

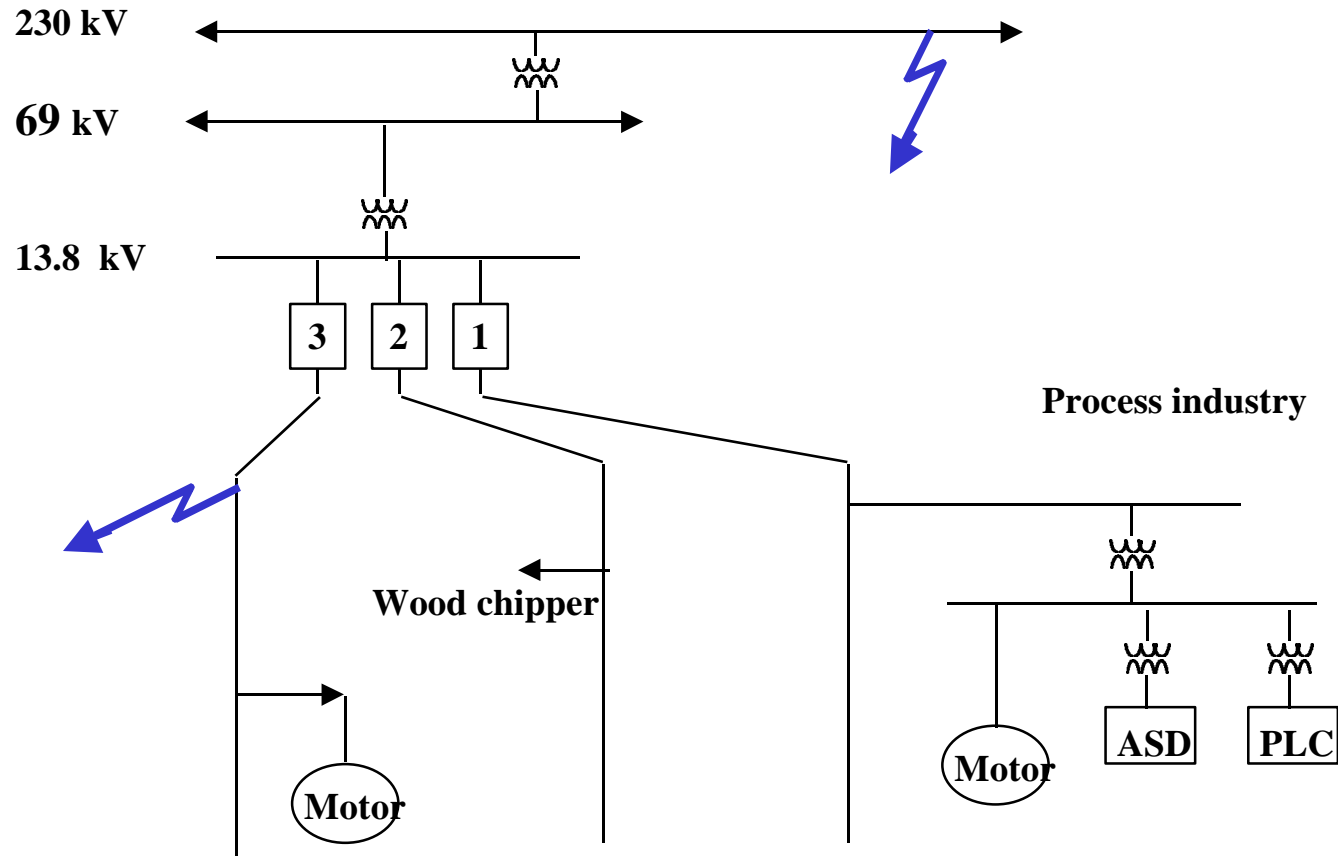
SIEMENS

**Series Voltage Injection for
Voltage Sag Mitigation**

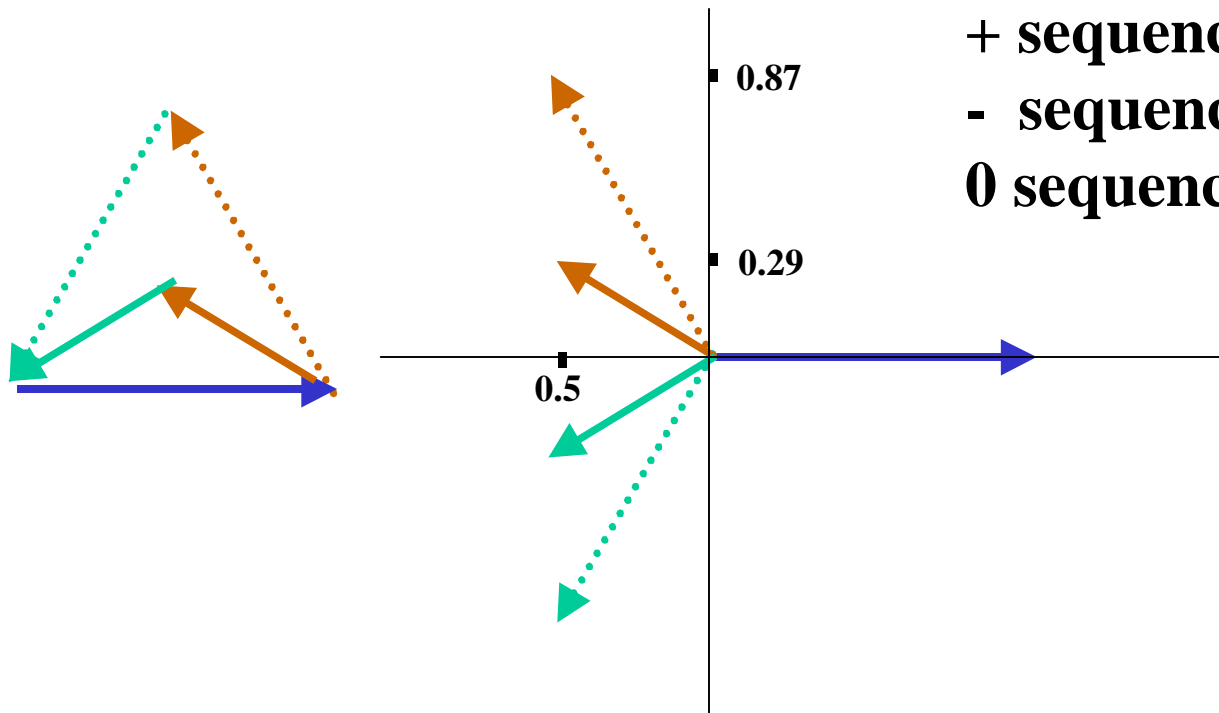
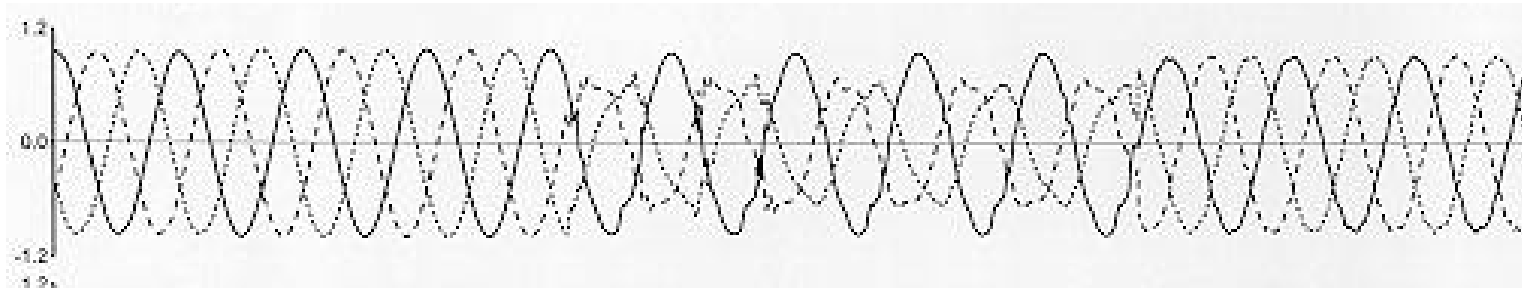
**Power Quality Panel Session
IEEE Summer Power Meeting
San Diego, July 1998**

