SAND2009-0079P

Transmission and Interconnection Service

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Wind Boot Camp

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Topics

- Open Access
- Transmission Service
- Generator Interconnection Service
- Queues

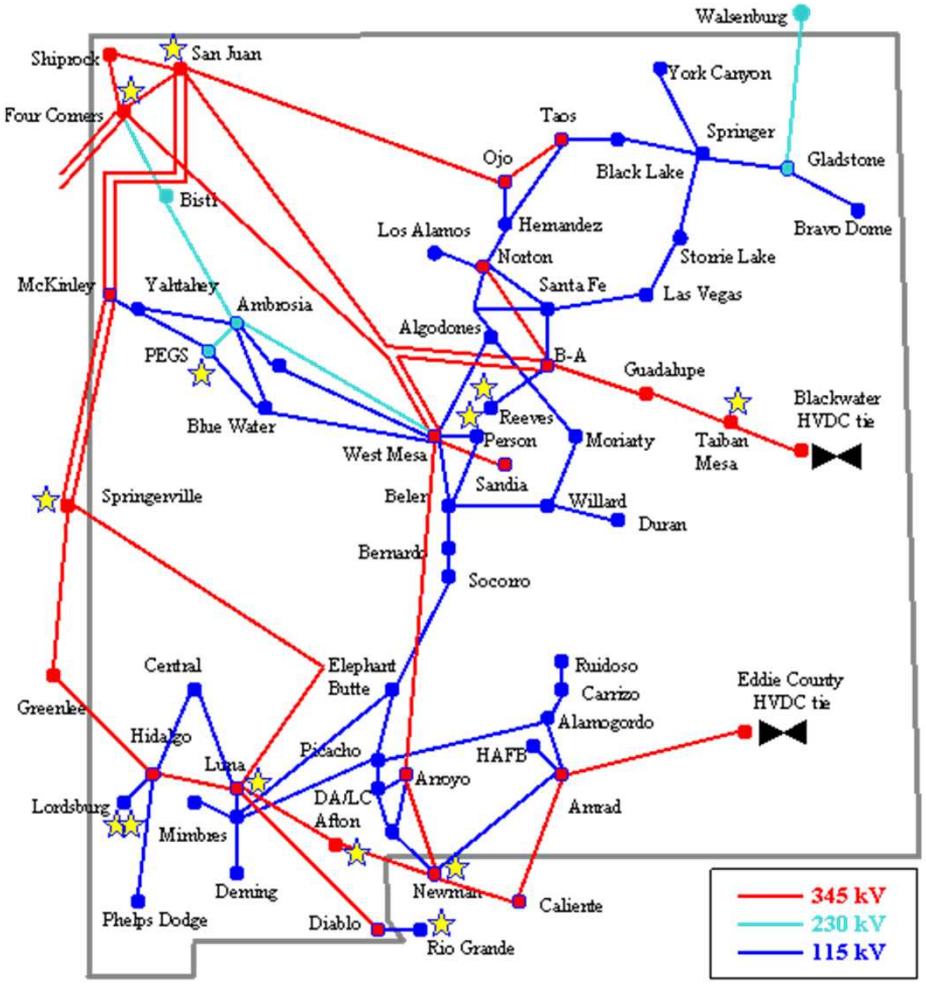
Open Access

- Access to the transmission system
  - FERC has jurisdiction
    - Interstate commerce
    - Wholesale transactions
    - No jurisdiction over TX
  - Access must be provided
  - Access must be fair, non-discriminatory
  - Pro-forma Open-Access Transmission Tariff (OATT) defines terns and conditions, procedures
    - Evolving…

Who offers Service under an OATT?

