Devers Subtransmission System Assessment

I. Purpose

This assessment was performed to determine the adequacy of SCE's Devers 115 kV subtransmission system to accommodate the [redacted] and to identify any system limitations that would require Distribution Upgrades on the subtransmission system to mitigate any identified impacts. The assessment included all existing and queued ahead generation projects in the Devers 115 kV subtransmission system, regardless of their in-service dates. The assessment considered minimum and maximum load levels in order to stress the Devers subtransmission system.

II. Load Assumptions

The load assumptions for the local subtransmission system utilized a combination of historical load as well as a 2020 load forecast in order to provide a projected representation of the load for the year 2020. The 2020 load forecast was derived using SCE's Distribution Engineering A-Bank Planning load forecast. The resulting load values that were used for the peak and off-peak conditions are shown below in Table 1 and were used as the basis for evaluating subtransmission system performance for inclusion of this project.

Table 1
Local Subtransmission System Load Assumptions

Year	Peak Load (MW)	Off-Peak Load (MW)
2020	549.7	350.3

III. Generation Assumptions

Generation dispatch of local subtransmission system generation (existing and queued) was done in a manner that would provide for a stressed export of generation in the system. In order to assess the subtransmission system and stress it to its maximum capacity, all local generation resources within the Devers 115 kV Subtransmission System were dispatched as listed in Table 2. Note that the total wind production from wind turbines installed at Garnet during the QF era have been modeled to reflect an aggregate of 101.1 MW output resulting in a total MW output of 1097.6 MW[1] modeled in the studies. The total MW output with the inclusion of the Desert Hot Springs Energy Project increased to 1099.5 MW.

[1] The total Garnet wind projects installed during QF era were combined and dispatched to 101.1 MW

Table 2
Local Generation in the Devers 115 kV Subtransmission System

Generation	Resource	Size (MW)	Status
WDT016A	Wind	10.12	In-Service
WDT016B	Wind	1.35	In-Service
WDT034	Wind	2.1	In-Service
WDT053	Wind	42.6	In-Service
WDT092	Wind	66.0	In-Service
WDT123A	Wind	8.7	In-Service
WDT123B	Wind	3.0	In-Service
WDT123C	Wind	6.8	In-Service
WDT176	Wind	6.5	In-Service
WDT213	Wind	49.9	In-Service
WDT334	Solar PV	18.5	In-Service
WDT400	Wind	30.0	In-Service
WDT423	Solar PV	2.0	In-Service
WDT440	Solar PV	4.0	In-Service
WDT459	Solar PV	9.0	In-Service
WDT685 (QFID 6030)	Wind	16.5	In-Service
WDT688	Wind	10.5	In-Service
WDT855	Wind	31.0	In-Service
WDT873QFC (QFID6096)	Wind	15.7	In-Service
WDT947QFC (QFID 6112)	Wind	19.3	In-Service
WDT948QFC (QFID 6031)	Wind	25.5	In-Service
WDT1012 (TOT019)	Wind	44.4	In-Service
WDT1013 (TOT021)	Wind	22.2	In-Service
WDT1014 (TOT023)	Wind	3.7	In-Service
WDT1015 (TOT015)	Wind	45.0	In-Service
WDT1016 (TOT048)	Wind	45.3	In-Service
WDT1017 (TOT056)	Wind	90.6	In-Service
WDT1019 (TOT051)	Wind	22.4	In-Service
WDT1127QFC (QFID6004)	Wind	39.75	In-Service
WDT1129QFC (QFID 6087)	Wind	32.9	In-Service

