



# Power Management Control

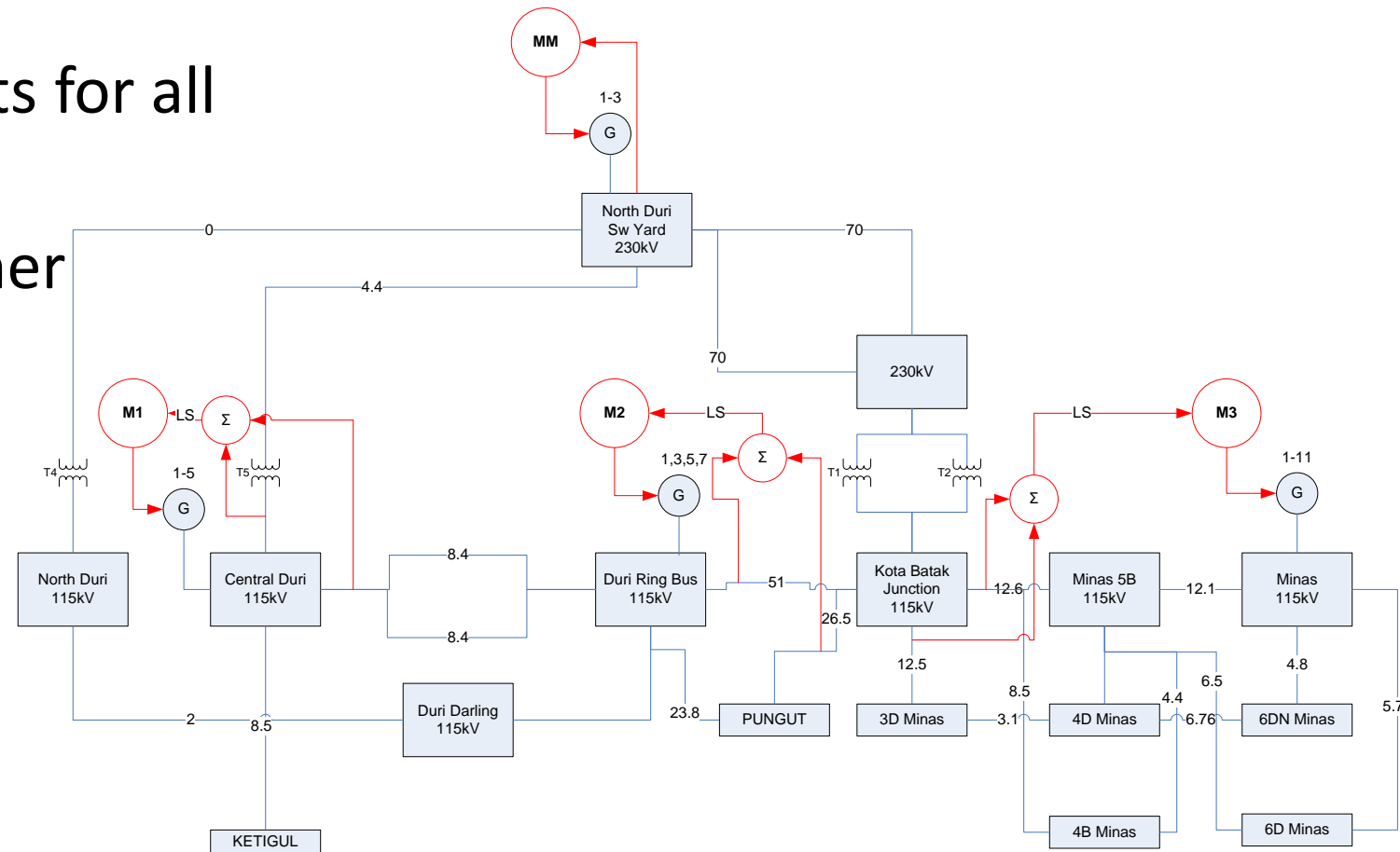
# Automatic Regulatory Control

- Automatic regulatory control
  - Ensure health of grid and components
  - Adjust power output across multiple generators at different power plants and substations in response to changes in consumption or load