Sasan Jalali

Background



SLG fault on the Δ of a $\Delta : Y$ transformer

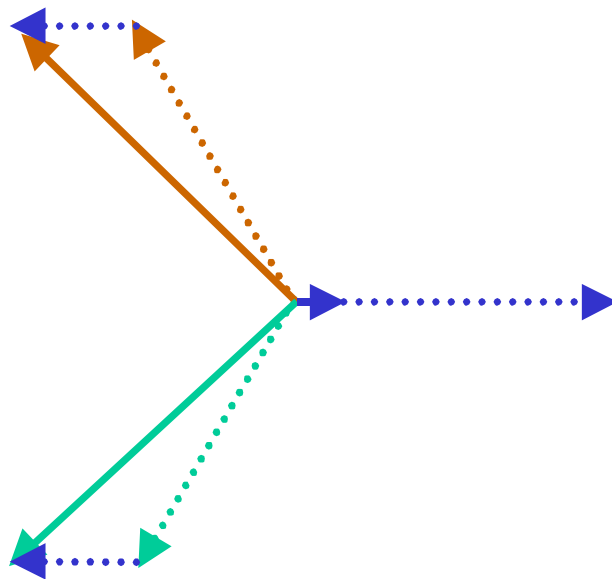
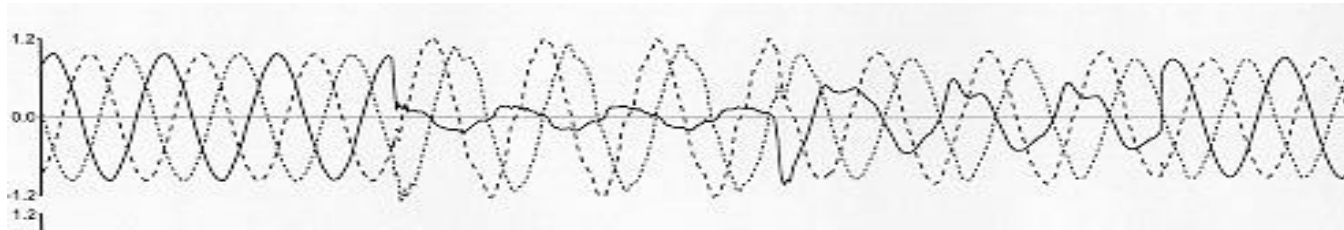


+ sequence \cong 66 %

- sequence \cong 33 %

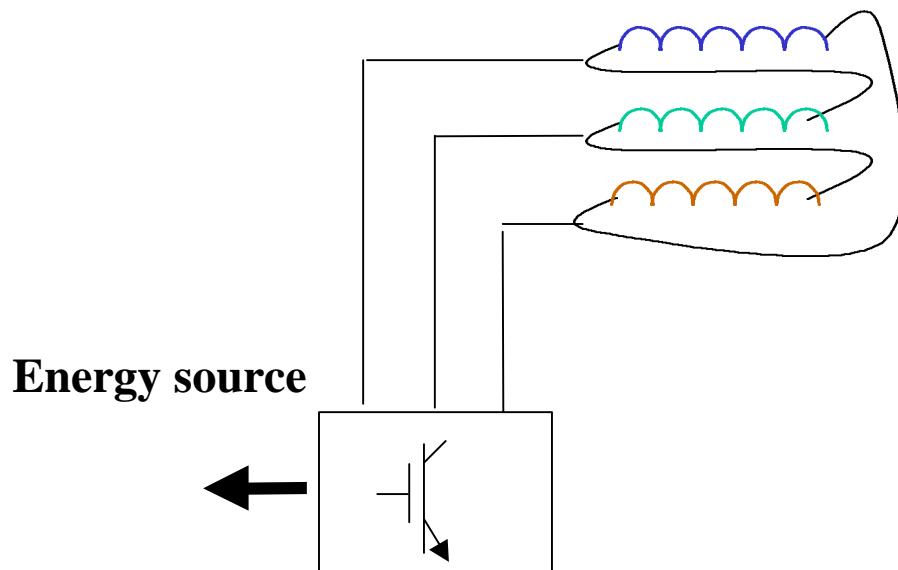
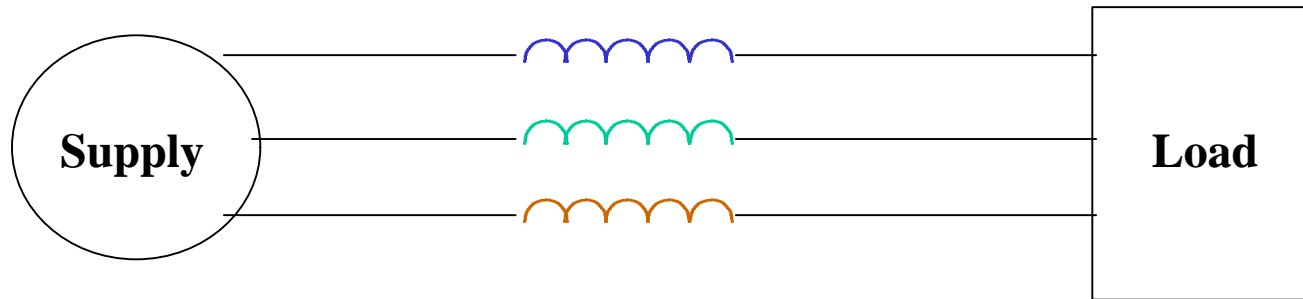
0 sequence \cong 0

