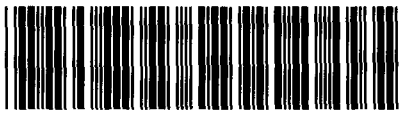

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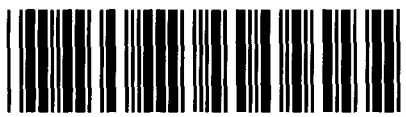

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REVIEW OF THE INCLUSION OF MARGINAL LOSSES IN SECURITY-CONSTRAINED ECONOMIC DISPATCH	§ § § §	**BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS**

COMMENTS OF PATTERN ENERGY

COMES NOW, Pattern Energy Group Inc. ("Pattern Energy") and files these comments in response to the questions posed by Commission Staff.[1]

INTRODUCTION

Pattern Energy is a publicly listed, independent power company on NASDAQ with ownership in twenty-four wind and solar energy facilities in the United States, Puerto Rico, Canada and Japan. We grow our business through acquisitions, including from Pattern Development, our privately-held affiliated company and a leading developer of renewable energy assets. Combined, we employ more than 500 staff worldwide – 150 in Texas – and have experience at all stages of project management. Our development and operations teams are based in Houston where our Operations Control Center manages our entire operating fleet of nearly 4,000 MW, including 966 MW of installed wind capacity in Texas that represents approximately $2 billion of investment in the state. Pattern Development is currently developing several solar, wind and energy storage projects in Texas. These development assets represent approximately $4 billion of investment in the state.

Pattern Energy appreciates the opportunity to contribute to the Commission's ongoing dialogue concerning long-term resource adequacy in the ERCOT region. To the extent the Commission decides that refinements to the ERCOT market design are warranted, Pattern

[1] 43 Tex Reg. 5602-5603 (Aug. 24, 2018).

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Energy believes the Commission has wisely divided the proposal to implement Real-Time Co-optimization ("RTC") of energy and ancillary services from the proposal to include marginal transmission losses in locational marginal price ("LMP") formation that is addressed in this proceeding. Pattern Energy respectfully recommends that the Commission reject the proposal to implement marginal transmission losses in energy pricing.

As described above, Pattern Energy has invested billions of dollars in generation resources located in ERCOT. Pattern Energy's investments, and presumably the significant investments by other stakeholders, were made after careful evaluation of the ERCOT market design and with the recognition that the Commission has a history of restraining from regulatory intervention and making changes only after careful deliberation, with broad-based stakeholder support, and with an eye towards the efficiency of the market as a whole. Implementation of marginal transmission losses in energy pricing would not be consistent with the Commission's historical approach. Implementation of marginal losses would discourage investment in additional generation resources in ERCOT.

As Pattern Energy makes clear below, the marginal losses proposal would balkanize the grid into geographically-determined winners and losers amongst both loads and generators without any clear net benefit to the system. In fact, credible studies demonstrate inclusion of marginal losses likely would be a net harm to the Texas economy. In contrast, there is abundant evidence that RTC would provide systemwide benefits far in excess of implementation costs. Pattern Energy recommends the Commission reject proposals that pit one region of the state against another, such as marginal losses, and instead focus its attention on market design changes which benefit the whole system, such as RTC.

COMMENTS

1. **What are the benefits of implementing the use of marginal losses rather than average transmission losses in the Electric Reliability Council of Texas' (ERCOT's) Security-Constrained Economic Dispatch (SCED) over the long term?**

PA Consulting Group conducted a long-term (20-year) study investigating the impact of marginal losses in ERCOT and found that the long-term costs associated with implementing marginal transmission losses in LMP formation greatly outweigh any near-term benefit.[2] Over the long run, PA Consulting found that Texas consumers and industry would experience $4.6 billion in increased energy costs if ERCOT implemented marginal losses.[3] In addition, the Texas economy would experience $7.1 billion in reduced economic output and the loss of 29,000 full time employees ("FTEs") in the ERCOT region.[4]

From a theoretical perspective, including marginal transmission losses in energy pricing is designed to improve the efficiency of a wholesale power market by increasing the dispatch of generators located closer to load centers. This is essentially achieved by financially penalizing electricity based on how far away from load centers it is produced. In a traditional power system based exclusively on thermal generation resources, this improvement in *physical* efficiency can improve *economic* efficiency by reducing the overall system cost to produce electricity, since less electricity needs to be produced to meet demand. However, PA Consulting's findings demonstrate that, in ERCOT, focusing on optimizing the physical efficiency of system dispatch does not necessarily optimize economic efficiency for Texas customers in the long-run.