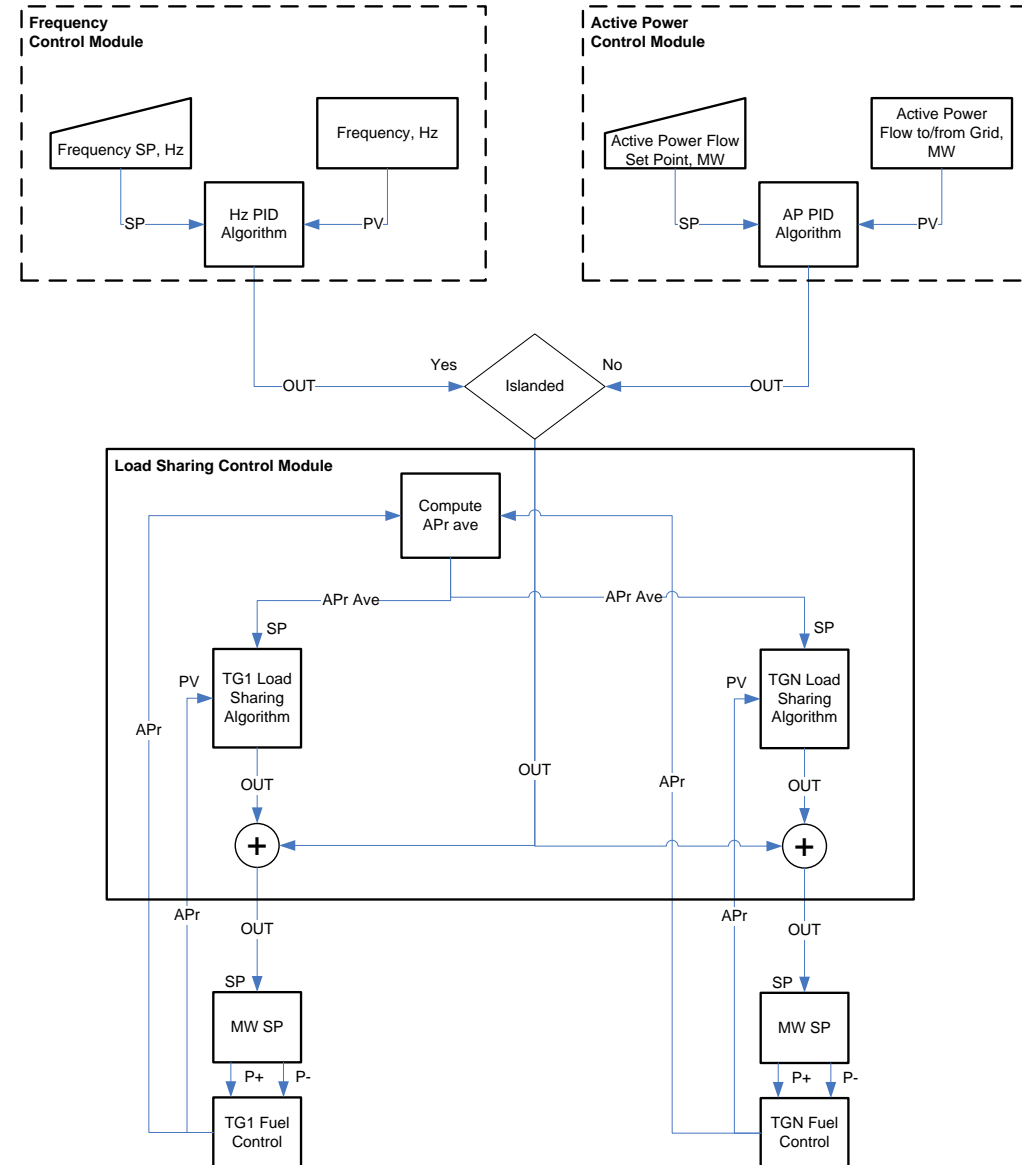
# Regulatory Control Strategy

- System produces set points for all generators
- System controls transformer OLTC set points for connections between different subnetworks



