Southern California Edison
A.09-09-022 – Alberhill PTC & CPCN

DATA REQUEST SET C P U C - S u p p l e m e n t a l D a t a R e q u e s t - 0 1 4

To: CPUC
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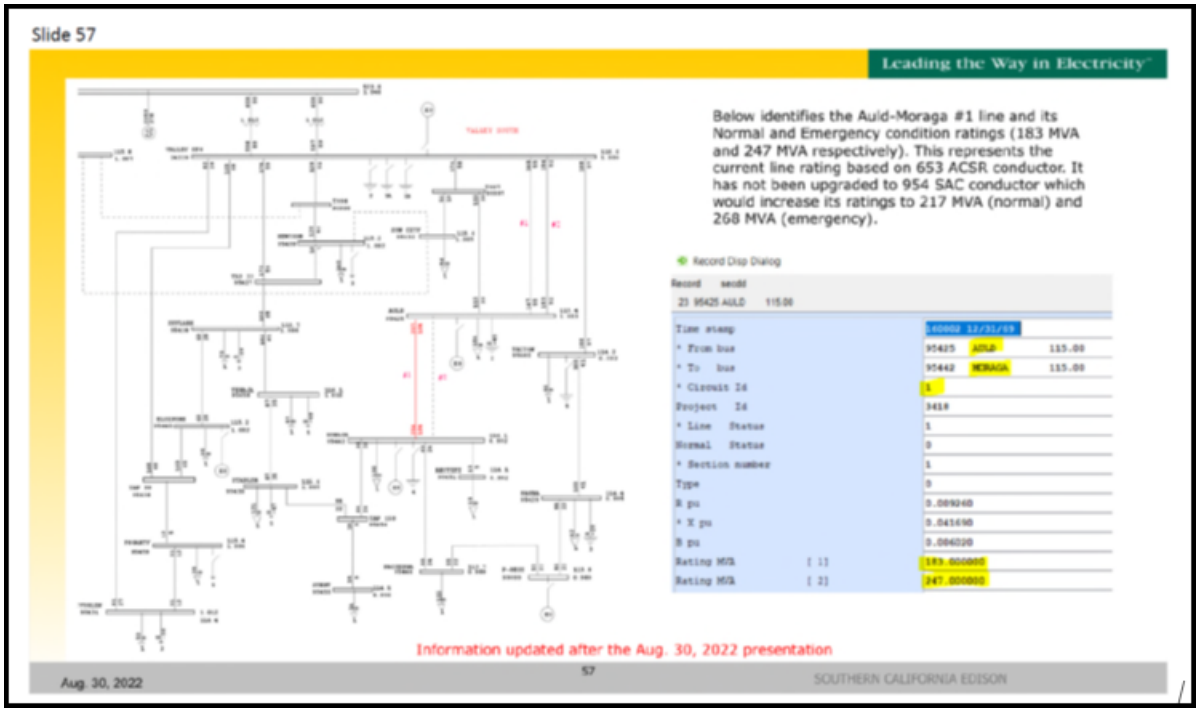
Job Title: Senior Advisor
Received Date: 11/15/2022

