DOCKET NO. 42476

COMPLAINT OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC AGAINST THE ELECTRIC RELIABILITY COUNCIL OF TEXAS	§ § § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

COMPLAINT OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC AGAINST THE ELECTRIC RELIABILITY COUNCIL OF TEXAS AND REQUEST FOR EXPEDITED DECISION

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CenterPoint Energy Houston Electric, LLC ("CenterPoint Energy") requests that the Public Utility Commission ("Commission") set aside the April 30, 2014 decision of the Electric Reliability Council of Texas ("ERCOT") allowing Cross Texas Transmission, LLC ("Cross Texas") and Garland Power & Light ("Garland") to build part of the Houston Import Project ("Project"), a new 345-kilovolt ("kV") transmission line extending from the Limestone Substation to the Zenith Substation.[1] CenterPoint Energy owns both the Limestone and Zenith Substations, and the ERCOT Protocol that governs this proceeding provides that the entity owning the two endpoints of a project shall be the default provider for that project.[2] Thus, CenterPoint Energy is entitled to construct the entire Project under the plain language of the applicable ERCOT Protocol, and ERCOT has abused its discretion by failing to follow that Protocol.

ERCOT also erred by using the geographical proximity of distribution service territories as a factor in allocating responsibility for the Project. That factor does not appear anywhere in the applicable Protocols, and ERCOT provides no explanation of why having a nearby distribution service territory should trump the language of the Protocol awarding a project to the owner of the endpoints. Moreover, the portion of the Project from the Limestone Substation to

[1] A copy of the April 30, 2014 letter from ERCOT is Appendix A to this Complaint.

[2] ERCOT Protocol § 3.11.4.8 ("The default TSPs [Transmission Service Providers] will be those TSPs that own the end points of the new projects.").

the Gibbons Creek Substation is not near the distribution service territory of either of the entities that ERCOT chose to build and operate that portion of the Project. Cross Texas has no distribution service area at all, and Garland's distribution service area is more than 100 miles north of the Limestone Substation, which is the northernmost point of the Project.

Finally, CenterPoint Energy should be allowed to construct the Project because it is necessary to ensure reliability for the customers in CenterPoint Energy's service area. As a matter of public policy, the transmission service provider ("TSP") that is responsible for providing safe and reliable electric service in a particular area should be allowed to construct and operate the facilities necessary to provide service to that area. Moreover, CenterPoint Energy has far more experience constructing and operating transmission facilities than Cross Texas and Garland do.

Because ERCOT's decision allowing Cross Texas and Garland to construct part of the Project is contrary to ERCOT's own Protocols and to sound public policy, CenterPoint Energy requests that the Commission overturn ERCOT's decision and authorize CenterPoint Energy to construct and operate the entire Project.[3] In addition, CenterPoint Energy requests that the Commission process this case on an expedited schedule because ERCOT has determined that the Project is critical for reliability in the Houston area.[4] A prolonged complaint proceeding at the Commission would jeopardize ERCOT's stated goal of having the Project in service before the summer peak of 2018.

[3] As described in more detail later in this Complaint, CenterPoint Energy does not object to the portion of the ERCOT decision allowing Garland and Cross Texas to perform any necessary upgrades to accommodate new transmission lines at the Gibbons Creeks Substation.

[4] ERCOT Independent Review of Houston Import RPG Project at 39 (Feb. 20, 2014) (attached as part of Appendix A to this Complaint).

I. JURISDICTION

The Commission has jurisdiction over this complaint under section 39.151(d-4) of the Public Utility Regulatory Act ("PURA"), which authorizes the Commission to resolve disputes between ERCOT and persons affected by ERCOT's acts or omissions.[5] The Commission also has jurisdiction under P.U.C. PROC. R. 22.251 ("Rule 22.251"), which prescribes the procedure by which an entity may appeal a decision by ERCOT or any successor in interest to ERCOT.

II. IDENTITY OF PARTIES

The complainant in this case is CenterPoint Energy, a transmission and distribution utility that has the statutory duty to provide safe and reliable electric service to retail customers in a 5,000 square-mile service area in and around Houston, Texas (the "Houston Region"). The names, mailing addresses, telephone numbers, and e-mail addresses of CenterPoint Energy's authorized representatives for service of all pleadings and documents in this docket are the following:

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[5] PURA is codified in Title II of the Texas Utilities Code. *See* TEX. UTILS. CODE ANN. §§ 11.001-66.016 (Vernon 2008 and Supp. 2013).

The respondent in this docket is ERCOT, an independent system operator that is charged with the statutory responsibilities of nondiscriminatory coordination of market transactions, system-wide transmission planning, and network reliability.[6] To CenterPoint Energy's knowledge, the name, mailing address, telephone number, and e-mail address of ERCOT's authorized representative for service of all pleadings and documents are the following:

Bill Magness
Vice President and General Counsel
Electric Reliability Council of Texas
7620 Metro Center Drive
Austin, Texas 78744
Telephone: (512) 225-7076
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E-mail: bmagness@ercot.com

CenterPoint Energy will serve a copy of this complaint on the ERCOT representative listed above.

III. STATEMENT OF THE CASE

A. Description of Underlying Proceeding[7]

This is an appeal of a decision by ERCOT to allow Garland and Cross Texas to build part of the Project. By letter dated April 30, 2014, ERCOT determined that CenterPoint Energy should be allowed to construct the portion of the Project from the Gibbons Creek Substation to the Zenith Substation, and that Cross Texas and Garland should be allowed to build the portion of the Project from the Limestone Substation to the Gibbons Creek Substation. CenterPoint Energy has appealed the ERCOT decision within 35 days of that decision, as required by Rule 22.251(d).

[6] PURA § 31.002(9).

[7] The subheadings in Section III of the Complaint address the requirements in Rule 22.251(d)(1)(B).

B. Persons Affected by Commission Decision

The persons or entities that will be affected by the Commission's decision in this docket include CenterPoint Energy, Cross Texas, and Garland, all of whom have been chosen by ERCOT to construct part of the Project. In addition, the Commission's decision will affect the retail customers in the Houston Region, who expect and are entitled to receive safe and reliable electric service.

C. Description of Erroneous Decision

ERCOT has violated its own Protocol § 3.11.4.8, which provides, "The default TSPs will be those TSPs that own the end points of the new projects." Because CenterPoint Energy owns the two end points of the Project, it is entitled to be designated as the default TSP for the entire project. ERCOT also erred by relying on an inapplicable factor, the geographical proximity of distribution service areas, and by making erroneous assumptions about the geographical proximity of Garland's distribution service area. Finally, ERCOT erred by ignoring the factors that support awarding the entire Project to CenterPoint Energy, such as the need for the line to serve the Houston Region and the far greater experience that CenterPoint Energy has in constructing and operating transmission lines.

D. Compliance with ERCOT Protocols

The ERCOT Protocol that applies to the merits of this dispute is Protocol § 3.11.4.8. As noted in the previous subsection, ERCOT violated that Protocol by awarding part of the Project to Cross Texas and Garland, even though they do not own either of the endpoints of the Project.

Both Rule 22.251(c) and Section 20 of the ERCOT Protocols require parties complaining of an act or omission by ERCOT to engage in Alternative Dispute Resolution ("ADR") at ERCOT before bringing a complaint proceeding at the Commission, although there are certain exceptions to that ADR requirement outlined in Rule 22.251(c):

(1) A complainant may present a formal complaint to the commission, without first using the Applicable ERCOT Procedures, if:
   (A) the complainant is the commission staff or the Office of Public Utility Counsel;
   (B) the complainant is not required to comply with the Applicable ERCOT Procedures; or
   (C) the complainant seeks emergency relief necessary to resolve health or safety issues or where compliance with the Applicable ERCOT Procedures would inhibit the ability of the affected entity to provide continuous and adequate service.

(2) For any complaint that is not addressed by paragraph (1) of this subsection, the complainant may submit a written request for waiver of the requirement for using the Applicable ERCOT Procedures. The complainant shall clearly state the reasons why the Applicable ERCOT Procedures are not appropriate. The commission may grant the request for good cause.

CenterPoint Energy requests that the Commission waive the ADR requirement in accordance with the Rule 22.251(c)(1)(C) exception because compliance with the ADR requirement would delay the processing of this complaint proceeding at the Commission, leading to a delay in the Certificate of Convenience and Necessity ("CCN") proceeding and a corresponding delay in the start of construction on the Project. ERCOT has found that the Project is needed for reliability in the 2018 summer peak season, and delaying the start of the dispute resolution process at the Commission will place at risk the ability of the prevailing party to construct the Project and place it into service by mid-2018.

CenterPoint Energy also requests that the Commission waive the ADR requirement in accordance with Rule 22.251(c)(2) for good cause because it is unlikely that ADR with ERCOT would be productive. CenterPoint Energy has engaged in an extensive dialogue with ERCOT regarding the Project and has provided ERCOT with numerous documents outlining CenterPoint Energy's position, including an April 17, 2014 letter explaining the legal and policy reasons why ERCOT should award the entire Project to CenterPoint Energy.[8] In addition, CenterPoint

[8] That letter is Appendix B to this Complaint.

Energy's representatives have met with ERCOT's representatives on numerous occasions to discuss the Project. As a result of those exchanges, ERCOT has been fully apprised of CenterPoint Energy's position but has nevertheless recommended that part of the Project be awarded to Cross Texas and Garland. Because further discussions between CenterPoint Energy and ERCOT are unlikely to be productive, and because of the need to begin constructing the Project in time for it to be in service by 2018, CenterPoint Energy requests that the Commission waive the ADR requirement for good cause as authorized by Rule 22.251(c)(2).

CenterPoint Energy has not invoked Section 21 of the ERCOT Protocols because CenterPoint Energy is not seeking an exception or revision to the Protocols. To the contrary, CenterPoint Energy is asking the Commission to require ERCOT to comply with its Protocols. Accordingly, it is not necessary to initiate a Protocol revision action under Section 21 of the Protocols. But to the extent the Commission determines compliance with Section 21 is required, CenterPoint Energy seeks a waiver for good cause in accordance with Rule 22.251(c)(2). It would be a futile act to require CenterPoint Energy to undertake a proceeding under Section 21 when CenterPoint Energy is not asking ERCOT to revise its Protocols.

E. Suspension of Implementation of Decision

CenterPoint Energy requests that the Commission suspend the implementation of ERCOT's decision in accordance with Rule 22.251(i) by refusing to entertain applications for a CCN for all or part of the Project until the Commission decides who should build the Project. Allowing CCN proceedings to go forward before the conclusion of this proceeding would lead to a possible duplication of effort and may cause confusion among landowners. For example, if Cross Texas and Garland were to begin holding landowner meetings but CenterPoint Energy was later awarded the Limestone to Gibbons Creek segment of the Project, CenterPoint Energy

would have no way of knowing what representations Cross Texas and Garland had made to landowners.

As noted earlier, however, CenterPoint Energy requests that the Commission process this case on an expedited schedule and issue an expedited decision in this docket so that the prevailing party or parties can begin the CCN process as quickly as possible.

F. Basis for Commission Jurisdiction

The Commission has jurisdiction over this proceeding for the reasons stated in Section I of the Complaint.

IV. STATEMENT OF ISSUES PRESENTED

1. ERCOT Protocol § 3.11.4.8 provides that in selecting TSPs for a reliability project, the "default TSPs will be those TSPs that own the end points of the new projects." CenterPoint Energy owns the two endpoints of the Project, which are the Limestone Substation and the Zenith Substation, yet ERCOT awarded part of the Project to Cross Texas and Garland. Did ERCOT err by failing to adhere to its own Protocol?

2. Nothing in PURA, the Commission rules, or the ERCOT Protocols provides for geographical proximity of a distribution service territory as a ground for awarding a transmission project to a TSP. To the contrary, the applicable Protocol provides that TSPs will be selected based on ownership of the endpoints of the project. Did ERCOT err by using proximity of distribution service territories as a factor in awarding part of the Project to Cross Texas and Garland?

3. One of the reasons offered by ERCOT for awarding part of the Project to Cross Texas and Garland is that the distribution service territories of three members of the Texas Municipal Power Agency ("TMPA") are near the Limestone to Gibbons Creek segment

of the Project. But TMPA was not selected to build part of the Project, and the two entities to whom TMPA delegated its purported rights do not have distribution service territories near the Project. Did ERCOT err by assuming that the Garland distribution service territory is near the Project or by assuming that other TMPA distribution service territories can be substituted for Garland or Cross Texas distribution service territories?

4. The Project is needed to serve CenterPoint Energy's customers, and CenterPoint Energy is responsible for providing safe and reliable electric service in the Houston Region. Moreover, CenterPoint Energy has far more experience and expertise in constructing and operating transmission lines than either Cross Texas or Garland does. Did ERCOT err by failing to take these factors into consideration when selecting TSPs for the Project?

V. STATEMENT OF FACTS

A. The Project is necessary for reliability in the fast-growing CenterPoint Energy service area.

The Houston metropolitan area, most of which is served by CenterPoint Energy, is one of the major load centers in Texas, with approximately 25 percent of the entire ERCOT load. The Houston area is also a vital part of the economy of Texas, and in fact Houston is essential to the economy of the entire United States. As ERCOT Staff noted in its April 8, 2014 presentation to the ERCOT Board:

- The Houston metro area has nearly 40 percent of the nation's petrochemical manufacturing capacity;
- The Port of Houston has ranked first among U.S. seaports in terms of import tonnage for 22 consecutive years;

- Population in the Houston region is expected to grow at a rate of over 100,000 residents per year; and
- Gross area product in the Houston metro area is projected to grow at an average annual rate of 3.5 percent.[9]

Because of the strong Texas economy, the load in Houston has been growing in recent years, and it is expected to continue growing. At the same time, generation facilities in the Houston area are being retired much more rapidly than generating capacity in the area is being added in the area. According to the study performed by ERCOT staff, approximately 1,800 megawatts ("MW") of generation capacity in the Houston area have been added in recent years, but approximately 3,800 MW of generation capacity in the Houston area have been retired over that same time.[10] Moreover, the dense population and the air emission limitations in the Houston region make it increasingly difficult to locate new generating facilities in that area. Hence, it has become necessary to import power to the Houston Region from other parts of ERCOT to maintain reliability in the Houston Region.

B. ERCOT identified the Project as the best option to bring additional import capacity to the Houston Region.

In mid-2013, CenterPoint Energy and several other TSPs, including not only Cross Texas and Garland but also Lone Star Transmission, identified the need for additional transmission import capacity into the Houston Region. Each of those TSPs submitted project proposals to the ERCOT Regional Planning Group ("RPG") for review and comment.[11] ERCOT conducted a combined review of the proposals and added several options of its own choosing. Among 21 options studied, ERCOT determined that six of those options did not meet the N-1 criteria and

[9] Appendix C at 2.

[10] Appendix A at 4.

[11] Cross Texas and Garland submitted a joint proposal.

therefore excluded them. ERCOT next studied the remaining fifteen options and determined that seven of them did not address reliability issues under the G-1+N-1 conditions. Of the remaining eight options, ERCOT chose Option 4, the Limestone-Gibbons Creek-Zenith line proposed by Cross Texas and Garland as their preferred option. ERCOT further recommended that the Project be deemed critical to reliability in accordance with P.U.C. SUBST. R. 25.101(b)(3)(D).

On April 8, 2014, ERCOT Staff presented its recommendation to the ERCOT Board and requested a determination that the Project is needed. ERCOT Staff also requested a Board resolution that the Project is critical for reliability. The ERCOT Board approved both requests.

C. ERCOT chose CenterPoint Energy to construct part of the Project and chose Cross Texas and Garland to construct part of the Project.

After the ERCOT Board approved the construction of the Project, ERCOT Staff invited CenterPoint Energy, Cross Texas and Garland to submit letters explaining why they should be chosen to construct the Project. CenterPoint Energy submitted its letter to ERCOT on April 17, 2014, as did Cross Texas and Garland.

On April 30, 2014, ERCOT issued a letter containing its decision that the Project be divided in the following manner:

- CenterPoint Energy should construct the segment of transmission line from the Gibbons Creek Substation to the Zenith Substation, it should provide the T.H. Wharton-Addicks transmission line upgrade, and it should provide the upgrades to the Limestone and Zenith Substations.
- Cross Texas and Garland should construct the segment of transmission line from the Limestone Substation to the Gibbons Creek Substation, and it should provide the Gibbons Creek Substation upgrades.

CenterPoint Energy does not object to the portion of the award allowing Cross Texas and Garland to perform the upgrades at the Gibbons Creek Substation. CenterPoint Energy does object to the portion of the award allowing Cross Texas and Garland to construct the Limestone to Gibbons Creek segment of the Project.

VI. ARGUMENT

A. ERCOT's factual determinations are not entitled to any deference from the Commission.

Rule 22.251(l) provides the standard for Commission review of ERCOT's acts or omissions in a complaint proceeding such as this one:

> If the factual determinations supporting the conduct complained of have not been made in a manner that meets the procedural standards specified in this subsection, or if factual determinations necessary to the resolution of the matter have not been made, the commission will resolve any factual issues on a *de novo* basis. If the factual determinations supporting the conduct complained of have been made in a manner that meets the procedural standards specified in this subsection, the commission will reverse a factual finding only if it is not supported by substantial evidence or is arbitrary and capricious. The procedural standards in this subsection require that facts be determined:
>
> (1) in a proceeding to which the parties have voluntarily agreed to participate; and
>
> (2) by an impartial third party under circumstances that are consistent with the guarantees of due process inherent in the procedures described in the Texas Government Code Chapter 2001 (Administrative Procedure Act).

Under this part of the rule, ERCOT's factual determinations must be reviewed on a *de novo* basis unless those factual determinations were made by an impartial third party under circumstances that are consistent with guarantees of due process inherent in the Texas Administrative Procedure Act ("APA").[12]

[12] The APA is codified in Chapter 2001 of the Texas Government Code.

The factual determinations that ERCOT relied upon were not made by an impartial third party, but instead were made solely by ERCOT staff.[13] Thus, those factual determinations are not entitled to any deference in this proceeding. Moreover, the due process guarantees inherent in the APA procedures include the rights to participate in a hearing and to present evidence, among other things.[14] Because ERCOT made its decision to award part of the Project to Cross Texas and Garland without the benefit of a hearing or evidence from CenterPoint Energy and the other stakeholders, ERCOT's factual determinations must be reviewed by the Commission on a *de novo* basis.

B. ERCOT violated its own Protocol by failing to award the entire Project to CenterPoint Energy.

ERCOT Protocol § 3.11.4.8 prescribes the method that ERCOT must follow to select TSPs:

> Upon completion of the RPG Project Review, ERCOT shall determine designated providers for the recommended transmission projects. *The default TSPs will be those TSPs that own the end points of the new projects.* Those TSPs can agree to provide or delegate the new facilities. *If different TSPs own the two ends of the recommended project, ERCOT will designate them as co-providers of the recommended project*, and they can decide between themselves what parts of the recommended project they will each provide. If they cannot agree, ERCOT will determine their responsibility following a meeting with the parties. If a designated TSP agrees to provide a project and that designated TSP does not diligently pursue the project (during the time frame before a CCN is filed, if required) in a manner that will meet the required in-service date, then upon concurrence of the ERCOT Board, ERCOT will solicit interest from TSPs through the RPG and will designate an alternate TSP.[15]

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[13] The Commission has made clear that the impartial third party contemplated by Rule 22.251(l) is an arbitrator selected by the parties as part of the ADR procedure before ERCOT. 28 Tex. Reg. 2489, 2493 (2003). Because of the urgent need to place the Project into service by mid-2018, it is not feasible to undertake an arbitration process at ERCOT.

[14] TEX. GOV'T CODE ANN. § 2001.051.

[15] ERCOT Protocol § 3.11.4.8 (emphasis added).

As the italicized language indicates, ERCOT is required to select a default TSP based on ownership of the two endpoints of the recommended project.

It is undisputed that the Project will terminate on the northern end at the Limestone Substation and will terminate on the southern end at the Zenith Substation. Moreover, it is undisputed that CenterPoint Energy owns both the Limestone Substation and the Zenith Substation. Thus, under the plain language of Protocol § 3.11.4.8, CenterPoint Energy should have been selected as the default TSP for the entire Project, and ERCOT erred by finding otherwise.

In its April 30, 2014 letter, ERCOT contends that both CenterPoint Energy and TMPA own endpoints of the Project. But in the studies, presentations, and deliberations at ERCOT, all parties – including ERCOT – have consistently defined the "project" as the "Houston Import Project," and they have defined the Project to be the transmission line that will extend from the Limestone Substation to the Zenith Substation. For example, in the "ERCOT Independent Review of Houston Import RPG Project," ERCOT repeatedly refers to the proposed line from the Limestone Substation to the Zenith Substation as a single "project":

> Among various options evaluated, ERCOT prefers Option 4 (new Limestone-Gibbons Creek-Zenith 345 kV doubt circuit line) as the best solution for the area and recommends *the project* to be in service by 2018. *The project* will address the reliability need, improve the import capability into Houston, and provide additional benefits to the system in both the near-term and long-term transmission planning horizons.
>
> . . . .
>
> The construction cost for *the preferred project* is estimated to be approximately $590 million in 2018 dollars.[16]

Similarly, in its April 8, 2014 presentation to the ERCOT Board, ERCOT Staff requested "Board of Director endorsement of the need for "the following *project* (Study Option # 4), which was

[16] Appendix A, Executive Summary (emphasis added). In fact, the very title of the report – "ERCOT Independent Review of Houston Import RPG *Project*" (emphasis added) – indicates that the transmission line from the Limestone Substation to the Zenith Substation is a single project, not a combination of individual projects.

found to be the best alternative to address both the near-term and long-term reliability needs in the Houston area." (Emphasis added.) ERCOT Staff then proceeded to describe the "project" as follows:

- Construction of a new Limestone-Gibbons Creek-Zenith 345 kV double circuit to achieve approximately 2988 MVA of emergency rating for each circuit.
- Upgrade of the substations at Limestone, Gibbons Creek and Zenith to accommodate the terminations of new transmission lines.
- Upgrade of the existing T.H. Wharton-Addicks 345 kV line to achieve approximately 1450 MVA of emergency rating.[17]

Clearly, at the time it asked the Board to approve the Project, ERCOT Staff viewed the entire transmission line from Limestone to Zenith, along with accompanying upgrades to substations, as a single "project," not a combination of projects with endpoints at every substation.