The ERCOT market is unique – among several reasons – in that the best renewable generation potential is located within the western and northern portions of the State, whereas

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2 PA Consulting, *The Long-Term Impact of Marginal Losses on Texas Electric Retail Customers*, April 2018 (hereinafter "PA Consulting Report"), filed in *Project to Assess Price-Formation Rules in ERCOT's Energy-Only Market*, Project No. 47199 (hereinafter "Project No. 47199"), Item 93 (April 20, 2018).

3 PA Consulting Report at 5 and 14-21.

4 *Id.*

most of the electricity demand is concentrated in regions farther east and south. Wind and solar resources are different from thermal generation in that the marginal cost of producing electricity from wind and solar is close to zero, whereas the marginal costs of thermal resources are much higher due to fuel and other operating costs.[5]

PA Consulting found that the implementation of marginal transmission losses in energy pricing would alter future power generation investment decisions.[6] Since the implementation of marginal losses would financially penalize resources farther from load, it would decrease the development and overall electricity production of zero marginal cost renewable resources on the system. In turn, higher levels of thermal generation would be needed on the system to meet future customer demand, which have higher marginal costs than renewable generation, thus increasing system production and energy costs in a system with marginal losses implemented. This indicates a less optimal economic outcome for electricity customers in ERCOT.

2. **Are the benefits identified in response to Question 1 sufficient to justify the near term costs to the market as a whole? Please consider individual stakeholder implementation costs as well as the costs to ERCOT identified in its study.**

No. The long-term negative impacts of including marginal transmission losses in SCED far outweigh the short-term benefits identified in the ERCOT study.

3. **What are the effects on retail customers and the retail market from the implementation of marginal transmission losses?**

While there is no certainty regarding exactly how the implementation of marginal transmission losses in energy pricing would impact retail customers, some troubling implications are easy to see. First, economic impacts would likely be geographically distributed with winners and losers determined more by location than by any factor within the customer's control. As

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[5] See *Id.* at 7-9.

[6] PA Consulting Report at 14-15.

ERCOT found in its study, customers in Houston likely would see their retail bills increase.[7] This sort of location-based outcome was one reason the Commission wisely chose to use load zone pricing even as generation resources transitioned to nodal pricing. In addition, over the long term, the loss of $4.6 billion in energy cost savings due to the implementation of marginal losses can only be expected to lead to higher retail costs for some, if not all, Texas consumers and industry.

Adding marginal transmission losses in energy pricing also can be expected to penalize the numerous municipal utilities, electric cooperatives, and large consumers which have entered into long-term contracts for Texas wind and solar energy under existing rules which do not penalize remote generation. These power sources have been built and selected, and contracts have been entered into, without consideration of such loss penalties for remote generation. The Commission can not be sure how the cost shifting resulting from including marginal transmission losses in energy pricing would impact those customers.

4. **The ERCOT study of using marginal transmission losses instead of average transmission losses in SCED simulated one year. How would cumulative, multi-year impacts of using marginal transmission losses be different, if at all?**

Studying the impact of including marginal transmission losses in energy pricing over one year fails to capture the real harm this change would have on Texas customers and industry over the long term. In its study, ERCOT found that, in the near term, including marginal transmission in energy pricing would reduce the dispatch of thermal resources located farther from the center of load and reduce their associated transmission losses, but would not reduce production by wind generation resources.[8]

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7 *Project to Assess Price-Formation Rules in ERCOT's Energy-Only Market*, Project No. 47199, ERCOT Studies on Benefits of Real-Time Co-optimization and Marginal Losses, Attachment B, at 4-5 ("ERCOT Study").

