PM
To: RSparks@caiso.com
Subject: 2018-19 Transmission Plan

Hi Robert,

I've been able to get the load flow cases you sent me running and have pretty well settled on the system normal (pre-contingency) conditions. But I find some of the data not all that helpful without a copy of the Transmission Plan. Is it possible for you to send/get me a copy so I can fill in some of the assumptions that are part of the background. I would much appreciate it.

Thanks,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Thursday, November 15, 2018 7:10 AM
To: aymen.samaan@sce.com; hmaiga@semprautilities.com; rsparks@caiso.com
Cc: dkates@sonic.net; rwait@controltechnology.org
Subject: Change in Net Ties Policy between SDG&E and CFE?

Dear Advisors and Commenters,

It was my long-standing sense that the net tie flows between SDG&E and CFE should be zero MW. This would be measured at the Imperial Valley 230 kV substation on the CFE side of the phase shifters and the Otay Mesa 230 kV bus (Rosita and Tijuana on the CFE ends). Has this policy been changed? And, if so, to what? Please let me have your comments ASAP.

With thanks,

Fred

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352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Thursday, November 15, 2018 11:27 AM
To: RSparks@caiso.com; hmaiga@semprautilities.com; Ayman.Samaan@sce.com
Cc: dkates@sonic.net; rwait@controltechnology.org
Subject: Re: [EXTERNAL] Change in Net Ties Policy between SDG&E and CFE?

Thank you, Robert. I gather from what you said below that there is no policy or requirement in place. Is that true.

Fred

In a message dated 11/15/2018 12:48:22 PM Eastern Standard Time, RSparks@caiso.com writes:

> Fred,
>
> The base cases that were recently provided to Nevada Hydro for purposes of your FERC "Study 34" reflect energy transfers between CENACE (CFE) and the CAISO (400 MW N-S and 300 MW S-N) that are based on recent historical flow data.
>
> Robert Sparks
>
> CAISO
>
> **From:** fdepenbrock@aol.com <fdepenbrock@aol.com>
> **Sent:** Thursday, November 15, 2018 7:10 AM
> **To:** aymen.samaan@sce.com; hmaiga@semprautilities.com; Sparks, Robert <RSparks@caiso.com>
> **Cc:** dkates@sonic.net; rwait@controltechnology.org
> **Subject:** [EXTERNAL] Change in Net Ties Policy between SDG&E and CFE?
>
> Dear Advisors and Commenters,
>
> It was my long-standing sense that the net tie flows between SDG&E and CFE should be zero MW. This would be measured at the Imperial Valley 230 kV substation on the CFE side of the phase shifters and the Otay Mesa 230 kV bus (Rosita and Tijuana on the CFE ends). Has this policy been changed? And, if so, to what? Please let me have your comments ASAP.
>
> With thanks,

1

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Monday, December 3, 2018 6:52 AM
To: rsparks@caiso.com
Cc: dkates@sonic.net; ziad@zglobalbiz.onmicrosoft.com; rwait@controltechnology.org
Subject: Access to RAS information

Robert,

When we were discussing the range of contingencies to test for the phase shifter study, you mentioned that we should include the application of any Remedial Action Schemes for contingencies that may have an associated RAS. Unfortunately, what I already have are out of date, and I was denied permission by WECC to receive them. I was able to get the Path Rating Catalog and the system maps, but don't have the right credentials to receive a copy of the RAS listing. So, I need some help from you on how to accomplish what we already agreed to do. Please let me have your thoughts on this problem.

By the way, in doing some testing on the spring loads cases of the N-1-1 for Ocotillo-Suncrest and Eco-Miguel, with adjustments between, I didn't have any problems with the system in the IV area. It was close but not something that couldn't be handled. The peak load situation is a different matter.

Best regards,

Fred

Fred Depenbrock

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Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

SECTION 3

COMPLETE THE AGREED UPON TRANSMISSION STUDY CASES AND WRITE A DRAFT REPORT

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dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Monday, November 5, 2018 2:27 PM
To: dkates@sonic.net; rwait@controltechnology.org
Subject: Status on Phase Shifter Study

David, Rex,

I now have both CAISO cases fully functioning and can move ahead on the actual intended study. So far, the evidence is this:

- on the heavy South to North flow south of SONGS case, the angular difference between Talega and Alberhill is 4 degrees

- on the heavy North to South flow south of SONGS the angular difference is 24 degrees.