SLG fault on an adjacent feeder



+ sequence \cong 70 %
- sequence \cong -25 %
0 sequence \cong - 35 %

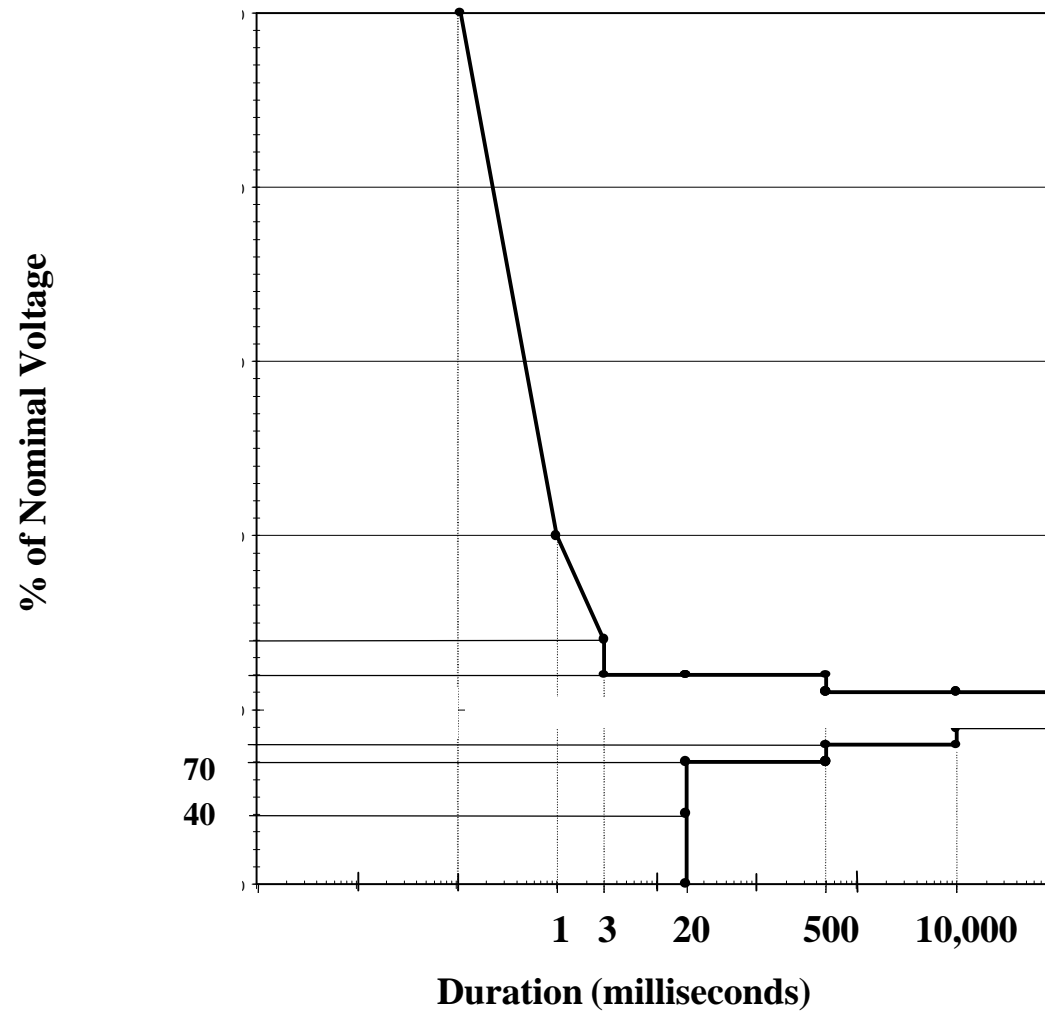
Series voltage injection connection topology