8 ERCOT Study at 3-4

Over the long term though paying generators less if they are located farther from ERCOT's load center near Houston would discourage the development of generation farther from Houston – both thermal and non-thermal generation – and would discourage the use of existing thermal generation located farther from Houston. As described above in response to Question 1, PA Consulting conducted a 20-year study on the impact of marginal losses on the ERCOT market. While PA Consulting's report indicates that the implementation of marginal losses would lead to some near-term benefit in production cost savings, over the long-term, PA Consulting found that the continuation of an average losses system would lead to approximately $5.1 billion in production cost savings and $4.6 billion in energy cost savings as compared to a scenario with the implementation of marginal losses

The primary reason for these production and energy costs savings under the current average cost structure is that PA Consulting's study forecasts higher levels of low-cost marginal renewable generation under the current market structure, as compared to a market where marginal losses are included in LMP formation. These higher levels of low-marginal cost generation reduce ERCOT's reliance on more expensive thermal generators in most years of the study period, which significantly decreases total system production costs by decreasing fuel and variable operations and maintenance costs of generators on the ERCOT system. This same dynamic also leads to lower all-hours power prices in ERCOT under the current market structure of average losses, which leads to lower total energy costs in ERCOT Energy costs represent the total cost of electricity consumed on the ERCOT system, inclusive of transmission losses.

5. **What costs would be incurred by market participants if marginal losses were implemented in the ERCOT market? Please provide an estimate of the costs that would be incurred by your company or companies or customers represented by your organization. Please describe the elements of those costs.**

In a study performed by the Brattle Group, the estimated cost incurred by market participants if marginal losses were implemented by ERCOT would be a system-wide decrease of generator net revenues by $248 million per year, although this would be offset by $8.6 million reduction in variable costs.[9] Of this, wind generators would experience a decrease of net revenues of $123 million.[10]

6. How would a decision to use marginal transmission losses affect your company's market systems?

Pattern Energy has not conducted a detailed impact analysis on its market systems of a Commission decision to use marginal transmission losses. For several market systems such as price forecasting and shadow settlement, Pattern Energy uses third party service providers. For internal systems, some reprogramming and restructuring will be necessary.

7. How would a decision to use marginal transmission losses affect your company's internal operations?

Pattern Energy's business and internal operations would be affected in a few ways. Pattern Energy personnel would need to be educated and trained to incorporate the market design changes into Pattern Energy's business functions. Additionally, Pattern Energy would need to work with third party vendors to implement system changes. Pattern Energy also would need to review projects under development and current contracts for impacts that would result from the market design change.

8. What are the effects on reliability on the ERCOT grid of using marginal transmission losses instead of average losses in SCED?

It seems unlikely that using marginal transmission losses instead of average transmission losses in SCED will have a positive impact on reliability. However, the perverse incentives

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9 Project No. 47199, First Solar Inc., Vistra Energy Corp., and the Wind Coalition Analysis of Marginal Losses Proposal at 6 and 17 (Oct. 12, 2017) (hereinafter "Brattle Group Study") (page references are to the Bates pagination of the filing).

10 *Id.* at 17.

resulting from marginal losses could have a negative impact reliability. As discussed above in Question 1, one of the goals of marginal losses is to penalize electricity generated farther from load. In ERCOT, the "center of load" is in the Houston Load Zone, so including marginal transmission losses will lead to higher LMPs in the Houston Load Zone and decreasing LMPs the further removed generation is located.[11] The result of this is to discourage – or penalize – the development of generation in areas remote from Houston, even when it is needed to serve local load. Thus, for example, if an entity proposed to build new generation near the Permian Basin to help serve the dramatic load growth in that region, that generation would be penalized due to the mere fact that it is remote from the Houston Load Zone. There is no doubt that load growth is occurring throughout the ERCOT region, and penalizing generation that builds closer to that load growth, but farther from Houston, could be an unintended consequence of including marginal transmission losses in LMP formation.

The implementation of marginal losses also may undermine reliability on the ERCOT grid by discouraging the investment in the development of new generation resources and the expansion, retrofits, and upgrades of existing generation resources as potential investors pause due to concerns regarding potential future market structure changes to fundamental market design principals. Today, wind and solar generation are the most economical resources to build in ERCOT due to long standing low wholesale prices. As PA Consulting found in its study, the implementation of marginal losses would discourage the development of additional wind and solar generation resources in West Texas, but it is not clear whether the thumb that the Commission would put on the scale to reward generation resources in and near Houston would do anything other than benefit incumbent generation resources. It is unlikely that the increased revenue resulting from implementation of marginal losses and paid to generators located in or

[11] Brattle Group Study at 16; ERCOT Study at 3

near Houston would be sufficient to encourage new generation being constructed in that region, especially when those resources would face a number of impediments to development, including higher environmental compliance costs due to ozone non-attainment issues in that region, higher land costs, water availability and costs, and other environmental, or local zoning restrictions. Thus, the impact of implementing the marginal losses proposal probably would be to cause ERCOT to dispatch existing generators in the Houston region more,[12] but do nothing to improve reliability on the ERCOT grid.