With an angular shift of up to 32 degrees on the phase shifters and the impedance increase at high phase shifter angles this should be adequate without any switching of the 500 kV or special actions.

My exploration of the high north to south flow case shows a LOT of generation east of Devers. As time goes on much of this (some coal, some gas-fired) will be retired. This will lessen the stress on the phase shifters. So what we have is the worst case situation to test at the start. Especially dramatic would be the eventual retirement of Palo Verde.

I'll keep you updated on finding as discovered.

Best,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

1

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Thursday, November 29, 2018 1:27 PM
To: rwait@controltechnology.org; dkates@sonic.net
Subject: Power Flow N-1, N-1 results in SDGE
Attachments: High_PV_Area_of_Interest_N-1-1_Loss_of_IV-ECO_IV-OCO_LEAPS_Off_After-PS_Changes.jpg; High_PV_CFE_N-1-1_Loss_of_IV-ECO_IV-OCO_LEAPS_Off_After-PS_Changes.jpg; High_PV_IV230_N-1-1_Loss_of_IV-ECO_IV-OCO_LEAPS_Off_After-PS_Changes.jpg; High_PV_IV500_N-1-1_Loss_of_IV-ECO_IV-OCO_LEAPS_Off_After-PS_Changes.jpg; High_PV_Otay_Mesa_Area_N-1-1_Loss_of_IV-ECO_IV-OCO_LEAPS_Off_After-PS_Changes.jpg; Area_of_Interest_High_PV_N-1-1_OCO-Suncrest_Eco-Miguel_LEAPS_Gen_500.jpg

Hi Rex,

The two load flow cases given to me were 2023 Spring cases with high Renewable generation in one case and minimal renewable generation in the other. The results evident from these two cases is that for the high renewables case the flow on Path 44 (South of SONGS) [no longer an official WECC path, but one steeped deeply in planners minds] was about 1,600 MW south to north. For the low renewables case the Path 44 flow is north to south of about 1,300 MW. It appears that those case choices that were supplied to me by CAISO were done so with the recommendation of SDG&E and SCE, as well as CAISO.

The high renewables case has, among others, a single 1,000 MW solar farm at full output in the Imperial Valley east of the Imperial Valley Substation. Thus, there is a lot of SDG&E's supply that comes from East of Imperial Valley or radial off of IV. So, contingencies west of Imperial Valley have a serious impact on SDG&E's ability to meet load. In fact, the worst "normal" contingency set is the loss of the Eco-Miguel 500 kV line, and then after system readjustment, the loss of the Ocotillo-Suncrest 500 kV line. There is a combined total generation connected to Eco and Ocotillo of about 500 MW, so this just adds to the pile of trouble.

The two cases given me have a total in-service load of about 3760 MW. However, for each load bus there is another load that is not in service. This totals about 5300 MW. The estimated peak demand for 2023 from the CEC Load Forecast used for the Integrated Resource Plan has a mid-range peak of 5035 MW and a high-range peak of 5143 MW.

The cumulative effects of the retirement of SONGS and the shutdown of Encina with only partial replacement at that site puts the total generation in the SDG&E load pocket at a net deficit versus load. And, the absence of SONGS to keep the area's voltage propped up makes the system even more vulnerable to voltage collapse or loss of synchronism. SDG&E is highly dependent on power delivered over its interties.

I'm attaching five flow diagrams that help you to understand the issue. These are taken from tests of an N-1-1 contingency package. That is- a line is lost, the system has changes made to accommodate the next possible contingency, and then the second item (in this case a 500 kV line). The diagrams show these results.

I've also attached a diagram with LEAPS running at 500 MW with flow toward SDG&E.

Now, increase the load in San Diego by a thousand or more MW and you have a system crash on your hands.