Δ connection

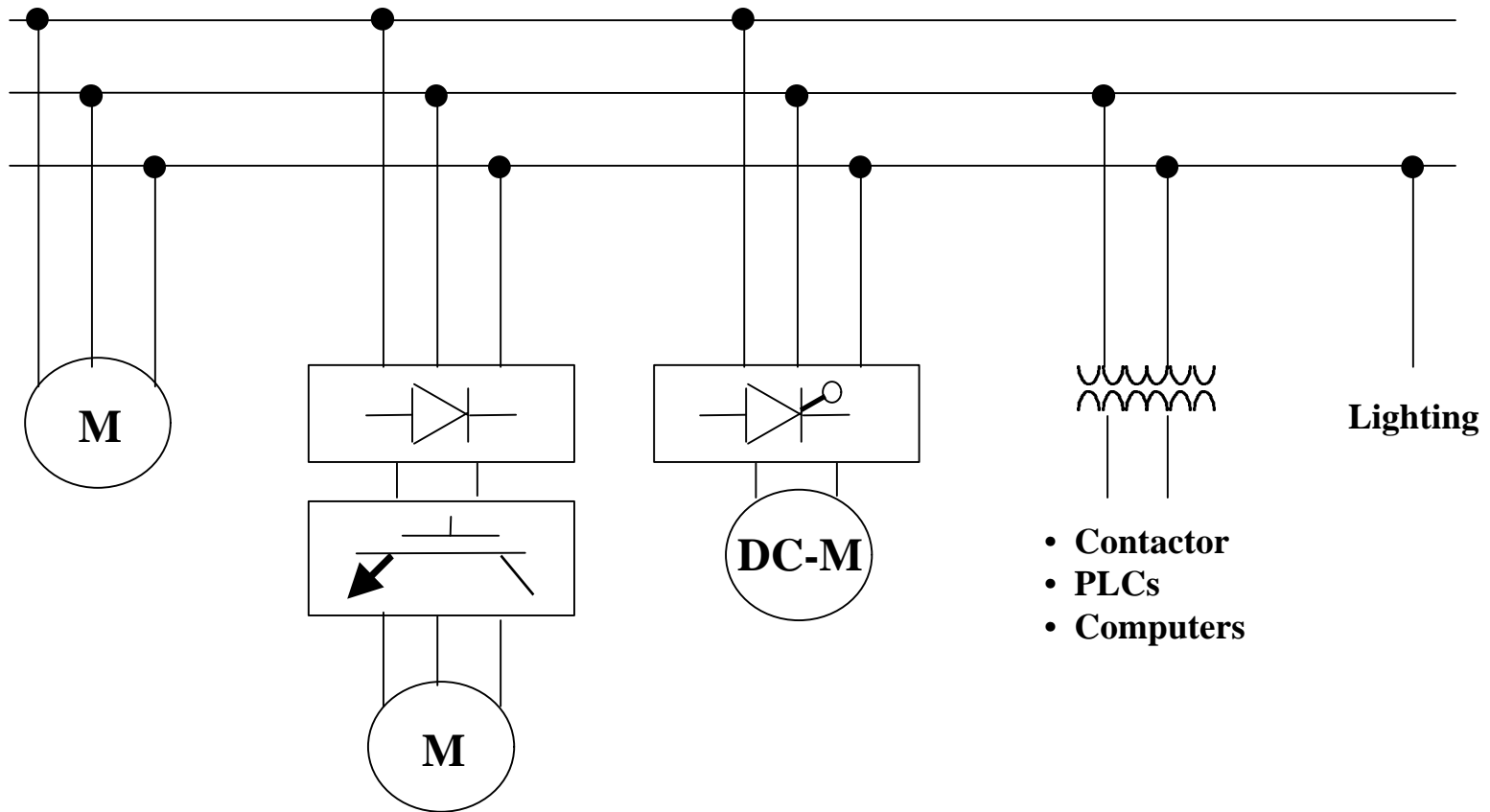
- Injects positive sequence
- Eliminates negative sequence
- No effect on zero sequence