9. What effects, if any, would marginal transmission losses have on grid hardening and resilience?

Including transmission marginal losses in energy price formation will have no impact on grid hardening or resiliency.

10. What effects would the use of marginal losses in SCED have on grid reliability in regions of the ERCOT grid where non-synchronous generation is more prevalent?

In regions of the ERCOT grid where non-synchronous generation is most prevalent, the use of marginal losses would not have a positive impact on reliability to the extent that it penalizes all resources of all fuel types relative to resources located near the reference bus. Adopting a marginal losses pricing methodology will discourage resource growth of all kinds in areas where non-synchronous generation is more prevalent, even if needed locally to serve growing load.

11. How would a decision to implement marginal transmission losses affect investment in new generation resources in ERCOT over the next five years, the next 10 years, and in the years beyond 10 years?

PA Consulting's analysis demonstrates that the integration of marginal losses into LMP formation would discourage further development of renewable resources in the geographic areas

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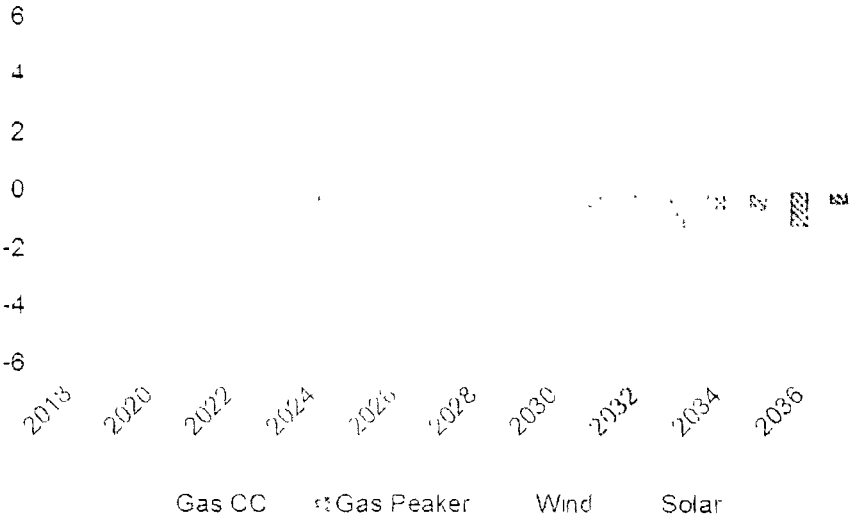
[12] *See, e.g.*, Brattle Group Study at 15 showing shift of dispatch of resources when marginal transmission losses are included in energy pricing.

of the state best suited for such development while simultaneously failing to change the amount of combined-cycle gas turbine development that will be economically viable in the market.[13] In short, PA Consulting's analysis projects use of marginal losses would produce a net drag on total resource development in ERCOT compared with continuing the current market structure.

Difference in Total Installed Capacity Between PA's Average Losses vs. Marginal Losses Cases (GW)



Although there is a small net difference in total capacity installed between the base case and the marginal losses case (~2GW less), the location of gas-fired capacity will likely change to be nearer load but would then incur the presumably higher costs associated with such siting decisions. Meanwhile load-serving entities and their retail customers who continue to exercise choice in favor of sustainable supply will likely also seek locations closer to load, sacrificing capacity factors by weighting proximity to load over renewable resource quality. Use of marginal losses will therefore likely add costs to both renewable resource development and thermal resource development – costs which must ultimately be recovered through the energy market.

[13] PA Consulting Report at 14-15

12. How would the implementation of marginal transmission losses affect the composition of the generation fleet in ERCOT?