I have about three more days of analysis to fill out the portfolio demonstrating that the phase shifters can manage whatever is needed to manage flows from Alberhill to Case Springs. I've done a few pages of report writing, but that still leaves at least an additional week to complete the first draft. I guess we will have to decide on who all will have any editing input. If CAISO, SCE and SDG&E have edit opportunity, this may take a while. And who knows what they may require changed to get their buy-in. And what about yours and David's input?

1

Best,

Fred

In a message dated 11/28/2018 2:26:56 PM Eastern Standard Time, rwait@controltechnology.org writes:

> Hello Fred; Important!
>
> Hey Fred; we had our weekly meeting and discussed your PF results
>
> run in SDGE N-1, N-1 issues:
>
> We need two paragraphs of what base case was used,
>
> what the N-1, N-1 conditions were; then what the overloads
>
> or instability occurred and where. Just simple observations.
>
> Then a third paragraph of LEAPS ON (Phase Shifter case);
>
> Then what would improve in the observations above.
>
> So three paragraphs.
>
> Then for planning when do you think the Phase Shifter study will be complete
>
> FERC was asking?
>
> THANKS!
>
> Rj

2

Respectfully,

Rex Wait

Control Technology President

Control Technology

2416 Cades Way • Vista, California • 92081

O: (760) 599-0086 | F: (760) 599-1815

http://www.controltechnology.org/

3

SECTION 4

SUBMIT THE DRAFT REPORT TO THE COMMISSION, SOUTHERN CALIFORNIA EDISON, SAN DIEGO GAS & ELECTRIC, AND THE CALIFORNIA ISO FOR REVIEW

This page is intentionally left blank.

dkates@sonic.net

From: fdepenbrock@aol.com
Sent: Tuesday, April 2, 2019 6:25 AM
To: rsparks@caiso.com; hmaiga@semprautilities.com; ayman.samaan@sce.com
Cc: nmillar@caiso.com; jstrack@semprautilities.com; garry.chinn@sce.com; dkates@sonic.net; rwait@controltechnology.org
Subject: Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

The Nevada Hydro Company is herewith asking for your comments, suggestions, and requests on its "Phase Shifting Transformer Range Control Study". The draft report can be downloaded using the link below.

http://leapshydro.com/wp-content/uploads/2019/02/V18-SB-2-Study-34b-Proposed-Transformer-Operation.pdf

We would appreciate receiving your responses as soon as reasonably possible. We will include whatever you may request that we agree with immediately. Where there are items that require further discussion, we will initiate that discussion with you promptly. Where there are remaining issues that can't be resolved, we will include those issues as such and their sources in our report to the FERC.

We have already found a few typographical errors which we will repair. Also, Section 3 of the report should have included a description of the physical characteristics of the phase shifting transformers (normal and emergency ratings, number of tap steps, control range in degrees, etc.) A draft of this missing piece will be sent to you shortly for your review, also.

There is a question that it would be helpful if you, collectively, could resolve the language to be used to describe contingencies. We recognize that NERC has developed a new nomenclature on this matter with the leading letter being "P". Yet, most of the discussion already exchanged between us has used the style of N-1, G-1-N-1, N-1-1, etc. We will follow whichever abbreviation naming style you select jointly in the final report to FERC.

We have noticed that there are a number of your comments that appear to us to be almost entirely operational in nature (i.e., automatic vs manual control). We are planning to have dialogue on this type of issue when the project is preparing to enter operation. Insofar as there may be the need to include awareness of some of these operational issues in this design phase (inclusion of control technology that can communicate with the CAISO or regional dispatch, instrumentation, maintenance process, etc.) your comments are important to us at this stage of the development process for LEAPS.

Thank you for your assistance and support in this development of the LEAPS project, which we see filling an important role in the renewable energy future.

On behalf of the Nevada Hydro Project team,

1

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

dkates@sonic.net

To: fdepenbrock@aol.com
Subject: RE: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

From: RSparks@caiso.com
To: fdepenbrock@aol.com
Sent: 4/2/2019 12:14:49 PM Eastern Standard Time
Subject: RE: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Fred,

The engineer that has been working on this will be going on vacation soon, so we expect to be able to provide comment by the middle of May.

