This paper introduces a novel idea for adding virtual inertia in power systems by controlling the frequency swing dynamics through voltage channel. The purpose is to develop a frequency-based supplementary VAR modulation to assist governor action during power imbalance events. In this aim, we propose a two-band power system stabilizer, tuned for very low-frequency common swing mode, to adaptively adjust reference voltage of a Synchronous Condenser (SC) and modulate its reactive power on a second-by-second basis. The feasibility of this idea is supported by theoretical and simulation evidences. From theoretical side, we formulate a computational procedure to measure the degree of control impact, accompanied by sensitivity analyses around varying operating points. On the simulation side, we perform extensive studies on four well-known IEEE multi-machine test systems. The results show that VAR modulation by SC has a considerable impact on the minimum post-contingency frequency (frequency nadir), even more than so-called load modulation methods in some cases, which in fact has not been given enough attention in the past. In addition, we show that the proposed method can aid governors to improve primary frequency response particularly in low inertia power systems by reducing post-event frequency settling time and bias.