PA Consulting's long-term study found that the implementation of marginal losses would have a meaningful impact on the amount of wind and solar capacity within the market but would have a comparatively smaller impact on the amount of thermal capacity within the market.[14] As demonstrated in Question 11, by 2037, under the current market structure, installed wind and solar capacity in ERCOT would be 3 percent and 4 percent higher, respectively, than under a market where marginal transmission losses are incorporated into LMP formation, although gas peaker capacity would be 2 percent lower under the current market structure. Importantly, PA Consulting's analysis did not project a net difference in combined cycle development over the full study period. The use of marginal losses appears to reward certain incumbent generators more than it appears to fundamentally alter the systemwide fuel mix.

13. Assuming the Commission decided to go forward with implementation of marginal transmission losses, what are the key issues related to determining the appropriate treatment and allocation of the marginal loss surplus revenues?

ERCOT has estimated that the revenues collected as a result of including marginal transmission losses in energy pricing would be approximately two times the revenues collected to pay for average transmission losses.[15] The Brattle Group estimated that the over-collections in a single year would be $205 million.[16] A key issue the Commission would have to address regarding those over-collections is which market participants should receive a refund. Should the Commission refund the generators who have been over-penalized or the customers who have been over-charged? As a generator, Pattern Energy would respectfully recommend the former. If the Commission decided to refund the penalties to generators, the Commission can expect

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14 PA Consulting Report at 15-16

15 Project No. 47199, ERCOT's Second Report in Response to Commission Staff's Request at 6 (Sept. 29, 2017).

16 Brattle Group Study at 3.

there will be serious debates about which generators should receive refunds. Similarly, if the Commission decided to refund the over-collections to customers, the question would be which customers would receive the refund and whether the Commission would have authority to ensure that retail electric providers actually flowed those refunds through to their customers, an issue which recently was highlighted in Project No. 47945 when questions arose regarding the extent to which retail electric providers would pass on to their customers the utility rate reductions as a result of the Tax Cuts and Jobs Act of 2017.[17] In any event, it is clear that the issue of how to handle the marginal loss surplus revenues would require the Commission to become more entangled from a regulatory perspective in the generation market and/or the retail market than it is today.

14. Does the ERCOT analysis of the benefits of including marginal transmission losses in SCED accurately measure such benefits? Are potential costs to the market or to market participants adequately accounted for?

ERCOT's analysis of the benefits of including marginal transmission losses in SCED is a reasonable estimation of the benefits of marginal transmission losses over the single simulated year. However, analyzing a single year is an insufficient timeframe to appropriately capture the impacts of such an important market structure change. As PA Consulting's long-term study indicates, while there may be some near-term benefits, there are significant long-term negative consequences that must be considered with the implementation of marginal losses. In particular, the Commission should consider the fact that customers and industry will experience higher long-term energy costs, the state would experience lower economic output and expect to see 29,000 fewer jobs for the citizens of Texas with the implementation of marginal losses on the ERCOT system.

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[17] See, e.g., *Proceeding to Investigate and Address the Effects of Tax Cuts and Jobs Act of 2017 on the Rates of Texas Investor-Owned Utility* Companies, Project No. 47945, Letter from Chairman Kelly Hancock (Feb. 14, 2018)

15. What ERCOT operational changes would need to be made that are not considered in ERCOT's studies?

Pattern Energy has no comments on this question at this time.

16. Would the use of marginal transmission losses in SCED change the ERCOT transmission planning process and transmission build-out?

Generally speaking, the use of marginal transmission losses should not cause major changes to the ERCOT transmission planning process. The regional planning process will continue to be focused on serving load and preserving reliability. There may be some changes in the transmission that ultimately gets built as compared to what we might expect under current market rules using average transmission losses since generation resource developers would be expected to take marginal transmission losses into account to the extent feasible in their siting decisions, and, as PA Consulting found in its study, there would be some changes in the development of generation over the long term. Therefore, economic transmission projects will continue to be justified by relieving congestion for zero-fuel-cost resources like wind and solar. Similarly, reliability upgrades will still be necessary to address load pockets since ERCOT cannot plan for new generation to solve reliability constraints and since the use of marginal transmission losses will neither produce sufficient revenue to incentivize new build nor overcome other local constraints to generation siting in urban or suburban areas of the state. However, there may need to be additional transmission built to address load growth in areas removed from Houston since implementing marginal transmission losses in energy pricing would discourage the development in generation in those areas.