Robert

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Tuesday, April 2, 2019 6:25 AM
To: Sparks, Robert <RSparks@caiso.com>; hmaiga@semprautilities.com; ayman.samaan@sce.com
Cc: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; Chinn (Southern California Edison), Garry <Garry.Chinn@sce.com>; dkates@sonic.net; rwait@controltechnology.org
Subject: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

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http://leapshydro.com/wp-content/uploads/2019/02/V18-SB-2-Study-34b-Proposed-Transformer-Operation.pdf

We would appreciate receiving your responses as soon as reasonably possible. We will include whatever you may request that we agree with immediately. Where there are items that require further discussion, we will initiate that discussion with you promptly. Where there are remaining issues that can't be resolved, we will include those issues as such and their sources in our report to the FERC.

1

We have already found a few typographical errors which we will repair. Also, Section 3 of the report should have included a description of the physical characteristics of the phase shifting transformers (normal and emergency ratings, number of tap steps, control range in degrees, etc.) A draft of this missing piece will be sent to you shortly for your review, also.

There is a question that it would be helpful if you,collectively, could resolve the language to be used to describe contingencies. We recognize that NERC has developed a new nomenclature on this matter with the leading letter being "P". Yet, most of the discussion already exchanged between us has used the style of N-1, G-1-N-1, N-1-1, etc. We will follow whichever abbreviation naming style you select jointly in the final report to FERC.

We have noticed that there are a number of your comments that appear to us to be almost entirely operational in nature (i.e., automatic vs manual control). We are planning to have dialogue on this type of issue when the project is preparing to enter operation. Insofar as there may be the need to include awareness of some of these operational issues in this design phase (inclusion of control technology that can communicate with the CAISO or regional dispatch, instrumentation, maintenance process, etc.) your comments are important to us at this stage of the development process for LEAPS.

Thank you for your assistance and support in this development of the LEAPS project, which we see filling an important role in the renewable energy future.

On behalf of the Nevada Hydro Project team,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

2

taken in reliance on it is strictly prohibited and may be unlawful. If you have received this electronic message in error, please delete and immediately notify the sender of this error.
****
**

3

dkates@sonic.net

Subject: FW: Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

From: HMaiga@semprautilities.com
To: fdepenbrock@aol.com, RSparks@caiso.com, JJontry@semprautilities.com
Sent: 4/7/2019 2:28:17 PM Eastern Standard Time
Subject: RE: Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Hi Fred,

John Jontry, copied, will lead SDG&E's comments if any.

Best regards,

Habib

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Tuesday, April 2, 2019 6:25 AM
To: rsparks@caiso.com; Maiga, Habibou A <HMaiga@semprautilities.com>; ayman.samaan@sce.com
Cc: nmillar@caiso.com; Strack, Jan <JStrack@semprautilities.com>; garry.chinn@sce.com; dkates@sonic.net; rwait@controltechnology.org
Subject: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

The Nevada Hydro Company is herewith asking for your comments, suggestions, and requests on its "Phase Shifting Transformer Range Control Study". The draft report can be downloaded using the link below.

http://leapshydro.com/wp-content/uploads/2019/02/V18-SB-2-Study-34b-Proposed-Transformer-Operation.pdf

We would appreciate receiving your responses as soon as reasonably possible. We will include whatever you may request that we agree with immediately. Where there are items that require further discussion, we will initiate that discussion with you promptly. Where there are remaining issues that can't be resolved, we will include those issues as such and their sources in our report to the FERC.

1

We have already found a few typographical errors which we will repair. Also, Section 3 of the report should have included a description of the physical characteristics of the phase shifting transformers (normal and emergency ratings, number of tap steps, control range in degrees, etc.) A draft of this missing piece will be sent to you shortly for your review, also.

There is a question that it would be helpful if you,collectively, could resolve the language to be used to describe contingencies. We recognize that NERC has developed a new nomenclature on this matter with the leading letter being "P". Yet, most of the discussion already exchanged between us has used the style of N-1, G-1-N-1, N-1-1, etc. We will follow whichever abbreviation naming style you select jointly in the final report to FERC.

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Thank you for your assistance and support in this development of the LEAPS project, which we see filling an important role in the renewable energy future.