- Investor-Owned Utilities (IOU)
- Public Power
- G&T Coops
- ISO/RTO

- In NM:
  - PNM, EPE, Xcel, TriState, WAPA, TEP, APS



Type of Access

(1) Transmission (Delivery) Service
- Allows transfer of power & energy through the system
- Transmission Service Agreement (TSA) or Network Integration Transmission Service Agreement (NITSA)

(2) Generator Interconnection Service
- Allows a generator to interconnect to the grid
- Interconnection Agreement (LGIA, SGIA)

- Interconnection service does not convey transmission service
  - Generator can inject at the Point of Interconnection (POI), but cannot schedule to any point beyond

Transmission Service

(1) Point-to-Point Transmission Service

- Allows for transmission of power and energy from the a Point of Receipt to a Point of Delivery
- Firm Reservation
  - Short term (< 1 year) or long-term (1 year or more)
  - Conveys right to transfer any time, except extreme (e.g., N-2) contingencies
  - To accommodate requests, transmission provider must
    - Expand or modify the system to accommodate, or
    - Offer Re-dispatch or Conditional Firm service
- Non-Firm Reservation
  - One hour to one month
  - Transfer is on an as-available basis, and is subject to Curtailment or Interruption for reliability reasons or to accommodate firm or longer-term non-firm reservations

Transmission Service

(2) Network Integration Transmission Service

- Allows a Network Customer to utilize the transmission system to serve its Network Load, the same way the Transmission Provider uses its transmission system to serve its Native Load
- Conveys firm transmission from designated Network Resources to Network Load
- Network Customer's Network Load is included in Transmission Provider's planning responsibility

TS Schedules

- S1 – Scheduling, System Control and Dispatch *
- S2 – Reactive Supply and Voltage Control *
- S3 – Regulation and Frequency Response **
- S4 – Energy Imbalance **
- S5 – Operating Reserve – Spinning Reserve **
- S6 – Operating Reserve – Supplemental Reserve **
- S7 – Long-Term & Short-Term Firm Point-To-Point Transmission
- S8 – Non-Firm Point-To-Point Transmission
- S9 – Generator Imbalance ***
- S10 – Loss Compensation

* Must offer, must provide
** Must offer only if load is within BA
*** Must offer to the extent physically possible

Point-to-Point Service Cost

- Embedded (Filed) Rate
  - Per Schedule 7 or Schedule 8
  - Transmission service charge is sufficient to cover cost of Network Upgrades
  - Transmission cost to existing transmission customers does not increase
- Incremental (Higher) Rate
  - Transmission service charge insufficient to cover cost of Network Upgrades
  - Cost could be significantly higher than embedded rate

TS Study Procedures

- Transmission Queue
  - First-come, first-served
- Study Sequence

  (1) System Impact Study
    - Requests can be studied in “Clusters”
    - Open Season

  (2) Facilities Study
- 60-day study timeline on studies
  - Possible penalties for delays

Interconnection Service

(1) Large Generators Procedures (LGIP)
- For proposed generators 20 MW or larger

(2) Small Generators Procedures (SGIP)
- For generators <20 MW

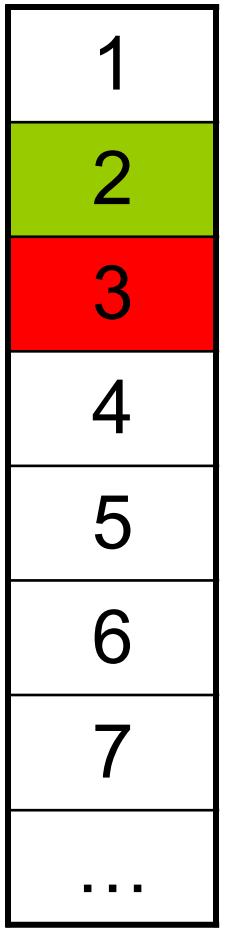
- Study Sequence
  - Feasibility Study, System Impact, Facilities Study
  - Fast-track possible for Small Generators
    - 2 MW or smaller
    - Meet standards (e.g., IEEE 1547, UL 1741, etc)
  - Study timelines defined in the OATT, but the benchmark is “reasonable effort”

Interconnection Queue

- Interconnection Queue
  - First-come, first-served
  - Queue position based on date of application
- Determines general order of studies
- Determines cost responsibility
- Studying several projects together (Clustering) possible
  - If implemented, a cluster also takes a position in the queue

Interconnection Queue

- Dealing with changes during study process
  - Project size, type of generator, generator configuration, POI, in-service date, reactive support system, unforeseen study results, withdrawal
- Allowed modifications
  - Some are explicitly permitted by the LGIP
  - Those that do not impact cost or timing of lower-queued projects (requires case-by-case evaluation)
  - Keep queue position, triggers restudy
- Material Modification
  - Withdraw or go to the end of the queue
  - Restudy may be needed for lower queued projects



