Switched Capacitor Based Multi Level Boost Inverter For Smart Grid Applications

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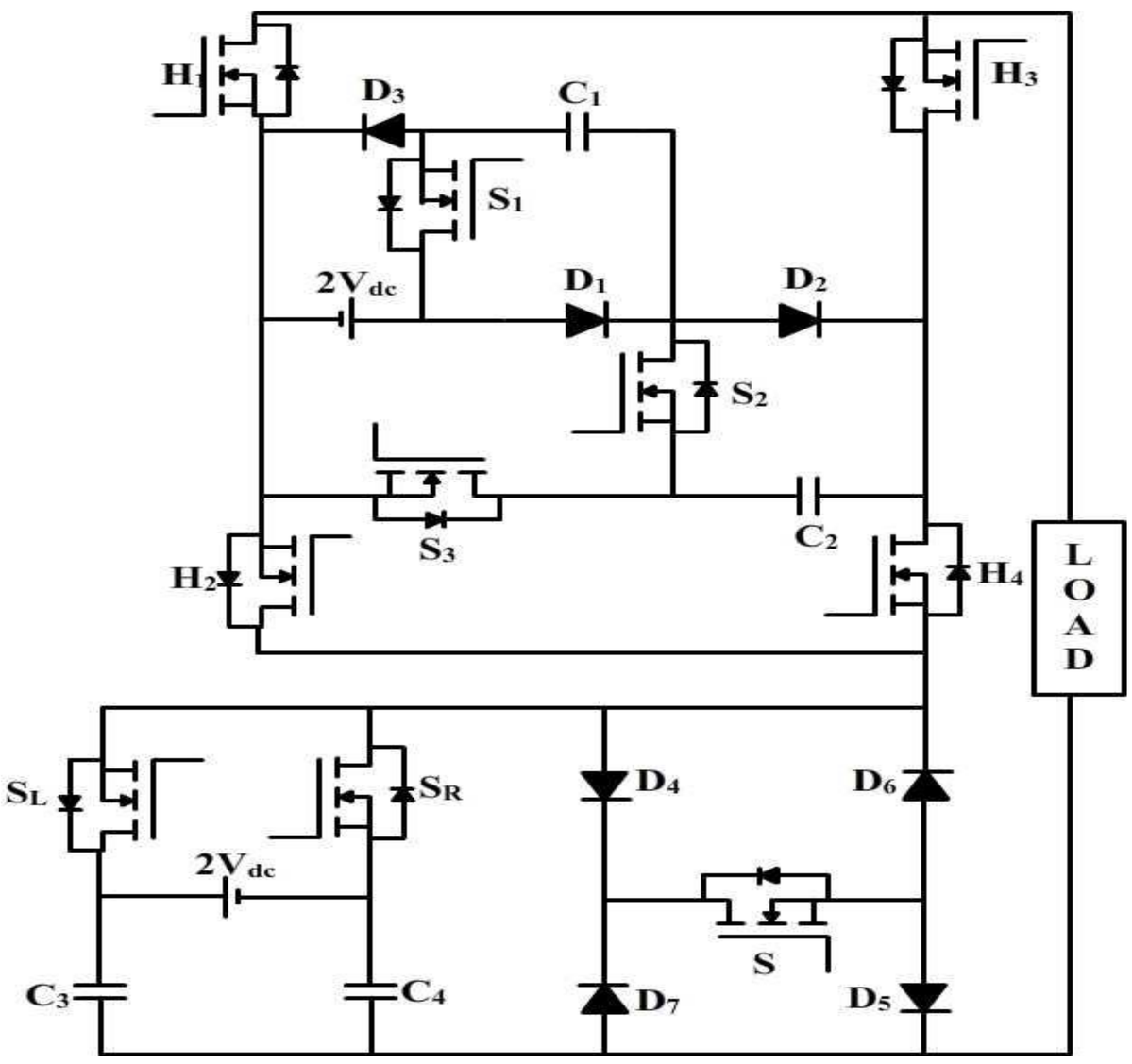
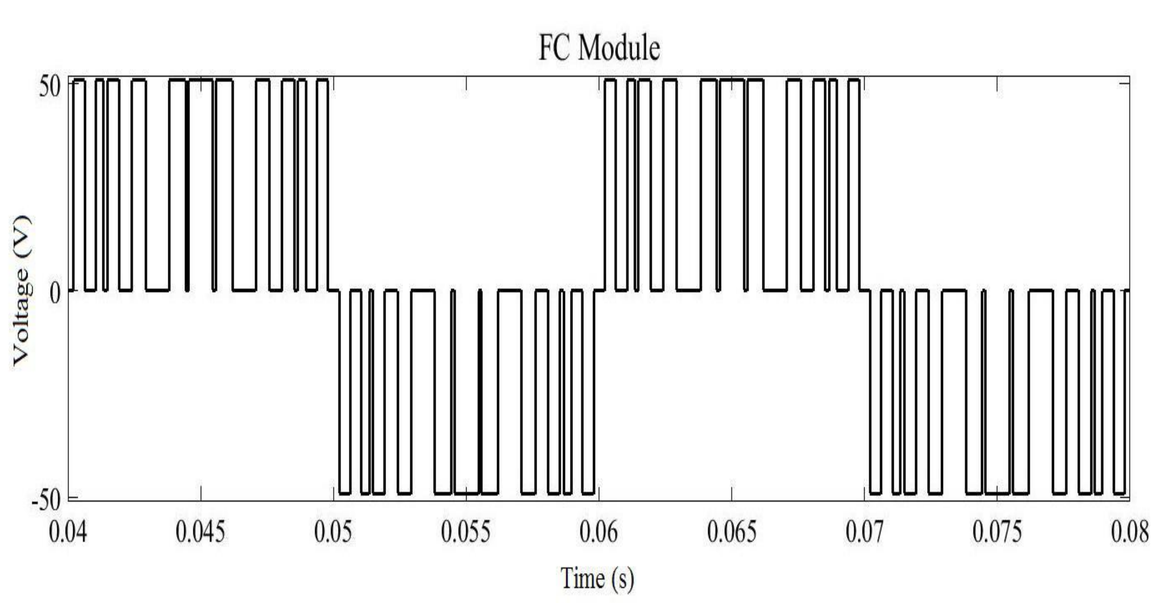
Introduction: Inverters are power electronic converters essential for linking sources of DC power to the AC grid. Conventional inverters use transformers and harmonic filters which are bulky, expensive and lossy. Multilevel inverters offer reduced THD, inductor-less design and increased range of control. They produce a stepped waveform, with close resemblance to a sine wave. Smart grids may have several distributed sources and when these sources have minimal THD, there is a reduced stress for filtering them at the point of common coupling. A switched capacitor based multilevel inverter offering boost capability and low THD is proposed. The inverter has inherent charge balancing capability. The switches in the inverter are modulated using PODPWM technique.