On behalf of the Nevada Hydro Project team,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

David Kates

From: David Kates
Sent: Monday, May 13, 2019 1:24 PM
To: 'rsparks@caiso.com'; 'hmaiga@semprautilities.com'; 'ayman.samaan@sce.com'
Cc: 'nmillar@caiso.com'; 'jstrack@semprautilities.com'; 'garry.chinn@sce.com'; 'rwait@controltechnology.org'; 'Fred Depenbrock'
Subject: RE: Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

All,

As a follow-up to Mr. Depenbrock's April 2 request to you below, I wanted to personally reach out to you once again to confirm whether you have comments on Fred's study. We are particularly interested in confirming that you are in accord with the cases and contingencies Fred ran in the study, as well as with his conclusions.

In order to ensure we have enough time to address any material comments you may have, please respond by COB May 31 so that we can address those comments before resubmitting the study to FERC as part of the license application process. If we have not received any comments by May 31, we will assume that you find Fred's work satisfactory.

Thanks so much.

David Kates

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Tuesday, April 2, 2019 6:25 AM
To: rsparks@caiso.com; hmaiga@semprautilities.com; ayman.samaan@sce.com
Cc: nmillar@caiso.com; jstrack@semprautilities.com; garry.chinn@sce.com; dkates@sonic.net; rwait@controltechnology.org
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Thank you for your assistance and support in this development of the LEAPS project, which we see filling an important role in the renewable energy future.

On behalf of the Nevada Hydro Project team,

Fred

Fred Depenbrock

451 Lakeside Circle, Apt. 214

Pompano Beach, FL 33060

954-532-3436 (Home)

352-256-4475 (Cell)

fdepenbrock@aol.com

David Kates

From: Maiga, Habibou A <HMaiga@semprautilities.com>
Sent: Monday, May 13, 2019 1:25 PM
To: David Kates
Subject: Automatic reply: Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Thank you for your email. I am out of the office returning Monday, May 20 2019. If you need immediate assistance, please contact Darren George (DCGeorge@semprautilities.com) for Generation Interconnection questions or Jan Strack (Jstrack@semprautilities.com) for Regulatory and Economics questions.

Thank you,
Habib

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SECTION 5

RESOLVE ANY CONCERNS IN THE DRAFT REPORT EXPRESSED BY THE COMMISSION, SOUTHERN CALIFORNIA EDISON, SAN DIEGO GAS & ELECTRIC, AND CALIFORNIA ISO

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June 7, 2019

Mr. Robert Sparks
California Independent System Operator

Mr. Ayman Samaan
Southern California Edison

RE: Your emails dated May 29, 2019

Dear Mr. Sparks and Mr. Samaan,

Robert, thank you for your email of May 29, 2019, providing comments on Nevada Hydro's Draft Report "Phase Shifting Transformer Range Control Study". I am writing in response to the points raised in your email with the following comments.

1.0. Regarding the concern expressed about the limited number of your proposed fourteen contingency tests that were included in the Study report:

I apologize for not explicitly including in the report what I found regarding the fourteen contingencies. They were studied, but most of them required either no or minor phase shift change to meet the study's objectives. The rest were included in the results presented. To provide the response you are asking for, I have included in Tables 1 and 2, attached, the results of the 14 contingency tests. By comparing the phase angle position shown for the specific contingency to the phase angle position for the normal, pre-contingency, angular position, it is possible to see what effect that contingency had on the phase shifters' operation. Please note that the phase shifters operate in two-degree increments.

2.0. Regarding the concern that the post-contingency, pre-phase angle adjustment flow was not shown in the report:

I'm not aware of what the importance is of knowing what the flows through the phase shifting transformers were in the immediate situation post-contingency, pre-phase shifter adjustment, but I have included those flow values in Tables 3 and 4, below. Also, because the emphasis of this study was on phase shifter performance, no generation shifts were used. The focus of the study was on the phase shifters' operation, so each case was kept to the original base cases you supplied, rather than attempting to solve any phase shifter issues by generation change.