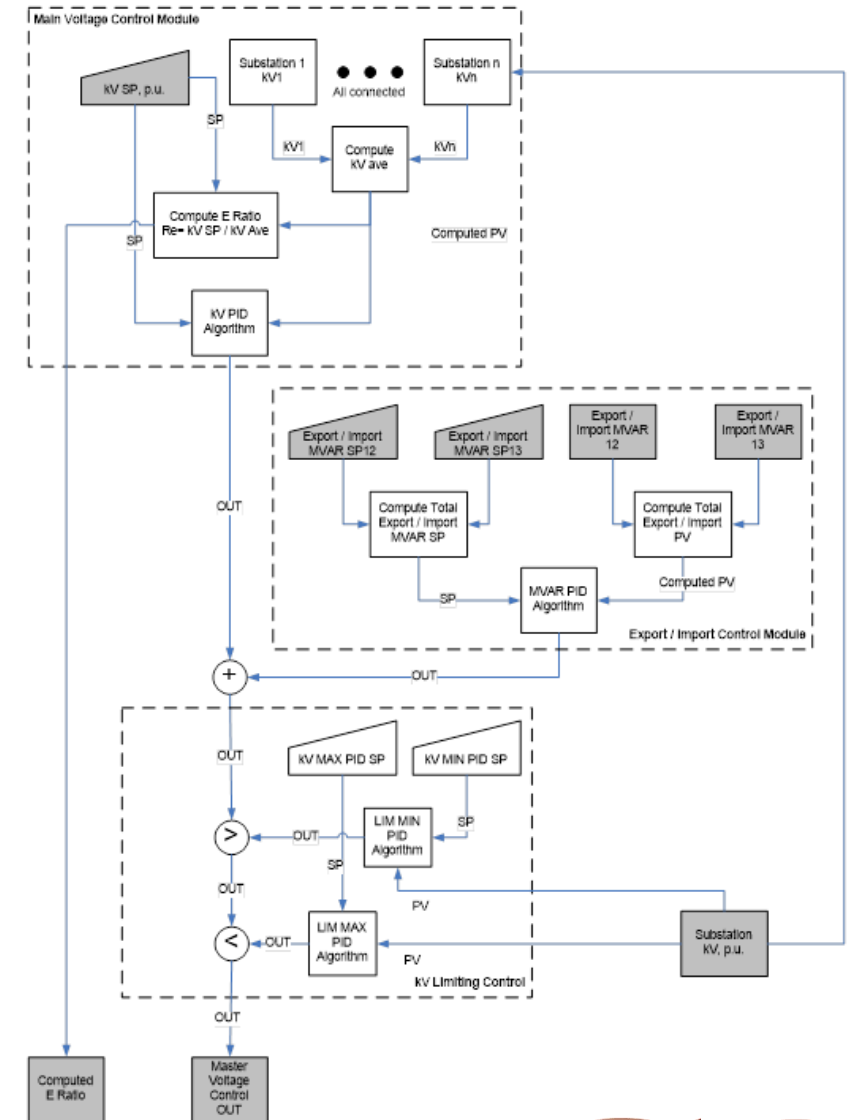
# Active Power Control

- Load Sharing Module
  - Analyze unit operating conditions
  - Calculates the adjustments (if any) to be made to main control output
  - Sends MW set point output adjustments to all generators operating in droop control mode