Types of Interconnection Service

(1) Network Resource Interconnection (NRI)

- Ability to inject power under all conditions, except severe contingencies (e.g., N-2)
- *"Compatible"* with firm transmission service
- Studies assume stressed conditions
  - Peak or off-peak load (depending on the situation)
  - Worst-case transmission schedules
  - Existing generators the vicinity at maximum output
  - Other generators in the Interconnection Queue pursuing NRI
- For study purposes, proposed generator is assumed to displace Network Load

Types of Interconnection Service

(2) Energy Resource Interconnection (ERI)

- Ability to inject power to the system on an "as-available" basis
- *"Compatible"* with non-firm transmission service
- Wider discretion on study conditions
  - System not necessarily stressed
  - Proposed generator displaces generator resources in the local area
- Minimal system upgrades required for interconnection

- Generator can request to be studied for both ERI and NRI until the Facilities Study stage

Goal of Interconnection Studies

- Determine system upgrades required to interconnect the generator at full output
  - Also find maximum amount that Generator can inject without Network Upgrades (ERI)
- Provide cost and construction schedule estimates
- Applicable performance criteria
  - WECC/NERC standards
  - Other applicable non-discriminatory policy, criteria
  - FERC policy (e.g., for wind generators)

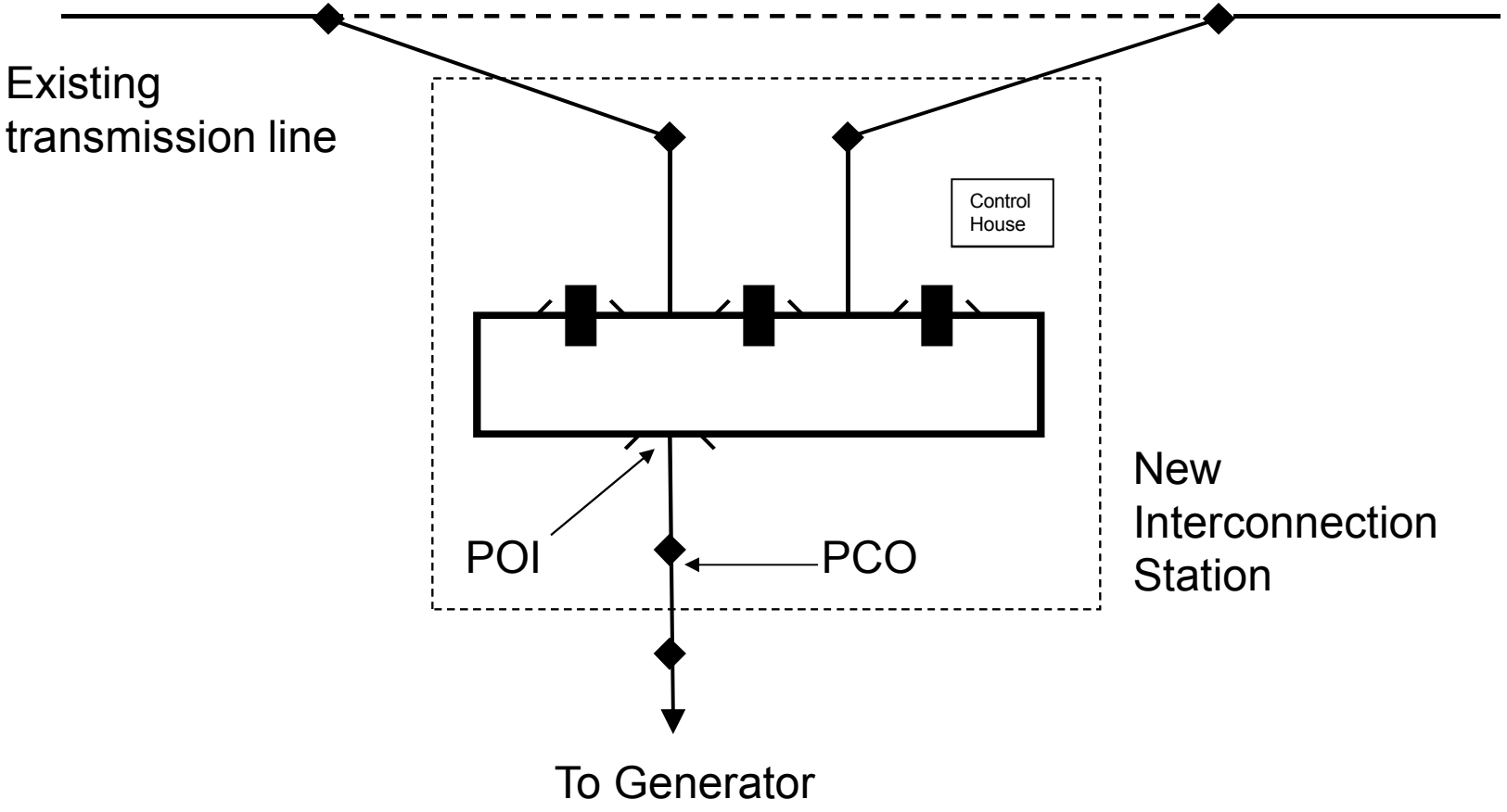
Scope of Studies

- Feasibility Study -- Optional
  - Short Circuit
  - Power Flow
    - Contingency analysis
    - Evaluation of reactive power requirements
- System Impact Study
  - Transient Stability
    - Contingency analysis
    - Further evaluation of reactive power requirement
    - Assessment of tolerance to disturbances (LVRT) ???
  - Other analyses
- Facilities Study
  - Engineering Design
  - Other analyses

Interconnection System Upgrades

- Network Upgrades
  - Upgrades on the system side of the POI
  - Generator finances, refundable as transmission credits
  - Transmission provider constructs, owns and operates
