## Steady-state analysis of the effect of reactive generation limits in voltage stability

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## Abstract-

Voltage collapse phenomena are highly affected by reactive power generation limits. Saturation of the reactive power generation limits of a unit may result in a deterioration of the voltage stability. However, in some cases when the power network is operating close to the voltage collapse point, the reactive power generation saturation of a unit can change the system voltages immediately from stable to unstable; thus, a dynamic voltage collapse leading to blackout may follow. This paper presents a steady-state analysis of the immediate instability caused by reactive power generation saturation phenomena. For this purpose, the paper proposes a novel index that evaluates when and why a reactive power generation saturation will only result in a deterioration of the system voltage stability or, on the contrary, it will make the system voltages immediately unstable.

Index Terms- Reactive power generation limits; Voltage stability; Voltage collapse; Transcritical bifurcation

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