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PERFORMANCE CREDIT	§	**PUBLIC UTILITY COMMISSION**
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MECHANISM	§	**OF TEXAS**

E3 RESPONSE TO COMMENTS ON COMMISSION STAFF QUESTIONS

On May 16, 2024, Public Utility Commission of Texas (Commission) Staff filed a memorandum containing proposed Questions for Comment to seek stakeholder feedback on design parameter options of the Performance Credit Mechanism (PCM). At the May 23, 2024 Open Meeting, the Commission approved the Questions. On June 20, 2024, 22 stakeholders filed comments in response to Commission Staff's Questions and, on July 9, 2024, the Independent Market Monitor (IMM) also filed comments.

Electric Reliability Council of Texas, Inc. (ERCOT) and its consultant, Energy and Environmental Economics, Inc. (E3), reviewed the filed comments and appreciate the feedback that stakeholders provided on the PCM design parameter options in response to Commission Staff's Questions. On February 29, 2024, ERCOT filed E3's *PCM Draft Design Parameters Options Memorandum*, which identified 37 design parameters and included a "default" option value for each design parameter as a starting point for PCM design evaluation. Based on the feedback received in stakeholders comments, E3 and ERCOT recommend changing the default value for Design Parameter Nos. 12, 14, 22, and 31. E3's response to stakeholder comments is included as **Attachment A**, which includes for each of Commission Staff's Questions: (1) the original default option value for the relevant design parameter and the reason(s) for that initial selection, (2) option values proposed by stakeholders for that design parameter, (3) E3's response to such stakeholder proposals, (4) the list of option values that E3 intends to evaluate in sensitivities, and (5) a recommendation for changes to the default value for that option, if any.

ERCOT and E3 appreciate the opportunity to provide these comments responding to stakeholders' feedback. ERCOT personnel will be available at the July 25, 2024 PCM Workshop to answer any questions and receive any feedback.

Dated: July 18, 2024

Respectfully submitted,

/s/ Matthew A. Arth

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ATTORNEYS FOR ELECTRIC
RELIABILITY COUNCIL OF TEXAS, INC.

Performance Credit Mechanism: E3 Response to Stakeholder Comments

Prepared for the Electric Reliability Council of Texas, Inc.

July 2024

1 Introduction

Energy and Environmental Economics ("E3") appreciates the opportunity provided by the Public Utility Commission of Texas ("PUCT") to share its thoughts on the comments stakeholders filed on the Performance Credit Mechanism ("PCM") as part of Project 55000.

E3 was retained by the Electric Reliability Council of Texas, Inc. ("ERCOT")—under close coordination with the PUCT—to develop a strawman of a detailed PCM design in order to clarify all decision points required for ERCOT and PUCT to develop rules to fully analyze and, if ultimately decided, implement a PCM. Supporting analysis used to inform different decision points is being conducted using Astrapé Consulting's "Strategic Energy & Risk Valuation Model" ("SERVM") reliability model, which has been used extensively in the ERCOT Region for similar analyses.

E3 identified 37 design parameters for the PCM and presented a range of design parameter options in its "Performance Credit Mechanism: Draft Design Parameters Options Memorandum" ("Options Memo") filed in Project 55000 on February 29, 2024. ERCOT then hosted a stakeholder workshop on April 17, 2024 where ERCOT and E3 presented the design parameters, the potential options for each design parameter, and the study methodology being used to evaluate each option. For ease of reference, the list of design parameters is included in Table 1 here.

