

# Transmission Capacitor Switching Analysis Module- Update

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# Power Quality



# Objectives behind the work

- Broad vision of EPRI PS1A: better utilization of available PQ data.
- Using existing PQ data streams to monitor the health of system assets.
- Calculate capacitor, pre-insertion equipment and relay system health.
- Determine type of operation and instances of resonance and/or restrike.
- Predict catastrophic failure before it actually happens.

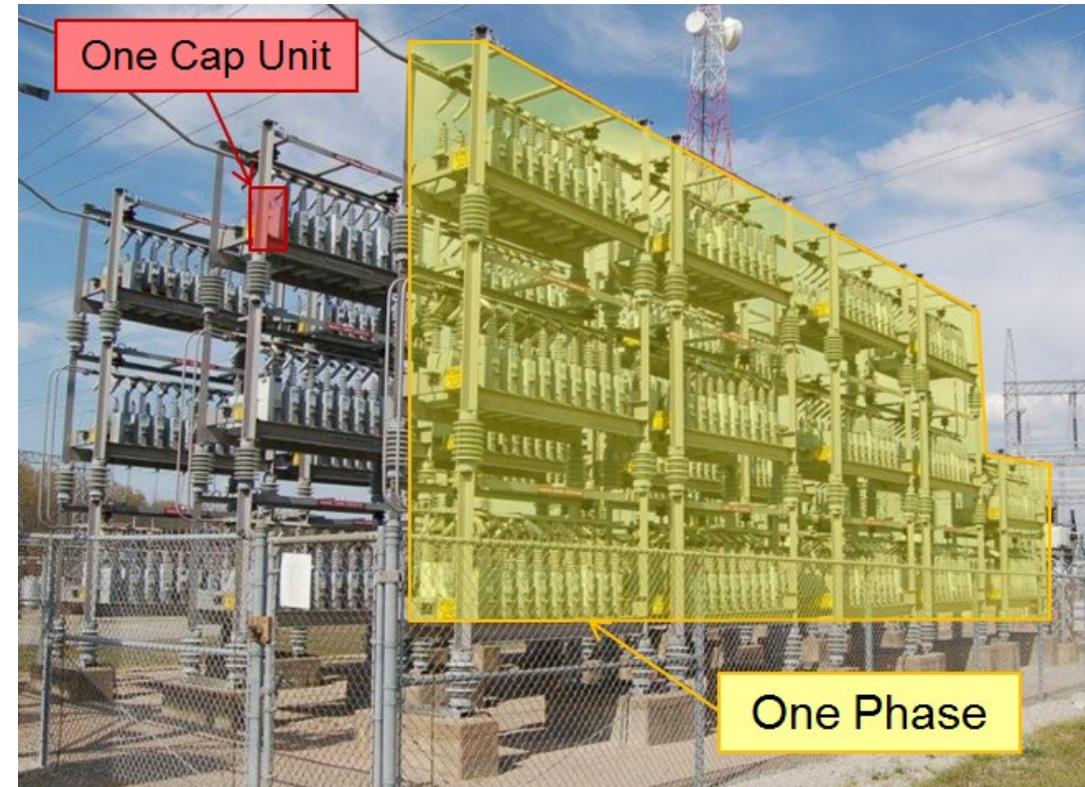
# TVA transmission capacitor infrastructure

## Facts

- 100 Substations
- 300 Cap Banks
- 34,400 Cap Units
- 15,300 Fuses

## Issues

- An Aging Fleet
- Nuisance Trips
- Excessive CMs
- Catastrophic Failures



# Capacitor Bank Catastrophic Failure

## Replacement Cost = \$300,000



# Current Functionality-Capacitor Health Diagnostics

Detect and Alert the Following:

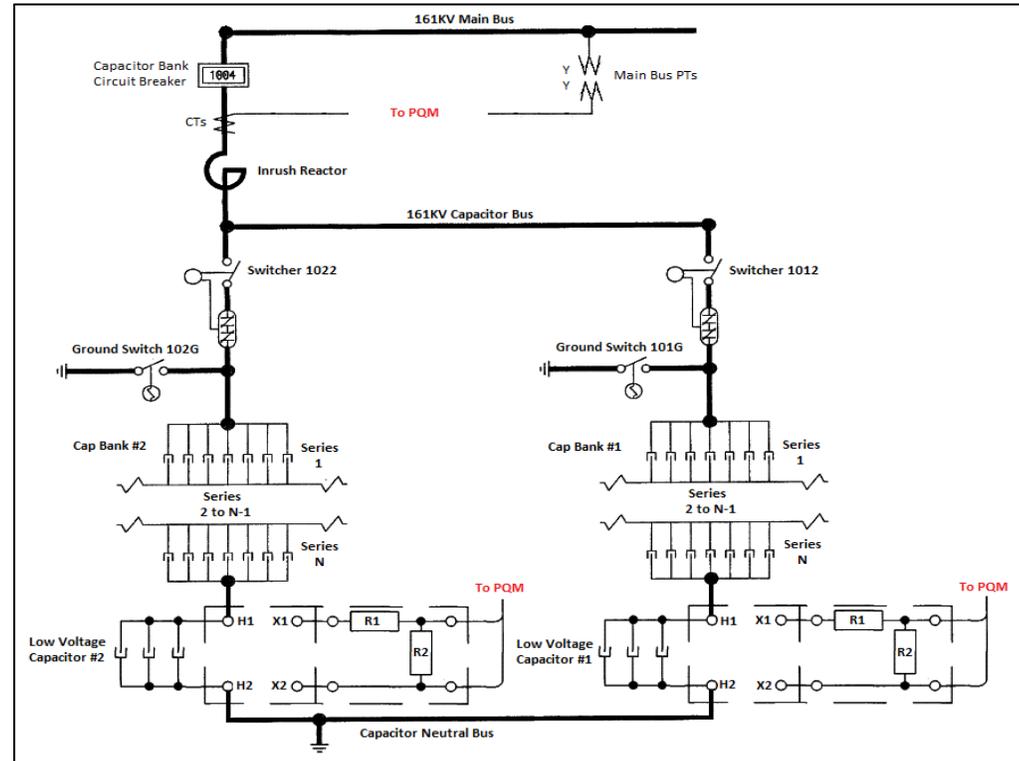
- Capacitor Units with Shorted Elements or Blown Fuses
- Non or Mis-operation of Capacitor Unbalance Protection
- Control Circuit Element Failures
- Timing of Breakers and Circuit Switchers
- Alignment of Circuit Switcher and Pre-Insertion Inductors
- Breaker and Circuit Switcher Restrikes
- Bus PT Incipient Failure