WDT1132QFC (QFID 6088)	Wind	15.1	In-Service
Garnet aggregate QFs	Wind	101.1	In-Service
QFID6090	Wind	27.0	In-Service
GFID2903	Diesel	0.0	In-Service
GFID5612	Solar PV	0.88	In-Service
GFID5613	Solar PV	1.4	In-Service
GFID5813	Solar PV	0.08	In-Service
GFID5814	Solar PV	0.26	In-Service
GFID5938	Solar PV	0.07	In-Service
GFID6349	Wind	1.5	In-Service
GFID7204	Combustion Turbine	4.6	In-Service
GFID8170	Solar PV	13.44	In-Service
GFID8176	Solar PV	0.99	In-Service
GFID8267	Internal Combustion	0.03	In-Service
WDT042	Wind	40.0	IA Amendment
WDT458	Solar PV	12.0	Construction
WDT530	Solar PV	20.0	Construction
WDT1056 (TOT120)	Wind	100.5	Material Modification
WDT1186	Battery Storage	20.0	Parked
GFID5500	Solar PV	1.5	Construction
GFID5501	Solar PV	1.5	Construction
GFID5523	Solar PV	1.5	Construction
GFID5524	Solar PV	1.5	Construction
GFID5665	Solar PV	1.5	Construction
GFID5668	Solar PV	0.21	Construction
GFID8160	Solar PV	0.92	IA Pending
GFID8299	Solar PV	0.99	IA Pending
GFID8422	Solar PV	1.85	Application Received
GFID8423	Solar PV	1.85	Application Received
GFID8465	Solar PV	0.03	Application Received
WDT1363ISP	**Solar PV**	**1.92**	**ISP Study**
Total (MW)		**1099.5**	

IV. Subtransmission System Assumptions

This assessment modeled the recently approved Yucca looping project and the Hi Desert 115 kV line reconfigurations in the Devers 115 kV Subtransmission system, a reliability project to increase load serving to the Yucca Substation, Leatherneck Substation and Carodean Substation.

V. Study Methodology

The base cases were developed to represent stressed loading and generation conditions for the Devers subtransmission system based on the load and generation data provided in Tables 1 and 2 respectively. The pre-cases included all existing and queued ahead projects, and the post-cases added the 1.92 MW Desert Hot Springs Energy Project to identify its incremental impacts.

VI. Power Flow Results

The existing configuration of the three 220/115 kV transformers installed at Devers Substation with their aggregate Normal and Emergency Ratings are shown in table 3. Please note that the total capacity of all the three transformers in parallel is slightly less than the sum of the individual rating of each transformer.

Table 3
Devers Substation 220/115 kV Transformers Rating

Bank	Normal Rating (MVA)	Emergency Rating (MVA)
1A	280	328
3A	280	330
4A	280	336
1A + 3A +4A	811	949

The combined capacity of the three 220/115 kV Devers transformers is sufficient to accommodate the Desert Hot Springs Energy Project (WDT1363) with no additional subtransmission upgrades needed as shown in table 4. Additionally, there were no voltage issues identified in this scenario.

Table 4
Devers Substation 220/115 kV Transformers Loading

Bank	Pre-Project Loading (MVA)	Pre-Project Loading (%)	Post-Project Loading (MVA)	Post-Project Loading (%)
1A	278.9	99.6	279.6	99.9
3A	262.5	93.7	263.1	94.0
4A	266.8	95.3	267.4	95.5

It is important to note that the loss of the Devers-Garnet 115 kV line or Devers-Garnet-Indigo 115 kV line would result in no source available for Garnet Substation during this outage. Such an outage would likely result in the Desert Hot Springs Energy Project being temporarily disconnected.

VII. Short Circuit Duty Results

Due to the size and location of this project, the short circuit duty contribution is considered minimal to the subtransmission system and would be limited to the distribution system.

VIII. Conclusion

Based on the results of this assessment, the Desert Hot Springs Energy Project did not trigger the need for upgrades in the Devers 115 kV subtransmission system. In addition, the short circuit duty contribution from the project to the subtransmission system is minimal. However, it is important to note that after the inclusion of the Desert Hot Springs Energy Project, the Devers 115kV subtransmission system cannot accommodate any additional projects, regardless of size, without the installation of a fourth Devers 220/115 kV transformer. The addition of a fourth A Bank may require the split of the Devers 115kV subtransmission system to mitigate potential short circuit duty concerns.

Furthermore, on the Bulk Transmission system due to the construction requirements for the West-of-Devers[2] (WOD) Transmission Upgrades this generation project may be subject to congestion management, i.e. generation curtailments during the construction of the WOD upgrades. The WOD Transmission Upgrades were triggered as part of the

[2] www.sce.com/westofdevers

Transition Cluster Interconnection Studies to upgrade five (5) 220 kV T/Ls along the west side of SCE's Devers Substation to support bundled 1590 ACSR conductors. Currently the West-of-Devers project is in the licensing phase with an expected completion date of 2021. During the construction of the West-of-Devers transmission upgrades, existing transmission lines will be demolished to enable use of existing right-of-way for new transmission infrastructure. This construction requirement will reduce existing West of Devers transmission capacity until the new transmission is constructed in the vacated right-of-way and energized.