3.0. Regarding the low renewable generation case the tests of normal operation and of any contingencies with LEAPS pumping with power delivered from the south

It became evident early in the study that pumping power for LEAPS delivered from the south (the SDG&E system) would be both impossible and dangerous to system operation. As can be seen in Table 5, in the low renewables case you provided, SDG&E has only 222.5 MW of generation operating in the metro San Diego area and 623.9 MW operating in the area west of Miguel and Suncrest, this with an SDG&E system load of 3759 MW, all located in the area west of Miguel and Suncrest (See Table 5). Also,

regarding the pumping power expected for LEAPS, while some may come from fossil-fuel generation, the predominant source was to be from renewables, which are, by the case's definition not producing.

Nevertheless, in order to test the capability of the phase shifters to manage flows, the pumping power for LEAPS was provided (in this situation only) by running gas turbine generators at the Encina site. But even with the additional 600 MW of fossil generation running and the phase shifters at 32° it was not possible to deliver 600 MW to LEAPS from the south.

The options were to reduce the pumping level at LEAPS to 400 MW or any level less, or even to switch to generating. The 400 MW pumping level would allow the phase shifters to manage the interconnections as required, while keeping the phase shifters within their operating range. The original(pre-contingency) case had LEAPS pumping at 600 MW. It should be noted that continuing to pump LEAPS with this contingency in effect does not appear to be a condition that the system operator would applaud.

4.0. Regarding your requests that Nevada Hydro supply you with the cases used in this study:

It should be noted that the two cases used were supplied by CAISO. This was mutually assumed to fulfill the desire to have the maximum phase angle difference across the LEAPS interconnection points so that the study would be based on the maximum stress on the phase shifters' performance. Great care was taken in the study to use these cases as presented to Nevada Hydro in order to keep to a minimum any changes to the base system's performance by the addition of the Project, and to focus on the performance of the phase shifting transformers at Case Springs.

A review of the information provided in Tables 1 and 2 shows that the range of operation of the phase shifting transformers at Case Springs spans from +32° to -22°. This is a total operating span of 54° on equipment that can span 64°. It is also possible, as system conditions unfold toward the startup of the Project that a shift of the "zero point" can be made as part of the startup five years hence. But it appears at this date that such a change is not needed.

In the course of this review I discovered a few anomalies, caused by some load flow modeling software modeling choices that were not correct. However, none of these situations when modeled with the correct software settings showed any conditions that were pushing the limits of the phase shifters' performance of their function. In fact, they produced results that were less stressful for the phase shifters.

I trust you find this fully responsive to the requests in your email, but please let me know if you would like to discuss anything additional.

Kind regards,

Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)

California ISO
916-351-4416

From: fdepenbrock@aol.com <fdepenbrock@aol.com>
Sent: Tuesday, April 2, 2019 6:25 AM
To: Sparks, Robert <RSparks@caiso.com>; hmaiga@semprautilities.com; ayman.samaan@sce.com
Cc: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; Chinn (Southern California Edison), Garry <Garry.Chinn@sce.com>; dkates@sonic.net; rwait@controltechnology.org
Subject: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

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On behalf of the Nevada Hydro Project team,

Fred

Fred Depenbrock
451 Lakeside Circle, Apt. 214
Pompano Beach, FL 33060
954-532-3436 (Home)
352-256-4475 (Cell)
fdepenbrock@aol.com

2

dkates@sonic.net

From: Ayman Samaan <Ayman.Samaan@sce.com>
Sent: Wednesday, May 29, 2019 3:37 PM
To: Sparks, Robert; Depenbrock (Power Technologies), Fred; hmaiga@semprautilities.com
Cc: Millar, Neil; Strack (Sempra Energy Utilities), Jan; Garry Chinn; dkates@sonic.net; Rex Wait
Subject: RE: (External):RE: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Fred,
SCE concurs with the CAISO's comments. We also would like to get the base cases for further review.

Thank you
Ayman S.