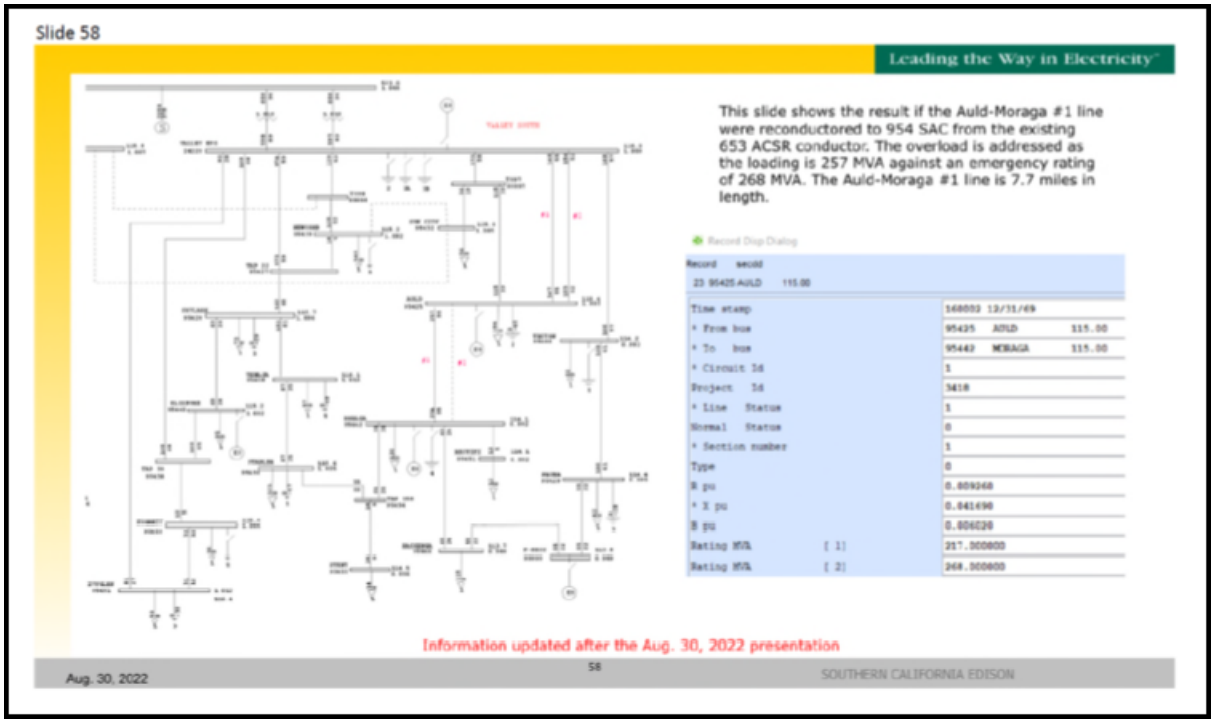
Response Date: 11/29/2022

Question DG-MISC-84:

a. Are the impedance values show on slides Slide 57 and 58 of SCE's Alberhill System Project Energy Division Presentation deck from 8/30/2022 correct?

b. Slides 57 and 58 (included below for reference) present the properties for a 653 ACSR conductor and 954 SAC conductor with identical impedance parameters. If the impedance parameters should change for the case of upgrading to the 954 SAC conductor, how does that alter the power flow through Auld-Moraga #1 Line? What is the impact on the battery sizing requirements?



