This series/parallel charge pump is a kind of DC-DC-converter.

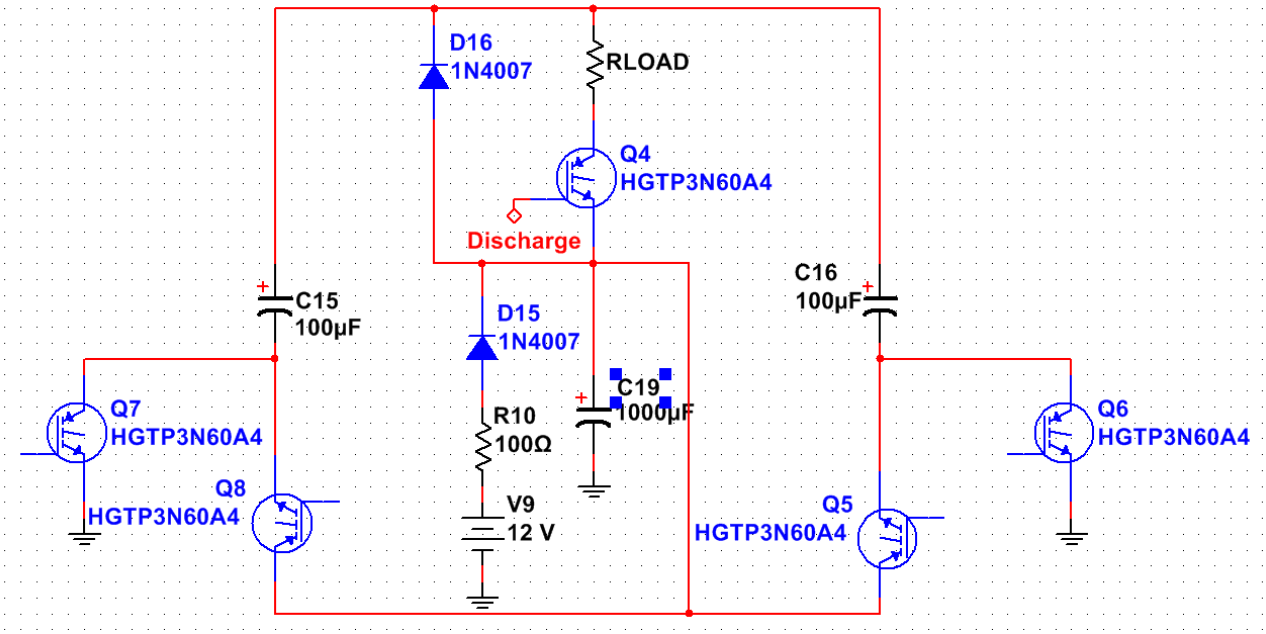
Basic idea
Capacitor cluster 1 is configured in a parallel configuration with an energy source. Then capacitor cluster 1 is configured in a series configuration with the energy source and both elements are configured in a parallel configuration with capacitor cluster 2. Then the roles of capacitor clusters 1 and 2 are swapped.

During each iteration, the voltage across the receiving capacitor cluster increases. After a number of iterations both capacitor clusters are discharged to a recovery capacitor with significantly larger capacitance than the sum of the capacitance of the two capacitor clusters. This will reduce the voltage in the circuit. The circuit states are:

- Parallel – Serial, No discharge
- Serial – Parallel, No discharge
- …
- Parallel – Seriel, No discharge
- Serial – Parallel, No discharge
- Parallel – Parallel, Discharge
- …

The energy source is a 12V laboratory power supply in parallel configuration with the recovery capacitor. The power supply is current limited at 500mA.

A 100 ohm resistor (R10) in series with the energy source limits current during testing. RLOAD is 100 ohm when testing.



Observations/problems
The circuit draws ~270mA of current during the charge cycle and 180mA when discharging or waiting after discharging. Much power is consumed by the 5 isolating DC-DC converters for the 5 IGBT gate drive ICs (each drawing ~30mA when idle).

The voltage across each 100uF capacitor never gets above 17.6V with 10 swaps of series/parallel

configuration and a 100ms charge time between each swap before discharging to C19. I expected and wanted the voltage to increase more rapidly. It seems like the energy is dumped to ground rather than collected in the capacitor clusters and eventually discharged to C19.