The ERCOT Board evidently considered the proposed transmission line from the Limestone Substation to the Zenith Substation to be a single project as well. In the resolution approved on April 8, 2014, the Board resolved to "endorse[] the need for the Houston Import RPG Project" and deemed "the Limestone-Gibbons Creek-Zenith 345 kV double circuit line critical to reliability of the ERCOT System."[18] The Board made no mention of multiple projects, each with its own endpoints.

Indeed, Cross Texas and Garland were the TSPs that initially recommended the Limestone-Gibbons Creek-Zenith route that was approved as the Project, and they too treated it as a single project. In their initial presentation to ERCOT, Cross Texas and Garland presented three separate options:

- The Limestone-Gibbons Creek-Zenith line, which Cross Texas and Garland referred to as the "most optimal performing option";

[17] Appendix C, slide 7.

[18] Appendix D.

- The Gibbons Creek-Zenith line; and
- The Gibbons Creek-Tomball line.

As this list shows, Cross Texas and Garland considered the Gibbons Creek-Zenith line to be a single project, and they considered the Limestone-Gibbons Creek-Zenith line to be a single project. It is too late now for Cross Texas and Garland to pretend that the Limestone-Gibbons Creek-Zenith line is composed of multiple projects.

Finally, ERCOT's argument that there are four endpoints of the Project cannot be reconciled with the language of Protocol § 3.11.4.8, which states, "If different TSPs own *the two ends* of the recommended project, ERCOT will designate them as co-providers of the recommended project, and they can decide between themselves what parts of the recommended project they will each provide." (Emphasis added). The Protocol indicates that a recommended project has only two ends, and the two ends of this Project are the substations owned by CenterPoint Energy.

For part of the Project to be awarded to Cross Texas or Garland, Protocol § 3.11.4.8 would have to be interpreted to read: "If different TSPs own the two ends of segments of the recommended project, ERCOT will designate them as co-providers of the recommended project, and they can decide between themselves what parts of the recommended project they will each provide." But the underlined language in the above quote does not appear in the Protocol. Instead, the Protocol indicates there are only two ends to a recommended project. Because administrative agencies or quasi-agencies such as ERCOT are required to follow their own

rules,[19] ERCOT abused its discretion by failing to award the entire Project to CenterPoint Energy.

C. Nothing in Texas law or the ERCOT Protocols authorizes ERCOT to use geographical proximity of a distribution service territory as a factor to consider when selecting a TSP.

In its April 30, 2014 letter allocating responsibility for constructing the Project, ERCOT set forth a completely new rationale for awarding part of the Project to Cross Texas and Garland:

> ERCOT notes that this assignment of responsibility tracks the relative proximity to the distribution service territories of the parties. The new 345 kV transmission line terminating into the Gibbons Creek and Zenith substations is geographically proximate to CenterPoint Energy's distribution service territory. Likewise, the new 345 kV transmission line terminating into the Limestone and Gibbons Creek substations is geographically proximate to the distribution service territories of three of the four TMPA members (Denton Municipal Electric, Garland, and GEUS). Relative geographic proximity does not determine the selection of a TSP when ERCOT is required to make the selection pursuant to Protocol Section 3.11.4.8, but on the facts of this situation, it provides a reasonable basis for moving forward.

ERCOT erred by relying on geographical proximity to a distribution service territory as a factor in selecting the TSPs because there is no authority in PURA, the Commission rules, or the ERCOT Protocols to use that factor. Indeed, ERCOT admits in the foregoing paragraph that geographic proximity does not determine the selection of a TSP when ERCOT is required to make the selection based on Protocol Section 3.11.4.8, but then ERCOT inexplicably goes on to state that "on the facts of this situation, it provides a reasonable basis for moving forward." Notably, however, ERCOT provides no explanation of *why* a factor outside of – and contrary to – the applicable Protocols provides a reasonable basis for moving forward.

Under Texas law, an agency acts arbitrarily and capriciously when it fails to consider a factor it is required to consider, when it considers an irrelevant factor, or when it weighs only

[19] *Texas Indus. Energy Consumers v. CenterPoint Energy Houston Electric, LLC*, 324 S.W.3d 95, 104 (Tex. 2010) (stating that agency action will be reversed as arbitrary and capricious when the agency does not follow the clear, unambiguous language of its rule).

relevant factors but still reaches a completely unreasonable result.[20] By relying on an irrelevant factor to award part of the Project to Cross Texas and Garland, ERCOT has acted arbitrarily and capriciously.

D. Even if geographical proximity to a distribution service territory were a valid ground to consider, neither Cross Texas nor Garland has a distribution service territory in the geographical proximity of the Project.

Even if ERCOT were free to ignore the language of its own Protocol and substitute a "geographical proximity" factor instead, its award of part of the Project to Cross Texas and Garland would be erroneous because neither of those TSPs has a distribution service territory in the proximity of the Limestone to Gibbons Creek segment of the Project.

ERCOT does not contend that Cross Texas has a distribution service territory in the proximity of the transmission line, nor could it credibly do so, given that Cross Texas has no distribution service territory at all. ERCOT instead asserts that the 345 kV transmission line terminating into the Limestone and Gibbons Creek Substation "is geographically proximate to the distribution service territories of three of the four TMPA members (Denton Municipal Electric, Garland, and GEUS)." That argument cannot support ERCOT's decision because it is simply wrong as a factual matter.

The Commission can take judicial notice that the cities of Garland, Greenville, and Denton are all more than 100 miles north of the Limestone Substation, which is the northernmost point of the Project. In fact, CenterPoint Energy's distribution service territory is far closer to the Gibbons Creek Substation than the distribution service territories of Garland, Denton, or Greenville are to the Limestone Substation. Indeed, CenterPoint Energy's distribution service territory is closer to the Limestone Substation than the Greenville and Denton distribution

[20] *City of El Paso v. Public Utility Comm'n*, 883 S.W.2d 179, 184 (Tex. 1994).

service territories are, and the Limestone Substation is roughly equidistant from the CenterPoint Energy and Garland distribution service territories.

Moreover, ERCOT cannot rely on Bryan's distribution service territory to provide geographical proximity because Bryan was not chosen as a TSP in this case. ERCOT chose Garland and Cross Texas, and ERCOT cannot bootstrap onto Bryan's distribution service territory to support the choice of Cross Texas and Garland.

E. Policy reasons support CenterPoint Energy's request to be awarded the entire Project.

1. CenterPoint Energy should be allowed to construct and operate the Project because it is needed to provide reliable service to CenterPoint Energy's customers.

Since the advent of utility regulation in Texas, the utility that is obligated to serve retail customers in a particular region has been allowed to construct, own, and operate the transmission infrastructure needed to provide safe and reliable power to that region. Tying the right to build transmission lines to the responsibility to maintain reliability has always represented sound public policy because it helps ensure accountability – that is, the utility that builds and operates the line cannot disclaim responsibility for reliability based on a claim that some third party has constructed the line poorly or is operating it poorly. But, the corollary of that proposition is that, if the utility is to be accountable for reliability, it must have the right to build and operate the lines that serve its customers. That is the compact that has existed for decades.

It is reasonable to assume that, if the Legislature or the Commission had intended to disturb that compact, it would have done so clearly and unmistakably. But there is no legislation relieving utilities of the rights and responsibilities in the compact; there is no Commission rule relieving utilities of the rights and responsibilities in the compact; and there is no ERCOT Protocol relieving utilities of the rights and responsibilities in the compact. To the contrary,

PURA continues to impose reliability requirements on the transmission and distribution utilities that serve retail customers, such as CenterPoint Energy.[21] Moreover, the ERCOT Protocol that governs this case expressly provides that the utility owning both endpoints of the Project – which is CenterPoint Energy – is the default TSP that should be awarded the entire Project.[22]

2. CenterPoint Energy should be allowed to construct and operate the Project because it has vastly more experience in building and operating transmission facilities than either Cross Texas or Garland has.

CenterPoint Energy has extensive experience in constructing, owning, and operating transmission facilities to serve the Houston Region. CenterPoint Energy serves over 2.2 million customers in the Houston Region, and as of December 31, 2013, its transmission network was composed of 3,728 circuit miles of transmission lines connecting 402 substations. The peak load that CenterPoint Energy served in 2013 was 17,012 MW, and it had annual operating revenues of $2,570 million from its Texas electric operations. CenterPoint Energy also owns, maintains, and operates other tie lines in the general area of the Project. It has also constructed, owned, operated, and maintained over 600 miles of 345 kV import lines from the south and north into the Houston Region. CenterPoint Energy has eliminated the South to Houston constraint with the Hillje project, and it has upgraded the northern tie lines to the point where a new line needs to be constructed. CenterPoint Energy also owns and operates its own control center to effectively and efficiently operate the transmission system providing service in the Houston Region.

In stark contrast, Cross Texas and Garland have far less relevant experience. Garland provides power to the residents and businesses within the City of Garland, has about 68,000 customers. Moreover, Garland is not required to obtain a CCN from the Commission in order to construct transmission facilities such as the Project, and therefore it has no experience obtaining

[21] TEX. UTILS. CODE ANN. § 38.005.

[22] ERCOT Protocol § 3.11.4.8.

CCNs from the Commission, whereas CenterPoint Energy must obtain CCNs for all transmission lines it constructs. In addition, Garland's transmission system is limited to 27 substations and 127 miles of transmission lines, a tiny fraction of the transmission infrastructure that CenterPoint Energy operates and maintains.

Cross Texas has even less experience constructing and operating transmission lines than Garland does. Cross Texas has built only one transmission line in Texas – a 235-mile 345 kV transmission line in the Panhandle. Building a transmission line in the Texas Panhandle, with its large expanses of rangeland, is far different from building a transmission line in the densely populated areas between the Limestone Substation and the Zenith Substation. Also, Cross Texas has no experience at all in operating a transmission line. In fact, South Texas Electric Cooperative ("STEC") has operated Cross Texas's transmission assets under a contractual arrangement. However, it is CenterPoint Energy's understanding that Cross Texas is building its own control center. This fact underscores the fact that Cross Texas has no experience in operating transmission lines in Texas.

VII. EXISTENCE OF QUESTIONS OF LAW OR FACT

Rule 22.251(d)(1)(F) requires a complainant to provide "a statement of all questions of fact, if any, that the complainant contends require an evidentiary hearing." CenterPoint Energy submits that the Commission can decide this case on legal grounds, without the need for an evidentiary hearing, because: (1) it is indisputable that the applicable ERCOT Protocol designates the owner of the endpoints of a transmission project as the default provider; and (2) it is undisputed that CenterPoint Energy owns the Limestone and Zenith Substations, which are the endpoints of the Project. Thus, CenterPoint Energy should be awarded the entire Project as a matter of law.

In addition, the Commission can and should decide as a matter of law that ERCOT erred by purporting to rely on the geographical proximity of distribution service territories. Nothing in the Protocols allows ERCOT to rely on that factor, and even if there were such a provision, the Commission can take judicial notice that neither Cross Texas nor Garland has a distribution service territory that is proximate to the Project.

If the Commission nevertheless concludes that it needs to resolve facts to decide this Complaint proceeding, CenterPoint Energy requests the opportunity for brief discovery and for an evidentiary hearing before the Commissioners, as described in the following section of this Complaint.

VIII. REQUEST FOR EXPEDITED COMMISSION DECISION AND FOR SUSPENSION OF ERCOT DECISION

ERCOT has determined that the Project is needed to meet the reliability criteria under the summer 2018 peak condition. Therefore, it is essential that the Project be built and placed in service by mid-2018. Although mid-2018 is four years away, it will take approximately 18 months to prepare and prosecute the CCN application at the Commission. It will take another 36 months to obtain the right of way and construct the line. Therefore, it is necessary to have a decision on the selection of the TSP for the Project no later than September 1, 2014.

To ensure a final decision in this docket by September 1, 2014, CenterPoint Energy requests that the Commission retain this case, rather than referring it to the State Office of Administrative Hearings, and that the Commissioners decide legal and policy issues based on briefing by the parties.[23] CenterPoint Energy further requests that, to the extent parties identify factual issues that must be resolved, the Commissioners hear and decide the case on an expedited

[23] Rule 22.251(m) provides, "If resolution of a complaint does not require determination of any factual issues, the commission may decide the issues raised by the complaint on the basis of the complaint and the comments and responses." That portion of the rule also allows the Commissioner or a Commissioner to serve as a fact finder if there are disputed factual issues.

procedural schedule, as authorized by Rule 22.251(k). CenterPoint Energy pledges to work with the Commission, ERCOT, Commission Staff, and any intervenors to ensure that the case is concluded as quickly as feasible.

CenterPoint Energy further requests that the Commission suspend the operation of ERCOT's order awarding part of the Project to Cross Texas and Garland for good cause, as authorized by Rule 22.251(i). As noted earlier in this Complaint, allowing the decision to remain in effect pending the outcome of this Complaint proceeding is likely to result in a duplication of effort and confusion among landowners if the Commission's decision differs from the ERCOT decision. Suppose, for example, that Cross Texas and Garland meet with landowners and discuss particular routes, or they commit to installing particular types of poles. If CenterPoint Energy is later awarded that portion of the Project and its routes or poles are not identical to those of Cross Texas and Garland, landowners will likely be angry and confused. The Commission can avoid that result by ordering that work on the CCN portion of the Project be deferred until after the Commission rules on CenterPoint Energy's Complaint.

IX. CONCLUSION AND PRAYER

For the reasons outlined in this Complaint, CenterPoint Energy prays that the Commission grant the following relief:

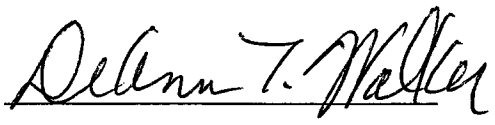
1. Retain the case at the Commission and adopt an expedited procedural schedule by which the Commissioners decide disputed legal issues and, to the extent necessary, factual issues;
2. Waive the ADR requirements in Rule 22.251(c) for the reasons discussed in this Complaint;
3. Suspend the operation of ERCOT's decision pending the outcome of this appeal;

4. Overturn the ERCOT decision awarding part of the Project to Cross Texas and Garland; and

5. Award the entire Project to CenterPoint Energy, except for necessary upgrades at the Gibbons Creek Substation.

CenterPoint Energy further prays for any other relief to which it may be entitled.

Respectfully submitted



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APPENDIX A

April 30, 2014 Letter From ERCOT

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April 30, 2014

By First Class Mail and Email

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Re: Houston Import RPG Project

Dear Sirs and Madam:

On April 8, 2014, Electric Reliability Council of Texas, Inc. (ERCOT) Board of Directors (Board) approved a resolution endorsing "the need for the Houston Import RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has

independently reviewed." As recommended by ERCOT staff and endorsed by the ERCOT Board, the Houston Import RPG Project includes the following Transmission Facilities:

- Construction of a new Limestone – Gibbons Creek – Zenith 345 kV double circuit to achieve 2988 MVA of emergency rating for each circuit;
- Upgrade of the substations at Limestone, Gibbons Creek and Zenith to accommodate the terminations of the new transmission lines; and
- Upgrade of the existing T.H. Wharton – Addicks 345 kV transmission line to achieve 1450 MVA of emergency rating.

The ERCOT Board resolution also deemed "the Limestone-Gibbons Creek-Zenith 345 kV double circuit line critical to the reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D)."[1]

The recommendation endorsed by the ERCOT Board was developed through the ERCOT Regional Planning Group (RPG) following the submission of project proposals by CenterPoint Energy Houston Electric LLC (CenterPoint Energy), the Cross Texas Transmission LLC/City of Garland dba Garland Power & Light[2] group (CTT/Garland), and Lone Star Transmission LLC in the summer of 2013. Each of those proposals identified a reliability need on the ERCOT System and included a variety of transmission improvements to meet that need. ERCOT initially screened 21 options and conducted a comprehensive analysis of eight of those options before making its recommendation, which comprises two new 345 kV transmission lines, an upgrade to an existing 345 kV transmission line, and related substation upgrades. The recommendation incorporates aspects of the proposed projects submitted by both CenterPoint Energy and CTT/Garland, and contemplates line construction and substation improvements affecting the Transmission Facilities of more than a single Transmission Service Provider (TSP).

Both CenterPoint Energy and Texas Municipal Power Agency (TMPA) own endpoints of the new 345 kV transmission lines terminating into the Limestone, Gibbons Creek, and Zenith substations. TMPA delegated its responsibility for the new Transmission Facilities to Garland, one of four TMPA member cities, and CTT/Garland partnered to construct the necessary Transmission Facilities. As a result, ERCOT designated CenterPoint Energy and CTT/Garland as co-providers of the recommended new 345 kV transmission lines.

It came to ERCOT's attention in March 2014 that CenterPoint Energy and CTT/Garland had not reached agreement regarding what portion of the new 345 kV transmission lines terminating into the Limestone, Gibbons Creek, and Zenith substations they would each provide upon endorsement by the ERCOT Board. Protocol Section 3.11.4.8 addresses

[1] The ERCOT Independent Review of Houston Import RPG Project (ERCOT Independent Review) contains additional details about the recommendation and is attached to this letter as Attachment A.

[2] The City of Garland provides electric service through Garland Power & Light, and ERCOT uses the two names interchangeably in this letter.

designation of the TSP or TSPs responsible for providing new Transmission Facilities. That section states in part:

> Upon completion of the RPG Project Review, ERCOT shall determine designated providers for the recommended transmission projects. The default TSPs will be those TSPs that own the end points of the new projects. Those TSPs can agree to provide or delegate the new facilities. If different TSPs own the two ends of the recommended project, ERCOT will designate them as co-providers of the recommended project, and they can decide between themselves what parts of the recommended project they will each provide. If they cannot agree, ERCOT will determine their responsibility following a meeting with the parties.

ERCOT met with representatives of CTT/Garland on March 17, 2014, and met with representatives of CenterPoint Energy on March 20, 2014. After considering the issues raised during those meetings, ERCOT issued a request for information to the parties on April 11, 2014. The parties submitted their responses to ERCOT on April 17, 2014. The parties' responses indicate that they continue to disagree regarding what portion of the new 345 kV transmission lines they will each provide. Consequently, pursuant to Protocol Section 3.11.4.8, ERCOT has determined their responsibility, as set forth below.

CenterPoint Energy, CTT, and Garland are each (1) a transmission service provider as defined by PUC Substantive Rule 25.5(143) and (2) registered with ERCOT as a TSP. In addition, both CenterPoint Energy and CTT have experience constructing 345 kV transmission lines in the ERCOT Region. ERCOT has concluded from these basic facts that CenterPoint Energy and CTT/Garland are each qualified to provide the new 345 kV transmission lines terminating into the Limestone, Gibbons Creek, and Zenith substations. In addition, ERCOT has concluded that none of the information provided by the parties during this process would warrant disqualifying either CenterPoint Energy or CTT/Garland from providing some portion of the transmission lines.

The Gibbons Creek substation, which is owned by TMPA, is a clear point of demarcation. The estimated length of the transmission line terminating into the Limestone and Gibbons Creek substations is roughly the same as the length of the transmission line terminating into the Gibbons Creek and Zenith substations. In addition, the Gibbons Creek substation provides a clear demarcation of responsibility for the construction and operation of these new 345 kV transmission lines. For these reasons, ERCOT has determined that responsibility for the new 345 kV transmission lines should be split at the Gibbons Creek substation.

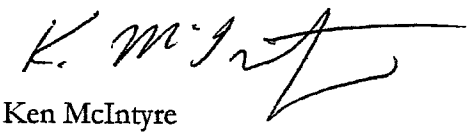
Specifically, ERCOT has determined that CenterPoint Energy should be responsible for the new 345 kV transmission line terminating into the Gibbons Creek and Zenith substations and that CTT/Garland should be responsible for the new 345 kV transmission line terminating into the Limestone and Gibbons Creek substations. ERCOT notes that this

assignment of responsibility tracks the relative proximity of each transmission line to the distribution service territories of the parties. The new 345 kV transmission line terminating into the Gibbons Creek and Zenith substations is geographically proximate to CenterPoint Energy's distribution service territory. Likewise, the new 345 kV transmission line terminating into the Limestone and Gibbons Creek substations is geographically proximate to the distribution service territories of three of the four TMPA members (Denton Municipal Electric, Garland, and GEUS).[3] Relative geographic proximity does not determine the selection of a TSP when ERCOT is required to make the selection pursuant to Protocol Section 3.11.4.8, but on the facts of this situation, it provides a reasonable basis for moving forward.

In addition, as stated in the ERCOT Independent Review, ERCOT has designated CenterPoint Energy as the provider of the T.H. Wharton-Addicks 345 kV transmission line upgrade and the upgrades to the Limestone and Zenith substations. And ERCOT has designated CTT/Garland as the designated providers of the Gibbons Creek substation upgrade.

ERCOT looks forward to the successful completion of the work and is ready to assist you with any planning and operations related activities. Should you have any questions, please contact me at any time.

Sincerely,



Ken McIntyre
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Electric Reliability Council of Texas, Inc.

Cc:

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Bill Magness, ERCOT
Chad V. Seely, ERCOT
Warren Lasher, ERCOT
Jeff Billo, ERCOT

[3] The fourth TMPA member, Bryan Texas Utilities, is geographically proximate to the Gibbons Creek substation.