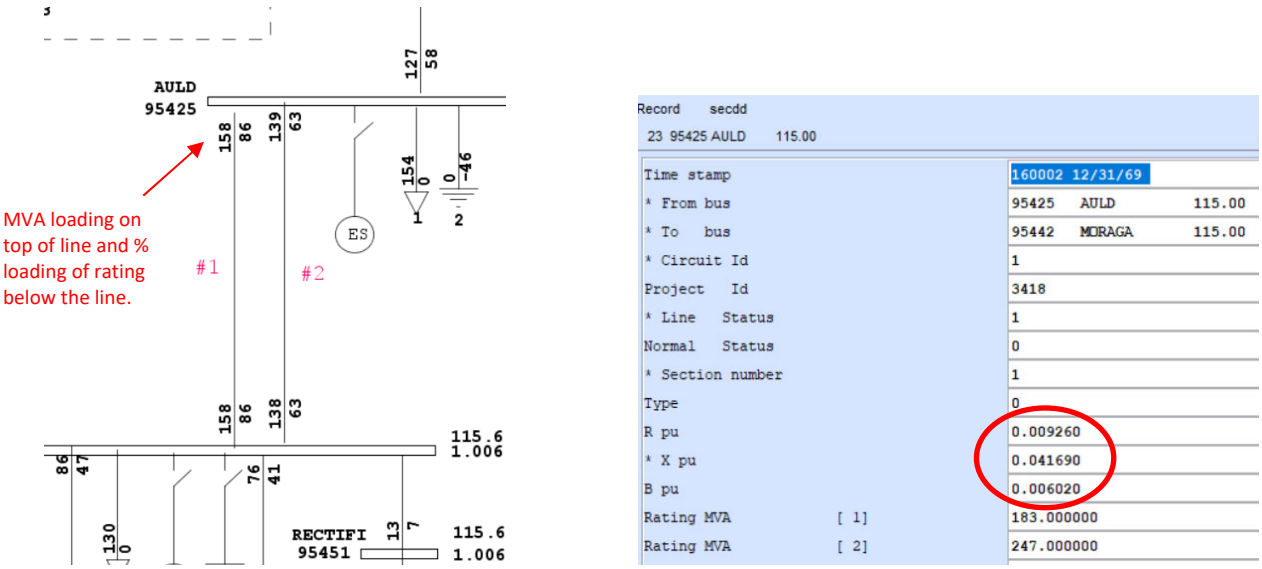


Response to Question DG-MISC-84:

While the normal and N-1 ratings were updated in slide 58 to reflect the modeled upgrade in conductor type, the impedance values for the Auld-Moraga #1 line should have been updated to reflect the change in conductor being modeled as upgraded from 653 ACSR to 954 SAC. The corrected slide is provided below in Figure 2.

For context however, the impedance characteristics between the two conductor types are very similar though their capacity ratings differ by an appreciable amount. Inputting the correct impedance values to reflect the conductor upgrade yields no significant change to the power flow values. The figures below demonstrate normal conditions with all facilities in service to illustrate how the correct impedance values for the Auld-Moraga #1 line impact the power flow. While this example illustrates the impact under normal conditions, the impact is the same under N-1 conditions.

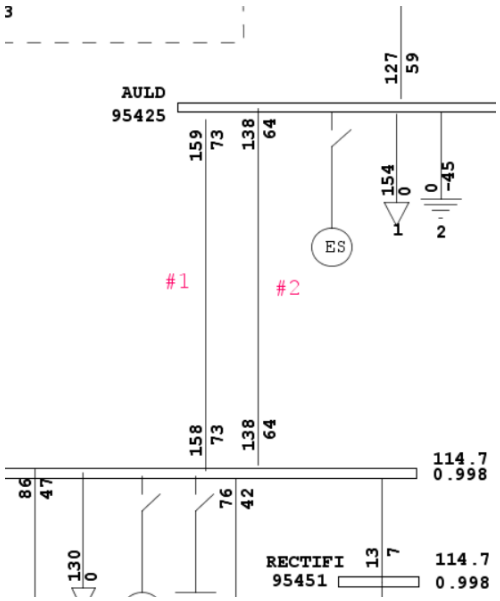
Figure 1 – Auld-Moraga #1 (existing conductor 653 ACSR)



Record secdd 23 95425 AULD 115.00		
Time stamp	160002 12/31/69	
* From bus	95425 AULD	115.00
* To bus	95442 MORAGA	115.00
* Circuit Id	1	
Project Id	3418	
* Line Status	1	
Normal Status	0	
* Section number	1	
Type	0	
R pu	0.009260	
* X pu	0.041690	
B pu	0.006020	
Rating MVA [1]	183.000000	
Rating MVA [2]	247.000000	

Auld-Moraga #1 – 653 ACSR with impedance values and ratings associated with that conductor. Power flow on Auld-Moraga #1 is 158 MVA and on Auld-Moraga #2 is 139 MVA.

