



Overview of Economic Transmission Planning at ERCOT

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Background on Economic Planning

- Economic planning in ERCOT was initially developed to address the fact that new generation is unable to procure firm transmission capability (as is the case in some other regions)
- The economic planning criteria is used to “right-size” the amount of transmission based on system needs and societal benefit
- The concept of “right size” is a policy decision open to stakeholder discussion

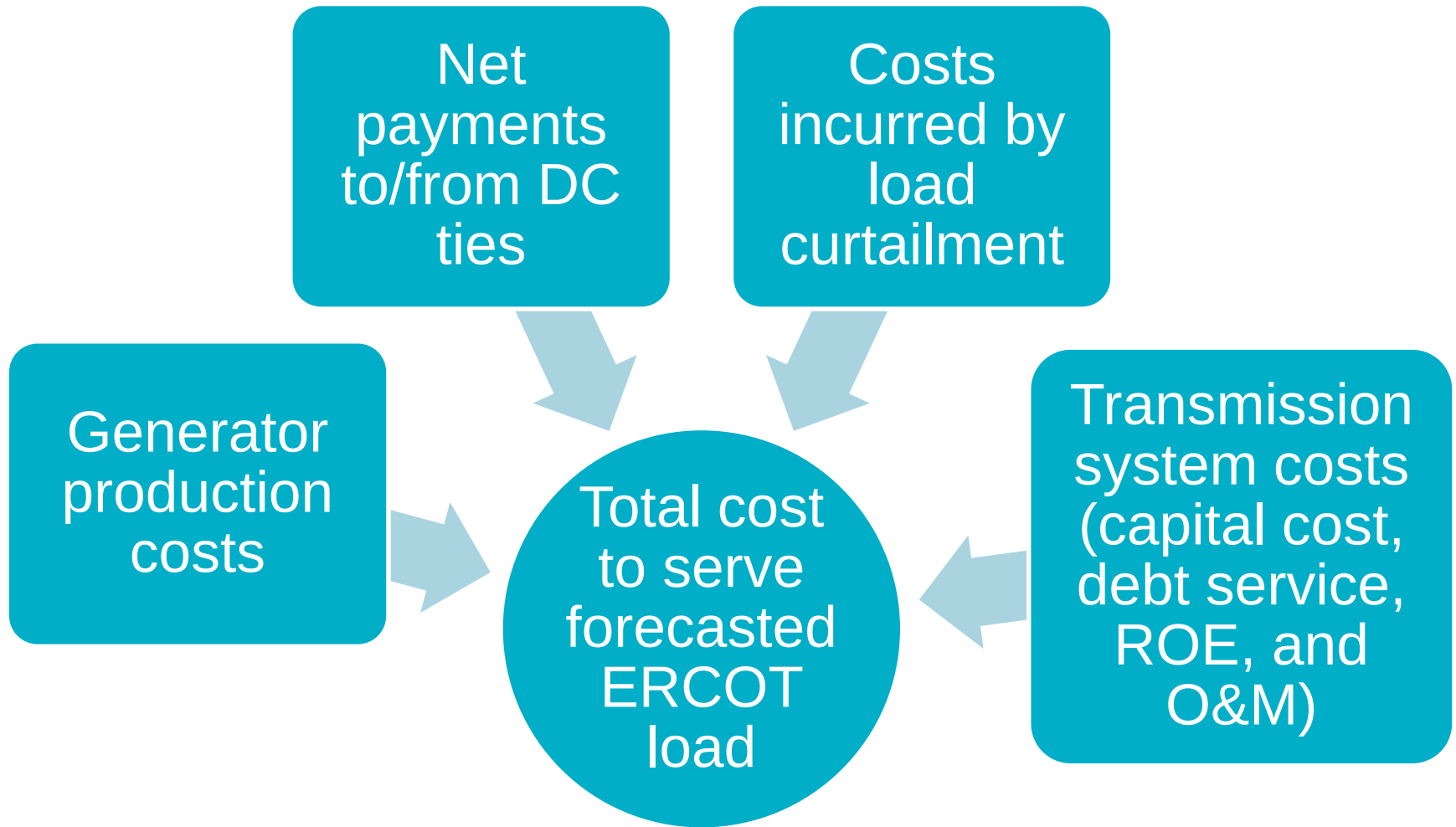
Reliability-Driven vs Economic-Driven Projects

