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**Toward Online VAR Control for Optimal Voltage Profile**

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**Abstract;**

The optimization of the power grid condition will become increasingly important to accommodate larger amount of the renewable energy. While the topic of optimizing voltage profile as reference voltages to be fed into local voltage control systems has received considerable attention in power industry, there have been very few discussions on how to adopt the control effort in the optimization function within the control architecture. Reducing the control effort (both number and amount) for voltage control apparatus is also important for effective asset management.

This presentation introduces our team effort for conditioning voltage control apparatus to realize the optimized voltage profile. Although, the optimal voltage profile of power grid should be solved uniquely, there are normally multiple sets of control actions to achieve this optimal voltage profile, depending on the amount of voltage control apparatuses installed in the power grid. It means that it is possible to optimize the voltage control with regard not only to the voltage profile but also to the control effort, which can be expressed as an operational cost.

This presentation also shows an empirical example of this optimization method applied to a sample power grid model to demonstrate the potential value of this co-optimization. Finally, a new simulator, named OPEN-VQ, to realize this co-optimization is introduced. This co-optimization is executed online using the OPEN-VQ simulator. The OPEN-VQ simulator can also be used as a support tool for planning and functional design of voltage control apparatus, as exemplified on a real 3000-bus power grid model .