Figure 2 – Auld-Moraga #1 upgraded to 954 SAC conductor

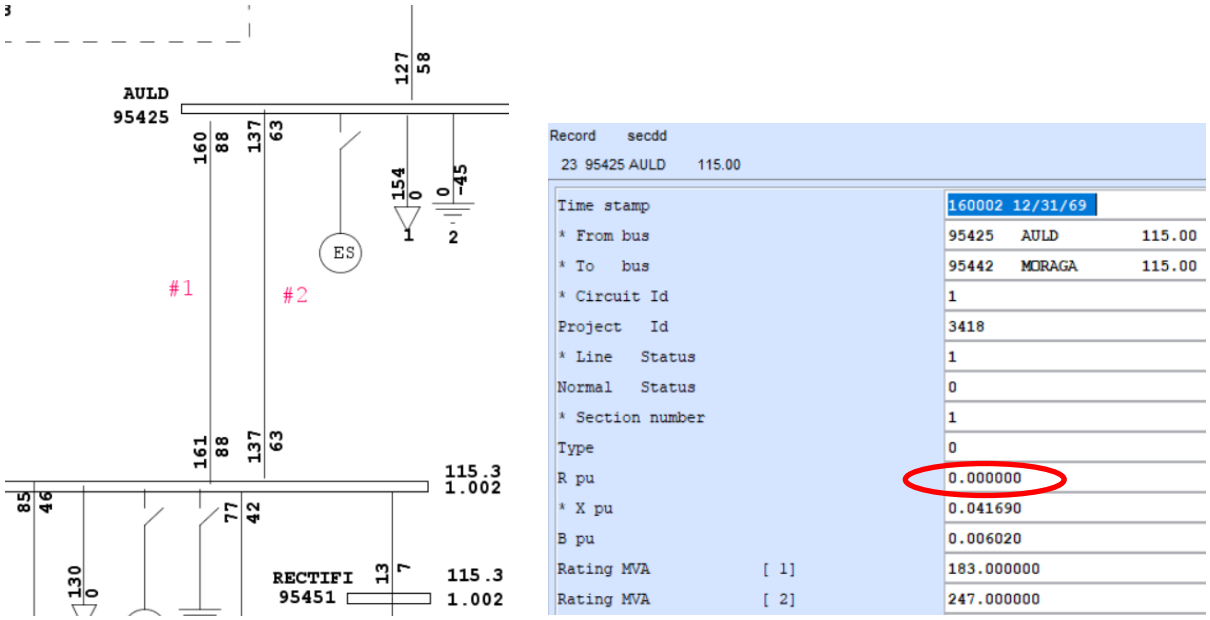


Record secdd 23 95425 AULD 115.00		
Time stamp	160002 12/31/69	
* From bus	95425 AULD	115.00
* To bus	95442 MORAGA	115.00
* Circuit Id	1	
Project Id	3418	
* Line Status	1	
Normal Status	0	
* Section number	1	
Type	0	
R pu	0.007100	
* X pu	0.041690	
B pu	0.006200	
Rating MVA [1]	217.000000	
Rating MVA [2]	268.000000	

Auld-Moraga #1 – 954 SAC with *correct* impedance values and ratings associated with that conductor. Power flow on Auld-Moraga #1 is 159 MVA (versus 158 MVA) and on Auld-Moraga #2 is 138 MVA (versus 139 MVA).

In modeling the power flow of subtransmission and transmission systems, the component of the impedance characteristics that most influences the flow of power within a network is the reactance, represented by the "X pu" value in the figure above. An example of this can be seen in the figure below.

Figure 3 – Identical parameters to Figure 1 above but with *resistance reduced to zero*



Power flow on the Auld-Moraga #1 line is 160 MVA (versus 158 MVA) and power flow on the Auld-Moraga #2 line is 137 MVA (versus 139 MVA). It is noted that completely eliminating resistance from the impedance values has virtually no impact on the power flows on the lines. The reactance component of the impedance dominates over the resistance component with respect to determining the flows of power.

On slides 57 and 58 of SCE's August 30, 2022 presentation, the intent was only to demonstrate that the overload on the Auld-Moraga #1 line during an outage of the Auld-Moraga #2 line would not be solved by using the system tie-line capacity of the Valley South to Valley North alternatives and that the overload could be remedied by upgrading the conductor of the Auld-Moraga #1 line. This was demonstrated by increasing the capacity of the line to that of 954 SAC conductor. While the impedance values should have also been updated for completeness and accuracy, they were not. However, as shown in the examples above, having done so would not change the result presented in those slides.

In answer to the question posed on whether the correct impedance values would impact the battery sizing requirements, the answer is no. As the battery sizing requirements were established to reduce the amount of power flowing through the Valley South System's transformers at Valley Substation, the manner in which the power flows within the network (i.e., how much power is flowing on each line) is immaterial to achieving the necessary reduction of power flow through the transformers. This is because all of the power to serve the load is delivered through the Valley South System's transformers regardless of the paths it takes.