CBEMA Curve

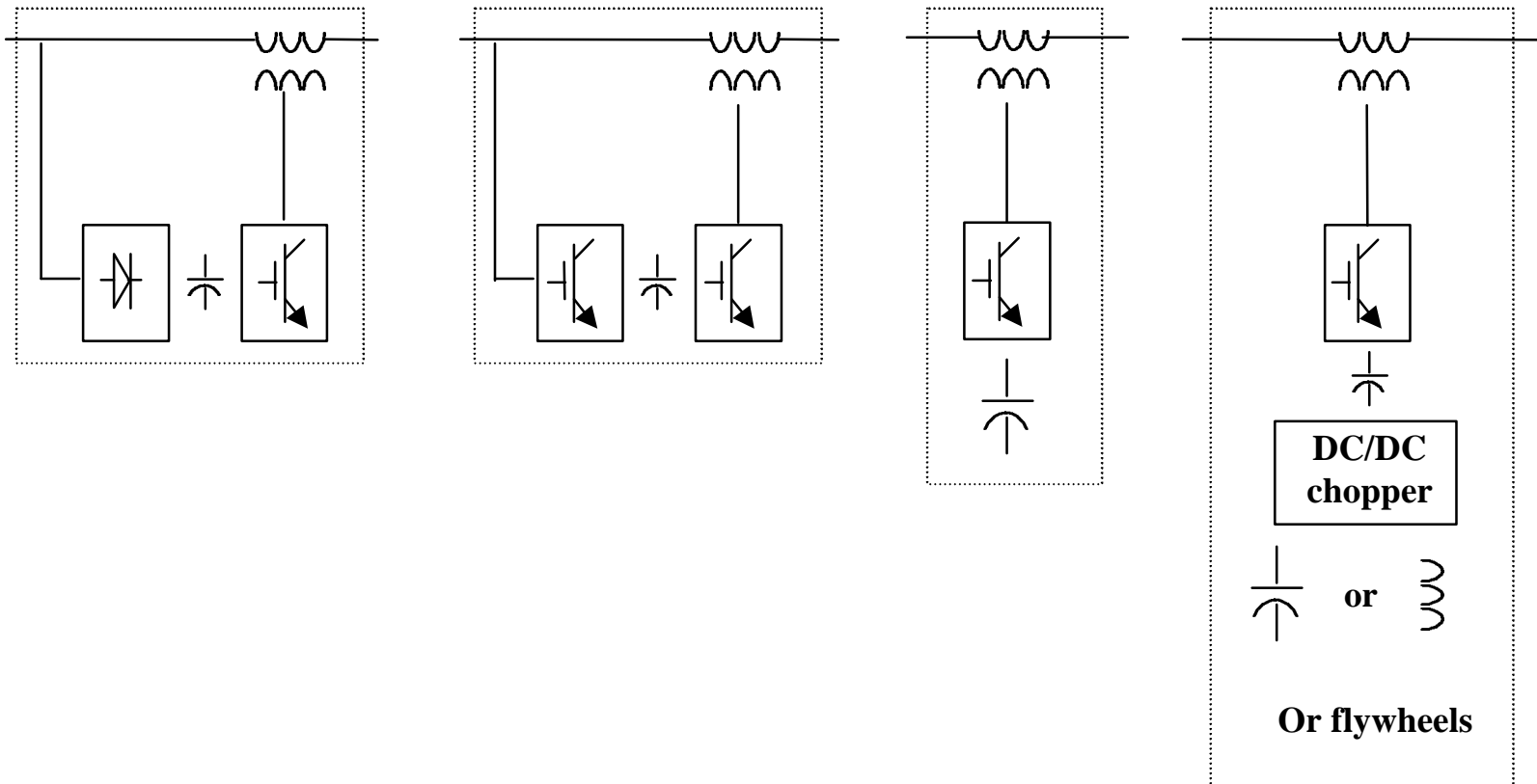


Load sensitivity to phase jump, (+) , (-) and zero sequence

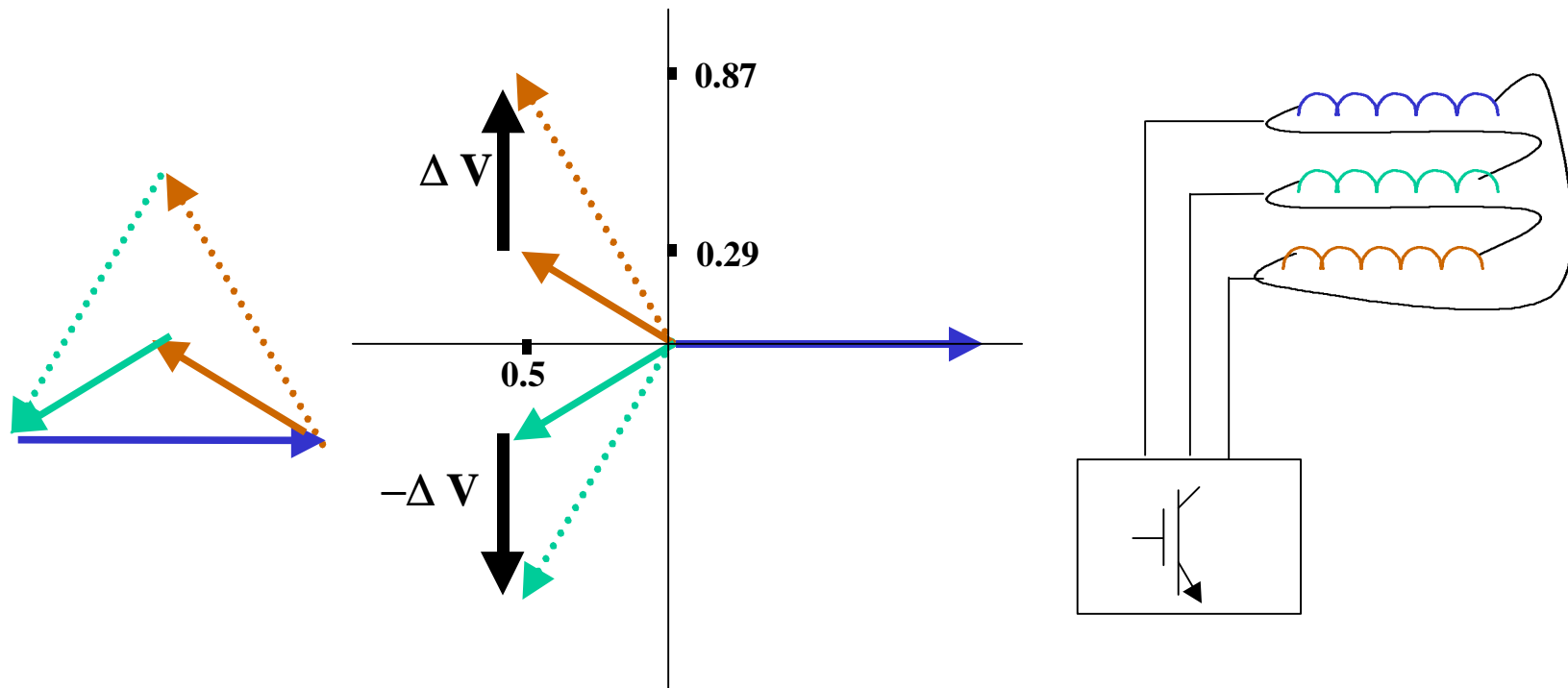
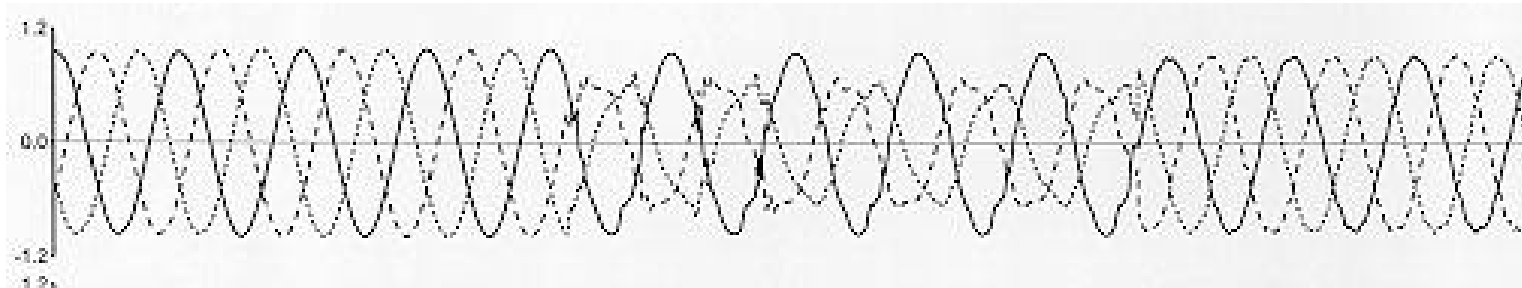
480 V, 3 ϕ