Attachment A

ERCOT Independent Review of Houston Import RPG Project

ERCOT System Planning

Document Revisions

Date	Version	Description	Author(s)
02/20/2014	1.0	Final	Sun Wook Kang, Jesse Boyd, Ying Li
		Reviewed by	Prabhu Gnanam, Jeff Billo

TABLE OF CONTENTS

1. Executive Summary

The load in the Houston metropolitan area is currently served by the generation in the area and the power imported through 345 kV lines from the north and south into the Houston area (Figure 2.1). Over the past ten years, a significant amount of generation has been retired in the Houston area, while the load in the region continues to grow. The continuous load growth and lack of new generation additions in the load center has resulted in the Houston system relying more on power imports through the existing 345 kV lines into the area. In addition, increasing dependence on power imports causes significant challenges in scheduling a planned outage with a sufficient duration on any of the major 345 kV lines along the Houston import path.

Identifying the reliability need to improve the import capability into Houston, CenterPoint Energy, Lone Star Transmission, and Garland Power & Light and Cross Texas Transmission submitted three different Regional Planning Group (RPG) proposals in July and August 2013. For the three RPG submittals, ERCOT has conducted a combined single independent review and determined that the import paths from the north into Houston are vulnerable to thermal overloads under various contingency conditions by 2018. The review also revealed post-contingency low voltage issues at certain 345 kV buses in the region.

Based on the result of the independent review, ERCOT concludes that transmission reinforcement is needed to meet the reliability criteria under the 2018 summer peak condition. Among various options evaluated, ERCOT prefers Option 4 (new Limestone-Gibbons Creek-Zenith 345 kV double-circuit line) as the best solution for the area and recommends the project to be in-service by 2018. The project will address the reliability need, improve the import capability into Houston, and provide additional benefits to the system in both the near-term and long-term transmission planning horizons.

The project preferred by ERCOT requires

- Construction of a new Limestone-Gibbons Creek-Zenith 345 kV double-circuit line to achieve approximately 2988 MVA of emergency rating for each circuit. The approximate length of the new line is estimated to be 129.9 miles.
- Upgrade of the existing substations at Limestone, Gibbons Creek and Zenith to accommodate the terminations of the new 345 kV line.
- Upgrade of the existing T.H. Wharton-Addicks 345 kV line to achieve at least 1450 MVA of emergency rating (~10.7 miles).

The construction cost for the preferred project is estimated to be approximately $590 million in 2018 dollars. The estimate may vary as the designated providers of the new transmission facilities (CenterPoint Energy, Garland Power & Light and Cross Texas Transmission) perform more detailed cost analysis.

2. Introduction

The Houston metropolitan area is one of the major load centers in Texas, serving more than 25% of the entire load in the ERCOT system. While the load growth in the region is expected to continue, a significant challenge is also anticipated in developing new resources in the increasingly urban area due to restrictions such as air quality standards and site availability inside the city. Historical data indicates that approximately 1,800 MW of new generation has been added in the Houston region over the past ten years (2004 to 2013), while approximately 3,800 MW of generation has been retired over that time. Such continuous load growth and lack of new generation additions in the load center resulted in the Houston system relying more on power imports through the existing 345 kV lines into the area. These issues have been the primary focus of various studies in the past such as the DOE long-term transmission planning study and the annual ERCOT voltage stability study.

Recently, four Transmission Service Providers (TSPs) including CenterPoint Energy (CNP), Lone Start Transmission (LST), and jointly Garland Power & Light and Cross Texas Transmission (GPL & CTT) independently submitted three Regional Planning Group (RPG) proposals, identified a reliability need and proposed new transmission reinforcement to address the need and to improve the import capability into Houston by 2018.

For the three RPG proposals submitted, ERCOT has conducted one combined independent review. ERCOT performed various studies to address the reliability need and identified a best solution that significantly improves the import capability into Houston, which is currently relying on the power import through the existing 345 kV lines:

- Existing import paths from North to Houston
  - Singleton-Zenith 345 kV line #98
  - Singleton-Zenith 345 kV line #99
  - Singleton-Tomball 345 kV line #74
  - Roans Prairie-Bobville-Kuykendahl 345 kV line #75

- Existing import paths from South to Houston
  - Hillje-W.A. Parish 345 kV line #72
  - Hillje-W.A. Parish 345 kV line #64
  - South Texas-W.A. Parish 345 kV line #39
  - South Texas-DOW 345 kV line #18
  - South Texas-DOW 345 kV line #27

Increasing dependence on the power import through the above import paths is also expected to cause significant challenges in scheduling a planned outage with a sufficient duration on any of the 345 kV lines. As the load continues to grow in Houston, it is expected that these outages (forced or planned) will cause significant reliability issues and become increasingly more costly.

The figure below shows the system map of the study area indicating the key 345 kV substations connecting the major import paths into the Houston area.

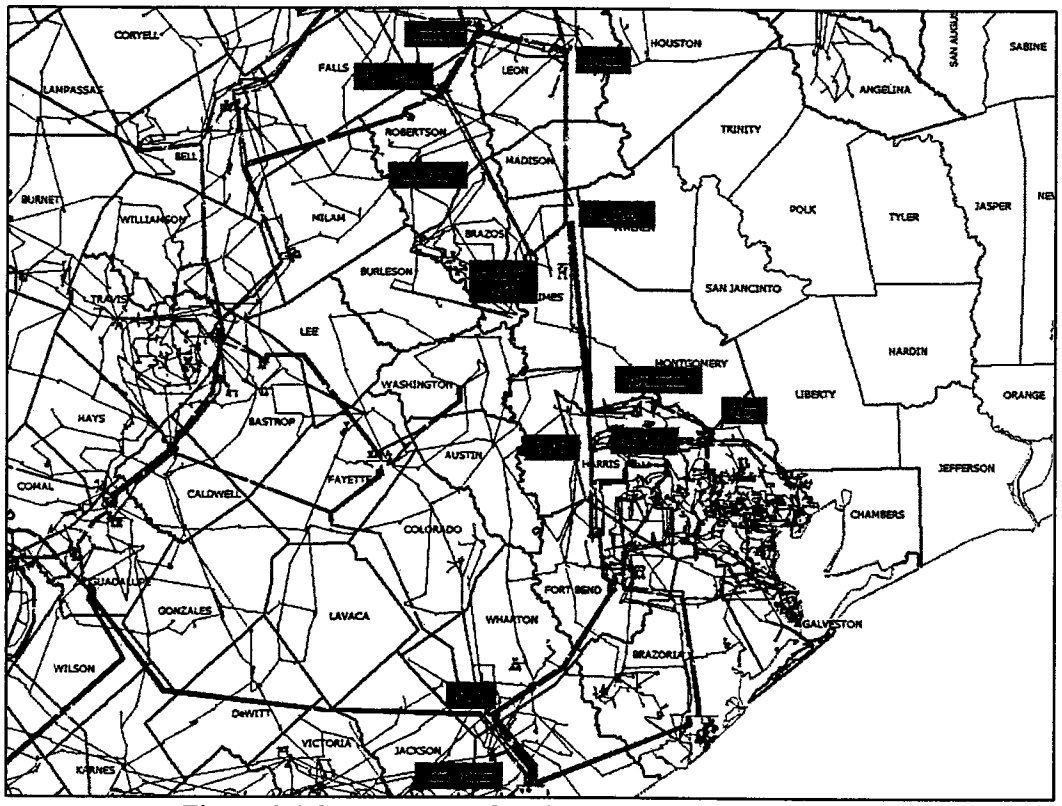

Figure 2.1 System map of study area with key substations

3. Criteria, Study Assumptions and Methodology

ERCOT performed studies under various system conditions to evaluate the reliability need and to find a robust and cost-effective solution from both near-term and long-term transmission planning perspectives. The study criteria, assumption and methodology for the ERCOT independent review are described in this section and are consistent with the NERC reliability standards, ERCOT Protocols, and ERCOT Planning Guide. The study scope and approach was also presented to the RPG at the September 2013 RPG meeting.

3.1 Study Criteria and Monitored Area

The criteria applied for the AC power flow analyses are consistent with the ERCOT Planning Guide 4.1.1.2 and the ERCOT 2013 Regional Transmission Plan (RTP). For the reliability analysis, the following thermal and voltage limits were enforced:

- Rate A under pre-contingency conditions for 60 kV and above transmission lines and transformers with a low side voltage of 60 kV and above

- Rate B under post-contingency conditions for 60 kV and above transmission lines and transformers with a low side voltage of 60 kV and above
- 0.95 pu voltage under pre-contingency conditions for 100 kV and above transmission lines and transformers with a low side voltage of 100 kV and above
- 0.90 pu voltage under post-contingency conditions for 100 kV and above transmission lines and transformers with a low side voltage of 100 kV and above

The area monitored in the study is the system in the ERCOT Coast weather zone and in the East weather zone (electrically close to the Houston metropolitan area).

3.2 Study Assumptions and Methodology

3.2.1 Study Base Case

Two 2018 summer peak cases that were created as part of an ERCOT stakeholder driven process were available for use at the beginning of the study. The first is the 2018 summer peak case from the 2013 Dataset B as developed by the Steady-State Working Group (SSWG) in accordance with the Reliability and Operations Subcommittee approved SSWG Procedure Manual. This is the case that was used by each of the TSPs when developing the results in the three project proposals submitted to the RPG.

The second 2018 summer peak case was developed for use in the ERCOT 2013 RTP. This case started with the SSWG 2018 summer peak case and then modified it in accordance with the 2013 RTP scope and process document which was presented to the RPG for comments. For this analysis, ERCOT elected to use the 2018 RTP summer peak case as the base case as this is the typical practice for independent reviews. As described in later sections of this report, ERCOT also used the SSWG case to perform sensitivities on the analysis.

When the summer peak cases are created by the SSWG or modified by ERCOT for use in the RTP, it is recognized that the load level for each area on the system is set to its non-coincident peak. That is, the load for an area will be set according to the maximum load that area is expected to experience during the summer which may be greater than the load for that particular area when the ERCOT system as a whole reaches its maximum load. Hence, the summed load that is modeled in the base cases when looked at from a system-wide perspective is much greater than the expected ERCOT system-wide load for a given year. Generation, which is provided by the market based on economic considerations, is assumed to be planned to meet the expected ERCOT system-wide load for a given year plus a reserve margin.

In transmission planning analysis the amount of generation available in the base case may not be enough to meet the summed non-coincident peak load of all areas of the system. In order to solve this challenge in the 2013 RTP, ERCOT split the 2018 summer peak case into two study areas, the so-called NW and SE areas. For each study area the load level was set to the forecasted peak load for that area while load outside of the area was scaled down until there was enough generation to meet the load plus an operational reserve of approximately 1375 MW (equal to the largest single unit on the ERCOT system).

In the 2018 SE summer peak case from the 2013 RTP, the load levels for the East, Coast, South Central, and Southern weather zones were set to their forecasted peak load levels. The load levels in the North, North Central, West, and Far West weather zones were set to approximately 85% of the peak load levels from the SSWG base case. ERCOT used 2018 SE summer peak case for the analysis in this review since the Houston area is located within the Coast weather zone and the facilities that were shown to be overloaded in the three RPG project submittals were wholly contained within the East and Coast weather zones.

In order to ensure that the load scaling did not adversely affect the results of the study by disproportionately modeling power flows from the scaled down weather zones to the Coast weather zone, ERCOT analyzed historic weather zone peak data. To do this ERCOT looked at the top ten peak load hours for the Coast weather zone for each of the last three years. For each of the other weather zones ERCOT assessed the percentage of their annual peak for those ten hours and then averaged the results. The data is presented in the below table.

Average % of peak load of each weather zone during the top ten hourly peak load conditions at the Coast Weather Zone							
Year	East	South	South Central	Far West	West	North	North Central
2011	97.46%	98.21%	96.38%	93.75%	83.70%	67.86%	93.37%
2012	96.32%	95.58%	96.08%	93.23%	92.93%	78.55%	85.56%
2013	76.77%	98.62%	97.42%	95.81%	78.23%	90.88%	88.81%

The results show that, with the exception of 2013, the East weather zone was near its peak when the Coast weather zone was at its peak. If the 2013 exception were to be taken into account it would likely increase flows along the North to Houston import path. Both the South and South Central weather zones were near their peaks (95% to 98%) when the Coast weather zone was at its peak. In all three years the Far West weather zone was above the assumed 85% loading, however, since the Far West weather zone is electrically far from the Coast weather zone and has a relatively small amount of load this difference is not considered meaningful for this study. Both the West and North weather zones have two years where the average is below the 85% assumption and one year where the average is above the 85% assumption. Therefore, the assumption seems reasonable. In all three years the North Central weather zone was slightly above the 85% assumption, but in 2012 the average was just 0.56% above and 85% can reasonably be assumed to occur.

Based on this analysis ERCOT concluded that the load levels in the 2018 SE summer peak case from the 2013 RTP represent a reasonable variation of load forecast in accordance with Planning Guide Section 4.1.1.1(5)(a), and decided to use the 2018 SE summer peak case as the base case of this ERCOT independent review.

Based on the result of the 2013 RTP studies, several transmission upgrades inside Houston were modeled to create the study case. ERCOT considers these upgrades not relevant to the Houston import project review as the upgrades listed below do not significantly change power flows on the import paths.

- Three new projects were identified in the 2013 RTP for the study area:

- Project to loop Roans Prairie-King into Rothwood 345 kV substation
- Project to upgrade the system in the Katy area, which includes
  - ✓ A new second 345/138 kV transformer at Zenith
  - ✓ A new 138 kV line from Zenith to Franz and reconfiguration of existing 138kV lines in the Katy area
- Project to upgrade the Dickinson-League City 138 kV line

The load level of the Coast weather zone assumed in the 2018 SE study base case is identical to the load level of the same weather zone in the SSWG case. This assumption is consistent with the study scope of the 2013 RTP, and the total load assumed for the year 2018 in the Coast weather zone is 26,355 MW.

Several future generators were modeled in the case based on the model-building requirement in Planning Guide Section 6.9 and the input from stakeholders:

- Future generators modeled online in the study area based on the above ERCOT planning criteria:
  - Deer Park Energy G6, Channel Energy GT3, Deepwater Energy (later cancelled)
- Future generators modeled offline based on the above ERCOT planning criteria and the input from ERCOT stakeholder:
  - A new W.A. Parish unit, Pondera King, Cobisa

3.2.2 Study Methodology

The purpose of the independent review of the Houston import project is first, to determine whether the system in the study area needs transmission reinforcement; and second, if it does, to evaluate options and develop a solution that performs best to meet the reliability criteria under various system conditions. The ultimate goal, if the system needs reinforcement, is to find a best value solution among various options from both system performance and cost perspectives.

To evaluate the reliability need described in the TSP's RPG submittals, ERCOT studied the 2018 study base case by applying the planning criteria in Section 3.1. In addition to the 2018 study base case, ERCOT also performed additional sensitivity studies with and without varying the load levels for all weather zones except the Coast weather zone. The additional studies were done to incorporate the comments from ERCOT stakeholders and to ensure the reliability need also existing in the SSWG case.

Once the reliability need was identified, ERCOT developed a number of options based on the RPG submittals, input from the stakeholders, and past ERCOT studies including the DOE long-term transmission planning study. For the various options developed, ERCOT took a two-step approach to screen and select options for more detailed analyses. First, ERCOT performed a contingency analysis to identify options that mitigate the reliability concerns under the ERCOT N-1 conditions. Then, as a second step, ERCOT studied G-1+N-1 (generator unit outage plus a contingency) conditions for the options that passed the N-1 criteria. If an option addressed the

reliability issues under both N-1 and G-1+N-1 conditions, the option was selected for further evaluation.

For the options selected based on the result of the G-1+N-1 analysis, ERCOT performed additional studies to determine the most robust and cost-effective solution that is the best for both the near-term and the long-term (the next 15 years) planning horizons. For each select option, ERCOT conducted a power transfer analysis to evaluate the thermal and voltage stability limits. For transfer analysis, ERCOT gradually scaled up the load in the Coast weather zone, while scaling down the loads in the North, North Central, West and Far West weather zones to balance supply and demand. The purpose of the transfer analysis was to identify additional future upgrades that may be needed for each select option beyond the project in-service year (2018) up to year 2028 and quantify the benefits of each select option from reliability and cost perspectives.

ERCOT also studied the impact of the potential retirement of older generation units (listed in Section 7.3) located inside the Houston area. An AC power flow analysis was performed for each select option using the 2018 study base case with the old units assumed offline. ERCOT also performed a generation reduction analysis to estimate the amount of generation that might be retired without causing any thermal issues on the major import paths. ERCOT compared the system performance of each select option under the potential system conditions.

Severe contingencies such as NERC Category C and D conditions were tested using the 2018 study base case for each of the selected options.

Transmission efficiency was also analyzed for each select option by computing system loss reduction using the 2018 system peak condition.

Although the project discussed in this RPG report is purely driven by reliability need, ERCOT also conducted an economic analysis of each select option using the 2013 RTP economic case developed for study year 2018 in order to compare the relative annual production cost savings of each option.

Finally, ERCOT performed various sensitivity analyses as discussed in Section 8. ERCOT performed a transfer analysis by using a different load-scaling approach to check if there is any significant impact on the result of the transfer analysis (discussed in Section 7.1).

3.2.3 Tools

ERCOT utilized the following software tools for the independent review of the Houston import project:

- PowerWorld version 17 with SCOPF was used for AC power flow analysis
- VSAT and PSAT version 11 were used to perform power transfer analysis
- UPLAN version 8.12.0.9073 was used to perform security-constrained production cost analysis

3.2.4 Contingencies

All NERC Category A and B and ERCOT double circuit contingencies were evaluated for the AC power flow analyses. For G-1+N-1 analysis, the following generator outages were considered to identify the worst G-1 conditions:

- South Texas U1 (1378 MW),
- Cedar Bayou N2 (749 MW),
- Frontier G4 (374 MW),
- Gibbons Creek L1 (470 MW)

In accordance with Planning Guide Section 4, following the outage of a generator (G-1), the system was adjusted (redispatched) before applying the N-1 contingency.

For the power transfer analysis, ERCOT tested roughly 450 contingencies (300 kV and above in Coast, East and South Central weather zone in ERCOT system) using the 2018 study base case. As a result, ERCOT identified 45 key contingencies. These key contingencies were tested for each select option in order to identify future transmission upgrades during the transfer analysis.

For the NERC Category C and D analysis, ERCOT tested 23 severe events selected based on past ERCOT experience and also based on the annual ERCOT stability analysis.

4. Project Need

ERCOT conducted an AC power flow analysis using the 2018 SE study base case. The result indicated the overload of the Singleton-Zenith 345 kV double circuit under N-1 contingency conditions. This issue was aggravated further under G-1+N-1 conditions causing other additional thermal overloads of the import paths and low voltages at certain 345 kV buses in the area.

The result also indicated that the worst G-1+N-1 issues would occur during the outage of South Texas Project (STP) U1. The issues under other G-1+N-1 conditions (i.e. N-1 under Frontier, Gibbons Creek, or Cedar Bayou outage condition) were found to be the subset of the N-1 issues under the STP U1 outage condition (G-1).

The key reliability issues identified in the study are listed below and also illustrated in Figure 4.1. Among various contingencies causing the reliability issues, the worst contingency is the loss of the Singleton-Tomball & Roans Prairie-Bobville 345 kV double circuit.

- Key reliability issues identified under N-1 conditions are
  - Overload (~116.6%) of the Singleton-Zenith 345 kV double circuit
  - Heavy flow (~98.9%) on the Jewett-Singleton 345 kV double circuit

- Key reliability issues under the worst G-1 (STP U1)+N-1 conditions are
  - Overload (~145%) of Singleton-Zenith 345 kV double circuit both under system intact and under contingency conditions
  - Overload (~124%) of Jewett-Singleton 345 kV double circuit

- Overload (~124%) of Jack Creek-Twin Oak 345 kV circuit #1
- Overload (~115%) of Roans Prairie-Bobville-Kuykendahl 345 kV circuit #75
- Overload (~115%) of Gibbons Creek-Twin Oak 345 kV circuit #1
- Overload (~112%) of Gibbons Creek-Singleton 345 kV double circuit
- Overload (~106%) of Gibbons Creek-Jack Creek 345 kV circuit #2
- Overload (~105%) of Singleton-Tomball 345 kV circuit #74
- Low voltage (below 90%) at Tomball, Rothwood, Bobville and Kuykendahl 345 kV buses

More detailed results on the reliability issues are presented in Appendices A and B.

The result of the power flow analysis also showed the overload of the 345/138 kV transformers at DOW substation and certain 138 kV lines inside the Houston area. ERCOT considered these issues as local issues not relevant to the Houston import capability study.

Based on the study result, ERCOT confirmed the reliability need to improve the import capability into Houston.

During the course of the independent review ERCOT provided study updates to the RPG at regularly scheduled monthly RPG meetings and received comments on the study at these meetings. NRG and other stakeholders commented that the load scaling methodology that ERCOT used in the creation of the 2013 RTP base cases may exacerbate the overloads on the North to Houston import pathways. As discussed in Section 3.2.1 of this report ERCOT validated the assumptions used in the study case in response to these comments. In addition ERCOT performed several sensitivities using the latest 2018 summer peak base case built by the SSWG from the 2014 Dataset B which was not available at the beginning of the analysis.

In order to incorporate the comments from the ERCOT stakeholders and ensure that the reliability need exists regardless of the load or generation assumptions used in the 2018 study base case, ERCOT evaluated the following cases (Appendix E has a more detailed description of each case):

Case 1: *2018 SSWG case (2018 SUM1 Final 10/15/2013) with no changes to load or generation*

Case 2: *2018 SSWG case with weather zone load scaled to the highest average percentage load level between 2011 and 2013 when the Coast weather zone was at its peak as presented in section 3.2.1 of this report.*

Case 3: *2018 SSWG case with weather zone load scaled to the average percentage of load level when the Coast weather zone was at its peak in 2013 as presented in section 3.2.1 of this report.*

These cases were evaluated under G-1 (STP U1) + N-1 conditions. As a result of the evaluation, ERCOT found either overloads or heavy flows of the 345 kV lines identified in the 2018 study

base case. The details of the results can be found in Appendix F (for Case 1), Appendix G (for Case 2) and Appendix H (for Case 3). The results are summarized in the table below.