It also should be noted that, in markets where marginal losses are included in energy prices, those markets also have methodologies by which generation owners can pay for

transmission construction to improve the system, mitigate losses, and acquire transmission rights. The ERCOT market does not have these features.

17. Assuming that the implementation of marginal transmission losses results in the location of generation closer to load, what advantages and disadvantages would there be during an emergency event or a market restart to having generation located closer to load?

Implementation of marginal transmission losses would create no meaningful advantages or disadvantages during an emergency event or a market restart.

18. What effects, if any, would the implementation of marginal transmission losses have on the Congestion Revenue Rights (CRR) market?

The implementation of marginal transmission losses may significantly alter current positions that may extend out up to 24 months. This potential change was not part of the original auction process for long-date transactions, and the impact on the value of CRRs could prove to be very disruptive financially.

19. How should the Commission direct ERCOT to implement marginal transmission losses in a way that mitigates any deleterious effects on the CRR market?

Due to the potential impact on the CRR market, should the Commission decide to implement marginal transmission losses which Pattern Energy opposes, such implementation should not occur until 2 to 3 years after a revised market structure is fully formulated, including issues such as reimbursement of the over-collection of losses

20. Does your assessment of the incorporation of marginal transmission losses change based on the timeline of implementation?

No. The timing of implementing marginal losses does not matter. Regardless of the timeline over which the Commission implemented such a change, the end result and negative consequences over the long term would be the same.

21. What are the effects of implementing both Real Time Co-optimization (RTC) and marginal transmission losses on reliability and price formation?

Potomac Economics estimated a $4.3 million reliability benefit from RTC due to the movement of energy production to locations that need more energy (by moving reserves away from those units) and by more efficiently utilizing ramping capability and non-frequency responsive capacity to reduce reliance on Regulation Up Service during scarcity conditions.[18] Neither the Potomac Economics nor ERCOT studies articulated any reliability benefit from the inclusion of marginal losses in energy price formation. The reliability benefits of RTC exist independent of adoption of a marginal losses calculation methodology. Conversely, nothing about the inclusion of marginal losses in price formation contributes to the reliability benefits of RTC. RTC has reliability benefits whereas the inclusion of marginal losses in price formation does not.

22. Are there any synergies that may result from contemporaneous adoption of both RTC and marginal transmission losses?

Other than some *de minimis* implementation cost savings that may occur if ERCOT bundled implementation of the two items together, Pattern Energy cannot identify any synergies of market design or in market outcomes that would result from contemporaneous adoption. However, Pattern Energy notes that including marginal losses in price formation could erode some of the RTC benefits identified by Potomac Economics. Neither Potomac Economics nor ERCOT studies of RTC considered marginal losses, so the impact of simultaneous adoption is unstudied and unknown. Considering the relevance of geographic re-dispatch resulting from RTC, however, Pattern Energy suspects that including marginal losses in price formation and thereby persistently pushing up Houston Zone pricing would likely alter RTC results in a manner less economically optimal for the system as a whole. It is another example of the many forms of

[18] Project No. 47199, Potomac Economics' Simulation of Real-Time Co-Optimization of Energy and Ancillary Services for Operating Year 2017 at 4 (June 29, 2018).

collateral damage and unintended consequences likely to flow from including marginal losses in energy price formation.

23. What are the effects on retail customers and the retail market from the implementation of both RTC and marginal transmission losses?

The Commission should expect mixed results for retail customers should it choose to implement both RTC and marginal losses. The Potomac Economics analysis suggests broad benefits to all retail customers from RTC given the dramatic improvements to systemwide market efficiency. However, as the ERCOT study on marginal transmission losses makes clear, that policy would create geography-based winners and losers, with consumers in the Houston region likely seeing higher retail prices.

CONCLUSION

Pattern Energy appreciates the opportunity to provide these comments. For the foregoing reasons, Pattern Energy respectfully recommends that the Commission reject including marginal transmission losses into SCED. Such a change in ERCOT's market would, in the long term, clearly be detrimental to Texas consumers and industry and benefit only a few incumbent generators in the Houston Load Zone

Respectfully submitted,

PATTERN ENERGY GROUP INC.

By _____