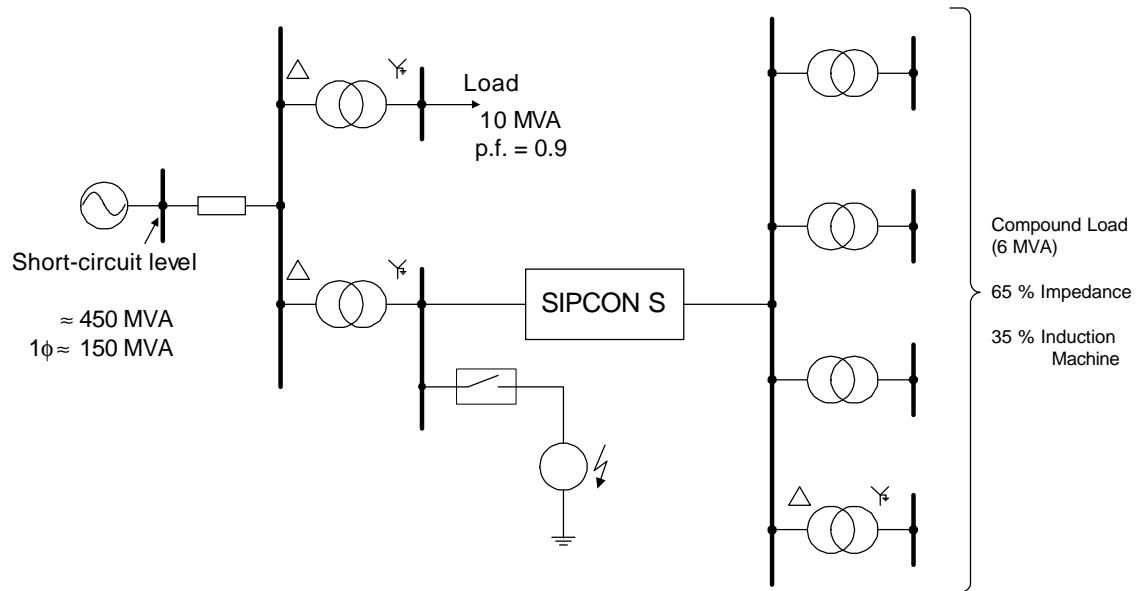
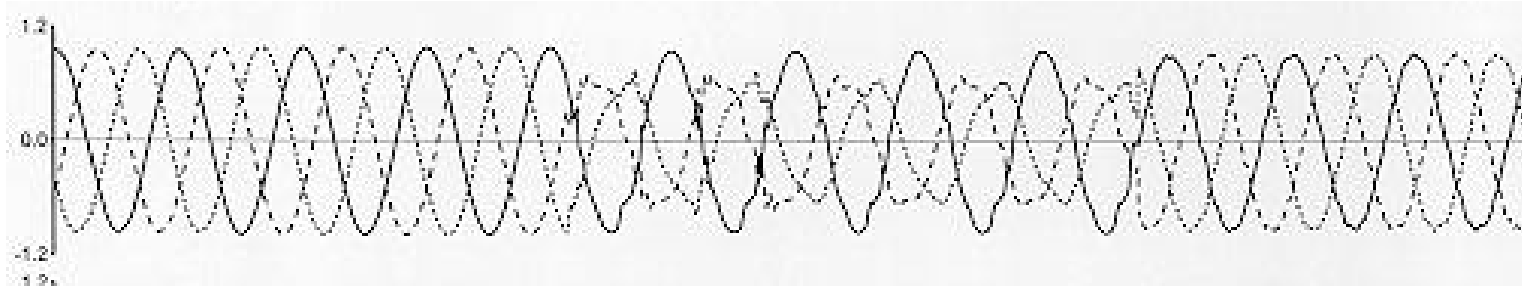
Alternative energy sources for series injection