Overload Element	Study Case	Case 1	Case 2	Case 3*
Singleton-Zenith double circuit	145%	122%	128%	137%
Roans Prairie-Bobville #75	115%	99%	104%	110%
Bobville-Kuykendahl #75	115%	99%	103%	110%
Jewett North-Singleton #1	124%	93%	99%	106%
Jewett South-Singleton #1	123%	91%	97%	103%
Gibbons Creek-Singleton #75	113%	92%	94%	101%
Gibbons Creek-Singleton #99	113%	92%	94%	101%
Jack Creek-Twin Oak #1	124%	92%	100%	102%
Singleton-Tomball #74	105%	Below 90%	93%	99%
Gibbons Creek-Twin Oak #1	115%	Below 90%	92%	95%
Gibbons Creek-Jack Creek #2	106%	Below 90%	Below 90%	Below 90%

* Low voltage issue (below 90%) at the Tomball 345 kV bus was also found in Case 3 under G-1+N-1 conditions.

The results showed that while overloads were generally less than in the study case, the project need was confirmed in all of the evaluated cases. Based on the results, ERCOT confirmed that the reliability need identified in this section is an imminent issue irrespective of the assumptions used in the 2018 study base case.

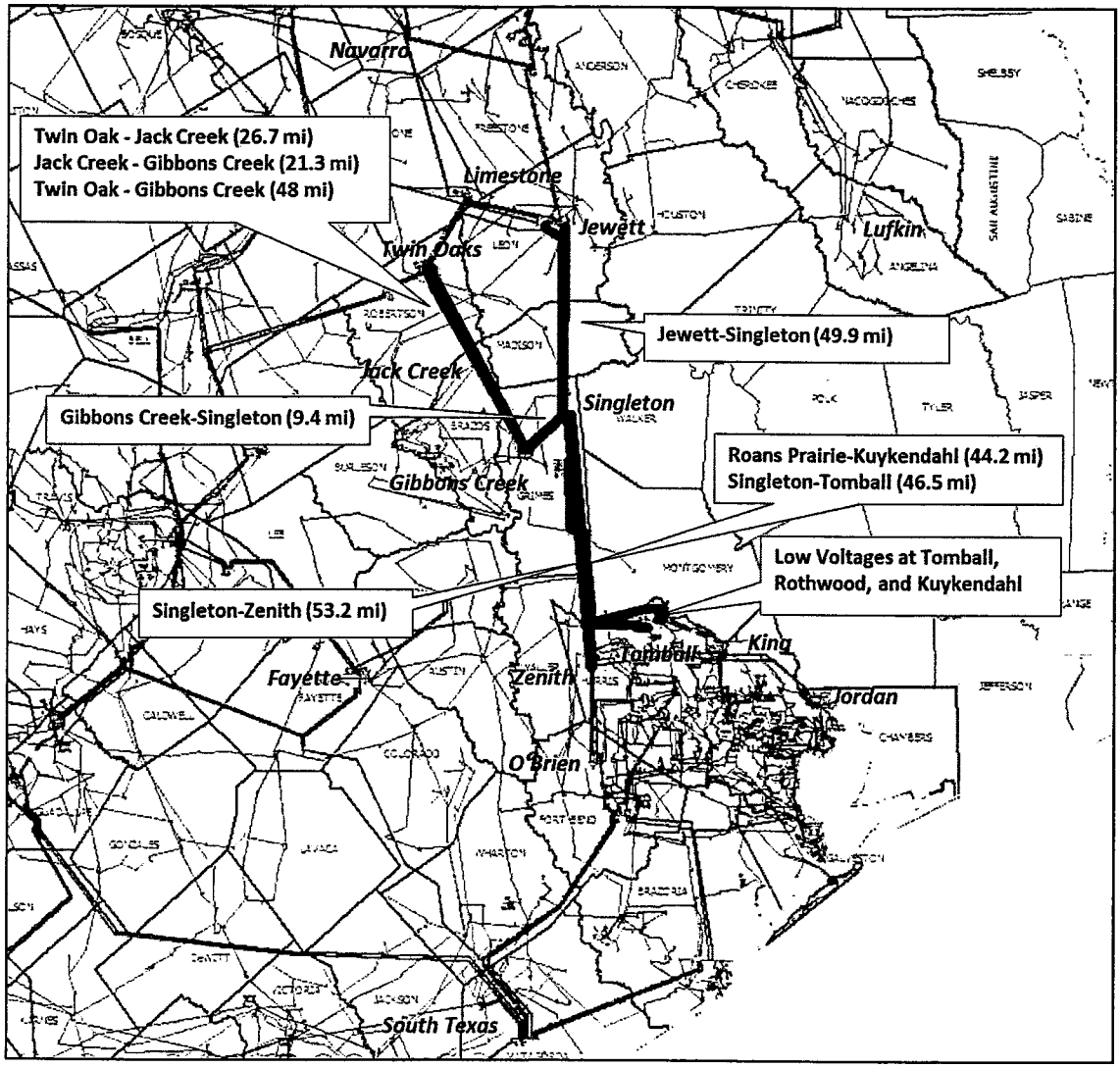

Figure 4.1 Map of system reliability issues related to Houston import capability

Table 4.1 Key thermal overloads identified in 2018 SE Study Base Case under N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	116.6
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	116.6

Table 4.2 Key thermal overloads identified in the 2018 SE Study Base Case under G-1+N-1

Overloaded Element	Percent Loading Under Worst Contingency			
	South Texas G-1	Cedar Bayou G-1	Gibbons Creek G-1	Frontier G-1
Singleton – Zenith 345 kV #98	145.5	136.0	114.2	114.7
Singleton – Zenith 345 kV #99	145.6	136.1	114.2	114.7
Gibbons Creek – Twin Oak Switch 345 kV #1	115.3	107.0	103.1	100.9
Gibbons Creek – Singleton 345 kV #75	112.6	104.7	N/A	N/A
Gibbons Creek – Singleton 345 kV #99	112.6	104.7	N/A	N/A
Jack Creek – Twin Oak Switch 345 kV #1	124.1	115.1	110.9	108.7
Jewett South – Singleton 345 kV #1	123.2	115.5	104.1	109.2
Jewett North – Singleton 345 kV #1	124.1	115.4	102.6	108.7
Roans Prairie – Bobville 345 kV #75	115.7	108.9	N/A	N/A
Bobville – Kuykendahl 345 kV #75	115.4	108.7	N/A	N/A
Gibbons Creek – Jack Creek 345 kV #2	106.1	N/A	N/A	N/A
Singleton – Tomball 345 kV #74	105.6	N/A	N/A	N/A

Table 4.3 Key low voltage issues identified in the 2018 SE Study Base Case under G-1+N-1

Bus Name	Bus Voltage Under Worst Contingency			
	South Texas G-1	Cedar Bayou G-1	Gibbons Creek G-1	Frontier G-1
Tomball 345 kV	0.87	0.89	> 0.90	> 0.90
Bobville 345 kV	0.89	> 0.90	> 0.90	> 0.90
Kuykendahl 345 kV	0.89	> 0.90	> 0.90	> 0.90
Kuykendahl 345 kV	0.89	> 0.90	> 0.90	> 0.90
Rothwood 345 kV	0.89	> 0.90	> 0.90	> 0.90

5. Initial Options

Based on the reliability analysis ERCOT identified that multiple 345 kV lines including Singleton-Zenith, Jewett-Singleton, Jack Creek-Twin Oak, Singleton-Tomball, Gibbons Creek-Singleton and Gibbons Creek-Twin Oak (more than 200 miles of double-circuit 345 kV lines) would overload under either N-1 or G-1+N-1 conditions in 2018. In addition to the overloads, ERCOT also identified other 345 kV low voltage issues under contingency conditions.

ERCOT does not consider upgrading all of the existing 345 kV import lines as a viable option. CNP, the owner of the Singleton-Zenith 345 kV line, estimated that it would take 12 to 18 months to rebuild this line alone. ERCOT's analysis showed that it would not be possible to take any of the lines out of service for construction when load levels in the Houston area are high because the next contingency would place the system at risk of voltage collapse. This would likely lead to high congestion costs because a significant portion of the generation in the Houston area would be required to run during the construction outage in order to maintain system

security. Much of this generation is older, less efficient generation that is not typically economic to run in the off peak times when the construction would likely occur. Further, since generators require maintenance outages as well it may not be possible to take all of the required outages for transmission construction and generator maintenance. Since there are over 200 miles of overloaded lines it is not feasible that all of the lines would be rebuilt by 2018. Lastly, the estimated cost (over $700 million) of upgrading all of the lines is more than most of the options studied in this analysis, but would not provide a comparable level of reliability.

ERCOT evaluated twenty-one options to address the identified need and improve the import capability into Houston. All twenty-one options require constructing a new transmission line into Houston area on a new right of way.

Among the options evaluated, three options were preferred by CNP, four options by LST and another three options by GPL & CTT. The remaining options were developed by ERCOT considering new transmission sources from various directions into Houston or modifying certain options from the TSPs. These options are listed in Table 5.1 through 5.4. ERCOT evaluated these options under N-1 and G-1+N-1 conditions. Figure 5.1 shows the system map of the study area overlapped with these options.

Table 5.1 CenterPoint's preferred options

Option ID	CenterPoint Options	Approximate Line Length Modeled in study (mi)
C1	– Construct a new Twin Oak-Zenith 345 kV double circuit	117.0
C2	– Construct a new substation, called Ragan Creek, adjacent to the existing double-circuit 345 kV line running between Gibbons Creek and Jack Creek – Loop the adjacent to the existing double-circuit 345 kV line between Gibbons Creek and Jack Creek into Ragan Creek – Construct a new Ragan Creek-Zenith 345 kV double circuit	69.0
C3	– Construct a new substation, called Ragan Creek, adjacent to the existing double-circuit 345 kV line running between Gibbons Creek and Jack Creek – Loop the adjacent to the existing double-circuit 345 kV line between Gibbons Creek and Jack Creek into Ragan Creek – Construct a new Limestone-Ragan Creek-Zenith 345 kV double circuit	130.2

Table 5.2 Lone Star's preferred options

L1	– Construct a new Navarro-Gibbons Creek-Zenith 345 kV double	165.0

	circuit	
L2	– Construct a new Navarro-King 345 kV double circuit	186.0
L3	– Construct a new 500/345 kV substation at Navarro – Install two new 500/345 kV transformers at Navarro – Construct a new 500/345 kV substation at King – Install two new 500/345 kV transformers at King – Construct a new Navarro-King 500 kV double circuit	186.0
L4	– Construct a new Navarro-King 345 kV double circuit with 50% Series Compensation	186.0

Table 5.3 Cross Texas and Garland Power & Light's preferred options

Option ID	Cross Texas & Garland Power and Light Options	Approximate Line Length Modeled in study (mi)
T1	– Construct a new Gibbons Creek-Tomball 345 kV double circuit	50.0
T2	– Construct a new Gibbons Creek-Zenith 345 kV double circuit	60.0
T3	– Construct a new Limestone-Gibbons Creek-Zenith 345 kV double circuit	122.0

Table 5.4 Other options developed by ERCOT

[illegible]	[illegible]	[illegible]
E1	– Construct a new Jewett-King 345 kV double circuit	142.5
E2	– Construct a new Lufkin-Jordan 345 kV double circuit	126.0
E3	– Construct a new Fayette-Zenith 345 kV double circuit	65.6
E4	– Construct a new Fayette-O'Brien 345 kV double circuit	73.9
E5	– Construct a new Jewett-Jack Creek-O'Brien 345 kV double circuit – Loop the existing Twin Oak-Gibbons Creek 345 kV line into Jack Creek	154.6
E6	– Construct a new Jewett-Jack Creek-Zenith 345 kV double circuit – Loop the existing Twin Oak-Gibbons Creek 345 kV line into Jack Creek	134.1
E7	– Construct a new Sandow-Salem-Zenith 345 kV double circuit	113.4
E8	– Construct a new Jewett-Jack Creek-Zenith 345 kV double circuit with 25% Series Compensation	134.1

E9	– Loop the existing Twin Oak-Gibbons Creek 345 kV line into Jack Creek – Construct a new Jewett-Jack Creek-Zenith 345 kV double circuit with 50% Series Compensation – Loop the existing Twin Oak-Gibbons Creek 345 kV line into Jack Creek	134.1
E10	– Construct a new Twin Oak-Zenith 345 kV double circuit with 25% Series Compensation	117.0
E11	– Construct a new Twin Oak-Zenith 345 kV double circuit with 50% Series Compensation	117.0

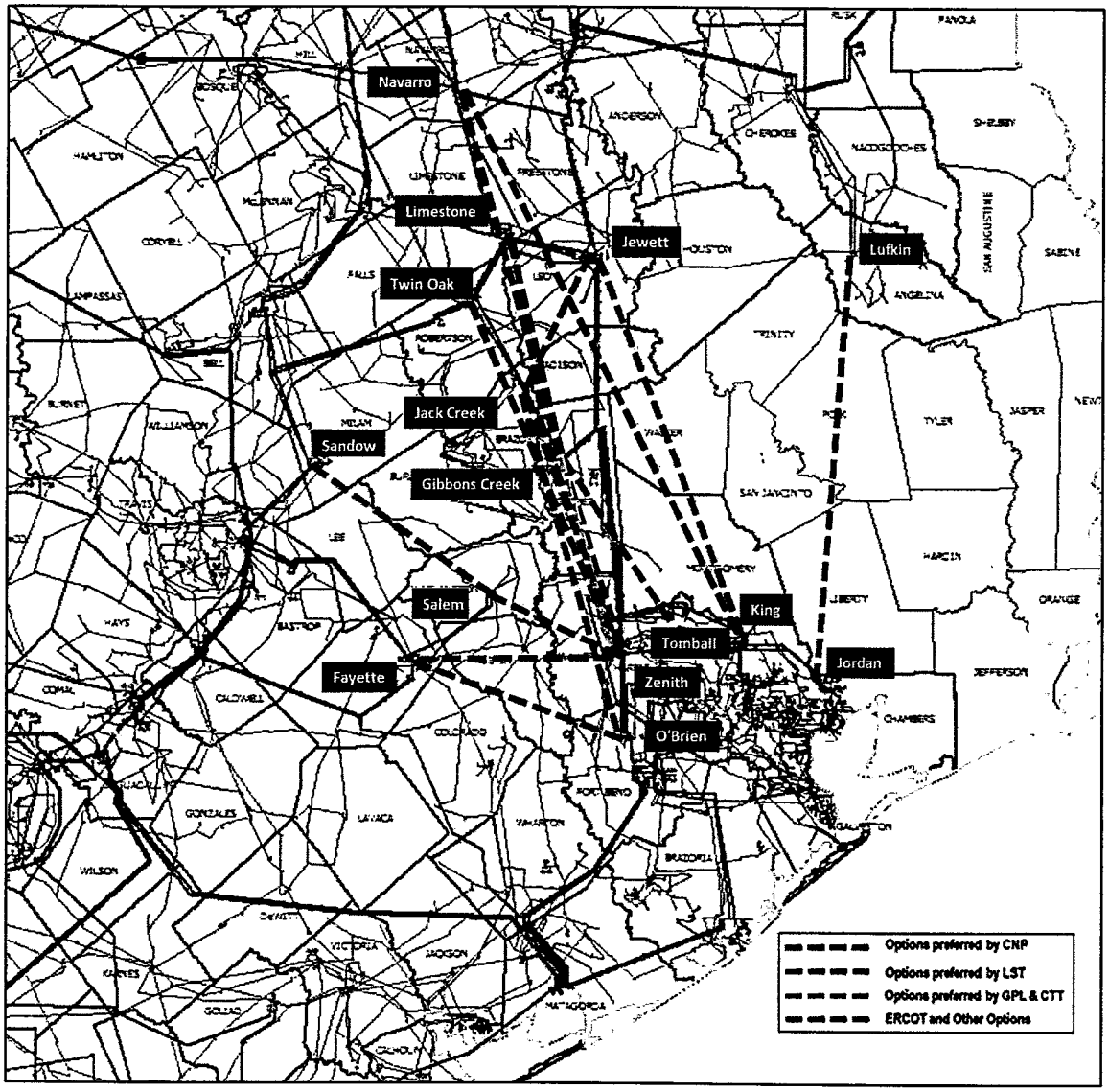

Figure 5.1 System map with initial options

5.1 Result of N-1 and G-1+N-1 Analysis of Each Initial Option

5.1.1 Result of N-1 Contingency Analysis

As described in the study methodology in Section 3, ERCOT tested each option under N-1 contingency conditions by using the 2018 SE study base case to identify options addressing the reliability need under N-1.

Among the initial twenty-one options evaluated, ERCOT found six options that did not meet the N-1 criteria. ERCOT eliminated these six options from further consideration because these options did not address the overload on the existing Houston import paths. ERCOT concluded that the total project cost in 2018 for these six options including the upgrade of existing 345 kV lines along the Houston import path would be significantly higher than other options that resolved all N-1 overloads. In addition, the upgrade of existing 345 kV lines along the Houston import would pose a reliability risk and add significant outage cost. These six options and the reason for the elimination are as follows.

- C2: Ragan Creek-Zenith 345 kV double circuit
  - Overload of Twin Oak-Ragan Creek 345 kV
  - Overload of Jack Creek-Twin Oak 345 kV
  - Heavy flow* on Jewett-Singleton 345 kV

- T1: Gibbons Creek-Tomball 345 kV double circuit
  - Overload of Jack Creek-Twin Oak 345 kV
  - Heavy flow* on Jewett-Singleton 345 kV
  - Heavy flow* on Gibbons Creek-Twin Oak 345 kV

- T2: Gibbons Creek-Zenith 345 double circuit
  - Overload of Jack Creek-Twin Oak 345 kV
  - Heavy flow* on Jewett-Singleton 345 kV
  - Heavy flow* on Gibbons Creek-Twin Oak 345 kV

- E2: Lufkin-Jordan 345 kV double circuit
  - Overload of ~50 miles of 138 kV lines in the Lufkin area

- E3: Fayette-Zenith 345 kV double circuit
  - Overload of Singleton-Zenith 345 kV

- E4: Fayette-O'Brien 345 kV double circuit
  - Overload of Singleton-Zenith 345 kV

* **Note**: Heavy flow means post-contingency loading greater than 95%

Table 5.1.1 Key thermal issues of Option C2 (Ragan Creek-Zenith) under N-1

Thermal Issues	Worst Contingency	Percent Loading
Twin Oak-Ragan Creek 345 kV	Jewett-Singleton 345 kV double circuit	100.0
Jack Creek-Twin Oak 345 kV	Jewett-Singleton 345 kV double circuit	106.9
Jewett North-Singleton 345 kV #1	Jack Creek-Twin Oak 345 kV and Twin Oak-Ragan Creek 345 kV #1	95.1
Jewett South-Singleton 345 kV #2	Jack Creek-Twin Oak 345 kV and Twin Oak-Ragan Creek 345 kV #1	96.8

Table 5.1.2 Key thermal issues of Option T1 (Gibbons Creek-Tomball) under N-1

Thermal Issues	Worst Contingency	Percent Loading
Jack Creek-Twin Oak 345 kV	Jewett-Singleton 345 kV double circuit	102.4
Gibbons Creek-Twin Oak 345 kV	Jewett-Singleton 345 kV double circuit	95.5
Jewett South-Singleton 345 kV #2	Jack Creek-Twin Oak 345 kV and Gibbons Creek-Twin Oak 345 kV	95.7

Table 5.1.3 Key thermal issues of Option T2 (Gibbons Creek-Zenith) under N-1

Thermal Issues	Worst Contingency	Percent Loading
Jack Creek-Twin Oak 345 kV	Jewett-Singleton 345 kV double circuit	104.1
Gibbons Creek-Twin Oak 345 kV	Jewett-Singleton 345 kV double circuit	97.2
Jewett North-Singleton 345 kV #2	Jack Creek-Twin Oak 345 kV and Gibbons Creek-Twin Oak 345 kV	95.2
Jewett South-Singleton 345 kV #2	Jack Creek-Twin Oak 345 kV and Gibbons Creek-Twin Oak 345 kV	96.9

Table 5.1.4 Key thermal issues of Option E2 (Lufkin-Jordan) under N-1

Thermal Issues	Worst Contingency	Percent Loading
Lufkin SS-Lufkin 138 kV	Stryker Creek SES-Lufkin 345 kV	166.11
Nacogdoches SE- Nacogdoches S 138 kV	Stryker Creek SES-Lufkin 345 kV	105.4
Nacogdoches SE- Henry North 138 kV	Stryker Creek SES-Lufkin 345 kV	120.0
Cushing-Gresham Road Switch 138 kV	MT Enterprise-Nacogdoches 345 kV	102.8
Nacogdoches S Tab-Lufkin 138 kV	Stryker Creek SES-Lufkin 345 kV	116.9

Table 5.1.5 Key thermal issues of Option E3 (Fayette-Zenith) under N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	106.0
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	106.0

Table 5.1.6 Key thermal issues of Option E4 (Fayette-O'Brien) under N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	106.7
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	106.7

The remaining fifteen options addressed the N-1 reliability issue and moved to the G-1+N-1 analysis.