From: Sparks, Robert [mailto:RSparks@caiso.com]
Sent: Wednesday, May 29, 2019 2:54 PM
To: Depenbrock (Power Technologies), Fred <fdepenbrock@aol.com>; hmaiga@semprautilities.com; Ayman Samaan <Ayman.Samaan@sce.com>
Cc: Millar, Neil <nmillar@caiso.com>; Strack (Sempra Energy Utilities), Jan <jstrack@semprautilities.com>; Garry Chinn <Garry.Chinn@sce.com>; dkates@sonic.net; Rex Wait <rwait@controltechnology.org>
Subject: (External):RE: [EXTERNAL] Request for Comments on Nevada Hydro's Draft Report on the LEAPS Project Phase shifter Range Study

Fred,

In response to the Nevada Hydro Company's request for comment on its "Phase Shifting Transformer Range Control Study" report, the ISO has reviewed the report and provides the following comments.

1. The CAISO comments on the proposed study plan specified the evaluation of the operational impact on the CAISO system of the PSTs for fourteen P1 contingencies based on the planned system configuration, but the study reported power flow results on only the LEAPS interconnection facilities and for only for three of the fourteen P1 contingencies.

2. It appears that the post-contingency power flow results on the LEAPS facilities were reported after automatic phase shifter angle adjustment. From the ISO viewpoint, the post-contingency power flows in the LEAPS interconnection facilities, the ISO, and other neighboring facilities should be monitored and evaluated both before and after the phase angle adjustment. The post-contingency power flow results prior to the operational actions that include re-dispatching generation and adjusting phase angles are essential to evaluating the system performance.

3. The ISO notes that the case with 1300 MW of north to south flow on the south of SONGS path was not studied with LEAPS pumping at 600 MW from the southern tie-line. It appears that an alternative case was studied with a total of approximately 400 MW of north to south flow on the south of SONGS path and the PSTs with LEAPS pumping at 600 MW from the southern tie-line. Under this less stressed operating condition, it appears that the PSTs failed to limit non-project power through the LEAPS interconnection facilities for the loss of the ECO-Miguel 500 kV line (P1). However, the ISO was unable to duplicate these results.

4. Please provide the ISO with all of the study base cases for further review since it is difficult to understand some of the results without looking into the study base cases.

Robert Sparks
Regional Transmission

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FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

WATER BOARD RESPONSE TO STUDY 4 & 7

LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Applicant:

THE NEVADA HYDRO COMPANY, INC.
2416 Cades Way
Vista, California 92081
(760) 599-1813
(760) 599-1815 FAX

June 2019

dkates@sonic.net

Subject: FW: LEAPS Project

From: Theisen, Ken@Waterboards <Ken.Theisen@waterboards.ca.gov>
Sent: Thursday, May 16, 2019 2:05 PM
To: Greg Kahlen <Greg@kahlengroup.com>
Cc: Barry, Barbara@Waterboards <Barbara.Barry@waterboards.ca.gov>; Willis, Lauma@Waterboards <Lauma.Willis@Waterboards.ca.gov>; Joy, Jayne@Waterboards <Jayne.Joy@Waterboards.ca.gov> **Subject:** Re: LEAPS Project

Hi Greg,

I got your voice message as well, but am still swamped and have not got the chance yet to read Dr. Anderson's report. Because of other priorities I may not be able to spend time on this for a month or so. How about I contact you when I get a chance to read the report.

Ken

From: Greg Kahlen <Greg@kahlengroup.com>
Date: Thursday, May 16, 2019 at 11:14 AM
To: "Theisen, Ken@Waterboards" <Ken.Theisen@waterboards.ca.gov> **Subject:** LEAPS Project

Good morning Ken,

Would you have time for a short phone conversation regarding the LEAPS project in the next few days? Please let me know what would work with your schedule.

Thanks!

Greg Kahlen
The Kahlen Group
Engineering-Funding-Management
1295 Corona Pointe Court, Suite 104
Corona, CA 92879
Office: 951-520-1331
Cell: 951-712-1741

From: Theisen, Ken@Waterboards
To: Greg Kahlen
Subject: Re: LEAPS - Dr. Anderson Report
Date: Wednesday, April 03, 2019 7:06:05 AM

Hi Greg,

I have not had a chance to review Dr. Anderson's report yet. Probably won't get to it until after the May 3 public workshop on the revised TMDLs. We can get together after that.