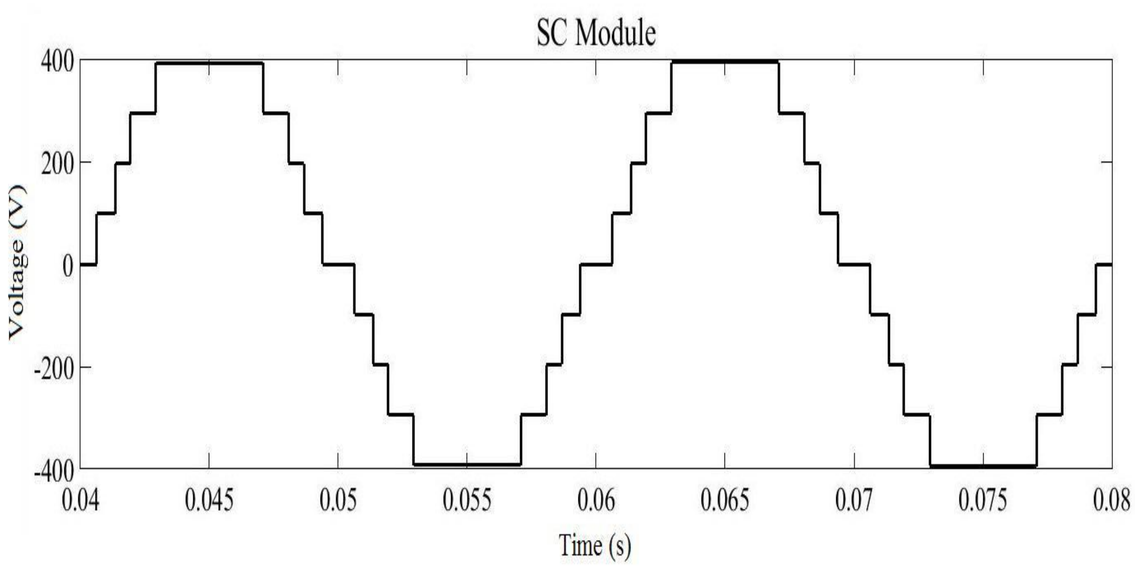


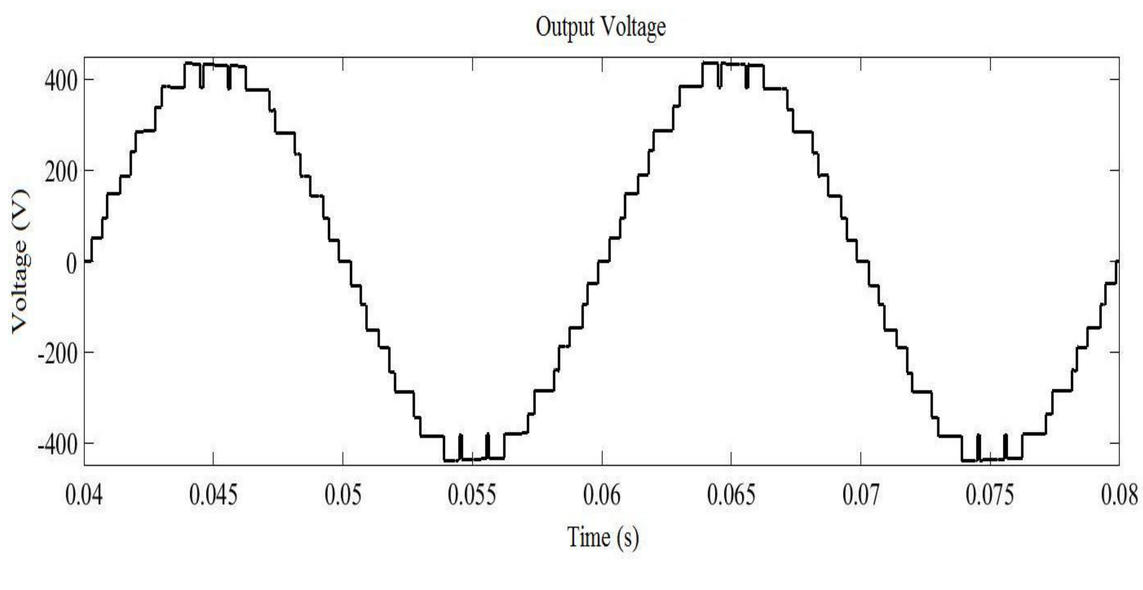
Power Circuit Diagram: The proposed topology consists of consists of two distinct units: a switched capacitor cell and a floating capacitor cell. Each cell has two capacitors which produces a separate 9-level and 3- level waveforms.

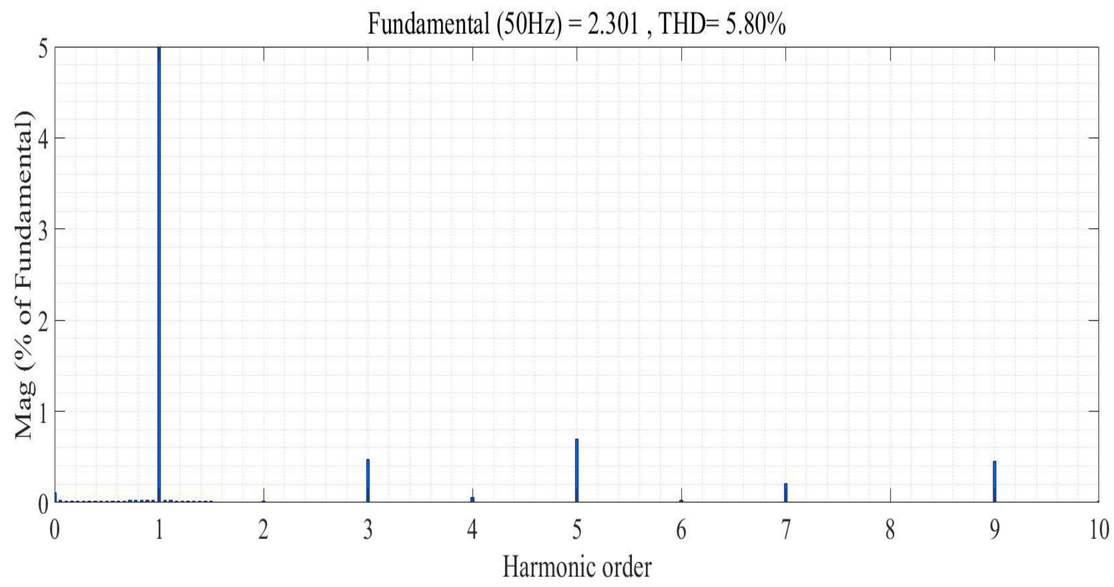
Parameter	Value
Cell 1 Source	100 V
Cell 2 Source	100 V
V_{rms}	302.9 V
I_{rms}	1.59 A
Output Power	481.61 W
Output Levels	19

Working: The proposed topology uses PODPWM, which reduces switching losses, minimizes switching frequency and allows for uniform charging and discharging of capacitors leading to self-balancing.









Results:

(i) The FFT analysis shows a THD of 5.80%. The third harmonic component is only 0.47% of the fundamental.

(ii) The proposed topology has inherent boost capability, eliminating the need for an interim boost converter.

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