5.1.2 Result of G-1+N-1 Contingency Analysis

ERCOT conducted the G-1+N-1 analysis (G-1: STP U1 offline) for the fifteen options that met the N-1 criteria. As a result of the analysis, ERCOT found seven options that did not address the reliability issues under the G-1+N-1 conditions. Although these seven options reduced the contingency loadings on the 345 kV import paths from the north into Houston, there are still overloads or impending overloads on the Singleton-Zenith 345 kV double circuit or the Jewett-Singleton 345 kV double circuit. These seven options are

- C1: Twin Oak-Zenith 345 kV double circuit
  - Heavy flow* on Singleton-Zenith 345 kV
- E1: Jewett-King 345 kV double circuit
  - Overload of Singleton-Zenith 345 kV
- E5: Jewett-Jack Creek-O'Brien 345 kV double circuit
  - Overload of Singleton-Zenith 345 kV
- E7: Sandow-Salem-Zenith 345 kV double circuit
  - Overload of Singleton-Zenith 345 kV
  - Heavy flow* on Jewett-Singleton 345 kV
- L2: Navarro-King 345 kV double circuit
  - Overload of Singleton-Zenith 345 kV
  - Heavy flow* on Jewett-Singleton 345 kV
- L3: Navarro-King 500 kV double circuit
  - Overload of Singleton-Zenith 345 kV
- L4: Navarro-King 345 kV double circuit with 50% series compensation
  - Heavy flow* of Singleton-Zenith 345 kV

* **Note:** Heavy flow means contingency loading greater than 95%

Table 5.2.1 Key thermal issues of Option C1 (Twin Oak-Zenith) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	97.0
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	97.0

Table 5.2.2 Key thermal issues of Option E1 (Jewett-King) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	106.3
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	106.3

Table 5.2.3 Key thermal issues of Option E5 (Jewett-Jack Creek-O'Brien) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	101.7
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	101.7

Table 5.2.4 Key thermal issues of Option E7 (Sandow-Salem-Zenith) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	117.3
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	117.3
Jewett South-Singleton 345 kV	Gibbons Creek-Singleton 345 kV double circuit	98.7
Jewett North-Singleton 345 kV	Gibbons Creek-Singleton 345 kV double circuit	99.4

Table 5.2.5 Key thermal issues of Option L2 (Navarro-King 345) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	112.2
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	112.3
Jewett South-Singleton 345 kV	Gibbons Creek-Singleton 345 kV double circuit	97.7
Jewett North-Singleton 345 kV	Gibbons Creek-Singleton 345 kV double circuit	98.5

Table 5.2.6 Key thermal issues of Option L3 (Navarro-King 500) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	105.3
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	105.4

Table 5.2.7 Key thermal issues of Option L4 (Navarro-King 345 with 50% SC) under G-1+N-1

Thermal Issues	Worst Contingency	Percent Loading
Singleton-Zenith 345 kV #98	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	99.4
Singleton-Zenith 345 kV #99	Singleton-Tomball 345 kV and Roans Prairie-Bobville 345 kV	99.5

6. Description of Options Selected for Further Evaluation

Among the initial twenty-one options, ERCOT found eight options effectively addressing the reliability issues under the N-1 and G-1+N-1 conditions. These eight options are

- E10: Twin Oak-Zenith 345 kV double circuit with 25% series compensation
- E11: Twin Oak-Zenith 345 kV double circuit with 50% series compensation
- C3: Limestone-Ragan Creek-Zenith 345 kV double circuit
- T3: Limestone-Gibbons Creek-Zenith 345 kV double circuit
- E6: Jewett-Jack Creek-Zenith 345 kV double circuit
- E8: Jewett-Jack Creek-Zenith 345 kV double circuit with 25% series compensation
- E9: Jewett-Jack Creek-Zenith 345 kV double circuit with 50% series compensation
- L1: Navarro-Gibbons Creek-Zenith 345 kV double circuit

Due to the injection of the new high voltage transmission source designed in the above options, several additional upgrades were needed to the existing lines located near the termination point(s) of each selected option. The upgrades of the existing lines are listed below:

- For all selected options listed above,
  - Upgrade the T.H. Wharton-Addicks 345 kV line (~10.7 miles)
- For E8 and E9,
  - Upgrade the Jack Creek-Twin Oak 345 kV double circuit (terminal upgrade)
- For L1,
  - Upgrade the Jack Creek-Twin Oak 345 kV line #1 (terminal upgrade)

With the few existing line upgrades included, the select options were updated, renamed, and listed below. The total estimated construction cost[1] provided for each select option is discussed further in Section 7.2, and the details of the estimates can be found in Appendix I.

[1] The line length of new line assumed for the cost estimate includes a 20% of uncertainty added to the straight length of the new line.

- Option 1:
  - Construct a new Twin Oak-Zenith 345 kV double-circuit line with 25% series compensation to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 117 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - The estimated cost for Option 1 is approximately $555 million in 2018 dollars.

- Option 2:
  - Construct a new Twin Oak-Zenith 345 kV double-circuit line with 50% series compensation to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 117 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - The estimated cost for Option 2 is approximately $572 million in 2018 dollars.

- Option 3:
  - Construct a new Limestone-Ragan Creek-Zenith 345 kV double-circuit line to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 130 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - The estimated cost for Option 3 is approximately $610 million in 2018 dollars.

- Option 4:
  - Construct a new Limestone-Gibbons Creek-Zenith 345 kV double-circuit line to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 129.9 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - The estimated cost for Option 4 is approximately $590 million in 2018 dollars.

- Option 5:
  - Construct a new Jewett-Jack Creek-Zenith 345 kV double-circuit line to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 128.9 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - The estimated cost for Option 5 is approximately $596 million in 2018 dollars.

- Option 6:
  - Construct a new Jewett-Jack Creek-Zenith 345 kV double-circuit line with 25% series compensation to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 128.9 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).

- Upgrade the Jack Creek-Twin Oak 345 kV double-circuit line (terminal upgrade) to achieve 1606 MVA of emergency rating.
- The estimated cost for Option 6 is approximately $617 million in 2018 dollars.

- Option 7:
  - Construct a new Jewett-Jack Creek-Zenith 345 kV double-circuit line with 50% series compensation to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 128.9 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - Upgrade the Jack Creek-Twin Oak 345 kV double-circuit line (terminal upgrade) to achieve 1606 MVA of emergency rating.
  - The estimated cost for Option 7 is approximately $629 million in 2018 dollars.

- Option 8:
  - Construct a new Navarro-Gibbons Creek-Zenith 345 kV double-circuit line to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 177.9 miles.
  - Upgrade the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
  - Upgrade the existing Jack Creek-Twin Oak 345 kV circuit #1 (terminal upgrade) to achieve 1606 MVA of emergency rating.
  - The estimated cost for Option 8 is approximately $806 million in 2018 dollars.

The estimates provided for Option 2, Option 3, Option 6 and Option 7 assumed series compensation with a 4000 Amp rating per circuit.

7. Evaluation of Selected Options

As described in the study methodology, ERCOT performed extensive studies to find the most robust and cost-effective solution among the select options. These studies include:

- power transfer analysis (both thermal and voltage stability analysis),
- long-term cost analysis (NPV analysis),
- impact of potential retirement of older generation units inside Houston,
- transmission efficiency in terms of system loss reduction,
- impact of severe events (NERC Category C and D contingency), and
- review of the congestion-related impact.

In this section, ERCOT presents the results of various studies done for each select option, and compares the overall performance of each select option based on the decision metrics in Section 7.8.

7.1 Power Transfer Analysis

Assuming each select option will be in service by 2018, ERCOT performed power transfer analysis (both steady-state thermal and voltage stability analysis) to identify additional future transmission upgrades that might be needed over the next 15 years (up to 2028) to serve the import needs of the Houston area.

Using VSAT and the 2018 SE study base case, ERCOT performed a screening analysis by testing roughly 450 contingencies (300 kV and above) in the Coast, East and South Central weather zones. As a result of the screening analysis, approximately 45 contingencies were found to be significant to the Houston import project study. ERCOT tested these 45 significant contingencies under the worst G-1 condition (STP U1) for each select option in the transfer analysis. ERCOT monitored transmission facilities (100 kV and above) in the Coast weather zone and the vicinity of the entire 345 kV import path into Houston.

For the transfer analysis, ERCOT incrementally scaled the load in the Coast weather zone up to the 2028 load level in order to simulate the continued load growth in the region and to identify what additional thermal issues would occur by 2028 assuming each select option is in-service by 2018.

ERCOT estimated the load level of the year 2028 based on the 2013 ERCOT 90/10 load forecast for 2018 and the 1.3% of annual load growth rate noted in the RPG report submitted by CNP. As demonstrated in Figure 7.1, ERCOT compared the assumed load growth rate against the historical data, and confirmed that it is very close to the historical load growth rate (~1.4%). Thus, ERCOT considered the assumption valid for the power transfer analysis. As shown in the figure, the future load projection estimated for the Coast weather zone is closely aligned with the trend of the historical peak loads of the weather zone.

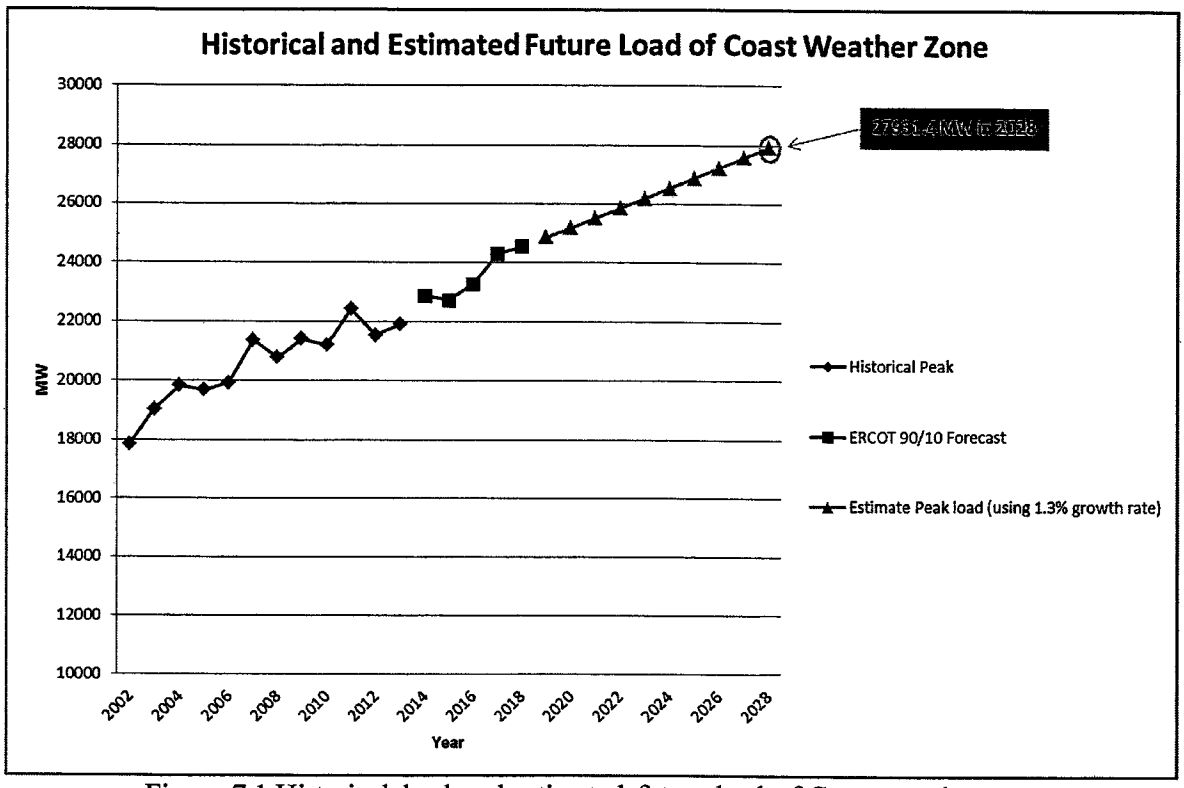

Figure 7.1 Historical load and estimated future load of Coast weather zone

Table 7.1 shows the results of the transfer analysis from a steady-state thermal perspective. The results indicated that some of the major import paths into Houston would need to be upgraded between 2025 and 2028. The result also indicated that the need year of the same line upgrade might vary depending on what option is in service by 2018. As an example, each select option requires the upgrade of the Singleton-Zenith 345 kV double-circuit line in the future, but the upgrade is needed by 2027 under Option 3 and Option 4, and by 2025 under Option 5. Therefore, Option 3 and Option 4 provide a benefit over Option 5 by deferring the need to upgrade the same line by two years. In order to capture such benefit of each select option, ERCOT performed a Net Present Value (NPV) analysis in Section 7.2 by considering not only the construction cost of each select option but also the construction cost of the future transmission upgrades identified in Table 7.1 taking into account the time value of money.

For this analysis ERCOT assumed that the net generation in the Houston area (existing generation plus generation additions minus generation retirements) stayed the same between 2018 and 2028. If more generation were to retire than be added to the area the upgrades identified may need to be accelerated. If more generation were to be added than retired in the area the upgrades identified may be deferred. Future planning analyses will determine the exact timing of upgrades.

Table 7.1 Result of power transfer analysis from a steady-state thermal perspective

Option		by 2025	by 2026	by 2027	by 2028
Option 1	Twin Oak-Zenith w/ 25% compensation plus TH Wharton-Addicks upgrade		Singleton-Zenith 345 kV (53.2 mi)	Big Brown-Jewett 345 kV (32.8 mi)	Zenith-TH Wharton 345 kV (15.1 mi)
Option 2	Twin Oak-Zenith w/ 50% compensation plus TH Wharton-Addicks upgrade		Big Brown-Jewett 345 kV (32.8 mi)		Singleton-Zenith 345 kV (53.2 mi), Zenith-TH Wharton 345 kV (15.1 mi)
Option 3	Limestone-Ragan Creek-Zenith plus TH Wharton-Addicks upgrade			Singleton-Zenith 345 kV (53.2 mi), Jack Creek-Twin Oak #1 (26.7 mi), Big Brown-Jewett 345 kV (32.8 mi)	Gibbons Creek-Ragan Creek 345 kV (96 mi)
Option 4	Limestone-Gibbons Creek-Zenith plus TH Wharton-Addicks upgrade			Singleton-Zenith 345 kV (53.2 mi), Big Brown-Jewett 345 kV (32.8 mi)	Jack Creek-Twin Oak #1 (26.7 mi)
Option 5	Jewett-Jack Creek-Zenith plus TH Wharton-Addicks upgrade	Singleton-Zenith 345 kV (53.2 mi)	Big Brown-Jewett 345 kV (32.8 mi), Twin Oak-Jack Creek 345 kV (26.7 mi)		Jewett-Singleton 345 kV (49.9 mi), Zenith-TH Wharton 345 kV (15.1 mi), Gibbons Creek-Singleton 345 kV (9.4 mi), Gibbons Creek-Jack Creek 345 kV (21.3 mi)
Option 6	Jewett-Jack Creek-Zenith w/ 25% compensation plus TH Wharton-Addicks & Twin Oak-Jack Creek upgrade		Big Brown-Jewett 345 kV (32.8 mi)	Singleton-Zenith 345 kV (53.2 mi)	Zenith-TH Wharton 345 kV (15.1 mi), Twin Oak-Jack Creek 345 kV (26.7 mi)
Option 7	Jewett-Jack Creek-Zenith w/ 50% compensation plus TH Wharton-Addicks & Twin Oak-Jack Creek upgrade		Big Brown-Jewett 345 kV (32.8 mi)		Singleton-Zenith 345 kV (53.2 mi), Zenith-TH Wharton 345 kV (15.1 mi), Twin Oak-Jack Creek 345 kV (26.7 mi)
Option 8	Navarro-Gibbons Creek-Zenith plus TH Wharton-Addicks & Twin Oak-Jack Creek upgrade		Jewett-Singleton 345 kV (49.9 mi), Gibbons Creek-Twin Oak & Gibbons Creek-Jack Creek-Twin Oak 345 kV (48 mi)	Singleton-Zenith 345 kV (53.2 mi)	

ERCOT also reviewed the performance of each select option from a voltage stability perspective. Figure 7.2 shows the load level of the Coast weather zone at the point of voltage collapse under each select option without any future transmission upgrades. The results indicated that the voltage collapse conditions would occur beyond 2028 under every select option except Option 5.

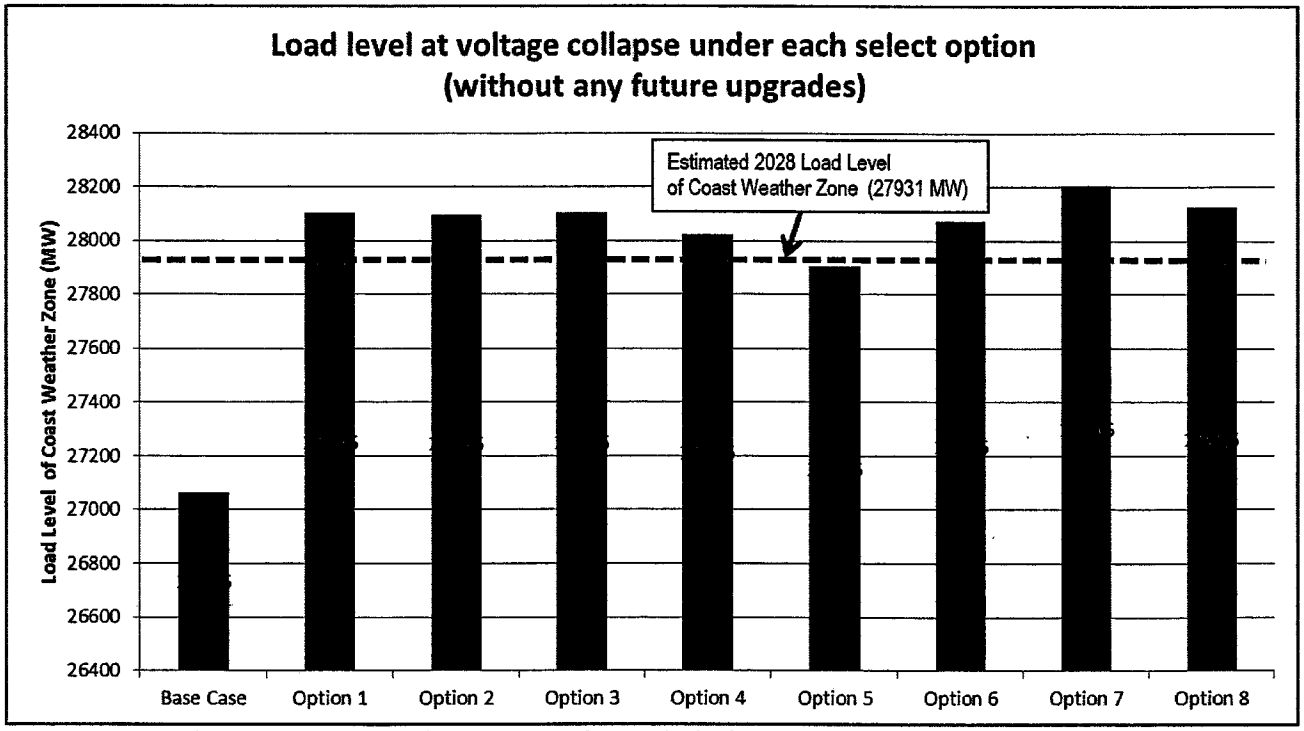

Figure 7.2 Results of power transfer analysis from a voltage stability perspective

7.2 Cost Analysis

This section presents the overall reliability impact of each select option on a NPV basis when considering the potential for Houston import needs out to 2028. For the NPV analysis, ERCOT considered the construction costs of each select option and future transmission upgrades to capture the long-term reliability benefit of each select option. ERCOT assumed 3% of escalation rate[2] and 8% of discount rate[3] to calculate the present value of each set of future upgrades in 2018 dollars, which is associated with each select option.

Based on cost estimates of each select option provided by each TSP, ERCOT found differences in the cost per mile of a new transmission line. CNP and TMPA used approximately $3.78 million per mile and $2.15 million per mile, respectively. Lone Star and Oncor used approximately $1.93 million per mile and $1.83 million per mile, respectively. Among the different cost-per-mileage assumptions for a new line, ERCOT assumed $3.78 million per mile

[2] The 3% escalation rate is consistent with the rate used by TSPs for their cost estimates.
[3] The 8% discount rate is from the report "Update on the ERCOT Nodal Market Cost-Benefit Analysis" prepared by CRA International for the Public Utility Commission of Texas in December 18, 2008, http://www.puc.texas.gov/industry/electric/reports/31600/PUCT_CBA_Report_Final.pdf

for the purpose of comparing the construction cost of each select option in 2018 dollars for the following reasons:

- The project in this report is driven by reliability need, not by economic benefit. Therefore, the cost estimate is not a driver for project justification and is only useful for comparing options.
- An analysis was performed by ERCOT using different cost-per-mileage assumptions ($2.2 mm/mi or combination of $2.15 mm/mi and $3.78 mm/mi) for a new transmission line. The results showed no significant impact in selecting the best solution recommended in this report. The results of the analysis can be found in Appendix D.

Appendix I has more details of the cost estimates of each select option and future upgrades. Shown in Table 7.2.1, the results of the cost analysis were summarized in 2018 dollars. The results of the cost analysis are further discussed in Section 7.8.