- Interconnection Customer's Interconnection Facilities
  - Interconnection Facilities on the Generator side of the Point of Change of Ownership (PCO)
  - Generator owns and operates
- Direct-Assignment Facilities
  - Interconnection Facilities on the Transmission provider's side of the PCO that are used exclusively by the Generator
  - Transmission provider constructs; Generator pays

System Upgrades

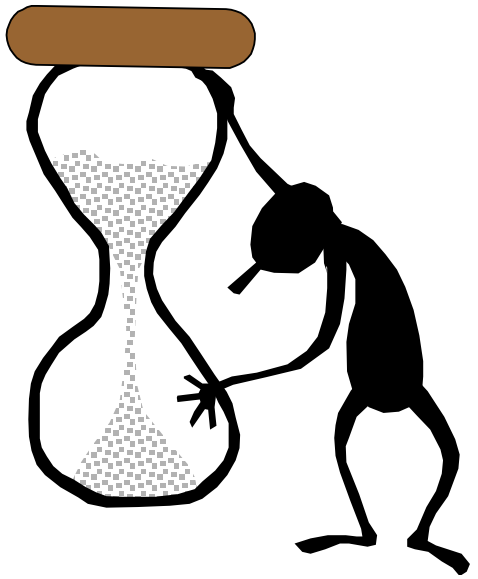


Interconnection Service

- At the end of the process, an Interconnection Agreement (LGIA or SGIA) is executed
  - Commits generator to finance system upgrades, if required
  - Transmission provider proceeds to construct system upgrades after generator provides Notice to Proceed
  - Generator can suspend construction for up to cumulative 3 years
- Interconnection service does not convey transmission service
  - Generator can inject power to the POI, but cannot schedule to any other point on the system
  - Must apply for Transmission Service separately

Queue Issues

- Backlogged
  - Too many speculative projects (especially wind!)
  - Projects allowed to stay in the queue too long
- Unreasonable study scenarios
  - Peak output during peak load
  - Competing projects simultaneously in service
  - All wind projects at peak output
- Coordination complexity
  - Coordination with other Affected Systems
  - Coordination with Transmission Queue
- What about clustering?
  - Benefits are limited
  - Transition from a traditional queue to a cluster?



What Can Be Done?

- Higher application fees
- Stiffer site control requirements
- Energy Resource Interconnection options
- Don’t allow projects to suspend for economic reasons
- Clustering
- ….

Summary & Discussion

- The interconnection process is too slow and complicated
  - Clogged with too many projects, many speculative
  - Cost allocation policy can discourage development
  - Clustering can help to some extent
- Pro-forma language leaves room for interpretation in some areas
  - Details can become very significant to a project
- Study the rules