# *Comprehensive Transmission Planning: New Challenges To Coherence, Functionality, and Economic Efficiency*

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AEP AMERICAN ELECTRIC POWER

# Transmission Planning- Historical Perspective

*Historical Perspective (Before… Regional Transmission Organizations)*

- Utilities designed systems to meet the individual load requirements; balancing internal generation and transmissions needs.
- System performance was optimized at the individual utility level without concern to optimize the system from a regional perspective. Exceptions being:
  - Tight power pools such as PJM and New England which recognized the value of collaborative planning for generation and transmission
  - Informal collaboration for operational reliability (through reliability organizations: NERC, NPCC, ECAR etc)
- 1970's spurred development of large scale fossil and nuclear generation requiring a different approach to transmission planning.
  - Scope and scale of large generation required 8-10 years to site and build
  - High capacity transmission was needed to integrate the generation and provide system flexibility and generation deliverability
  - Transmission and generation development timelines were aligned
- Economic and electricity demand growth expectations supported larger scale development.

*Utility centric "generation and transmission" planning.*

# Transmission Planning- Today

*RTO Based Planning*

- FERC encouraged the voluntary formation of Regional Transmission Organizations
  - Driving motivation was for wholesale market development and market regulation
- RTO participation was established by agreement with each RTO establishing individualized:
  - Market rules
  - Governance procedures
  - Planning criteria
- Different planning criteria results in increasing electrical seams between regions at a time when better integration is desperately needed:
  - Solutions focused on finding the next incremental problem without a broader eye to solutions that will better address long term issues
  - Factors such as loss savings, economic benefits, N-2 system protection benefits are not considered
  - Policy based factors such as the value of generation diversity and access to renewables are also not considered

*Today…the criteria and process derail the identification and development of optimal transmission solutions. Conceptual projects such as those identified by JCSP <u>cannot</u> be built under today's planning criteria.*

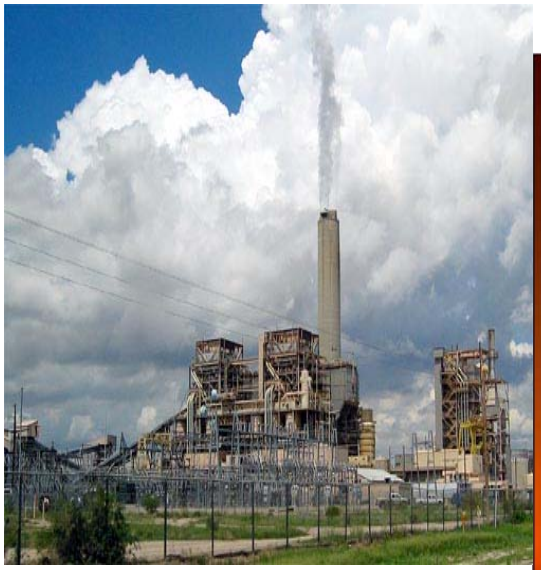
# Transmission Planning- Today (continued)

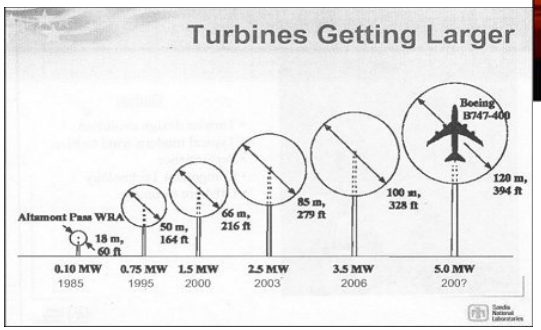
*RTO Based Planning*

- Inconsistencies and the inherent rigor of the RTO processes further complicate the ability to effectively assess and analyze broad cross regional solutions. Today the planning process:
  - Seeks minimal cost solutions and looks to build transmission as a backstop to generation or to meet minimum reliability requirements. Interpretation of a minimal cost solution standard has migrated to a short term "least cost" solution resulting in favoring smaller scale generation "patches" to shore up the system for weaknesses in the transmission grid
  - Applies a serial based model that uses interconnection queues to drive transmission without a need to ensure generation is "deliverable" and without consideration that transmission now takes longer than generation to come on line
  - Preference for incremental generation to address system needs over transmission solutions, resulting in transmission being developed as a "solution of last resort"
- Despite references in RTO agreements to possible collaboration, cross border solutions have not been developed or studied.
- High threshold for "economic projects" has virtually eliminated such projects from being developed.
- NEITC Corridor designation opened up the opportunity for congestion-related transmission, but has been challenged in its application.

