

69kV-138kV Ames Substation Design – SDDec24-02

Team Members:

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Client:

Burns & McDonnell -
Joseph Miller & Kaitlyn Ziska

Advisor:

Prof. Villegas

Introduction:

A substation needs to be designed to connect a 69kV solar farm in Ames, IA to the existing power system infrastructure. The station must also connect to preexisting stations in Nevada, Boone and Ankeny, IA thru 138kV lines. The station is needed to provide the local utility and its customers with reliable and renewable power.

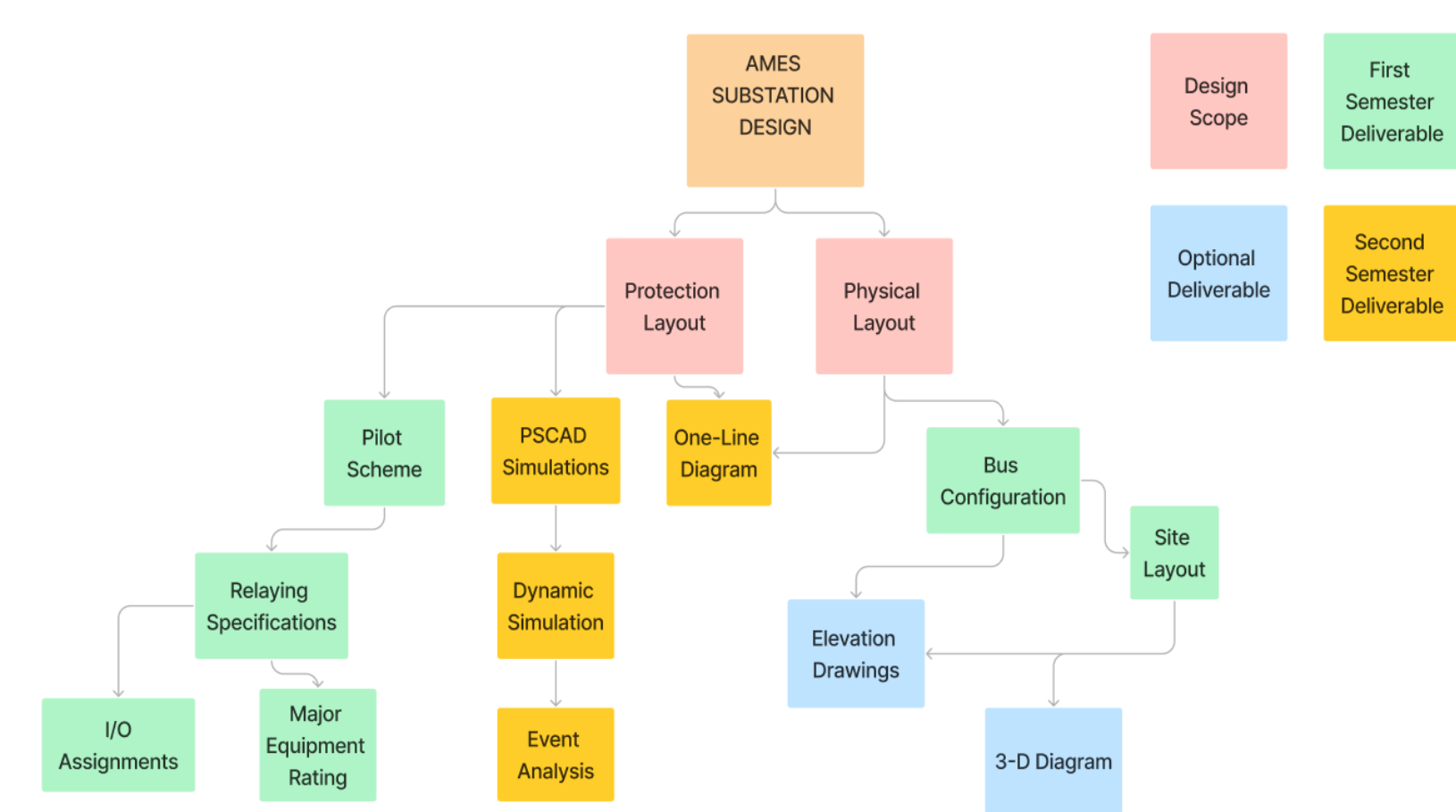
Users:

- Stakeholders
- Utilities & Maintenance Crew
- American Consumer

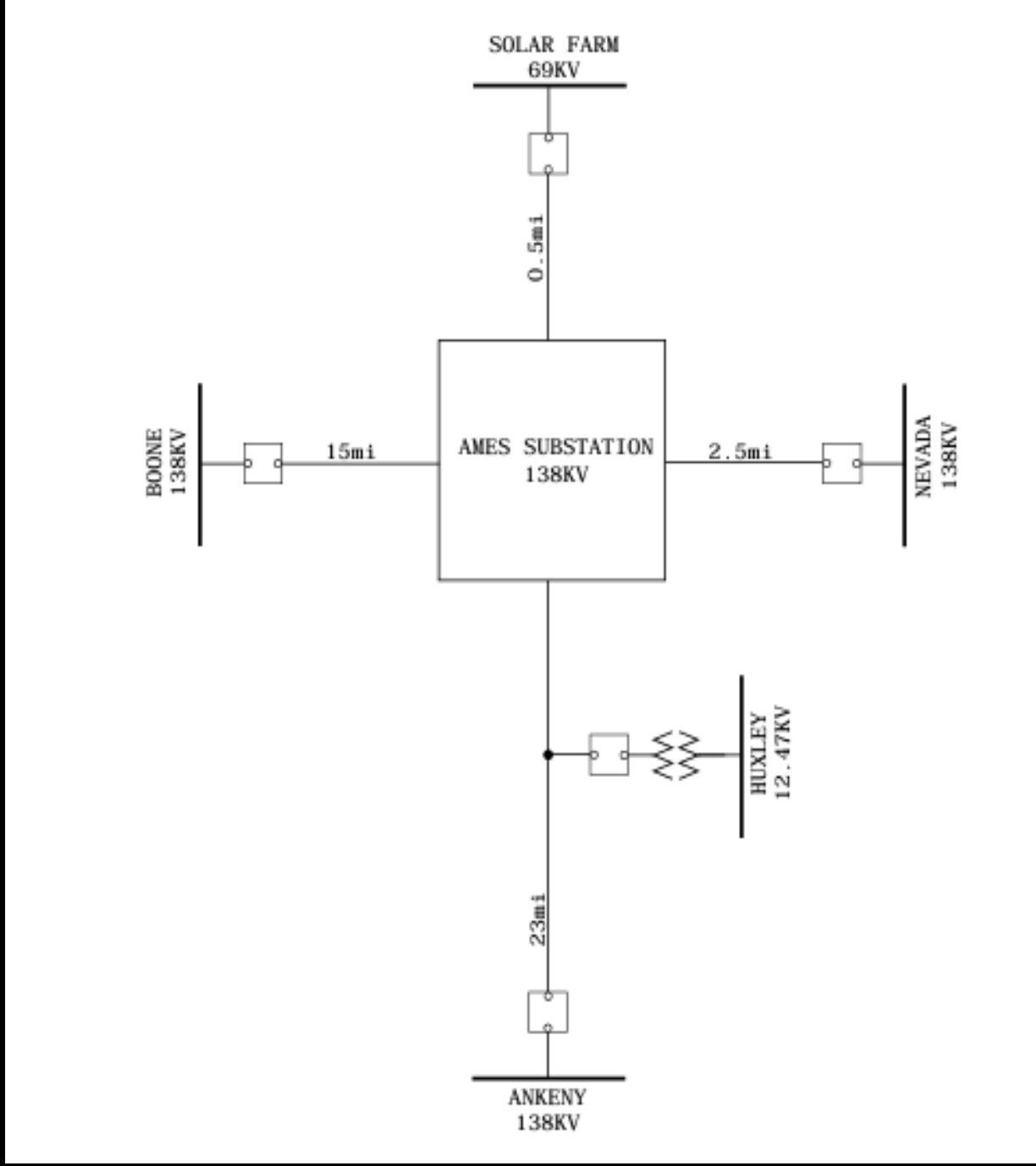
Relevant Courses & Software:

- EE 303 – Energy Systems
- EE 456 – Power Systems 1
- EE 457 – Power Systems 2
- AutoCAD
- PSCAD

Conceptual Design Sketch and Deliverables:



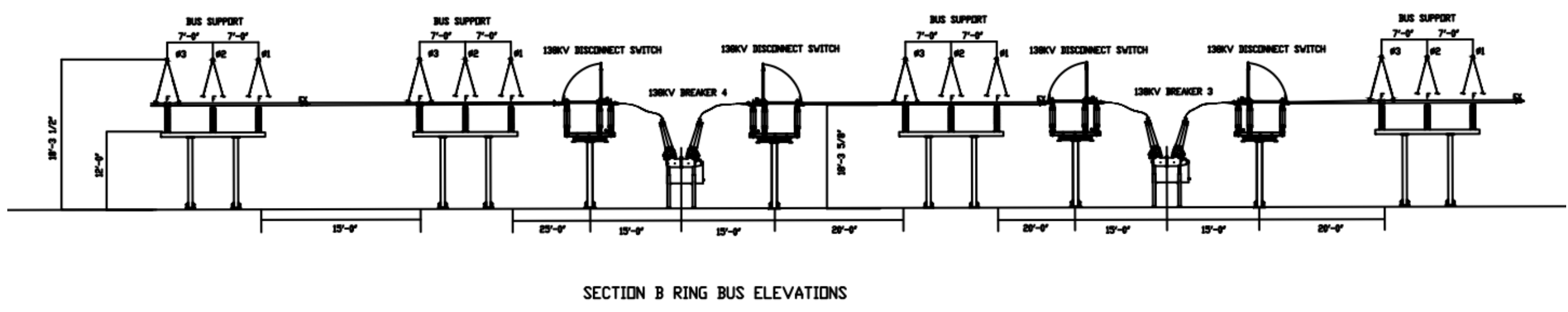
System Diagram:



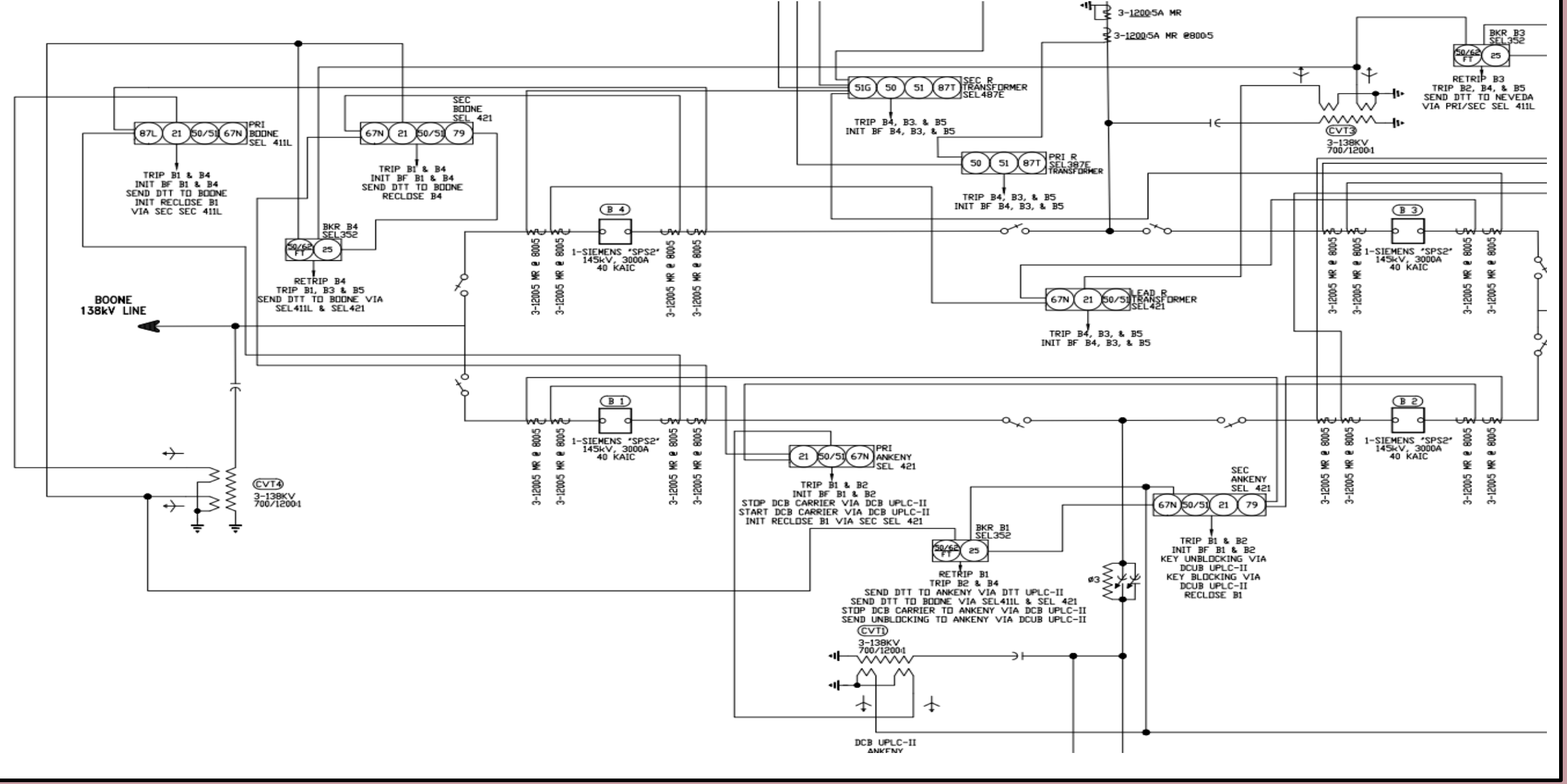
Station Specifics

- Ring bus configuration
 - (4) 138kV Circuit Breakers
- (1) 69kV Circuit Breaker
- (1) 69kV-138kV Transformer
- (1) 69kV CVT
- (4) 138kV CVT's

Elevation View:



Substation One-Line:



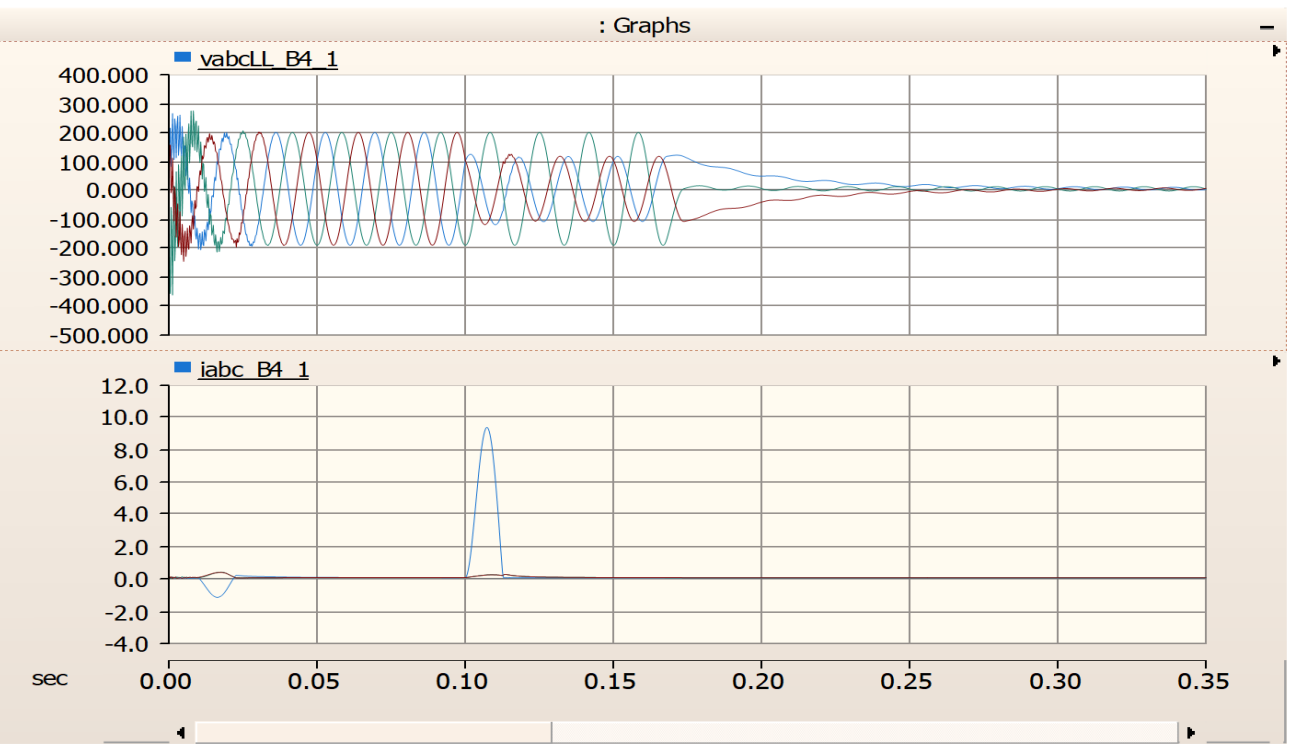
Testing:

Review Process

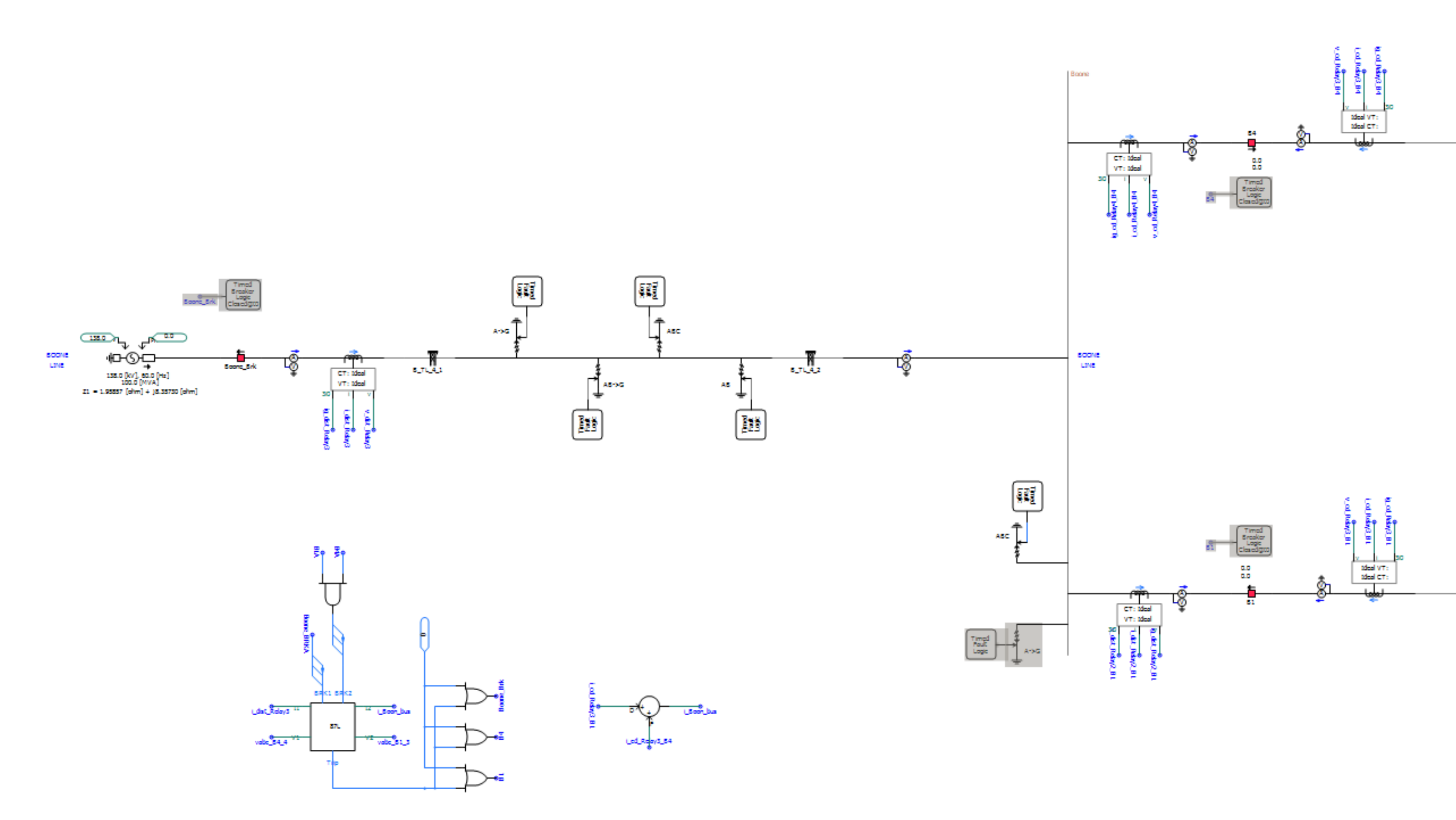
- Become familiar with IEEE standards
- Start design work
- Peer review and ensure design follows IEEE standards and meets technical requirements
- Send for client to review
- Receive comments from client and resubmit

Simulation Testing

- PSCAD simulation
 - Running fault simulations to ensure our piloting scheme works as anticipated
 - Testing logic of our design



PSCAD Model



Circuit Breaker



Disconnect Switch