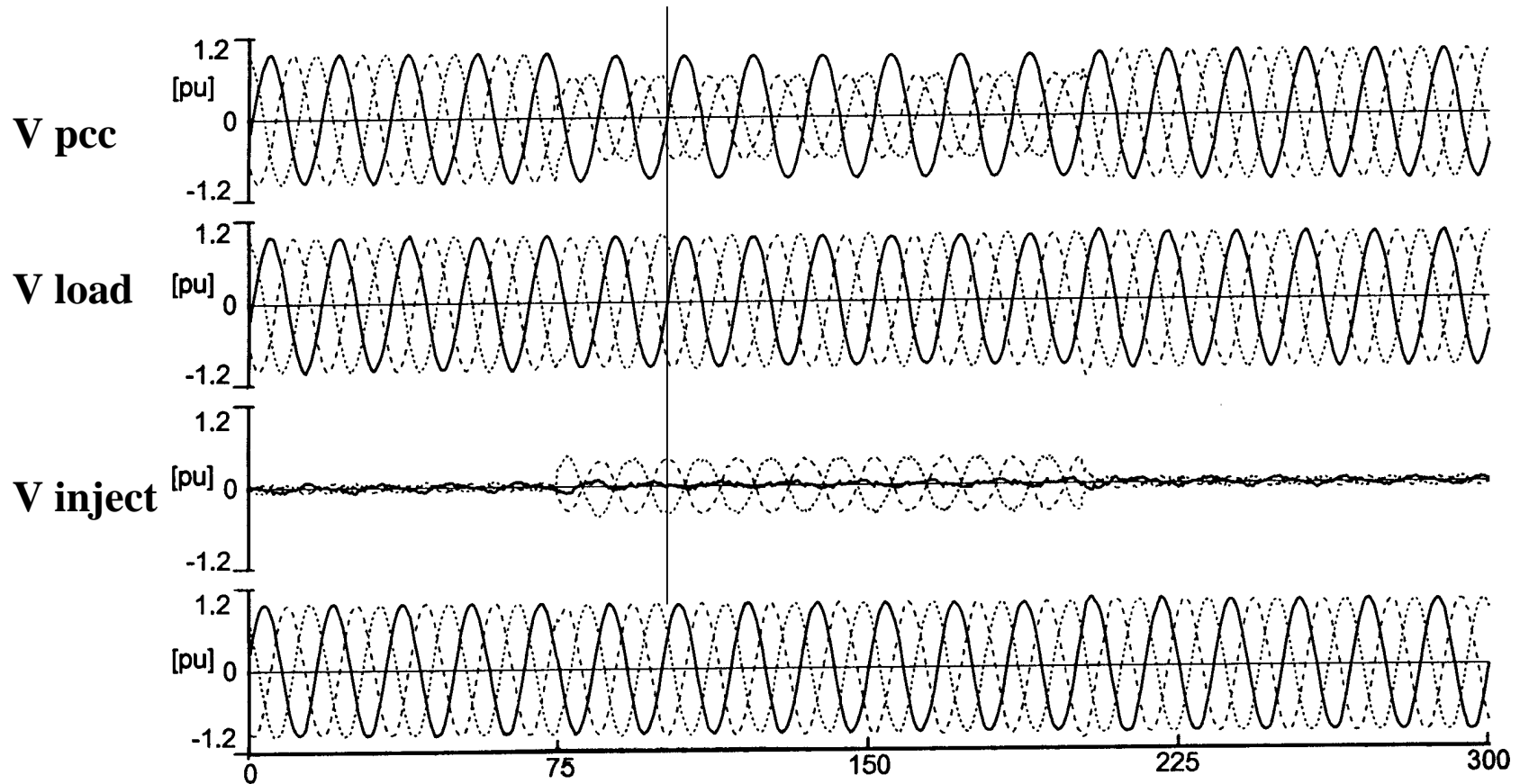
Series injection required



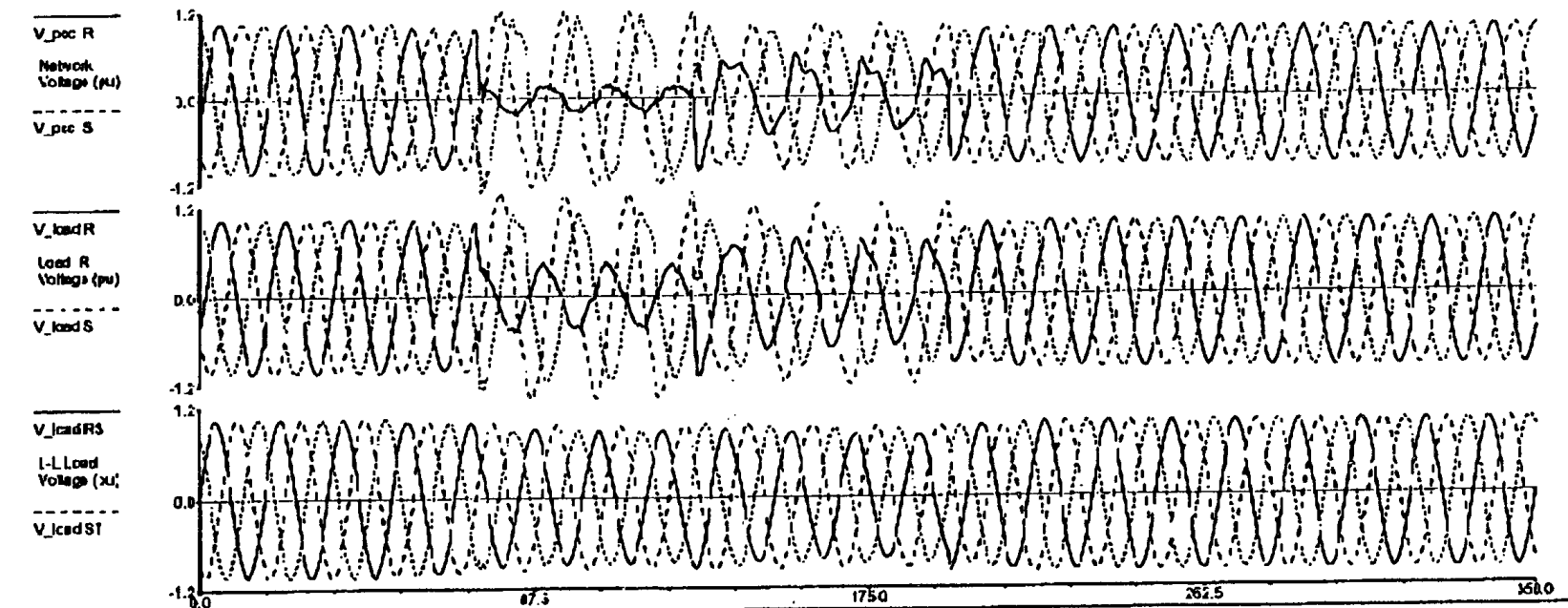
System description



SLG fault on the Δ of a $\Delta : Y$ transformer



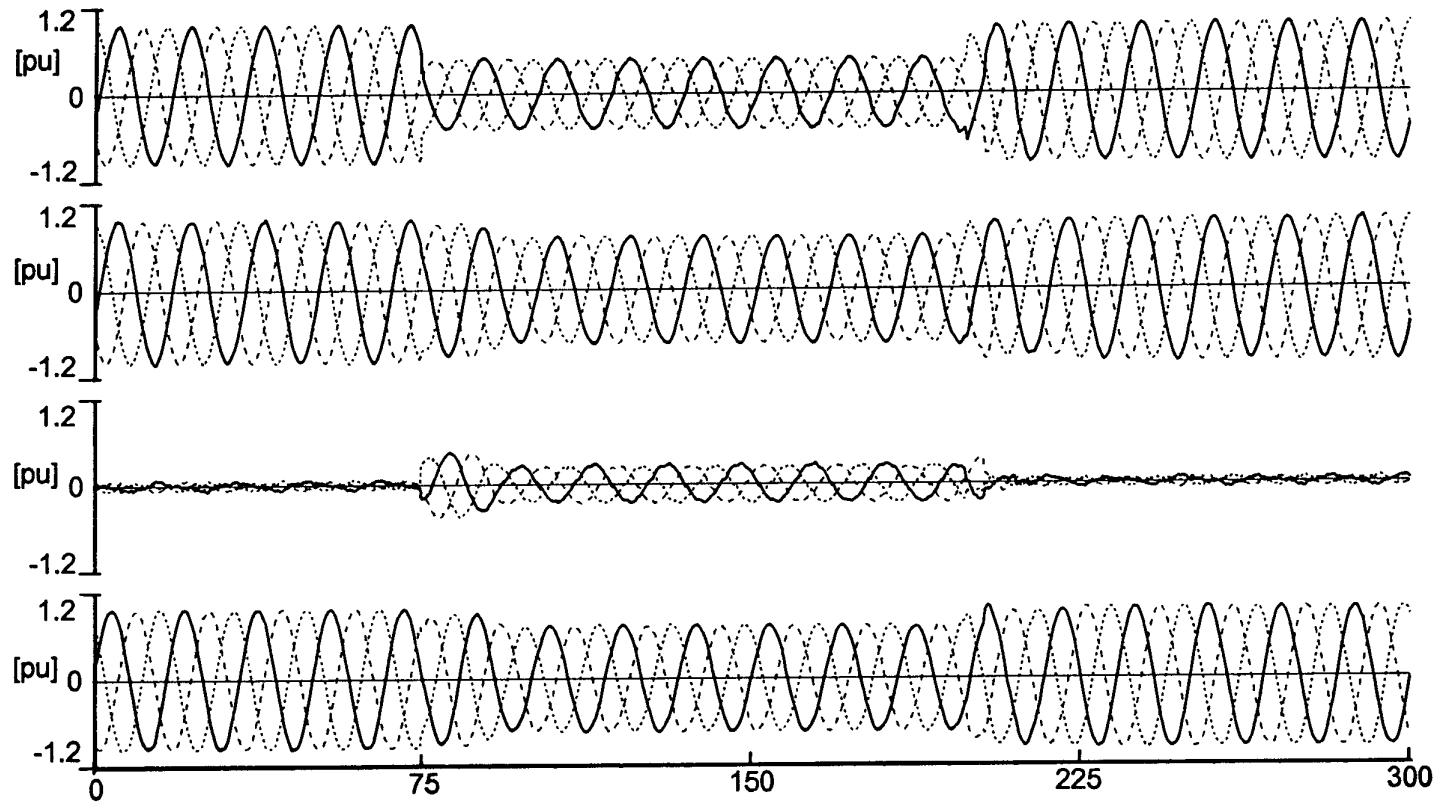
SLG fault, on an adjacent feeder



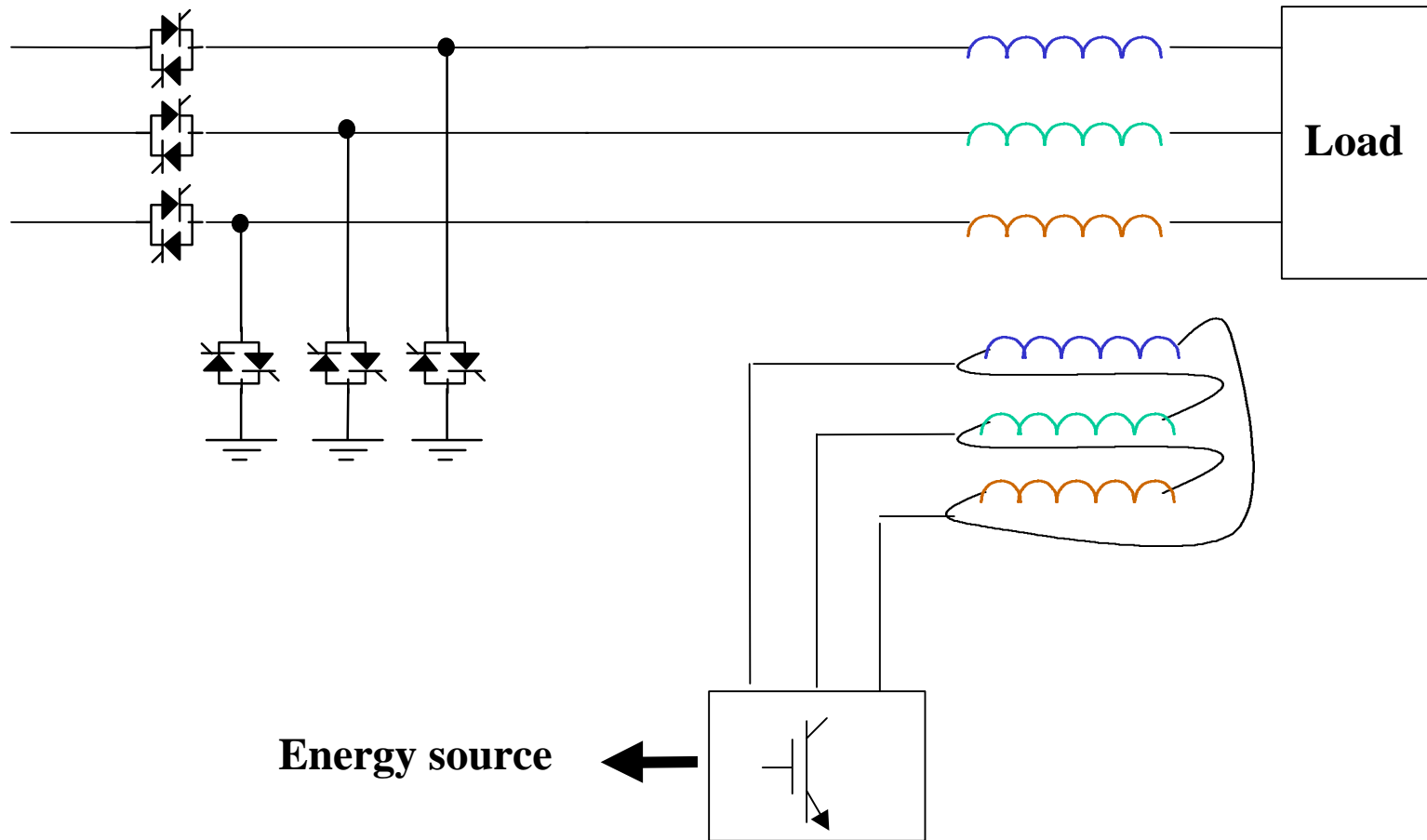
EV NP

SIFCON-S Connected to 13.8 kV Network - IEEE Fault waveform type 3
 6MVA Lcad - Power factor = 0.92
 Pulse-width modulation at 3kHz
 SIEMENS-AG/EV NP3/fo310S/Vs 23.05.97

3 phase fault



Connection topology for total outage solution



Bypass, disconnect and protection

