

PJM 2011 RTEP Voltage Analysis

Dominion SVC Proposal at Mt Storm

“Dominion Alternative” to Mt Storm – Valley SVC

Follow Up to the January 12, 2012 TEAC

01/17/2012

Follow Up on Dominion's Proposal

The intent of this information is to clarify issues raised during the January 12, 2012 TEAC, as well as provide additional benefits associated with Dominion's Proposal.

Dominion Alternative SVC Proposal

Dominion's Proposal is an alternative to a 250 MVAR SVC on the Mt Storm - Valley 500 kV line, as follows:

- Install a 250 MVAR SVC on Mt Storm 500 kV bus.
- Adjust GSU taps to allow for nominal bus voltage of 525 kV at Mt Storm.
 - Currently regulated at 520 kV
- Integrate Volt/VAR logic to control existing 600 MVAR fixed capacitor banks, generator units and SVC output to provide more efficient reactive support and operation.

Clarification On CPCN

Primary Power asserted even though Dominion claims a CPCN is not required, similar to Mt Storm – Doubts there will be a two-step process for Dominion to file for and obtain a Commission ruling to that effect; therefore, there is not a significant time difference between Primary Power's need to obtain a CPCN and Dominion's Proposal.

- Dominion **does not need** a CPCN.
 - Nor is there a required two-step process as mentioned during the TEAC. A CPCN is simply not required for Dominion to install a SVC at Mt. Storm and there is no reason to seek a declaratory ruling.
 - This is a normal course of business substation expansion within the same site.
 - Please refer to Dominion's response to PJM on question 4 regarding regulatory requirements in West Virginia.
 - W. Va. Code § 24-2-11a and W. Va. Code § 24-2-11

Clarification On CPCN - Continued

- Primary Power **does need** a CPCN.
 - Primary Power does need to obtain a CPCN and admitted to such need.
 - Dominion is experienced in regulatory siting procedures and timing for obtaining a CPCN which at a minimum is between six months to a year.
 - Timing can be prolonged if there are issues raised and opposition from interveners.
 - The WV Public Service Commission could take issue with granting a CPCN to Primary Power for the Mt Storm - Valley SVC where the TEAC material clearly shows a viable alternative at Mt Storm.
 - Land Already Obtained
 - Less Public and Environmental Impacts
 - Technical Advantages
 - Reduced Cost

Bus Regulation

Primary Power indicated they intend to provide details demonstrating that leaving the Mt Storm 500 kV bus at the existing 520 kV regulation combined with the Mt Storm – Valley SVC is the best option.

- Dominion encourages PJM to review the December 27, 2011 KEMA letter detailing the superiority of Dominion's alternative to Mt Storm-Valley SVC. This letter describes the operational performances including stability improvements of the generators that can be realized by raising the regulation to 525 kV along with automation of the fixed capacitor banks, SVC and generation VAR output to improve efficiency.
- In comparing the simulation results presented at the TEAC for the two alternatives, one thing that is not being taken into consideration is the automation at Mt Storm that would significantly improve the efficiency of the VAR supply to the system during critical N-1-1 conditions. In other words, the automation reduces or eliminates the generators fighting with the SVC which occurs without automation regardless of where the SVC is placed.

Bus Regulation – Additional Benefits

- Mt Storm is the lowest regulated 500 kV bus in the PJM system at 520 kV. All other buses are regulated at 525 kV or higher.
- During light loading periods, high voltage continues to be a problem on the Dominion and extended PJM system. According to our System Operations group, Mt Storm is one of the most difficult buses to control due to the current regulation. Current regulation is as follows:
 - Nominal Bus Voltage – 520 kV
 - Emergency Bus Voltage – 525 kV
- Raising the bus regulation to be more in line with the remaining 500 kV system would provide additional benefits from an operations perspective. The revised regulation would be as follows:
 - Nominal Bus Voltage – 525 kV
 - Emergency Bus Voltage – 538 kV

Bus Regulation – Additional Benefits - Continued

- In discussing raising the Mt Storm bus voltage with the Plant, they raised the concern that their reserve bus voltages are running low. Raising the 500 kV bus voltage regulation would improve the Plant's voltage profile on the reserve station service buses.
- Dominion also noticed in the base case that the new Warren generation station not yet in service, queue position V4-018, has a bus voltage regulated at 520 kV. Dominion recommends that this be raised as well. The same benefits and justification for Mt Storm would apply to Warren.

