As the owner/operator of a gas turbine power plant, your generator experiences routine frequency excursions as it starts up or shuts down. If your plant is deployed in peaking operations, these excursions can occur daily. Your current generator protection system often shuts down during these periods, leaving your asset unprotected. ABB generation protection solutions can cost-effectively safeguard your assets during machine startup and shutdown.

Challenges
Your unit was delivered more than 10 years ago and is approaching its first, or perhaps second, protection upgrade. Regulatory requirements, grid modernization phenomena such as subsynchronous oscillations, operational and footprint challenges are all driving the requirements for your next upgrade decision. Your current system has served you well, but aspects of its design will become increasingly problematic:

- It is based on electromechanical or first generation microprocessor generator protection relays deploying antiquated protection philosophies, exposing generation assets to greater risk.
- It shuts down when the frequency is less than 55 Hz, leaving your unit unprotected.
- It does not offer protection against stator or rotor winding earth faults.
- NERC/PRC regulations have significantly increased your disturbance reporting obligations and maintenance efforts.
- It cannot detect and respond to subsynchronous oscillations and subsynchronous resonance coming from your grid connection.
- It is not compatible with the latest protection and control technologies available in the digital world.

Situational analysis/background
Every generation plant needs a protection solution to safeguard critical assets during the ramp up, ramp down, and normal operations. Gas turbines, especially when in simple cycle mode are capable of fast starts and therefore, are often deployed in peaking operations. Daily, or even multiple starts per day, result in the unit operating through a wide range of frequencies.

Microprocessor protection relay technology introduced in the 1980s permitted multiple protections (overcurrent, differential, under/over voltage, etc.) in a single device. These protections were based on fundamental system frequency (60 Hz) and could only tolerate small frequency variations from that nominal frequency. Many relays actually shut down during these variations, thus leaving the machine unprotected during ramp up and ramp down.

ABB can deliver the power of one solution for protection and control, protecting your assets throughout the cycle.
Points to consider

- Is your gas turbine deployed in simple or combined cycle?
- Do you operate as a base load unit or as a peaking unit? If peaking, roughly how many starts per year?
- What components of your generator protection and control system are original equipment?
- Which components have previously been upgraded? When were the upgrades performed?
- When is your next planned generator outage? Upgrade outage?
- If your generator output exceeds 150 MVA, is your current protection solution capable of protecting 100% of the stator and rotor windings from earth faults?
- Have you been impacted by subsynchronous oscillations or subsynchronous resonance?
- Are you in proximity to:
  - HVDC devices
  - Series capacitance, STATCOM, SVC or other active devices
  - Wind farms
- Are you able to comply with all the requirements of NERC/PRC as it pertains to generator disturbances?

Advanced applications

- Generator and unit transformer protection in one protection device
- ABB’s patented turn-to-turn winding detection for ultrafast fault detection and clearance
- ABB’s patented frequency tracking algorithm to protect the asset during generator startup and shutdown
- Smaller footprint, reduced control system wiring and integrated control for flexible automation
- NERC/PRC compliant trending, reporting and display
- Synchronizing and excitation systems for automatic voltage regulations for synchronous generators

The solution

ABB protection and control solutions allow for increased capability at a significantly smaller footprint for maximum asset protection during generator startup and shutdown.

ABB’s REG670 protection and control solution has a patented frequency tracking algorithm to ensure comprehensive machine protection over a wide range of operating frequencies from 10-90 Hz.

Next steps

Arrange a visit from our technical team to discuss

- The latest technological advances in generator protection and control
- Off nominal frequency protection solutions and the impact on your system
- Requirements for your next generator protection and control upgrade and a budgetary estimate for ABB solutions