Table 1. List of Required PCM Design Parameters to be Defined in Strawman

Category	#	Design Parameter
PCM Seasons	1	Number of Seasons
	2	Months in Each Season
PC Hours	3	Number of PC Hours per Season
	4	Metric Used to Determine PC Hours
PC Generation	5	Metric Used to Determine PC Generation by Resource
	6	PC Generation Duration-Based Cap (Duration-Limited Resources)
Resource Eligibility for PCs	7	Renewable Generator PC Eligibility
	8	Run-of-River Hydroelectric Generator PC Eligibility
	9	Duration-Limited Generation Eligibility – Minimum Duration
	10	Dispatchable Distributed Energy Resources ("DERs") PC Eligibility (ERCOT-Registered)
PC Demand	11	ERCOT-wide PC Requirement Determination Framework
	12	Net Cost of New Entry ("Net CONE" Determination Framework)
	13	Demand Curve – Max Annualized PC Price
	14	Demand Curve – Seasonal Value Allocation
	15	Demand Curve – Shape
	16	Allocation of System PC Requirement across LSEs
Performance Requirements	17	Start-Up Performance Requirement
	18	High Sustained Limit ("HSL") Performance Requirement
Annual Net Cost Cap Compliance	19	Absolute Annual vs. Average Annual Net Cost Cap
	20	Framework Utilized to Comply with Net Cost Cap
	21	Distribution of Net Cost Cap across Seasons
Framework & Timeline of Forward PC Market	22	Cadence of Forward Market
	23	Prompt Definition of Forward Market
	24	Forward Market Participation Requirements & Incentives for Generators
	25	Non-Performance Penalties for PCs Cleared in Forward Market
	26	Non-Performance Penalties for PCs Offered but not Cleared in Forward Market
	27	Non-Performance Penalty Compliance Framework
	28	Forward Market Participation Requirements for LSEs
	29	Eligibility of Virtual Parties to Participate in Forward Market
	30	Framework & Timing of Forward Market Settlements
Framework & Timeline of PC Market	31	Timing of Seasonal PC Market Settlement
	32	LSE PC Market Collateral Requirement
	33	LSE PC Market Collateral Timeline
	34	Generator PC Market Collateral Requirement
	35	Generator PC Market Collateral Timeline
	36	PC Market Collateral Recalculation & Update Cadence
Market Power Mitigation	37	Additional Rules to Mitigate Market Power under PCM

On May 16, 2024, PUCT Staff filed ten questions requesting stakeholder comments on certain design parameters. E3 has reviewed the comments provided by stakeholders and appreciates the opportunity provided by the PUCT to acknowledge, evaluate, and respond to the key themes identified throughout the 23 comments filed.

2 E3 Feedback on Stakeholder Comments

For each design parameter relevant to the question asked by PUCT Staff, E3 will provide:

- Original "default" value and the rationale behind its selection;
- Values proposed by stakeholders;
- E3's responses to stakeholder proposals;
- List of values intended to be explored in sensitivities; and
- Resulting changes to the "default" value, if any.

2.1 Question 1.a: Number of Seasons

The "default" value for this parameter is **four seasons**. If utilizing a seasonal construct, the number of PCM seasons should be aligned with the number of different reliability risk profiles the system faces. In ERCOT, the system generally faces four different types of risk depending on the season of the year: summer risk is driven by high evening loads as solar generation ramps down, winter risk is driven by extreme weather conditions that lead to high loads and generator forced outages, and spring and fall is driven by high levels of planned outages, intermittent high loads, and renewable generation variability. Since each weather season generally has a different risk profile, E3 believes that there should be one PCM season for each weather season.

Stakeholders proposed a wide range of possible values: one, two, four, or 12 seasons. E3's comments on these proposed values are summarized below:

- **One season:** E3 understands that having an annual construct for PCM would allow for increased market design flexibility and simplicity since Performance Credit ("PC") Hours will determine the time periods within the year where reliability risk is highest. However, Public Utility Regulatory Act (PURA) § 39.1594(a)(5) states that PCM must utilize a seasonal market construct and having a single "season" may not be interpreted to be compliant with the statute.
- **Two seasons:** Having two PCM seasons is a potentially viable alternative. E3 intends to evaluate this option in its study.
- **Four seasons:** Four PCM seasons is consistent with E3's "default" value and thus is also planned for evaluation.
- **12 seasons:** 12 PCM seasons has the effect of separating certain months with identical risks into different PCM seasons. Actual risk tends to occur in a small number of months in a given year which cannot be known in advance. Therefore, this construct has the effect of misaligning actual system risk with how resources are compensated for performance during the riskiest periods. Therefore, E3 does not believe this is an economically efficient design. Moreover, utilizing 12 seasons where each season has a fixed non-zero number of hours has the potential to further complicate the planning of scheduled maintenance, which could exacerbate concerns already raised by some stakeholders on this issue.

For these reasons, E3 intends to evaluate two options for the number of PCM seasons:

- **4 seasons** (default)
- **2 seasons**

2.2 Question 1.b: Months in Each Season

The “default” value for the months within each season is: **winter (Dec-Feb), spring (Mar-May), summer (Jun-Sept), and fall (Oct-Nov)**. This is consistent with the seasonal definition ERCOT uses for various other studies and programs, including load forecasts and Emergency Response Services (“ERS”). Moreover, this is also consistent with the different types of reliability risk profiles driven by weather variability that affects both load and generation.