- Planning Guide Section 3.1.3.1 provides the criteria for classifying proposed transmission projects as either reliability-driven or economic-driven
- If there is a security-constrained dispatch solution to a potential reliability problem that a project is proposed to resolve, then that project cannot be considered reliability-driven
- Proposed projects that may allow all reliability criteria to be met at a lower cost are considered economic-driven

Economic Planning Criteria

- The economic criteria used to evaluate economic-driven projects is defined by PUCT Substantive Rules Section 25.101 and ERCOT Protocols Section 3.11.2
- Projects are recommended if they are reasonably expected to result in positive net societal benefits
- In general, annual production cost savings are compared to the first-year annual revenue requirement of the proposed project

Societal Benefit = Total Cost Savings



First-Year Revenue Requirement

- The financial assumptions used to determine first-year revenue requirement are reviewed annually
- A schedule-based methodology is utilized to update financial assumptions considering updated PUCT filings related to wholesale transmission rates
- The first-year revenue requirement used for the economic planning criteria is currently 14% of a proposed project's capital cost
 - An update was presented at the September 2019 Regional Planning Group (RPG) meeting

Generation Included in Economic Planning

- In order to be included in the production cost models used for economic transmission planning, planned generation projects must meet the requirements of Planning Guide Section 6.9(1)
 - Signed IA
 - Air permits (if applicable)
 - Water rights (if applicable)
 - Notice to proceed with construction of the interconnection
 - Financial security required to fund the interconnection facilities
- Note that this requirement is more restrictive than that for planned generation to be included in the CDR

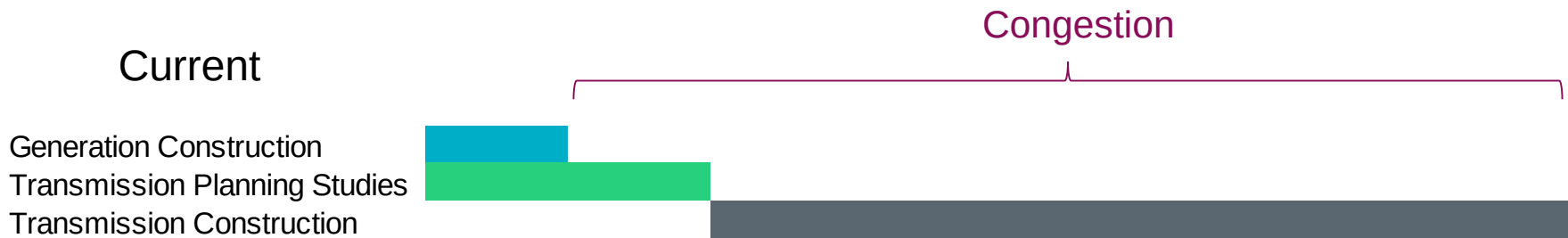
Generation and Transmission Timelines

- The average time from when planned generation meets PG6.9(1) requirements to when that generation becomes commercially operational is getting shorter
 - The last tranche of financial security is often not due until construction on the interconnection facilities is set to start

Previous



Current



Stability Limits

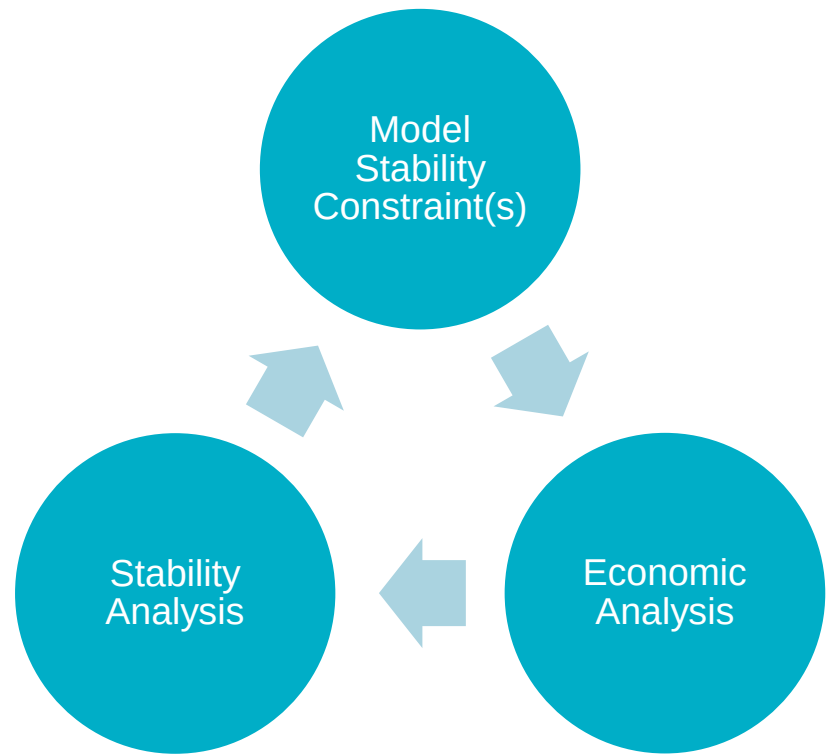
- ERCOT reviews recent stability studies and current GTC documentation to determine which interfaces and associated limits should be modeled in economic planning studies
 - GTCs are operational tools for managing identified stability constraints and may or may not represent the most appropriate interfaces and limits for the planning horizon
- Only N-1 limits are modeled and enforced in base analysis
- Appropriate N-1-1 limits are modeled and enforced when outage sensitivity analysis is performed