Table 7.2.1 Result of NPV analysis

Unit: $ Million

Option	Estimated Cost of Each Select Option (in 2018 dollars)	Net Present Value (NPV) of Estimated Cost of the Set of Future Upgrades (in 2018 dollars)	Overall Cost (in 2018 dollars)
Option 1	554.8	387.0	941.8
Option 2	572.0	390.6	962.6
Option 3	610.2	399.5	1,009.7
Option 4	590.1	383.1	973.3
Option 5	596.3	652.9	1,249.3
Option 6	617.1	419.5	1,036.6
Option 7	629.1	435.2	1,064.4
Option 8	805.9	537.5	1,343.4

Table 7.2.2 Estimated cost of each future upgrade at the potential need year

Unit: $ Million

Option	Construction Cost of Future Upgrades Under Each Option			
	2025	2026	2027	2028
Option 1		279.6	76.5	78.8
Option 2		74.2		375.4
Option 3			416.2	16.4
Option 4			364.5	53.3
Option 5	271.5	123.3		372.7
Option 6		74.2	288.0	130.9
Option 7		74.2		427.5
Option 8		313.8	288.0	

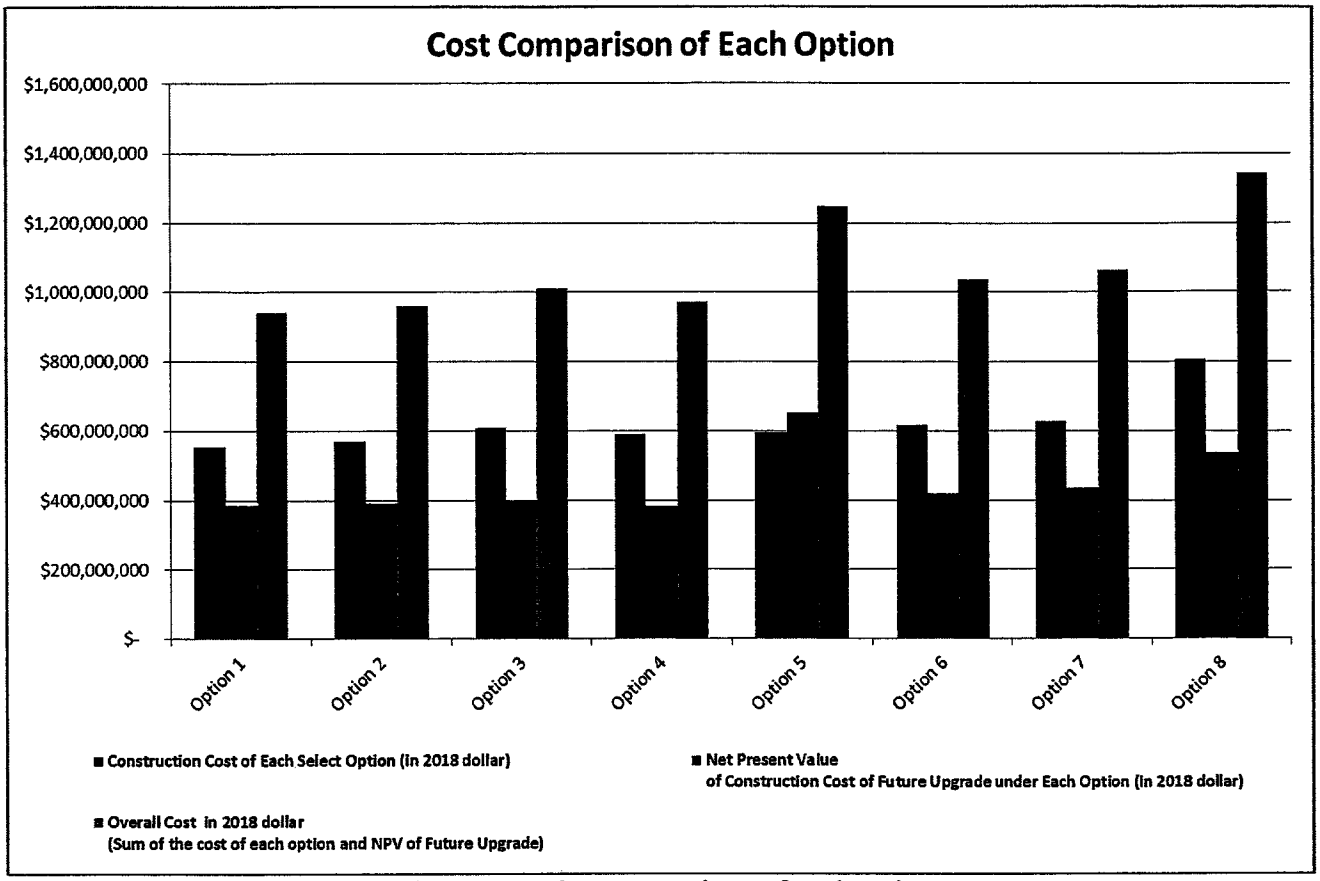

Figure 7.2.1 Cost comparison of each option

7.3 Impact of the Potential Retirement of Older Generation Units inside Houston

Including the Houston area, existing urban load centers in ERCOT rely on legacy generation resources located within the area and power imports from outside of the region to serve their load. Some generation units within the load centers were built approximately fifty years ago. Nearing the end of their useful life, these units are generally less efficient when compared to the overall generation fleet within ERCOT and may be retired relatively sooner than other newer generation units. As pointed out by Luminant Energy in submitted comments, natural gas units of similar vintage throughout ERCOT have retired or mothballed over the last ten years. Examples of these units include Atkins units 4, 5, and 6, Newman unit 5, H.O. Clarke units 1, 2, 3, 4, 5, and 6, J. L. Bates units 1 and 2, Lake Creek unit 2, Lon Hill units 3 and 4, Morgan Creek units 5, 6, 7, and 8, North Lake units 1, 2, and 3, North Texas units 1, 2, and 3, Nueces Bay unit 6, Oak Creek unit 1, P.H. Robinson units 1, 2, 3, and 4, Paint Creek unit 3, Permian Basin units 5 and 6, Rio Pecos units 5 and 6, San Angelo units 1 and 2, Spencer units 4 and 5, Tradinghouse units 1 and 2, Valley units 1, 2, and 3, Tuttle units 3 and 4, and Webster unit 3.

In addition, rapid urbanization has surrounded many of the legacy resources with residential, commercial and industrial development. With increasing urban density and environmental

regulations typically it is not as feasible to site generation within a major load center. The siting difficulty is expected to put an increasing demand through the transmission import paths into the Houston area in the future. Furthermore, a new import path into the Houston area may open the market for new, more efficient generation sources to construct outside of the area and sell power by importing into Houston which will introduce additional competition for the legacy generation resources in the area.

To assess the robustness of each select option, ERCOT studied a hypothetical condition for the older generation units inside Houston. Within the Houston area, there are approximately 1939 MW of generation units that will be more than fifty years old by 2018. For the older units shown in Table 7.3.1, ERCOT performed two studies for each select option:

- AC power flow analysis under N-1 conditions with the old units assumed offline
- Generation reduction study using VSAT to compare the amount of generation output that may be retired without causing thermal issues under G-1+N-1 conditions

Table 7.3.1 Generation units more than fifty years old within the Houston area

Generation Unit	(MW)
S.R. Berton GT2	13
S.R. Berton 1	118
S.R. Berton 2	174
S.R. Berton 3	230
S.R. Berton 4	230
T. H. Warton 1	13
W.A. Parish GT1	13
W.A. Parish 1	169
W.A. Parish 2	169
W.A. Parish 3	258
W.A. Parish 4	552
Total MWs for Units fifty Years or more in service	1939

For the AC power flow analysis, ERCOT conducted the N-1 contingency analysis using the 2018 SE study base case with and without each option, assuming all of the old units offline.

The result of the study indicated a number of system issues. The key issues identified in the 2018 SE study base case are

- Under system intact conditions with the units offline,
  - Overload of Singleton-Zenith 345 kV double circuit
  - Overload of Jewett-Singleton 345 kV double circuit
  - Low voltage around Tomball, Kuykendahl, Bobville, and Rothwood

- Under N-1 contingency conditions,
  - Overload of Jewett-Singleton 345 kV double circuit
  - Overload of the bus ties at Twin Oak/Oak Grove
  - Overload of Singleton-Zenith 345 kV double circuit
  - Overload of Gibbons Creek-Twin Oak 345 kV line
  - Overload of Jack Creek-Twin Oak 345 kV line
  - Overload of Gibbons Creek-Singleton 345 kV double circuit
  - Overload of Roans Prairie-Bobville-Kuykendahl 345 kV line
  - Heavy flow on Singleton-Tomball and Gibbons Creek-Jack Creek 345 kV line
  - Low voltages at 15 345 kV buses and 38 138 kV buses in Houston area

Based on this analysis, ERCOT found no system problems under system intact conditions and no low voltage issues under N-1 conditions for each of the selected option. Table 7.3.2 shows the result indicating overloads or heavy flows on certain 345 kV lines under N-1 conditions that might still exist even with each option if all of the old units were retired. Among options, Option 3, Option 4 and Option 7 showed no overload issues although a few heavy flow issues on certain 345 kV lines were found under N-1 conditions with the older units offline.

Table 7.3.2 Performance of each select option under N-1 conditions with the older units offline

Elements	Jewett S-Singleton 345 kV line #1	Jewett N-Singleton 345 kV line #1	Twin Oak-Oak Grove 345 kV bus tie	Twin Oak 345 kV bus tie	Singleton-Zenith 345 kV line #98	Singleton-Zenith 345 kV line #99	Gibbons Creek-Twin Oak 345 kV #1	Gibbons Creek-Jack Creek 345 kV #2	Jack Creek-Twin Oak 345 kV #1	Jack Creek-Twin Oak 345 kV #2
Option 1			Overload	Overload	Overload	Overload				
Option 2			Overload	Overload						
Option 3			Heavy flow	Heavy flow	Heavy flow	Heavy flow			Heavy flow	
Option 4			Heavy flow	Heavy flow	Heavy flow	Heavy flow				
Option 5			Overload	Overload	Overload	Overload			Overload	Overload

Option 6			Overload	Overload	Heavy flow	Heavy flow				
Option 7			Heavy flow	Heavy flow					Heavy flow	Heavy flow
Option 8	Overload	Overload	Heavy flow	Heavy flow	Heavy flow	Heavy flow	Overload	Heavy flow	Heavy flow	

ERCOT also performed a generation reduction analysis under G-1+N-1 conditions. Using the 2018 study base case with each select option modeled and with the STP U1 offline (G-1), ERCOT gradually reduced the MW output from the older units using VSAT while testing the G-1+N-1 conditions. Table 7.3.3 shows the result of the generation reduction analysis. As an example, if Option 3 or Option 4 is assumed in service, a thermal overload start to occur when approximately 1000 MW from the older units is retired.

Table 7.3.3 Results of generation reduction study

Option	Description	Approximate MW generation reduction that starts causing overloads under G-1+N-1
Option 1	Twin Oak-Zenith with 25% series compensation plus TH Wharton-Addicks upgrade	900.6
Option 2	Twin Oak-Zenith with 50% series compensation plus TH Wharton-Addicks upgrade	911.1
Option 3	Limestone-Ragan Creek-Zenith plus TH Wharton-Addicks upgrade	1061.3
Option 4	Limestone-Gibbons Creek-Zenith plus TH Wharton-Addicks upgrade	1020.0
Option 5	Jewett-Jack Creek-Zenith plus TH Wharton-Addicks upgrade	400.0
Option 6	Jewett-Jack Creek-Zenith with 25% series compensation plus TH Wharton-Addicks upgrade and Twin Oak-Jack Creek upgrade	773.8
Option 7	Jewett-Jack Creek-Zenith with 50% series compensation plus TH Wharton-Addicks upgrade and Twin Oak-Jack Creek upgrade	662.6
Option 8	Navarro-Gibbons Creek-Zenith plus TH Wharton-Addicks upgrade and Twin Oak-Jack Creek upgrade	652.6

7.4 Impact of NERC Category C and D Contingencies

NERC Category C and D contingency conditions are rare events, but the consequences of the events can be severe. To check if each select option provides any benefit to the system under the severe events, ERCOT tested twenty-three NERC Category C and D events selected based on the annual ERCOT voltage stability analysis and knowledge of the system in the area.

Table 7.4.1 shows the result of the analysis, indicating that every option provides better system conditions under the severe events compared to the 2018 SE study base case with no Houston Import project. Particularly, under the NERC Category D events, the number of unsolved contingencies was reduced from six to one under every option. (ERCOT has analyzed the one remaining unsolved contingency in past studies and has taken steps to minimize the likelihood of the occurrence of this event.) This indicates that the new transmission sources designed in each select option will provide significant improvement in the reliability of the system of the area even under the extreme system conditions. It should be noted that the Houston area under-voltage load shedding (UVLS) scheme was not modeled in this analysis.

Table 7.4.1 Impact of NERC Category C and D conditions with each select option

Options	Number of Unsolved Contingencies (NERC Cat. D)	Number of Thermal Overload On 345 kV (115% above)	Number of Low Voltage at 345 kV Buses (below 0.9 pu)
w/o Option	6	6	5
Option 1	1	1	4
Option 2	1	0	3
Option 3	1	0	5
Option 4	1	0	5
Option 5	1	1	6
Option 6	1	0	5
Option 7	1	0	3
Option 8	1	0	5

7.5 System Loss Reduction

When a new transmission line is added to a system, transmission efficiency will be improved due to a decrease in the system impedance and improvement in the system voltage profile. The transmission efficiency improved by a new line can be measured by system loss reduction.

ERCOT performed the system loss analysis with and without each option, using the 2018 SE study base case (summer peak case), in order to capture the benefit of transmission efficiency improved by each select option. The amount of loss reduction is shown in Table 7.5.1 indicating significant loss reduction realized for each of the select options during the peak hour.

Table 7.5.1 System losses reduced by each select option (2018 summer peak condition)

Option	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
System Loss Reduction (MW)	44.7	38.8	47.6	31.2	38.2	44.8	35.0	32.7

7.6 Economic Analysis

Although this RPG project is driven by reliability need, ERCOT also conducted an economic analysis to compare the relative performance of each select option in terms of production cost savings.

Using the 2018 economic case built for the 2013 RTP, ERCOT modeled each select option and performed production cost simulations for the year 2018. The annual production cost under each select option was compared to the option yielding the highest annual production cost in order to obtain a relative annual production cost saving for each option.

As shown in Table 7.6.1, the result indicates that none of the options provides significantly better production cost savings than others.

Table 7.6.1 Relative annual production cost savings (referenced to Option 8)

Unit: $ Million

Option	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Relative Annual Production Cost Savings (referenced to Option 8)	4.3	3.4	3.2	1.7	2.1	2.2	1.7	0.0

7.7 Sub-Synchronous Resonance due to Series Compensation

Four of the eight select options (Option 1, Option 2, Option 6, and Option 7) require series compensation. The series compensation is the capacitor connected in series with a transmission line, used typically to increase power flow by reducing line impedance, to relieve bottlenecks, to increase stability and to reduce voltage variation. However, series capacitors can create a sub-synchronous resonance (SSR) condition in the system under some circumstances, typically when the series capacitor is radially connected to nearby generation. The SSR condition due to a series compensated transmission line may cause damage to the generator shaft and failure of insulation of the windings of the generator. The damage can be extremely costly and require a significant amount of time for repair.

There are existing generators in the area including the conventional units at Gibbons Creek, Twin Oak, Frontier, TNP One, and Limestone that are connected to the major 345 kV import paths. These units may be at risk due to SSR introduced by the series compensation designed in Option 1, Option 2, Option 6 and Option 7. Although no SSR study was performed for the options with series compensation, ERCOT considered the following issues associated with series compensation in comparing each select option:

- Significant time and resources may be needed to perform detailed SSR studies for each generator in the area, which may jeopardize the in-service year of the project. Due to the nature of the study, accurate generator data will be needed for each unit. It may take 3 to 6 months for data gathering, and an additional 6 to 12 months will be needed to complete the SSR studies.

- As mentioned in Section 6, the overall project cost of Option 1, Option 2, Option 6, and Option 7 by TSPs assumed series compensation with a 4000 Amp rating. This cost will increase further for 5000 Amp series compensation if required to match the conductor rating of the new line (5000 Amp conductor).

- Thyristor Controlled Series Capacitors (TCSC) may be used to mitigate the potential SSR issues. The cost of the TCSC will be significantly higher (roughly 1.5 to 5 times more expensive than the fixed series compensation assumed in the given cost estimates).

- Relatively high cost filters may be required to protect area generators from the effects of SSR.

- For Option 1, Option 2, Option 6, and Option 7, the units in the area may become radially connected to a series capacitor under some contingency conditions.

- As pointed out in comments submitted by Edison Mission Marketing and Trading, at the time of this analysis, there were still open policy questions in ERCOT regarding which entities are responsible for paying for SSR mitigation measures when required.

Further discussion of these options with series compensation can be found in Section 7.8.

7.8 Overall Comparison of Selected Options

ERCOT performed various studies to evaluate the options selected as discussed in the previous sections. The results of the studies done for each select option were compared in Table 7.8.1, and summarized as follows:

- All eight selected options addressed the reliability need identified in the 2018 study base case, and met the reliability criteria.
- There are differences in the estimated cost per mile of a new transmission line. ERCOT assumed $3.78 million per mile based on the reasons listed in Section 7.2. The result of the cost analysis indicates:
  - Option 1 as the least cost option, followed by Option 2 and 4.
  - Option 1, followed by Option 2 and Option 4, as the least cost options if the NPV of the future upgrades is considered.
- Except Option 5, each select option performed similarly from a voltage stability perspective. The results indicated that the voltage stability limit exceedance would occur beyond 2028 under every select option except Option 5.
- AC power flow analysis was performed under N-1 conditions with the units 50-years old or older inside Houston assumed offline. As a result of the analysis, potential overloads on certain 345 kV facilities were found under Option 1, Option 2, Option 5, Option 6, and Option 8. Although several heavy flow issues (see Table 7.3.2) were found under Option 3, Option 4 and Option 7, no immediate N-1 overloads on the 345 kV facilities were expected even if the older units inside Houston are assumed to be retired in 2018.
- In addition to the AC power flow analysis, the generation reduction analysis was performed under G-1+N-1 conditions by gradually reducing the MW generation from the older units inside Houston. The results indicated Option 3 and Option 4 as the best performers causing no thermal issues on the 345 kV lines under G-1+N-1 conditions even with significant MW reduction (~1000 MW) from the older units.
- Severe system conditions (NERC Category C and D contingencies) critical to the area were evaluated. The results showed that every select option significantly improved the reliability of the system and equally reduced the number of unsolved events.
- The results of economic analysis indicated no significant difference in the relative annual production cost savings between the options.
- The system loss analysis done using the 2018 peak load condition demonstrated significant system loss reduction under every option resulting in substantial improvement in transmission system efficiency.
- All of the eight select options require new right of way, ranging from 117 miles to 178 miles.
- As discussed in Section 7.7, the series compensation in Option 1, Option 2, Option 6 and Option 7 may introduce potential risk of SSR to the existing conventional thermal units in the area.

Based on the overall comparison above, Options 1 through 4 provided better overall reliability benefits and lower overall project costs compared to the remaining options. Options 1 through 4 performed very similarly in terms of reliability and overall project cost. Although Options 1 and 2 had slightly lower overall costs compared to Options 3 and 4, Options 3 and 4 performed the

best under the scenario with the older generation units in the Houston area assumed to be retired. In addition to the reliability benefits, Options 3 and 4 will not cause the potential issues (as discussed in Section 7.7) associated with series compensation required by Options 1 and 2. Therefore, Options 3 and 4 are significantly better options to the system in the area despite the slightly higher project cost.

Based on these overall comparisons, ERCOT narrowed the eight options to Option 3 and Option 4 as the potential solutions to best meet the overall reliability need for the area. The two options are very similar except that Option 3 requires constructing a new 345 kV substation roughly 9 to 10 miles north of the existing Gibbons Creek substation. Between Option 3 and Option 4, ERCOT considers Option 4 as the best alternative for meeting the near-term and future transmission reliability needs in the Houston area based on the comparison of the capital cost estimates of Option 3 and Option 4, and the fact that Option 4 utilizes the existing Gibbons Creek 345 kV substation while Option 3 requires building a new substation. Hence, Option 4 may have slightly less public impact than Option 3.

Table 7.8.1 Overall comparison of each select option

Description	Option 1 (TWZ-25comp-TA)	Option 2 (TWZ-50comp-TA)	Option 3 (LRZ-TA)	Option 4 (LGZ-TA)	Option 5 (JJZ-TA)	Option 6 (JJZ-25comp-TATJ)	Option 7 (JJZ-50comp-TATJ)	Option 8 (NGZ-TATJ)
System Performance (2018) (All options addressed the reliability need)	Met criteria	Met criteria	Met criteria	Met criteria	Met criteria	Met criteria	Met criteria	Met criteria
Capital cost in 2018 dollar ($ Million), (Based on $3.78 million per mile for T-cost)	554.8	572.0	610.2	590.1	596.3	617.1	629.1	805.9
NPV of the set of future upgrades under each option in 2018 dollar ($ Million)	387.0	390.6	399.5	383.1	652.9	419.5	435.2	537.5
Overall cost impact: Sum of the cost of each option and NPV of future upgrades in 2018 dollar ($ Million)	941.8	962.6	1009.7	973.3	1249.3	1036.6	1064.4	1343.4
Voltage stability Analysis (Estimated 2028 load level in Coast zone = 27931 MW)	28105 MW (beyond 2028)	28095 MW (beyond 2028)	28105 MW (beyond 2028)	28025 MW (beyond 2028)	27905 MW (2028)	28075 MW (beyond 2028)	28205 MW (beyond 2028)	28125 MW (beyond 2028)
Performance with the old units offline (AC power flow under N-1)	4 overloads	2 overloads	0 overload	0 overload	6 overloads	2 overload	0 overload	3 overloads
Amount of generation reduction from the old units without causing overload under G-1+N-1 (MW)	900.6	911.1	1061.3	1020.0	400.0	773.8	662.6	652.6
NERC Category C and D performance	Good	Good	Good	Good	Good	Good	Good	Good
Economic Benefit (Relative annual production cost savings in $ million, referenced to Option 8)	4.3	3.4	3.2	1.7	2.1	2.2	1.7	0.0
System Loss Reduction at Peak (MW)	44.7	38.8	47.6	31.2	38.2	44.8	35	32.7
New Right of Way	117 mi	117 mi	130 mi	129.9 mi	128.9 mi	128.9 mi	128.9 mi	177.9 mi
Sub-Synchronous Resonance (SSR) concern	Yes	Yes	No	No	No	Yes	Yes	No

8. Sensitivity Analysis

8.1 Transfer Sensitivity Analysis

Based on the feedback from RPG meetings regarding the load scaling approach assumed in the power transfer analysis in Section 7.1, ERCOT conducted an additional study to check if there would be any significant impact on the results of the power transfer analysis due to a different load scaling approach. ERCOT tested the following two load scaling approaches under N-1 conditions for some of the select options.