Stakeholders proposed a wide range of possible values given the many possible combinations of number of seasons and months within each season. E3 acknowledges that changing the seasonal split from the “default” selection by one month (or less) would likely have limited impact on the efficiency of the PCM market design. However, there is one proposal shared across a few stakeholders that is worth discussing:

- **Administratively leaving months out of any season:** Some stakeholders suggested having two seasons—summer and winter—and not covering every month in those seasons (e.g., summer is May-Sep and winter is Dec-Feb). Administratively excluding months from the PCM construct can be detrimental for multiple reasons. First, it limits the flexibility and long-term effectiveness of PCM working in a changing system. If, for whatever reason, the ERCOT system starts facing reliability risk in November, a PCM market that excludes shoulder months will be ineffective in increasing the reliability of the system. On the other hand, including all months in the construct allows actual system risk to dictate the value of PCs in each season/month such that, if there is no risk in the fall, low or no value will be allocated to PCs generated in the fall. Second, ERCOT has been experiencing higher and increasing risk in the shoulder seasons due to increases in planned outages, and it is therefore important that PCM includes those potential risks within its construct.

E3 intends to evaluate various possible combinations of months and seasons qualitatively since small permutations in seasonal definitions show no differences in modeling results.

2.3 Question 2.a: Number of PC Hours per Season

The “default” value for this parameter is **15 hours per season**. This value was selected given that it is a reasonable middle point in the range of potential hours that balances the tradeoffs between having too few hours—which leads to higher variability in PCM costs and resource compensation—and too many hours—which leads to a misalignment between PC Hours and true high-reliability-risk hours.

Most stakeholders proposed a constant number of hours per season, with a wide range of values. However, some stakeholders also proposed an alternative of having a dynamic number of PC Hours per season, such that PC Hours are triggered when the system faces a specific threshold (e.g., when reserves fall below a certain level). Both of these options are discussed below:

- **Constant number of PC Hours per season:** Specific proposals ranged from 4 to 120 hours per season. E3 acknowledges the range of potential values shared by stakeholders and expects the modeled quantitative results to show similar results across the range. Therefore, the evaluation of the range of possible values will be mainly focused on the qualitative criteria.
- **Dynamic number of PC Hours per season:** The benefits of this proposal is that PC Hours will be better aligned with system risk. However, this methodology will generally lead to a low—or even zero—number of PC Hours per season for many seasons. As mentioned earlier, having too few hours per season will mean PC prices, PCM costs, and resource compensation will be subject to significant variability. In the most extreme example where there is only one hour that meets the threshold—and thus only one PC hour in the season—, a resource that was unlucky and not available for this one hour would receive zero compensation from PCM that season. Moreover, there is also value in having a known set of hours in advance for generators and loads to be able to plan ahead for both the forward PC market as well as actual scheduling during the season. The benefits of knowing the number of hours in advance can be seen in other Texas electricity products, such as PUCT's existing four coincident peak ("4CP") methodology used for transmission cost allocation. The number of PC Hours per season should mostly be thought of as a metric used to determine generator availability, while the actual value of each PC is determined by the seasonal allocation design parameters. The only exception to this rule is with including all Energy Emergency Alert ("EEA") as part of PC hours, since (1) EEA hours occur infrequently and will generally not exceed the pre-determined number PC hours for a season in a system that meets a target reliability standard and (2) conditions that lead to EEA are generally forecastable in advance. This topic is discussed in more detail in the following section.

Quantitatively, E3 intends to evaluate three options for the number of PCM seasons:

- **Five hours per season**
- **15 hours per season** (default)
- **30 hours per season**

2.4 Question 2.c: Automatically Include EEA Hours as PC Hours

The original "default" value for this parameter is **yes**, such that EEA hours should automatically become PC Hours even if that means that the number of PC Hours per season exceeds the pre-determined amount. As mentioned in *Question 2.a: Number of PC Hours per Season*, the main drawback of having too many PC Hours is that these would not align with actual high risk hours. EEA hours are, by definition, high risk hours, meaning that there is no drawback in adding additional hours. Moreover, the goal of the PC Hours is to characterize the system during hours of high reliability risk to be able to appropriately allocate reliability value across loads and generators. Therefore, using all EEA hours as PC Hours would increase the sample of high-risk hours represented in PCM.

Stakeholders had mixed responses to PUCT Staff's question, with advocates for including all EEA hours and advocates for capping the number of hours to a static value. E3 believes that the option that includes all EEA hours more accurately reflects the reliability risk and therefore intends to evaluate this as the main option in the study. Although adding all EEA hours will make PC Hours dynamic, the benefits of adding EEA hours overcome the drawbacks of having a dynamic set of hours (explained in the previous section). This is the case because (1) EEA hours occur infrequently and will generally not exceed the pre-determined number PC hours for a season in a system that meets a target reliability standard (potentially less than once every ten years) and (2) EEA hours are easy to forecast and thus does not increase uncertainty significantly.