Coordination with Mt Storm

Primary Power asked for clarification on TEAC slide 62 dealing with coordination of Mt Storm generation, existing Mt Storm capacitors and Dominion's proposed SVC. An SVC at the Mt Storm - Valley site as proposed by Primary Power would require coordinating integration across multiple sites, versus integrating within a single site, Mt Storm, as proposed by Dominion.

- Dominion's Proposal will integrate Volt/VAR logic to control the existing 600 MVAR fixed capacitor banks, generator units and SVC output to provide more efficient reactive support and operation.
- Without this automation the SVC and generation dynamic capability would fight each other resulting in loss of efficiency and performance regardless of where the SVC is placed, locally or remotely at the Mt Storm - Valley site.

Coordination with Mt Storm - Continued

- Integration at the single site, Mt Storm, is much easier to accomplish; and more reliable and secure.
 - Integration requires establishment of a secure communication and control scheme that ties the generators, SVC and fixed capacitor together.
 - Security is achieved as the controls are contained entirely within the Mt Storm site.
 - Cyber Security(CIP) issues are much easier to deal with when controls are contained within the same local site.
 - Maintenance and/or issues with the control scheme are easily resolved with 24 hour onsite relay technicians and substation personnel.
 - With the SVC, fixed capacitors, and generation all connected directly to the Mt Storm bus, the reliability of the control scheme is enhanced and readiness to respond to events is optimized.

Coordination with Mt Storm - Continued

- Integration at a remote site, Mt Storm - Valley, is more difficult to accomplish and is much less reliable and secure.
 - Integration requires establishment of a secure communication and control scheme from a remote SVC site that ties the generators, SVC and fixed capacitor together.
 - Security is significantly compromised as the controls are remote from Mt Storm.
 - Cyber Security(CIP) issues are much more difficult to deal with resulting in Dominion and the Plant not allowing this type of control scheme to be implemented.
 - Maintenance and/or issues with the control scheme are more difficult to address in a timely manner as the Mt Storm - Valley site is not manned with onsite personnel.
 - With the Mt Storm - Valley SVC remote from the fixed capacitors and generation, outages of the new Mt Storm - Petersburg line section would render the scheme useless.
 - Petersburg would be a new switching substation cutting the existing Mt Storm – Valley line into two line sections, Mt Storm – Petersburg, and Petersburg – Valley.

Cost Comparison of the Two Proposals

Primary Power mentioned on the TEAC slide 62 with regards to cost that the land expense is small and the difference in cost between the two proposals is small.

- PJM owes it to the stakeholders to develop and approve solutions that not only resolve the issues but also are least cost.
- It is more than the need to acquire land for a new substation site that will drive the Mt Storm - Valley location to be more costly than Dominion's proposal.
 - Additional equipment like breakers are required to cut into the existing Mt Storm - Valley line to establish a new switching substation.
 - Additional right of way required beyond the substation is needed to interconnect the Mt Storm - Valley line with the SVC substation.
 - Higher substation development costs for a green field site, Mt Storm - Valley, versus an established substation location at Mt Storm.
 - Additional cost for regulatory approval.

Conclusion

- Dominion believes the evidence clearly demonstrates the Mt Storm SVC proposal is superior to the Mt Storm - Valley SVC proposal.
- Superiority comes in the form of many technical and reliability advantages by placing the SVC at an existing site at a reduced cost where land has already been obtained and regulatory approval is limited to a few local permits.
- The Mt Storm - Valley site will require a CPCN, whereas the Mt Storm location does not.
- The reliability issues that PJM is addressing with this and other reactive support on the system can have a severe reliability impact to the area if the most optimized solution is not selected that has the least risk for meeting the required in service date.

Conclusion - Continued

- Interveners in the Mt Storm - Valley CPCN proceeding could easily impact the timely approval and/or jeopardize approval from West Virginia.
- Raising the bus voltage at Mt Storm to 525 kV is consistent with the rest of the 500 kV buses in PJM and will provide improved system operations for light load high voltage conditions.
- **Bottom line**: The Mt Storm - Valley SVC is technically deficient by comparison to Dominion's Proposal and entails greater cost and risk for PJM and its stakeholders.