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Import Limit Definition and Management in Support of Under-Frequency Load Shedding (UFLS)

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Through its operations of the California Independent System Operator Corporation (ISO) grid as the Balancing Authority the ISO has monitored and enforced import limits established for the purpose maintaining allowable imports based on the percentage of Under-Frequency Load Shedding (UFLS) requirements for the entire ISO Balancing Area as well as each individual Participating Transmission Owner (PTO) area, as applicable. The import limits are necessary to ensure operations of the PTO systems consistent with the UFLS requirements and increase the likelihood of operating balanced separated system(s) after an under frequency event. The ISO Operating Procedure E-503A specifies the plans with trip settings and time delays for the three PTO areas, PG&E, SCE, and SDG&E, and provides an operational tool to enforce these limits.

Prior the start of the new market design on April 1, 2009, the ISO and the respective PTOs monitored these limits. If and when the limit was exceeded or close to being exceeded, the ISO operators took steps to commit and/or dispatch (out-of-sequence or out-of-market) additional internal generation to mitigate the limit violations, real or potential, using the generation must-offer waiver denial process. After the start of the new market design on April 1, 2009, the ISO and the respective PTOs continue to monitor these limits. Again, if and when the limit is exceeded or close to being exceeded, the ISO operators take steps to commit and/or dispatch additional internal PTO generation to mitigate the limit violations, real or potential, through the Exceptional Dispatch process.

Under the new market design, the ISO may use the market software to enforce such import limits so that if the limit binds, the market dispatch will reflect any re-dispatch necessary to honor the import limit. To the extent feasible, the ISO strives to manage all congestion through its markets. On November 11, 2009, the ISO began enforcing in the markets models the import limit that applies specifically to the SCE area (SCE_PCT_IMP_BC). Between April 1, 2009 to October 22, 2009, system conditions were such that the SCE import limit was not exceeded. Therefore, no actions were necessary to ensure that the limit was honored. However, as of October 22, 2009, conditions were such that it was necessary to perform an increased level of Exceptional Dispatch to maintain the real-time imports within the limit. As of November 11, 2009, the ISO began enforcing the import limit in the market so that the ISO congestion related to this limit may be managed through the market optimization.

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This technical bulletin provides details of this constraint and related information.

1. Constraint Name and Definition

   Named as "**SCE_PCT_IMP_BG**", this is an internal ISO branch group that is presently enforced in the ISO market. The branch group or BG is composed of 31 transmission tie lines that connect SCE to the transmission grid external to SCE. In the FNM format, these tie lines are shown as follows:

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19012_MEAD S  _230_24041_ELDORDO _230_BR_1 _1
19012_MEAD S  _230_24041_ELDORDO _230_BR_2 _1
24019_CAMINO  _230_19012_MEAD S  _230_BR_E _1
19042_PARKER  _230_25402_GENE    _230_BR_1 _1
21007_COACHELV_230_24804_DEVERS  _230_BR_1 _1
21076_RAMON   _230_24806_MIRAGE  _230_BR_1 _1
24042_ELDORDO _500_26048_MCCULLGH_500_BR_1 _1
14002_MOENKOPI_500_99002_MOE-ELD _500_BR_1 _7
24729_INYO    _230_24998_INYO SCE_230_BR_1 _1
99010_VELAS-LB_230_24076_LAGUBELL_230_BR_1 _1
24086_LUGO    _500_26105_VICTORVL_500_BR_1 _1
24036_EAGLROCK_230_24147_SYLMAR S_230_BR_1 _1
24114_PARDEE  _230_24147_SYLMAR S_230_BR_2 _1
24114_PARDEE  _230_24147_SYLMAR S_230_BR_1 _1
24147_SYLMAR S_230_24059_GOULD   _230_BR_1 _1
25903_MOH-LGHN_500_24097_MOHAVE  _500_BR_1 _1
18229_SO POINT_69.0_25909_MOHVAUX2_69.0_BR_1 _1
18620_MERCHANT_230_24041_ELDORDO _230_BR_1 _1
30060_MIDWAY  _500_24156_VINCENT _500_BR_2 _2
30060_MIDWAY  _500_24156_VINCENT _500_BR_3 _2
30060_MIDWAY  _500_24156_VINCENT _500_BR_1 _2
22844_TALEGA  _230_24131_S.ONOFRE_230_BR_2 _1
22844_TALEGA  _230_24131_S.ONOFRE_230_BR_1 _1
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_3 _1
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_2 _1
22716_SANLUSRY_230_24131_S.ONOFRE_230_BR_1 _1
64096_SLVR PS2_55.0_24722_CONTROL _55.0_BR_2 _1
64096_SLVR PS2_55.0_24722_CONTROL _55.0_BR_1 _1
15021_PALOVRDE_500_99011_AZ CAPS _500_BR_1 _1
19020_BLYTHE  _161_24017_BLYTHESC_161_BR_1 _1
24019_CAMINO  _230_19012_MEAD S  _230_BR_W _1
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The summation of the flows, in the import direction, on all the tie lines is defined as the SCE import. The SCE import limit is calculated using the following formula:

0.6*(SCE Total Load - CDWR Pump Load - MWD Pump Load)
+ CDWR Pump Load
- 20% of Songs Generation (unit #2 & #3)

Where:

SCE Total Load is the ISO forecast total load for SCE,
CDWR is short for California Department of Water Resources,
MWD is short for Metropolitan Water District.

2. Intended Purpose of the Limit

This limit protects the SCE load in the event of a system-wide under-frequency event. In extreme under-frequency conditions, UFLS protection relays would drop certain amounts of load per WECC UFLS requirements. The import limit is a function of the amount of load that is armed with UFLS. By adhering to this import limit, the SCE system would be able to survive a total separation from the transmission grid external to SCE's system and retain approximately 40% of its load that would be supplied by the generation internal to SCE's system.