*Regional "reliability"-centric transmission planning.*

# Today's Challenges….






*Why change now?*

- Generation profile is shifting and will continue to shift dramatically:
  - New large scale renewables need to be interconnected that are today largely electrically isolated
  - Environmental requirements will require a retirement of large fossil units, potentially of a magnitude never before faced in this country
- Generation needs to be deliverable to load not simply interconnected. Attention must be focused on the robustness of the grid.
- The search for a "bright line" between reliability and economic projects is increasingly artificial.

*What needs to change?*

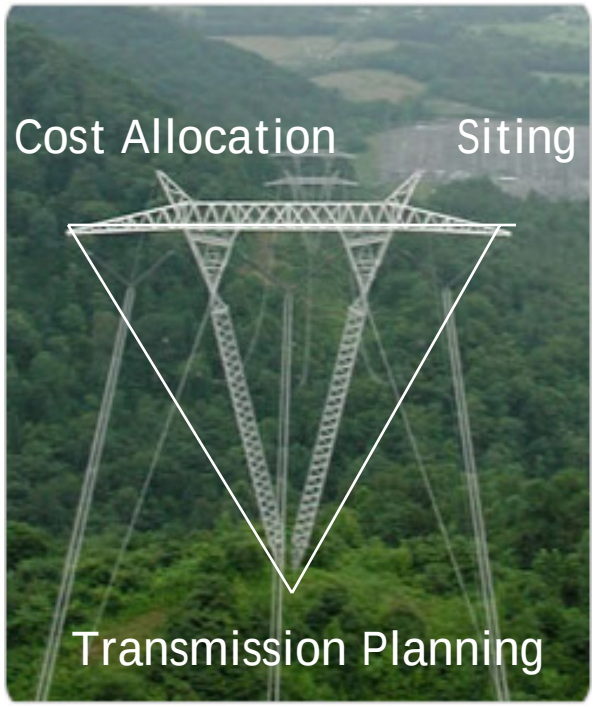
- A new energy supply paradigm requires a different type of transmission planning to enable greater capacity and flexibility.
- Cost allocation principles must be broadened to encompass this strategic new build.

# Changing the Way we *Plan….*

- Long term planning horizon 20-30 years
- Focus must be *within and between* planning regions with a common platform particularly for EHV planning
- Transmission planning needs to "anticipate" rather than "react" to problems
  - Blackout of 2003 is an example. In less than 15minutes, events on 345kV lines in Ohio resulted in the Northeast black out, with effects extending as far as Quebec and New England. (*PJM's 500 and 765 systems prevented further extension of the event.)*
  - Today loading at 99% of rating is an acceptable system condition, but is unsustainable, particularly as variable supply sources are integrated into the system
  - Utilize N-2 for EHV transmission; system should be planned anticipating events that happen in the future rather than using today's criteria (N-1, N-1-1)
- Broader system benefits need to be considered and accounted for:
  - Reliability benefits beyond the short term least cost solution (that moves a problem from today to tomorrow)
  - Economic benefits
  - Operational flexibility and loss savings
- Once need is determined, EHV projects should be encouraged to come into service as soon as possible, rather than targeting a specified date

*Creating a foundation for efficient and cost effective EHV solutions….*

# Changing the Way we *Plan….*




- Evolution in EHV Transmission planning: to advance a "System-Based" approach to planning.
- Transmission grid should be adaptable to address:
  - policy driven goals to interconnect and ensure deliverability of renewables
  - enable the retirement of aging and expensive resources
  - regional availability of the resources and other changing operational requirements of the grid.
- EHV planning is needed both "within and between" traditional planning regions
  - Consistent planning criteria to be applied to EHV transmission
  - Focus between regions to be as important as transmission within regions

A strategically planned EHV grid can provide the required transmission capacity and operating flexibility while drawing on diverse resources that will insulate consumers from resource shortages and catastrophic events.

# Changing the Way we *Plan….*

*Avoiding a patchwork approach to planning…*

- Need to overall goals and plan to shape project-specific transmission planning.
- EHV planning must focus and look beyond regional borders.
- Policy is driving generation development; so policy must also drive transmission development.
- Transitioning the way we plan the system will enable us to meet new national and regional policy objectives in a timely and efficient manner.

"Change is the law of life. And those who look only to the past or present are certain to miss the future." *John Fitzgerald Kennedy*