Ken

From: Greg Kahlen <Greg@kahlengroup.com>
Date: Tuesday, April 2, 2019 at 4:46 PM
To: "Theisen, Ken@Waterboards" <Ken.Theisen@waterboards.ca.gov>
Subject: LEAPS - Dr. Anderson Report

Hello Ken,

I wanted to reach out to you regarding Dr. Anderson's report on the impact of LEAPS on water quality in Lake Elsinore. I know you've been busy with the TMDL Task Force report among many other things, so I don't know if you've had a chance to read his document. If you have, I would like to get some informal feedback from you on what else we might be able to provide to you to make sure we get your questions and concerns addressed.

Would you have time at some point to sit down with me and let me know of any questions or comments you may have, or additional information you would like to see, regarding the report from Dr. Anderson? I will make time whenever it works with your schedule.

Thanks Ken. I look forward to talking with you.

Greg Kahlen
The Kahlen Group
Engineering-Funding-Management
1295 Corona Pointe Court, Suite 104
Corona, CA 92879
Office: 951-520-1331
Cell: 951-712-1741

dkates@sonic.net

From: Theisen, Ken@Waterboards <Ken.Theisen@waterboards.ca.gov>
Sent: Wednesday, February 27, 2019 5:13 PM
To: Greg Kahlen
Cc: Rexford Wait; David Kates; Willis, Lauma@Waterboards
Subject: Re: Dr. Anderson's Report on LEAPS and Lake Elsinore

Thank you Greg, I heard this was out and asked Dr. Anderson if I could see it yet, and he kindly sent me a copy. Thanks for the more formal submittal. I have not had a chance to look at the report though, but plan to, soon.

Ken

From: Greg Kahlen <Greg@kahlengroup.com>
Date: Wednesday, February 27, 2019 at 4:45 PM
To: "Theisen, Ken@Waterboards" <Ken.Theisen@waterboards.ca.gov>
Cc: Rexford Wait <rwait@controltechnology.org>, David Kates <dkates@sonic.net> **Subject:** Dr. Anderson's Report on LEAPS and Lake Elsinore

Hello Ken,

Attached for your review is a copy of Dr. Anderson's report on the impacts of the LEAPS project on water quality in Lake Elsinore. As I think you are aware, this report was prepared at the request of FERC to address water quantity and quality in Lake Elsinore resulting from project implementation, but it is definitely **NOT** considered by us to be the final word on all water quality issues. Rather, it lays a foundation and we hope it demonstrates the LEAPS team's commitment to undertake whatever additional studies may be needed to zero in on certain key water quality concerns.

Specifically, we recognize that more work is needed to evaluate your concerns regarding the lysing of cyanobacteria cells in the project turbines. Dr. Anderson's report touches briefly on the subject by referring to a study in the Klamath River, but that is just the beginning. There will be more to come on this subject.

We also want you to know that the proposed approach for providing supplemental water to the lake is just one possible approach. We are certainly willing to look at other options for when and how much water is delivered to the lake. For instance, it may be better to provide less water "up-front" (esp. if the lake is already above 1240') but provide more water over time to keep the lake above that level.

Thank you for your patience and cooperation Ken. Please let me know if you have any questions, or if you need additional information.

Greg Kahlen

The Kahlen Group
Engineering-Funding-Management
1295 Corona Pointe Court, Suite 104
Corona, CA 92879
Office: 951-520-1331
Cell: 951-712-1741

1

FINAL APPLICATION FOR LICENSE OF MAJOR UNCONSTRUCTED PROJECT

VOLUME (20 OF 20)

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LAKE ELSINORE ADVANCED PUMPED STORAGE PROJECT FEDERAL ENERGY REGULATORY COMMISSION PROJECT NUMBER 14227

Prepared by:

THE NEVADA HYDRO COMPANY, INC.
2416 Cades Way
Vista, California 92081
(760) 599-1813
(760) 599-1815 FAX

June 2019

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A.	Study 8: Aquifer Impact Study Report
B.	Study 9: Quiño Butterfly Spring Survey Report
C.	Study 34B: Transformer Study Report
1.	Consultation regarding establishing cases and contingencies
2.	Consultation regarding agreed cases
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4.	Consultation regarding requesting comments on draft report
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