- Approach #1: Scaling load down in North, North Central, West and Far West, while scaling load up in the Coast weather zone
- Approach #2: Scaling all load down except the load in Coast weather zone, while scaling load up in the Coast weather zone

As a result, ERCOT found that:

- reliability criteria violations still exist in 2018 regardless of which approach is used and,
- the need for the next set of future upgrades (in the 2025 to 2028 timeframe) may be deferred by one or two years if the all-load-scaling approach (#2) is used. For example, ERCOT found roughly 220~300 MW difference in the transfer capability when the future overload issue on the Singleton-Zenith 345 kV double circuit occurs with each option.

8.2 Non-Transmission Alternative Sensitivity Analysis

A high-level sensitivity analysis was performed to estimate the impact of new future generation or demand response within the Coast weather zone.

To perform this sensitivity the load was scaled down from the base case level in the study case for 2018 in the entire Coast weather zone to mimic the new generation addition or demand response. The results indicated that approximately 1800 MW of new generation and/ or demand response would reduce the G-1 + N-1 overload to 100%. Hence, if a net of 1800 MW of generation were to be added in the Houston area it would defer the need of the project until 2019. However, should this amount of new generation materialize ERCOT would not recommend deferring the project due to the risk of retirement of existing generation within the area as described in Section 7.3. It should be noted that ERCOT cannot compel generation or demand response to locate in a certain area and participate in the ERCOT market. Therefore, ERCOT must plan transmission projects when reliability criteria violations are found.

Since there is currently not a mechanism in ERCOT to call on demand response for a transmission security issue this is not considered a feasible alternative.

9. Conclusion and Recommendation

ERCOT identified a reliability need to increase the Houston import capability by 2018 and based on the independent review selected Option 4 as the preferred option to meet the reliability need.

The following facilities constitute the preferred option:

- Construction of a new Limestone-Gibbons Creek-Zenith 345 kV double circuit to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 129.9 miles.
- Upgrade of the substations at Limestone, Gibbons Creek and Zenith to accommodate the terminations of new transmission lines.
- Upgrade of the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).
- The estimated total cost for Option 4 is approximately $590 million in 2018 dollars. The estimate may vary as the designated providers of the new transmission facilities perform more detailed cost analysis.

9.1 Critical Energy Infrastructure Information (CEII) Considerations *(This section redacted from public version)*

10. Designated Provider of Transmission Facilities

In accordance with the ERCOT RPG Planning Charter and Procedures Section 2.3.4, ERCOT staff is to designate transmission providers for projects reviewed in the RPG. The default providers will be those that own the end points of the new projects. These providers can agree to provide or delegate the new facilities or inform ERCOT if they do not elect to provide them. If different providers own the two ends of the recommended projects, ERCOT will designate them as co-providers and they can decide between themselves what parts of the recommended projects they will each provide.

Both CenterPoint Energy and Texas Municipal Power Agency (TMPA) own endpoints of the new 345 kV transmission line from Limestone to Gibbons Creek to Zenith listed in the project scope of this recommendation. TMPA has delegated their portion of the project to Cross Texas Transmission and Garland Power & Light. Therefore, ERCOT designates CenterPoint Energy, Cross Texas Transmission and Garland Power & Light as co-providers of the new 345 kV transmission line. CenterPoint Energy is the designated provider of the T.H. Wharton-Addicks 345 kV line, Limestone substation, and Zenith substation upgrades. Cross Texas Transmission and Garland Power & Light are the designated providers of the Gibbons Creek substation upgrades.

The designated TSPs have indicated that it is unlikely for the project to be in-service before summer peak of 2018 unless ERCOT designates the project critical to reliability per PUCT Substantive Rule 25.101(b)(3)(D). Since there is a reliability need to have the project in place before summer 2018 ERCOT deems the project critical to reliability.

11. RPG Process of Houston Import Project Review

The following table details significant milestones in the Regional Planning Group review of the project:

Date	Description
7/26/2013	Project proposal submitted by CenterPoint Energy to RPG
7/29/2013	Project proposal submitted by Garland Power & Light and Cross Texas Transmission to RPG
8/16/2013	End of comment period for CenterPoint Energy proposal
8/19/2013	End of comment period for Garland Power & Light and Cross Texas Transmission proposal
8/19/2013	Project proposal submitted by Lone Star Transmission to RPG
8/27/2013	The three project proposals were presented in the RPG meeting by the TSPs
9/9/2013	End of comment period for Lone Star Transmission proposal
9/24/2013	Approach for ERCOT Independent Review of the Houston import project was presented for comment in the RPG meeting
10/22/2013	ERCOT presented and took comments on the results of the 2018 study base case including the reliability need at the RPG meeting
12/17/2013	ERCOT presented the status of the ERCOT Independent Review of the Houston import project at the RPG meeting, which included a list of options under evaluation, the results of various studies (power flow, transfer analysis, impact of older units, NERC C and D contingency analysis, loss analysis and other sensitivity analyses)
11/1/2013	End of project study mode (responses to comments)
1/16/2014	Lone Star submitted late comments concerning the project evaluation to RPG
1/21/2014	ERCOT presented the result of various studies (cost analysis, congestion-related impact analysis, sensitivity analysis, other consideration) at the RPG meeting
1/21/2014	NRG presented comments/concerns with the study assumptions at the RPG meeting
1/30/2014	ERCOT informed RPG of extending the review period to February 20, 2014 in order to review and address the additional comments received from ERCOT stakeholders
2/12/2014	ERCOT sent a response to the Lone Star's January 16 comments to the RPG
2/18/2014	ERCOT addressed the NRG comments/ concerns from the January RPG meeting and presented the final results at the RPG meeting. ERCOT also verbally addressed the Calpine comment/concern at the RPG meeting by referring to the results of the sensitivity analysis presented in the January RPG meeting
2/20/2014	ERCOT posted the independent review

Comments from stakeholders that were received by ERCOT during RPG meetings or formally submitted through the RPG process have been taken into account and included as appropriate in

the analysis presented in this report. The following entities formally submitted comments during the official comment phase for one of the three submitted project proposals:
Bay Area Houston Economic Partnership
Galveston County Economic Alliance
The Woodlands Area Economic Development Partnership
Humble Independent School District
The Economic Development Alliance for Brazoria County
Baytown – W. Chambers County Economic Development Foundation
Galveston Economic Development Partnership
Pearland Economic Development Corporation
City of Waller Economic Development Corporation
Economic Alliance Houston Port Region
City of Houston
Texas Medical Center
Pasadena Second Century Corporation
Tomball Economic Development Corporation
Greater Fort Bend Economic Development Council
Shriners Hospital for Children
Uptown Houston
City of Missouri City, Texas
Calpine
Waller County EDP
NRG Texas Power LLC
Lone Star Transmission
Edison Mission Marketing & Trading
Luminant Energy Company LLC
Texas Industrial Energy Consumers (TIEC)
LCRA Transmission Services Corporation
Cross Texas Transmission (CTT) [and Garland Power & Light]
F to Z Coalition
Oncor Electric Delivery
Mercuria Energy America

12. Appendices

Appendix A: AC Contingency Result of 2018 SE Study Base Case (N-1 analysis)	Houston_Import_BaseCase_N-1.xlsx
Appendix B: AC Contingency Result of 2018 SE Study Base Case (G-1+N-1 analysis)	Houston_Import_BaseCase_G-1_STX_N-1.
Appendix C: AC Contingency Result of 2018 SE Study Base Case with Option 4 (N-1 analysis)	Houston_Import_CTT-LGZ-TA_N-1.xlsx
Appendix D: Result of cost analysis using different cost-per-mileage for new transmission line in each select option	Summary of Cost Analysis using differe
Appendix E: Description of the SSWG Cases, and Summary of the study result	Appendix E.docx
Appendix F: AC Contingency Result of the 2018 SSWG Case 1 (G-1+N-1 analysis)	Contingency Result - Case 1 2018 SSWG C
Appendix G: AC Contingency Result of the 2018 SSWG Case 2 (G-1+N-1 analysis)	Contingency Result - Case 2 2018 SSWG v
Appendix H: AC Contingency Result of the 2018 SSWG Case 3 (G-1+N-1 analysis)	Contingency Result - Case 3 2018 SSWG v
Appendix I: Estimates of selected options and future upgrades in 2018 dollars	Cost Estimates of Selected Options and

APPENDIX B

April 17, 2014 Letter from CenterPoint Energy

CenterPoint Energy

April 17, 2014

Chad V. Seely
Assistant General Counsel
Electric Reliability Council of Texas
7620 Metro Center Drive
Austin, Texas 78744

RE: Houston Import Project

Dear Mr. Seely:

On April 11, 2014, CenterPoint Energy Houston Electric, LLC ("CenterPoint Energy" or "the Company") received an email from the Electric Reliability Council of Texas ("ERCOT") requesting information on four issues. Responses were requested by close of business on April 17, 2014. The Company is submitting the following information in response to the request.

Introduction

Since the advent of utility regulation in Texas, the utility that is obligated to serve retail customers in a particular region has been allowed to construct, own, and operate the transmission infrastructure needed to provide safe and reliable power to that region. Tying the right to build transmission lines to the responsibility to maintain reliability has always represented sound public policy because it helps ensure accountability – that is, the utility that builds and operates the line cannot disclaim responsibility for reliability based on a claim that some third party has constructed the line poorly or is operating it poorly. But, the corollary of that proposition is that, if the utility is to be accountable for reliability, it must have the right to build and operate the lines that serve its customers. That is the compact that has existed for decades.

It is reasonable to assume that, if the Legislature or the Public Utility Commission of Texas ("the Commission") had intended to disturb that compact, it would have done so clearly and unmistakably. But as will be discussed below, there is no legislation relieving utilities of the rights and responsibilities in the compact; there is no Commission rule relieving utilities of the rights and responsibilities in the compact; and there is no ERCOT Protocol relieving utilities of the rights and responsibilities in the compact. To the contrary, PURA continues to impose reliability requirements on the transmission and distribution utilities that serve retail customers, such as CenterPoint Energy.[1] Moreover, the ERCOT Protocol that governs this case expressly provides that the utility owning both endpoints of the Houston Import Project ("the Project") –

[1] TEX. UTILS. CODE ANN. § 38.005.

which is CenterPoint Energy – is the default Transmission Service Provider that should be awarded the entire Project.[2]

By tendering questions asking whether Garland Power & Light or Cross Texas Transmission may be eligible to build the transmission infrastructure necessary to maintain reliability in the Houston Region, ERCOT has implicitly suggested that the transmission compact has somehow been dissolved. There is no statutory or regulatory basis for that implication, however, and ERCOT would be in violation of law if it were to act based on the assumption that the compact has ceased to exist. ERCOT should instead follow the law and its own Protocols by awarding the entire Project to CenterPoint Energy.

Questions

1. ***Identify the portions of the Transmission Facilities for which CenterPoint Energy seeks responsibility.***

Transmission Facilities are defined by the ERCOT Protocols as follows:

"Transmission Facilities

(1) Power lines, substations, and associated facilities, operated at 60 kV or above, including radial lines operated at or above 60 kV;

(2) Substation facilities on the high voltage side of the transformer, in a substation where power is transformed from a voltage higher than 60 kV to a voltage lower than 60 kV or is transformed from a voltage lower than 60 kV to a voltage higher than 60 kV; and

(3) The direct current interconnections between ERCOT and the Southwest Power Pool or Comision Federal de Electricidad (CFE)."

CenterPoint Energy seeks responsibility for the following portions of the Transmission Facilities for the Project:

- Construction of the new Limestone-Gibbons Creek-Zenith 345 kV double circuit to achieve 2988 MVA of emergency rating for each circuit. The line length assumed for the cost estimate is approximately 129.9 miles.
- Upgrades to the substations at Limestone and Zenith to accommodate the terminations of new transmission lines.
- Upgrades to the existing T.H. Wharton-Addicks 345 kV line to achieve 1450 MVA of emergency rating (~10.7 miles).

[2] ERCOT Protocol § 3.11.4.8.

2. ***Indicate whether CenterPoint Energy will agree to split the Transmission Facilities with the other TSPs (CTT and Garland Power) designated by ERCOT. If so, please indicate what part of the Transmission Facilities is preferred and why. If not, please explain why CenterPoint will not agree to split the Transmission Facilities with CTT/Garland Power.***

CenterPoint Energy will agree that Cross Texas Transmission and Garland Power & Light should be designated responsibility for the upgrades to the substation at Gibbons Creek to accommodate the midpoint of the Project.

CenterPoint Energy will not agree to any further assignment of the Project, because it strongly believes that the Company should have 100% of the responsibility to construct, own, and operate the Project for the reasons stated below.

a. As determined by ERCOT, the Project is needed for additional import capacity into the Houston Region by 2018.

Jeff Billo correctly noted the following in his presentation to the ERCOT Board:

> ERCOT has determined that there will be a need for additional import capacity into the Houston region by 2018. Houston is the fifth most populous metropolitan area in the U.S. Population in the Houston region is expected to grow at a rate of over 100,000 new residents per year. Gross area product in the Houston metro area is projected to grow at an average annual rate of 3.5%. The Houston metro area has almost 40% of the nation's petrochemical manufacturing capacity. The Port of Houston has ranked first among U.S. seaports in terms of import tonnage for 22 consecutive years. The Houston region represents approximately ¼ of the total ERCOT peak system load.

Mr. Billo further noted at the Board meeting that the refineries, petrochemical industry, and the Port of Houston are important not only to Texas, but to the entire United States. These facts evidencing a growing economy in the Houston Region are the impetus for construction of the Project.

CenterPoint Energy is the sole entity responsible for providing safe and reliable electric service to the Houston Region. Indeed, when customers are without power in the Houston Region, the customers, the media, the Commission, ERCOT, and local, state, and national government officials depend on CenterPoint Energy to restore power. In addition, during a blackstart event, CenterPoint Energy is the sole entity responsible for the restoration of service within the Houston Region prior to ERCOT restoring service between other portions of the ERCOT Region. The Company takes these responsibilities very seriously. The proposed Project is an important asset that is necessary to meet that obligation. Reliability to the Houston Region is dependent on the proposed transmission line to be in service by the peak of 2018.

On the other hand, neither Garland Power & Light nor Cross Texas Transmission has an obligation to serve the citizens and businesses within the Houston Region. In fact, Garland

Power & Light's own website defines a singular mission for that municipal utility: "to provide high quality, safe and reliable electric service at competitive rates to the citizens and businesses of the City of Garland." Constructing a portion of a transmission line that begins roughly 100 miles south of the City of Garland clearly does not fall within that stated mission.

Similarly, Cross Texas Transmission has no obligation to serve the residents and businesses in the Houston Region, and in fact has no obligation to serve retail customers anywhere in Texas. By its own admission, Cross Texas Transmission was formed for the purpose of bringing wind energy from West Texas to ERCOT via the CREZ lines: "Cross Texas Transmission was designated by the Public Utility Commission of Texas (PUCT) to help deliver wind resources to millions of homes and businesses across Texas." Involvement in the Project is not within that stated business purpose.

No doubt both Garland Power & Light and Cross Texas Transmission would like to generate additional revenue by constructing part of the Project, but that is not a sufficient reason to prevent CenterPoint Energy from constructing and operating the Project in a manner that helps ensure reliability for the retail customers in CenterPoint Energy's service territory.

b. CenterPoint Energy owns the two end points of the Project.

The proposed transmission facilities will traverse from the Zenith Substation through the Gibbons Creek Substation to the Limestone Substation. Thus, the two end points of the Project are the Zenith and Limestone Substations, both of which are owned by CenterPoint Energy. Section 3.11.4.8 of the ERCOT Protocols states the following: "The default TSPs will be those TSPs that own the end points of the new projects." Because CenterPoint Energy owns the two end points of the Project, it should be designated as the default transmission service provider ("TSP") for the Project. This will be discussed further in response to Question 3.

c. The Company has extensive experience in constructing, owning, and operating transmission facilities to serve the Houston Region.

CenterPoint Energy has extensive experience in constructing, owning, and operating transmission facilities to serve the Houston Region. The Company serves over 2.2 million customers in the Houston Region. As of December 31, 2013, the Company's transmission network is composed of 3,728 circuit miles of transmission lines connecting 402 substations. The peak load that it served in 2013 was 17,012 MW, and it had annual operating revenues of $2,570 million from its Texas electric operations. The Company owns, maintains, and operates other tie lines in the general area of the Project. It has also constructed, owned, operated, and maintained over 600 miles of 345 kV import lines from the south and north into the Houston Region. CenterPoint Energy has eliminated the South to Houston constraint with the Hillje project, and it has upgraded the northern tie lines to the point where a new line needs to be constructed. CenterPoint Energy also owns and operates its own control center to effectively and efficiently operate the transmission system providing service in the Houston Region.

On the other hand, neither Garland Power & Light nor Cross Texas Transmission has the same level of relevant experience as CenterPoint Energy. Garland Power & Light, which

provides power to the residents and businesses within the City of Garland, has about 68,000 customers. Moreover, Garland Power & Light is not required to obtain a certificate of convenience and necessity ("CCN") from the Commission in order to construct transmission facilities such as the Project, and therefore it has no experience obtaining CCNs from the Commission. In contrast, CenterPoint Energy must obtain CCNs for all transmission lines it constructs. In addition, Garland Power & Light's transmission system is limited to 27 substations and 127 miles of transmission lines. Finally, the peak load that Garland Power & Light served in 2012 was 495 MW, with annual operating revenues of $224 million.

Cross Texas Transmission has even less experience constructing and operating transmission lines than Garland Power & Light does. Cross Texas Transmission, which was formed as a new Transmission Service Provider in the CREZ process, has built only one transmission line in Texas – a 235-mile 345 kV transmission line in the Panhandle. Building a transmission line in the Texas Panhandle, with its large expanses of rangeland, is far different from building a transmission line in the densely populated areas between the Limestone Substation and the Zenith Substation. Also, Cross Texas Transmission has no experience at all in operating a transmission line. In fact, it does not own a control center within Texas, and therefore, it does not currently operate the transmission facilities that it owns. Instead, the South Texas Electric Cooperative operates those assets under a contractual arrangement.

3. ***Describe all legal and policy arguments that the end points for this transmission project should either be: (1) the Limestone and Zenith substations; or (2) the Limestone, Gibbons Creek and Zenith substations. Provide all applicable laws and regulations to support the position.***

Section 3.11 of the ERCOT Protocols, which provides the procedures to be used for transmission planning in the ERCOT Region, states the following: "The default TSPs will be those TSPs that own the end points of the new projects. . . . If different TSPs own *the two ends* of the recommended project, ERCOT will designate them as co-providers of the recommended project, and they can decide between themselves what parts of the recommended project they will each provide." (Emphasis added)[3] It is clear that the Protocols contemplate that there are two end points to a transmission project, and not multiple points.

In the studies, presentations, and deliberations at ERCOT, all parties – including ERCOT – have consistently defined the "project" as the "Houston Import Project," and they have defined the Project to be the transmission line that will extend from the Limestone Substation to the Zenith Substation. Because CenterPoint Energy owns both the Limestone Substation and the Zenith Substation, CenterPoint Energy owns both endpoints of the Project, and thus CenterPoint Energy is the default TSP for the entire span of the Project. In contrast, the Gibbons Creeks Substation is merely the midpoint of the Project. Section 3.11.4.8 confers no rights on the transmission service provider that owns the midpoint of a project. Therefore, the owner of the Gibbons Creek Substation, Texas Municipal Power Authority, is not a default provider, and it

[3] While Section 10 of ERCOT's independent study states that ERCOT made the designation of the transmission providers according to "ERCOT RPG Planning Charter and Procedures Section 2.3.4," the ERCOT Regional Planning Group ("RPG") Charter and Procedures no longer exists. Instead, Section 3.11 of the ERCOT Protocols and the Planning Guide have replaced the RPG Planning Charter and Procedures document.

cannot delegate any default-provider rights to Garland Power & Light and Cross Texas Transmission.

To award part of the Project to Garland Power & Light or Cross Texas Transmission, ERCOT would have to interpret Protocol 3.11.4.8 to read: "The default TSPs will be those TSPs that own the end points of *segments of* the new projects." But that is not what the Protocol says, and it is well settled that administrative agencies or quasi-agencies such as ERCOT are required to follow their own rules.[4]

4. ***Describe all legal and policy arguments that the provision of transmission and the selection of TSPs to build Transmission Facilities in the ERCOT Region is or is not a competitive process. If there is a distinction between the CREZ selection process and other transmission projects outside of the CREZ selection process, please explain. Provide all applicable laws and regulations to support the position.***

a. Texas law does not provide for competitive bidding for transmission projects needed to serve retail customers in ERCOT.

The provision of transmission services in Texas is not a competitive process. Sections 11.002(b) and 31.001(b) of the Public Utility Regulatory Act ("PURA") state the following: "Public utilities traditionally are by definition monopolies in the areas they serve. As a result, the normal forces of competition that regulate prices in a free enterprise society do not operate. Public agencies regulate utility rates, operations, and services as a substitute for competition." In fact, when the Legislature fundamentally restructured the electric industry within ERCOT in 1999, it expressly reaffirmed transmission and distribution services are not competitive services:

> The legislature finds that the production and sale of electricity is not a monopoly warranting regulation of rates, operations, and services and that the public interest in competitive electric markets requires that, *except for transmission and distribution services* and for the recovery of stranded costs, electric services and their prices should be determined by customer choices and the normal forces of competition. As a result, this chapter is enacted to protect the public interest during the transition to and in the establishment of a fully competitive electric power industry. (Emphasis added.)