RAS Actions

- Approved RAS actions are not included in initial economic analysis
- Approved RAS actions are included in final economic analysis if no project meeting the economic planning criteria is identified to resolve congestion that is resolved by those RAS actions
- ERCOT is drafting a companion PGRR for NOGRR215 that reflects current practice for how RAS actions are considered in planning studies

Stability Constraints

- Enforcing stability limits and curtailing generation represents a dispatch solution
- Proposed transmission projects that resolve stability constraints are considered economic-driven
 - GTC exit alternatives are evaluated as economic transmission projects
 - GTC exit alternatives must meet the economic planning criteria



Sensitivity Analysis

- ERCOT presented a methodology for applying weather scenario and transmission outage sensitivity analyses to the evaluation of economic-drive projects to RPG in August 2017
- A whitepaper, *Impact of Weather Uncertainty and Transmission Outages on Economic Project Evaluations*, was shared with RPG in November 2017
- Weather scenario analysis and transmission outage analysis were developed in response to recommendations made by the 2013 Brattle report, *Recommendations for Enhancing ERCOT's Long-Term Planning Process*

Sensitivity Analysis

Benefit Category	Transmission Benefit
Traditional Production Cost Savings	Production cost savings as currently estimated, including impact of planned and forced generation outages
1. Additional Production Cost Savings	a. Reduced transmission energy losses
	b. Reduced congestion due to transmission outages
	c. Mitigation of extreme events and system contingencies
	d. Mitigation of weather and load uncertainty
	e. Reduced cost due to imperfect foresight of real-time system conditions
	f. Reduced cost of cycling power plants
	g. Reduced amounts and costs of operating reserves and other ancillary services
	h. Mitigation of reliability-must-run (RMR) conditions

Source: *Recommendations for Enhancing ERCOT's Long-term Transmission Planning Process*, The Brattle Group

Appendices

PUCT Substantive Rule §25.101(b)

- (3) **Electric transmission line.** All new electric transmission lines shall be reported to the commission in accordance with §25.83 of this title (relating to Transmission Construction Reports). This reporting requirement is also applicable to new electric transmission lines to be constructed by an MPE seeking to directly or indirectly construct, install, or extend a transmission facility outside of its applicable boundaries. For an MOU, the applicable boundaries are the municipal boundaries of the municipality that owns the MOU. For an MPA, the applicable boundaries are the municipal boundaries of the public entities participating in the MPA.
- (A) Need:
- (i) Except as stated below, the following must be met for a transmission line in the ERCOT power region. The applicant must present an economic cost-benefit study that includes an analysis that shows that the levelized ERCOT-wide annual production cost savings attributable to the proposed project are equal to or greater than the first-year annual revenue requirement of the proposed project of which the transmission line is a part. Indirect costs and benefits to the transmission system may be included in the cost-benefit study. The commission shall give great weight to such a study if it is conducted by the ERCOT independent system operator. This requirement also does not apply to an application for a transmission line that is necessary to meet state or federal reliability standards, including: a transmission line needed to interconnect a transmission service customer or end-use customer; or needed due to the requirements of any federal, state, county, or municipal government body or agency for purposes including, but not limited to, highway transportation, airport construction, public safety, or air or water quality.
 - (ii) For a transmission line not addressed by clause (i) of this subparagraph, the commission shall consider among other factors, the needs of the interconnected transmission systems to support a reliable and adequate network and to facilitate robust wholesale competition. The commission shall give great weight to:
 - (I) the recommendation of an organization that meets the requirement of PURA §39.151; and/or
 - (II) written documentation that the transmission line is needed to interconnect a transmission service customer or an end-use customer.