# Typical Monitoring Configuration

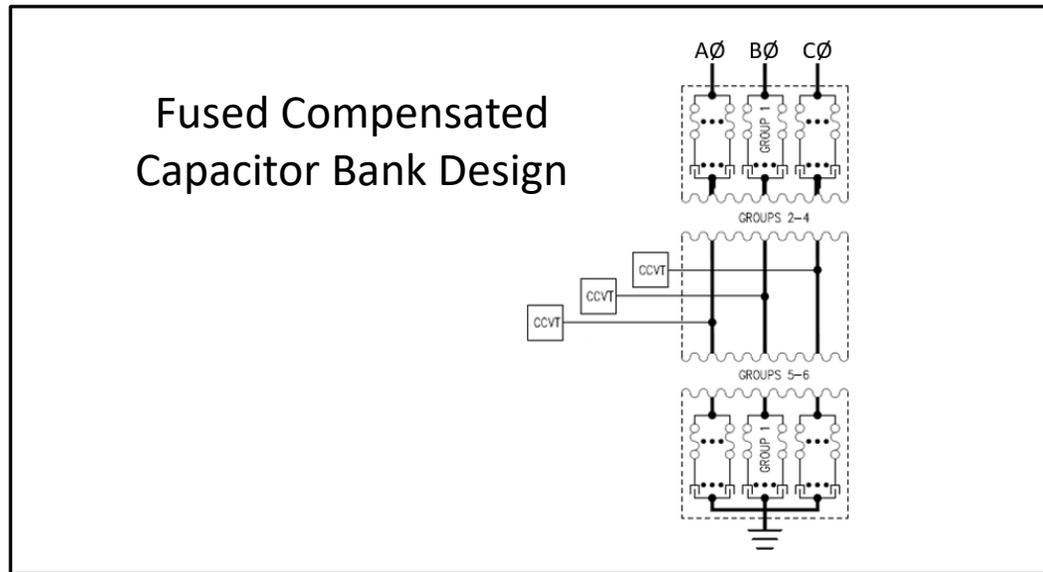
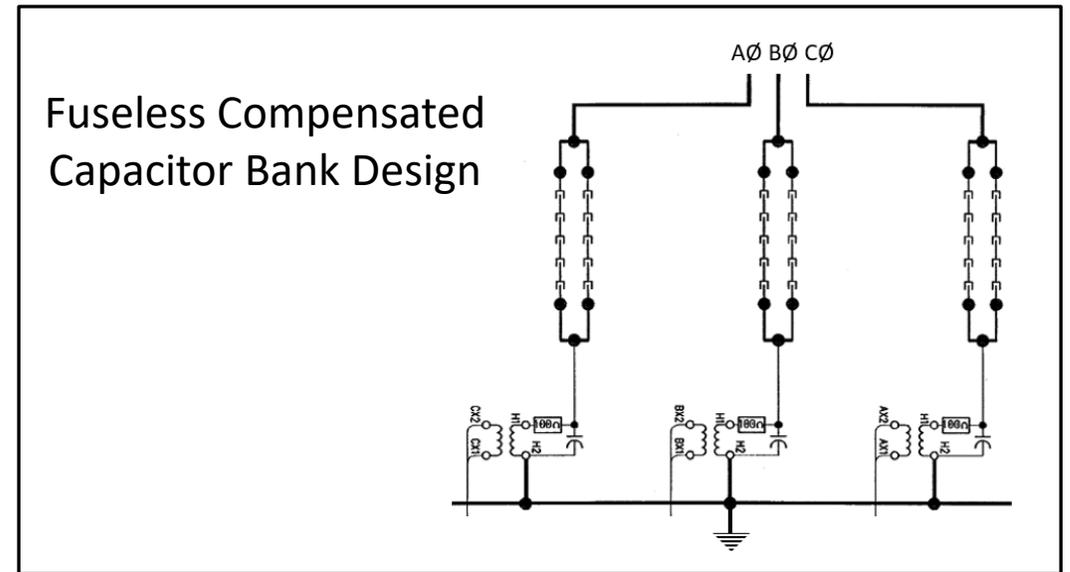
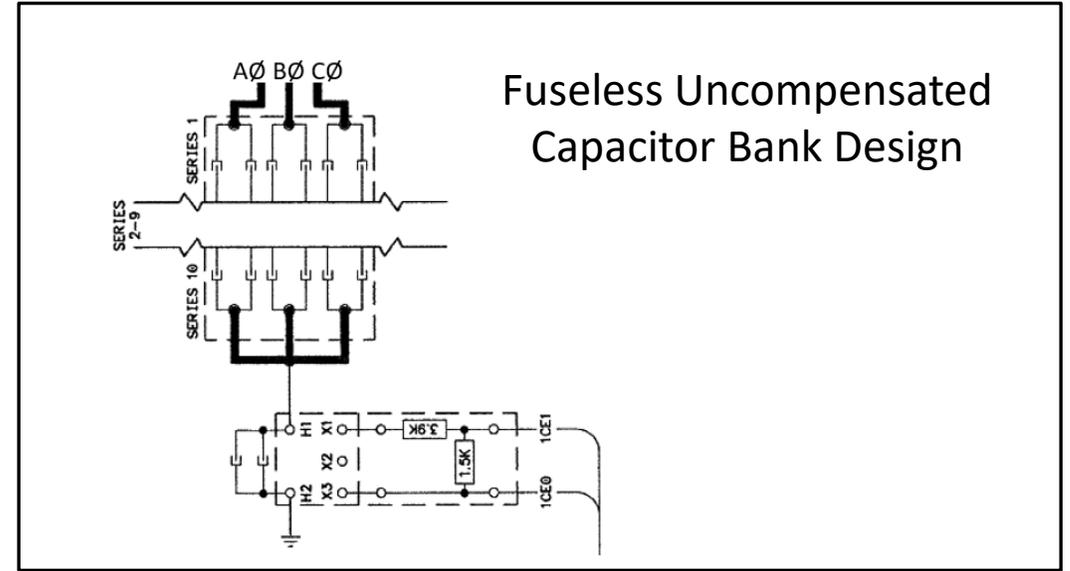
## Inputs

- Bus Voltages
- Cap Bank Breaker Currents
- Cap Bank Relay Control Voltages
- Digital Status of Cap Circuit Switchers



# Designs addressed currently

- Fused Compensated
- Fuseless Uncompensated
- Fuseless Compensated
- Analysis could easily be extended to more designs.



# DEMO

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# Power Quality



Transmission &  
Distribution PQ



PQ Data &  
Analytics



PQ  
Compatibility



PQ  
Knowledge