Thus, under the plain language of PURA § 39.001(a), the provision of transmission service, which includes the construction of transmission lines, is not subject to competition.

CenterPoint Energy anticipates that Garland Power & Light and Cross Texas Transmission will rely on PURA §39.904(g) to support their argument that the awarding of transmission projects in ERCOT is now competitive, but their reliance is misplaced. PURA § 39.904 is concerned solely with the development of renewable energy, and PURA §39.904(g) is expressly limited to transmission projects that deliver "the electric output from renewable

[4] *Rodriguez v. Service Lloyds Ins. Co.*, 997 S.W.2d 248, 255 (Tex. 1999) (stating that agency action will be reversed as arbitrary and capricious when the agency does not follow the clear, unambiguous language of its rule).

energy technologies in the competitive renewable energy zones." In addition to the plain language of the statute, the legislative history underlying PURA § 39.904 makes it clear that the sole purpose of that section was to require the Commission to "develop a plan to construct the transmission capacity required to deliver the output from renewable energy technologies to customers." Nothing in the language of the PURA § 39.904(g) or the legislative history of that provision indicates that the Legislature intended to overturn the well-established practice of allowing utilities to construct the transmission facilities needed to provide safe and reliable service to their customers. Indeed, the Commission expressly recognized in Project No. 34560 that the competitive process is limited to CREZ facilities: "The commission has the authority to use a competitive selection process *for CTP Facilities*."[5] The Commission did not determine that such authority extended to other transmission facilities.

b. If the Legislature, the Commission, or ERCOT had intended for the construction of transmission lines to be a competitive process, standards would have been developed for the selection of the winning bidder.

If ERCOT were to award projects based on bids, there would need to be consistent standards to ensure that the competitors' bids can be evaluated on an apples-to-apples basis. But there are no such standards in PURA, the Commission rules, or the ERCOT Protocols. That further undermines the argument that non-renewable energy transmission projects in ERCOT are subject to competitive bidding. In fact, the Commission has expressly found that "ERCOT does not have a process to select a TSP for a transmission project when several entities desire to build a project."[6]

This case provides a textbook example of the need for consistent standards in determining bids. Under the current process, the cost estimate provided to ERCOT by CenterPoint Energy for the Project was $3.78 million per mile, but that estimate was conservative due to the uncertainty of the route. In fact, CenterPoint Energy's cost estimate was never intended as a competitive bid, partly because the parties did not have enough information to make detailed bids and partly because the process for awarding transmission projects within the ERCOT Region has never been determined on a competitive basis. Even ERCOT in its study acknowledged that the estimates could change as more and better information became available: "The estimate may vary as the designated providers of the new transmission facilities (CenterPoint Energy, Garland Power & Light and Cross Texas Transmission) perform more detailed cost analysis." Consistent with that approach, CenterPoint Energy will provide a more detailed estimate in the application for a CCN when actual route alternatives are proposed.

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[5] Project No. 34560, *Rulemaking Proceeding to Amend PUC Substantive Rules Relating to Selection of Transmission Service Providers Related to Competitive Renewable Energy Zones and Other Special Projects* (June 19, 2008).

[6] *Id.*

CenterPoint Energy's assumptions for the cost estimate include the following:

- The same steel lattice tower designed for 115 MPH winds, with 800' spans, is used for the entire length of the Project.
- Dead-end or heavy angle structures are assumed every two miles, which is approximately $1 million per structure. Due to Commission precedent in transmission CCN proceedings, there was an assumption that the actual route will not be a straight line; therefore, multiple turns and angles will be required.
- 150 foot right-of way acquisition costs were assumed to be $20,000 per acre.
- Contingencies for right-of-way clearing and improvements (culverts, bridges etc.) were included.
- Stores and corporate overheads were also included, which were calculated at approximately 29%. These costs are incremental to the ratepayers within the Houston Region.

CenterPoint Energy does not have any information to determine the assumptions included in the cost estimate provided by Garland Power & Light and Cross Texas Transmission. However, it is extremely unlikely that the two cost estimates were prepared on a comparable basis due to the fact that ERCOT does not have a procedure and process for entities to submit comparable bids.

Numerous other issues would need to be examined to ensure that the bids are comparable:

- Garland Power & Light and Cross Texas Transmission presumably have some type of financial arrangement to compensate Garland Power & Light for its delegation to Cross Texas Transmission, but that information has not been disclosed. Will the payments from Cross Texas Transmission to Garland Power & Light be in the transmission cost of service? For that matter, has Garland Power & Light made any financial commitments to Texas Municipal Power Agency for the delegation of its purported rights to Garland Power & Light? Will that amount be in the transmission cost of service?

- Garland Power & Light is not liable for property taxes to the tax entities along the span of the Project. If it promises to make payments in lieu of taxes, will it try to recover them from Cross Texas Transmission, and will Cross Texas Transmission try to recover them in the transmission cost of service?

- The entity that constructs the Project will presumably record Allowance for Funds Used During Construction ("AFUDC"), which will have a debt and equity component. Is the bid from Garland Power & Light based on the City of Garland's debt rate, or is it based on Cross Texas Transmission's debt rate? And will that entity be the actual borrower?

- If Cross Texas Transmission is allowed to build the line, will it hire a contractor to operate the line? If so, will that cost more than using CenterPoint Energy's existing control center facilities? If Garland Power & Light operates the line, will it need to expand its current control center? Will it need to hire more personnel?

These and many more questions need to be answered to create an apples-to-apples comparison of the bids. The fact that there is no process to ensure that comparison demonstrates that no competitive process exists in ERCOT for non-renewable transmission projects.

c. Competitive bidding will not result in any significant savings.

The notion that a competitive process will result in major cost savings to customers is largely an illusion. The three major cost components of transmission projects are the construction costs, the land acquisition costs, and the financing costs. There can be no major cost savings from the construction costs because all TSPs utilize a competitive process to select contractors to construct major transmission projects. There are also a limited number of entities that provide construction services for such projects. Therefore, a competitive process is already used by the TSPs to select the providers of the construction services.

The next component of major cost is the land acquisition cost, but that is the most volatile cost component of transmission projects and the hardest to control. If the TSP is unable to acquire the land through agreement with the landowner, then condemnation proceedings must be used. CenterPoint Energy's experience has varied on the outcome of such proceedings. In some instances, the awards of the Commissioner's Court are in line with the Company's appraisal, while in other instances the Commissioner's Court's award of damages has resulted in significantly higher costs. Simply stated, a competitive process would have no impact on the ultimate costs that the TSPs will be required to pay for land rights, either through negotiation or condemnation.

The third significant cost element for transmission construction projects is the financing cost. But ERCOT transmission providers' costs of financing are established by the Commission pursuant to PURA §36.051, which states that "the regulatory authority shall establish the utility's overall revenues at an amount that will permit the utility a reasonable opportunity to earn a reasonable return on the utility's invested capital." Therefore, the financing costs are established through the regulatory process, instead of a competitive process, and the financing costs established by the Commission do not vary greatly.

d. The current system for awarding transmission projects has worked well.

In addition to being contrary to law, a competitive process to select the entities to build transmission facilities in ERCOT would be poor public policy because the current system of selecting the TSP to construct needed transmission facilities works well, as evidenced by the fact that the incumbent TSPs within ERCOT have constructed numerous major transmission projects at very reasonable costs. Even with significant construction in recent years, the transmission costs within ERCOT remain a small percentage, approximately 10%, of customers' electric bills.

Other policy reasons that militate in favor of using the current system include:

- The current system of utilizing cost of service price regulation by the Commission is necessary in the absence of competition for monopoly services, and price regulation by the Commission would be inappropriate for a competitive model. Stated otherwise, piecemeal implementation of competition for transmission services is inappropriate. The service should be treated holistically as either as a regulated monopoly or a competitive service.

- Cooperation among TSPs is essential to the successful operation of the ERCOT grid, and such cooperation exists today. However, continued use of a cooperative model would likely raise anti-trust concerns if competition among TSPs were introduced.

- The Project is needed to maintain reliability in the Houston Region, and CenterPoint Energy is regulated by numerous entities in the Houston Region, including the City of Houston and many surrounding cities. If CenterPoint Energy fails to construct, operate, and maintain the facilities necessary to ensure safe and reliable electric service, the Company is accountable to those regulators. In contrast, Garland Power & Light and Cross Texas Transmission would be accountable to no one in the Houston Region.

Conclusion

Section 3.11.4.8 of the ERCOT Protocols states the following: "The default TSPs will be those TSPs that own the end points of the new projects." CenterPoint Energy owns the end points of the Project. Therefore, under ERCOT's own Protocols, CenterPoint Energy must be awarded the entire Project, save for those improvements needed to upgrade the Gibbons Creek Substation. Any other result would violate the ERCOT Protocols and would be an abuse of discretion.

Correspondence concerning this matter should be sent to the following:

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If you should have any questions, please do not hesitate to contact me.

Yours truly,

DeAnn T. Walker

DeAnn T. Walker
Associate General Counsel

APPENDIX C

April 8, 2014 Presentation to the ERCOT Board

Item 8: Houston Import RPG Project

Jeff Billo
Manager, Transmission Planning

Board of Directors Meeting
ERCOT Public
April 8, 2014

Study Overview

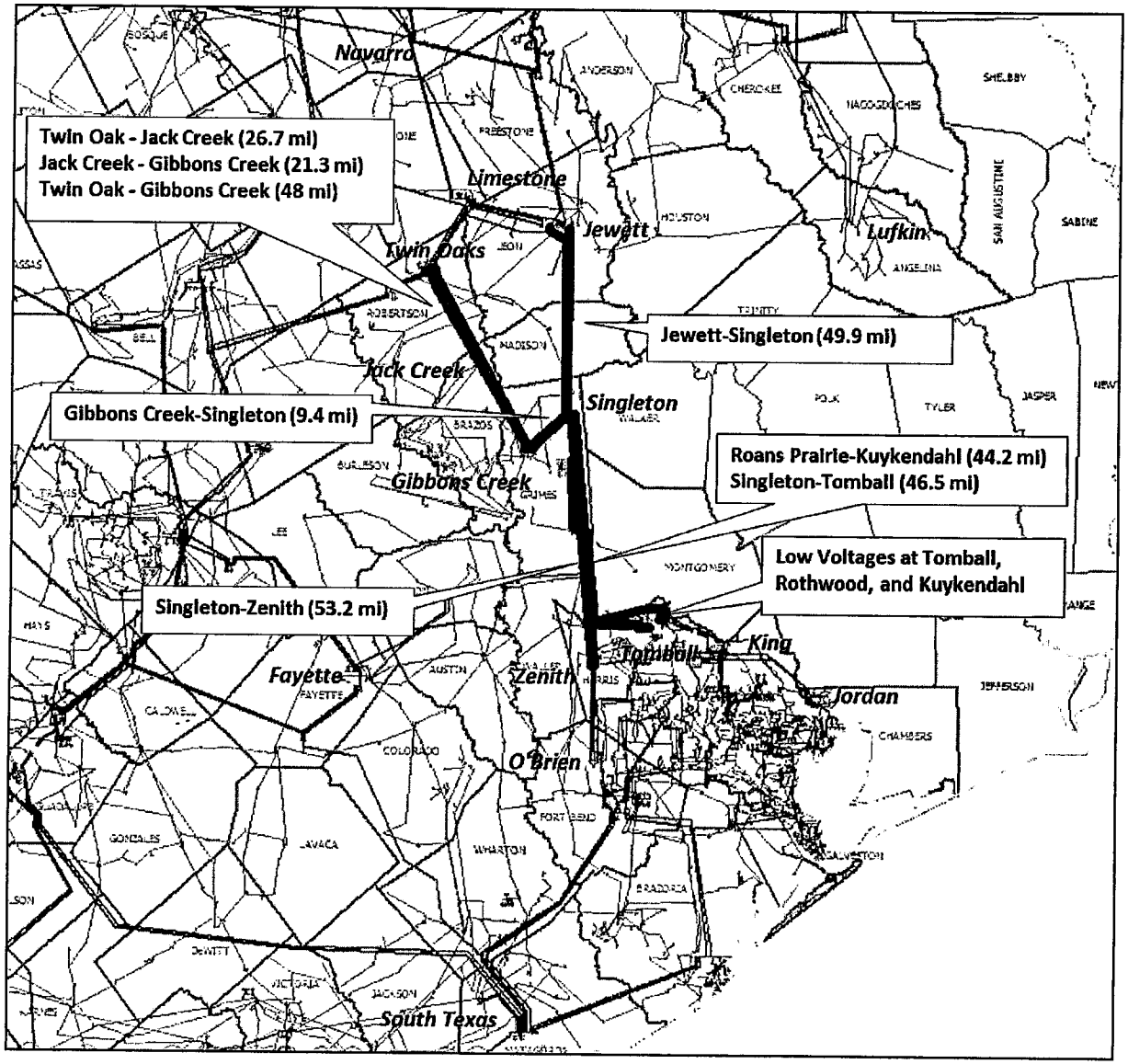
- ERCOT has determined that there will be a need for additional import capacity into the Houston region by 2018
  - Houston is the fifth most populous metropolitan area in the U.S.
  - Population in the Houston region is expected to grow at a rate of over 100,000 new residents per year.
  - Gross area product in the Houston metro area is projected to grow at an average annual rate of 3.5%.
  - The Houston metro area has almost 40% of the nation's petrochemical manufacturing capacity.
  - The Port of Houston has ranked first among U.S. seaports in terms of import tonnage for 22 consecutive years.
  - The Houston region represents approximately ¼ of the total ERCOT peak system load.
  - ERCOT long-term transmission planning has consistently indicated a need for additional import capacity into the Houston region since 2008. A Houston import project was found to be economically justified based on the generator revenue test in 2010.

ERCOT Study Approach

- In mid-2013, CenterPoint Energy, City of Garland and Cross Texas Transmission, and Lone Star Transmission separately identified a reliability need to increase the import capability into the Houston area by 2018
  - Each Transmission Service Provider submitted a project proposal to the Regional Planning Group (RPG) for review and comment
  - ERCOT conducted a single, combined Independent Review of the proposals
- ERCOT Independent Review study assumptions are consistent with the 2013 and previous Regional Transmission Plans
  - Used the 2018 summer peak load transmission planning case
- Generation assumptions followed Planning Guide Section 6.9
- Load assumptions followed Planning Guide Section 4.1.1.1(5)
- ERCOT conducted AC contingency analysis following Planning Guide criteria

Project Need Study Results

- Several ERCOT planning criteria violations were found in the 2018 peak load planning case
- The Singleton-Zenith 345 kV lines are overloaded under N-1 (contingency loss of one transmission element)
- Multiple 345 kV lines are overloaded (total length ~200 miles) and low voltage conditions in G-1 + N-1 analysis (G-1 is the outage of one generation unit)



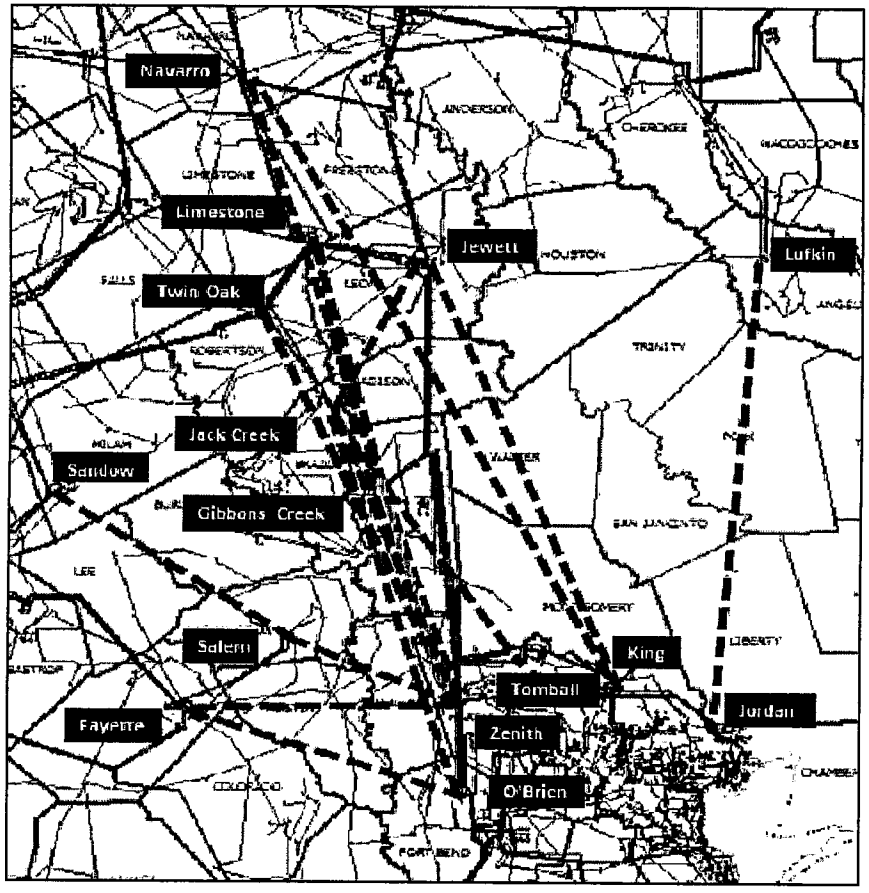
Stakeholder Comments

- Stakeholders had questions regarding the load assumptions for the Houston region used in the study.
  - Loads used in transmission planning include the impact of hot weather (different from the CDR which includes a 50/50 load forecast).
  - Non-coincident regional peak demands can occur at times when system-wide scarcity and resulting price-responsive demand are not present.
- Stakeholders commented on the use of load scaling in the study.
  - ERCOT studied the system with loads outside the study area scaled down to reflect typical non-coincidence of regional loads.
  - Stakeholders asked if ERCOT's load scaling methodology could exacerbate the North-Houston line loading in the 2018 study case.
  - To address stakeholder comments ERCOT ran three sensitivity cases with reasonable variations in load (including a case with no load scaling). Overloaded circuits were noted in all three sensitivity cases.

Worst overload	Case 1	Case 2	Case 3
Singleton-Zenith double circuit	122%	128%	137%

Project Alternatives Evaluation

ERCOT evaluated 21 project alternatives



ERCOT performed the following analysis to determine which option would best meet the long-term needs of the system:

- Assessment of potential future system upgrades and time value of money analysis of those upgrades
- Voltage stability margin analysis
- System needs analysis if older generation in the Houston area were to retire
- NERC Category C and D contingency analysis
- Production cost savings analysis
- System loss analysis

ERCOT Recommendation

- **ERCOT requests Board of Director endorsement of the need for the following project (Study Option #4), which was found to be the best alternative to address both the near-term and long-term reliability needs in the Houston area:**
  - Construction of a new Limestone-Gibbons Creek-Zenith 345 kV double circuit to achieve approximately 2988 MVA of emergency rating for each circuit
  - Upgrade of the substations at Limestone, Gibbons Creek and Zenith to accommodate the terminations of new transmission lines
  - Upgrade of the existing T.H. Wharton-Addicks 345 kV line to achieve approximately 1450 MVA of emergency rating
- **ERCOT requests that the Limestone-Gibbons Creek-Zenith 345 kV line be deemed critical to reliability pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D)**

Questions?

APPENDIX D

ERCOT Board Proposed Resolution

ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, staff of Electric Reliability Council of Texas, Inc. (ERCOT) has prepared the Independent Review of the Houston Import Regional Planning Group (RPG) Project, which is attached hereto as *Attachment A*;

WHEREAS, after due consideration of the alternatives, the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) deems it desirable and in the best interest of ERCOT to accept ERCOT staff's recommendation, to: (1) endorse the need for the Houston Import RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) has voted to support; and (2) deem the Limestone-Gibbons Creek-Zenith 345 kV double circuit line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D); and

THEREFORE, BE IT RESOLVED, that ERCOT is hereby: (1) endorses the need for the Houston Import RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed; and (2) deem the Limestone-Gibbons Creek-Zenith 345 kV double circuit line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

CORPORATE SECRETARY'S CERTIFICATE

I, Vickie G. Leady, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its April 8, 2014 meeting, the ERCOT Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of April, 2014.

_____
Vickie G. Leady
Assistant Corporate Secretary

VERIFICATION OF JOHN R. KELLUM, JR.

DOCKET NO. _____

COMPLAINT OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC AGAINST THE ELECTRIC RELIABILITY COUNCIL OF TEXAS	§ § § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

STATE OF TEXAS §

COUNTY OF HARRIS §

VERIFICATION OF JOHN R. KELLUM, JR.

BEFORE ME, the undersigned notary public, this day publicly appeared John R. Kellum, Jr., to me known, who being duly sworn according to law, deposes and says:

"My name is John R. Kellum, Jr. I work for CenterPoint Energy Houston Electric, LLC as Division Vice President of High Voltage Power Delivery. I am over 18 years of age and am competent to testify to the matters stated herein.

I have read the Complaint to which this verification is attached. I have personal knowledge of the factual statements contained in the Complaint, and those statements are true and correct."

JOHN R. KELLUM, JR.

Subscribed and sworn to before me on this 30th day of April 2014 by John R. Kellum, Jr.

Lana K. Holub
Notary Public, State of Texas

My Commission Expires: 07-27-2014

CERTIFICATE OF SERVICE

I certify that a true and correct copy of the foregoing document was served on the Commission Staff and the Electric Reliability Council of Texas by hand delivery, overnight delivery, facsimile, email, or United States first class mail on this 1st day of May, 2014.

Delois Prince