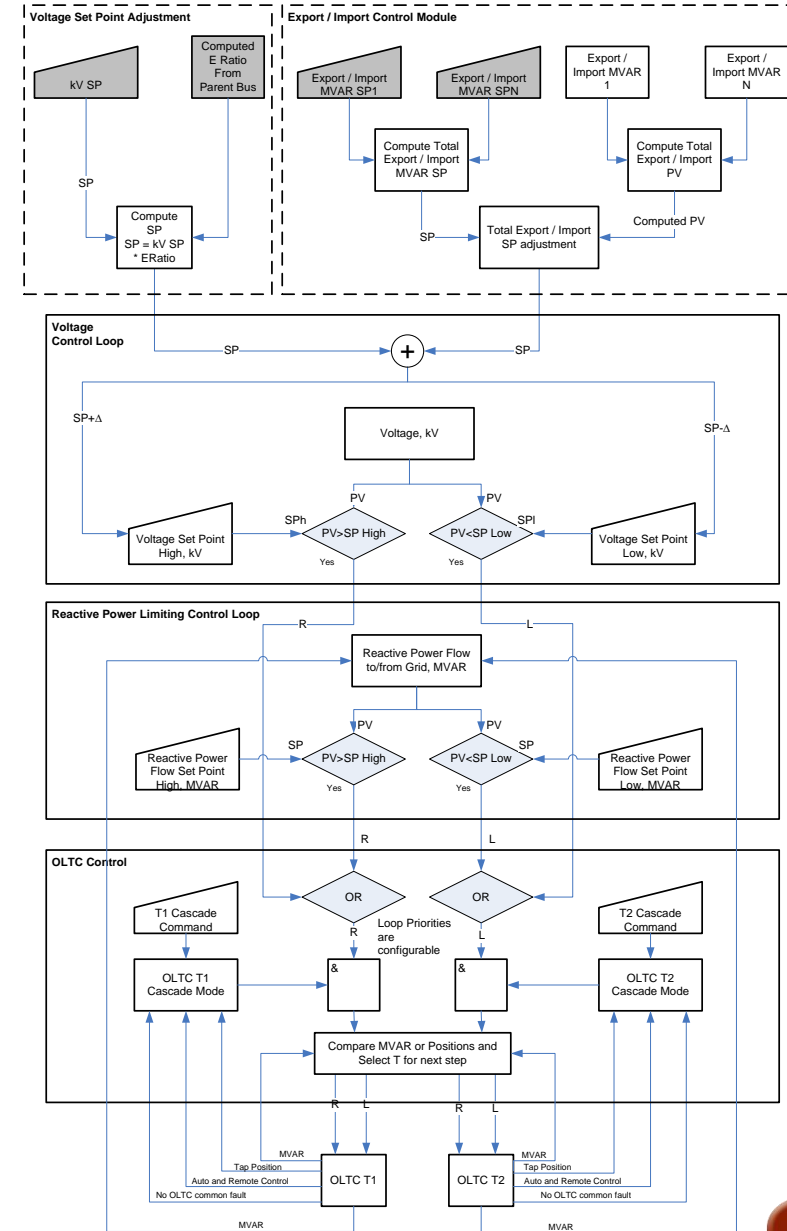
# Coordinated Voltage Control

- Two main components in high-level substation voltage control
  - Main Voltage Control Module
    - Maintain average voltage of all high-level substations by producing set points to corresponding turbogenerator AVRs
  - Reactive power controller exemplified by MVAR Export/Import Control Module
    - Distribute total load by equalizing appropriate variables



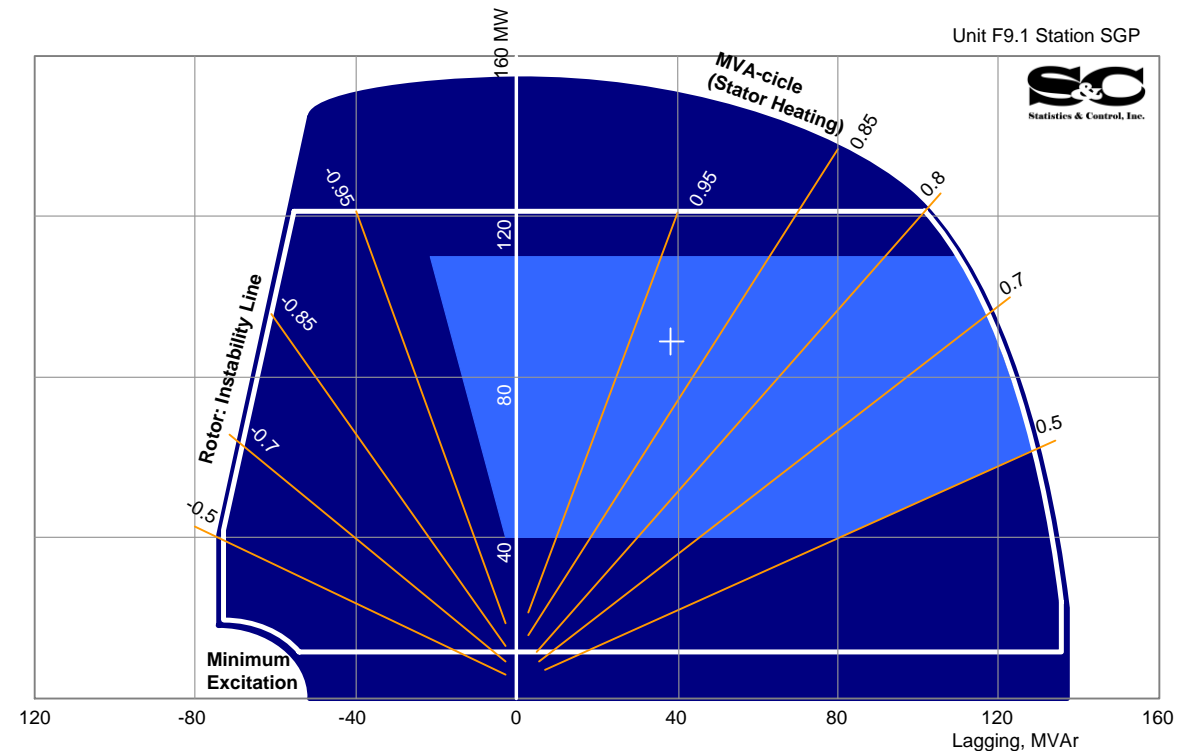
# Transformer Voltage Control

- Control action implemented by manipulating OLTC of one or two transformers based on bus voltage metering
- Voltage Control Module uses transformer OLTC as “coarse” adjustment



# Capacity Monitoring Computations

- Unit Computation Module
  - Calculate unit's available active and reactive power from temperature and power transmitters measurements using adjusted performance curve functions and generator capability map
  - Power functions used to compute unit power outputs based on inlet conditions and voltage



# Functions

- Analyze system structure based on state of specific breakers
- Determine gas turbine generator operating mode based on actual system configuration
- Provide voltage control for 230 kV and 110 kV busbars
- Provide active and reactive power load sharing
- Limit exchange of reactive power between substations
- Control frequency
- Monitor reserve capacity



# Conclusion

- Minimize life cycle costs
- Ensure the greatest operating flexibility
- Maximize overall efficiency
- Optimize grid operating conditions in terms of reliability and performance