

Consulting

Impact Study



Impact Study – What is it?

Customer Need:

- A basic principle in power system planning and operation is that all equipment should operate within their normal thermal ratings and voltage limits when the system is operating with all scheduled elements in service.
- Equipment should operate within their emergency thermal ratings and emergency voltage limits immediately after a disturbance involving the loss of single contingency condition, i.e., a single generator, transformer, or transmission line.
- The new units should not adversely affect the transient behavior (specifically rotor-angle stability) of nearby or distant units.
- Short circuit contribution from the new generation should not worsen the short circuit levels of existing Circuit Breakers.



Impact Study – What is it?

- An interconnection study considers the impact of operating the new plant on the interconnected transmission power grid, and establishes a basis for consideration for future evaluations of the project. Several factors may be affected and must be analyzed prior to the addition of generation.
 - Transmission Line thermal capacity
 - Voltage violations
 - System stability
 - Fault duty of existing equipment
- Several scenarios for transmitting power from the new plant into and outside the local utility may be considered.



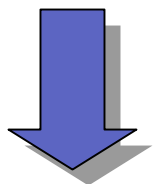
Impact Study – What is it?

- An Impact Study will:
 - test system steady-state and transient stability performance without the proposed plant to establish the baseline performance
 - repeat the testing with the new plant in-service to determine the impact of connecting the facility to the transmission system
 - consider the impact of delivering energy from the facility to the transmission system under different dispatch scenarios
 - determine if available transfer capability (ATC) is sufficient to accommodate the transfer of power from the new generator (source) to regional & outside systems (sink)
 - ensure the adequacy of system facilities
 - identify constraints that might restrict the transfer of power, and suggest possible improvements and upgrades



Impact Study: Objective

The **objective** of this study is to assess the reliability impact of a new facility on a transmission system with respect to the steady state and transient stability performance of the system as well as its effects on the system's existing short circuit current capability.



In addition, it will also identify and evaluate transmission improvements if the transmission system does not meet performance criteria when the plant is in-service.



The Impact Study consists of.....

■ Feasibility Study (optional)

- Quick DC scan to determine if available transfer capability (ATC) is sufficient to accommodate the transfer of power from the new generator (source) to regional & outside systems (sink)

■ Detailed Interconnection Study

- Load Flow Analysis
- Short Circuit / Breaker Rating Analysis
- Transient Stability Analysis



Feasibility Study

The **Feasibility Study** determines the local area constraints for various generation output levels up to the customer specified generation output level.

- Identifies generator output level(s) required to avoid equipment overloads
- Completed in a short period of time (DC scan)

Results

- Transmission constraint report
- Cost estimate for relieving each constraint



Detailed Interconnection Study

A **Detailed Interconnection Study** is a refinement of the Feasibility Study. This study will identify the transmission constraints for a fixed level of generation output as specified by the customer.

- Determines the impact of connecting the new facility to the transmission system
- Determines the impact of delivering energy from the facility to the local transmission system
- Ensures the adequacy of the system facilities
- Investigates possible interconnection arrangements
- Recommend improvements & Upgrades



Detailed Interconnection Study

■ Load Flow Analysis

- AC Load Flow Analysis
- Conducted with and without the new generation
- Used to identify equipment overloads & excessive deviations due to the added generation

■ Short Circuit Analysis / Breaker Rating Analysis

- Determines the effect on system fault currents
- Evaluates the impact on breaker fault duty
- Identifies equipment replacement



Detailed Interconnection Study

■ Transient Stability Analysis

■ Determines:

- Unit stability during faults
- Voltage levels
- Frequency deviation at the point of interconnection
- Synchronous generator rotor oscillations
- Real and reactive power outputs



Summary

Results of the study include....

- Identify limiting elements
- Identify solutions to alleviate overloading
- Recommend Upgrades & Reinforcements