Nodal Protocols Section 3.11.2, Planning Criteria

- (3) ERCOT shall attempt to meet these reliability criteria as economically as possible and shall actively study the need for economic projects to meet this goal.
- (4) For economic projects, the net economic benefit of a proposed project, or set of projects, will be assessed over the project's life based on the net societal benefit that is reasonably expected to accrue from the project. The project will be recommended if it is reasonably expected to result in positive net societal benefits.
- (5) To determine the societal benefit of a proposed project, the revenue requirement of the capital cost of the project is compared to the expected savings in system production costs resulting from the project over the expected life of the project. Indirect benefits and costs associated with the project should be considered as well, where appropriate. The current set of financial assumptions upon which the revenue requirement calculations is based will be reviewed annually, updated as necessary by ERCOT, and posted on the Market Information System (MIS) Secure Area. The expected production costs are based on a chronological simulation of the security-constrained unit commitment and economic dispatch of the generators connected to the ERCOT Transmission Grid to serve the expected ERCOT System Load over the planning horizon. This market simulation is intended to provide a reasonable representation of how the ERCOT System is expected to be operated over the simulated time period. From a practical standpoint, it is not feasible to perform this production cost simulation for the entire 30 to 40 year expected life of the project. Therefore, the production costs are projected over the period for which a simulation is feasible and a qualitative assessment is made of whether the factors driving the production cost savings due to the project can reasonably be expected to continue. If so, the levelized ERCOT-wide annual production cost savings over the period for which the simulation is feasible is calculated and compared to the first year annual revenue requirement of the transmission project. If this production cost savings equals or exceeds this annual revenue requirement for the project, the project is economic from a societal perspective and will be recommended.
- (6) Other indicators based on analyses of ERCOT System operations may be considered as appropriate in the determination of benefits. In order for such an alternate indicator to be considered, the costs must be reasonably expected to be on-going and be adequately quantifiable and unavoidable given the physical limitation of the transmission system. These alternate indicators include:
 - (a) Reliability Unit Commitment (RUC) Settlement for unit operations;
 - (b) Visible ERCOT market indicators such as clearing prices of Congestion Revenue Rights (CRRs); and
 - (c) Actual Locational Marginal Prices (LMPs) and observed congestion.

Planning Guide Section 3.1.3.1

3.1.3.1 Definitions of Reliability-Driven and Economic-Driven Projects

- (1) Proposed transmission projects are categorized for evaluation purposes into two types:
 - (a) Reliability-driven projects; and
 - (b) Economic-driven projects.
- (2) The differentiation between these two types of projects is based on whether a simultaneously-feasible, security-constrained generating unit commitment dispatch is expected to be available for all hours of the planning horizon that can resolve the system reliability issue that the proposed project is intended to resolve. If it is not possible to simulate a dispatch of the Generation Resources such that all reliability criteria are met without the project, and the addition of the project allows the reliability criteria to be met, then the project is classified as a reliability-driven project. If it is possible to simulate a dispatch of the Generation Resources in such a way that all reliability criteria are met without the project, but the project may allow the reliability criteria to be met at a lower total cost, then the project is classified as an economic-driven project. When performing a simulation of the generating unit commitment and dispatch, only contingencies and limits that would be considered in the operations horizon shall be simulated.

Sensitivity Analysis References

- Transmission Outage Update at March 2017 PLWG -
http://www.ercot.com/content/wcm/key_documents_lists/113016/PLWG_TransmissionOutageEconomicAnalysis_posting.pptx
- Weather Scenarios Update at May 2017 PLWG -
http://www.ercot.com/content/wcm/key_documents_lists/113024/Weather_Sensitivities_5-4-2017_002.pptx
- Weather Scenarios Update at July 2017 CMWG -
http://www.ercot.com/content/wcm/key_documents_lists/123595/Weather_Scenarios_6-29-2017.pptx
- Update on Economic Transmission Planning Practices at August 2017 RPG -
http://www.ercot.com/content/wcm/key_documents_lists/108880/EconomicTransmissionPlanningPractices.pptx
- Economic Planning Whitepaper posted to November 2017 RPG -
http://www.ercot.com/content/wcm/key_documents_lists/108892/Whitepaper_EconomicPlanning.pdf
- 2013 Brattle report -
https://brattlefiles.blob.core.windows.net/files/6112_recommendations_for_enhancing_ercot%e2%80%99s_long-term_transmission_planning_process.pdf