2.5 Question 3: "Availability" Definition for PC Generation Determination

The "default" value for this parameter is **"sum of available generating capacity by resource."** The benefits of such an approach are two-fold: (1) it compensates generators that would have been available if ERCOT had committed them in the day-ahead timeframe, and (2) it ensures that resources—most importantly if they have high start-up costs and long lead-times—are not inefficiently committed online when the system is not facing high risk and could serve load and reserves with lower cost resources.

Stakeholders proposed a wide range of possible values, which are listed below with E3's comments for each:

+ **Online + offline with status other than "OUT":** This option is equivalent to E3's current "default" parameter of "sum of available generating capacity by resource." The only two differences, which E3 recommends including are: (1) availability of energy-limited resources (e.g., storage) should be based on their state of charge, (2) "EMR" status should also be excluded as this would preclude operations except during declared emergencies, and (3) resources that have direct contracts with ERCOT—such as "Reliability Must-Run" resources—should also be excluded.
+ **Offers in day-ahead market and readiness to perform in real-time:** This is a potentially viable option since the day-ahead offer requirement should ensure that long lead-time resources are only online if their day-ahead offers clear. SERVM cannot model both day-ahead and real-time markets simultaneously, so this option cannot be explicitly modeled. However, E3 expects the market outcomes for this option to be similar to those of the "default" values as most generators that are "not on outage" generally provide offers in the day-ahead energy or ancillary services markets.
+ **Online + quick start offline capacity** or **Energy + ancillary services dispatch in real-time:** These options tie the definition of "availability" to the ability of a generator to dispatch if the system unexpectedly (in a short-time frame) becomes at risk. This option would be less tied to fundamentals since many PC Hours may not actually be that tight and thus the real-time buffer is not actually a meaningful metric if the system is not at risk. As discussed above, this design can lead to uneconomic commitment of resources by placing offers into the real-time energy and ancillary services markets that are lower than their marginal costs, in the hopes of ensuring they generate PCs. Uneconomic commitment could lower energy and ancillary services prices, but increase dependency on PCs for revenues. This design inefficiency would not be captured by SERVM given that it is unable to model how an additional real-time price stream—PCM is implemented this manner—would affect bidding behavior in the real-

time energy and ancillary service markets. There are already other electricity market products—mainly energy and ancillary services—that provide incentives for flexible and quick-start generators, whereas PCM's goal is to ensure there is enough capacity in the system to meet its reliability needs.

Given the limitations in modeling mentioned above for the last two options, E3 intends to quantitatively model only the "sum of available generating capacity by resource" option. However, E3 intends to qualitatively evaluate four main options.

+ **Sum of available generating capacity by resource** (default)
+ **Offers in day-ahead market and readiness to perform in real-time**
+ **A hybrid approach that combines day-ahead market offers for long lead-time resources and available generating capacity for all remaining resources**
+ **Energy + ancillary services dispatch in real-time**

2.6 Question 4.a: PC Generation Cap for Energy-Limited Resources

The "default" value for this parameter is **yes**, PC generation during consecutive PC hours is capped at its maximum duration for energy-limited resources. Stakeholders had mixed responses to PUCT Staff's question, with parties arguing for both "yes" and "no."

There are a few reasons why "yes" was selected as the original default parameter. Since PC Hours might not all be high-risk hours that require the energy or ancillary services dispatch of all available generators, storage might be able to just provide ancillary services and receive PCs. However, PC Hours are used to predict generator availability during the true high-risk (loss of load) hours. If a true loss of load event happened, storage would certainly have to dispatch its energy, running out of state of charge, and thus only receiving PCs for its maximum duration. Other dispatchable resources do not face the same issue since they are not energy-constrained; when a loss of load—or "near" loss of load—event occurs, thermal generators that can remain on-line would be able to continue dispatching and providing energy to the ERCOT grid without duration constraints.

Moreover, having no PC cap based on duration can lead to inefficient bidding and dispatch behavior from energy-limited resources. Without the cap, these resources will try to keep their state of charge intact to be available for all consecutive PC hours. This means that these resources may be incented to economically withhold from both the energy and ancillary services markets to ensure that they have enough state of charge during PC hours to qualify for PC revenues. This behavior actions would be inefficient for two reasons. Firstly, storage could have been a lower-cost alternative in the energy market than the generator that replaced it, which could lead to higher system and customer costs. Secondly, if storage withholds its energy, it will mean that other resources will have to increase their availability during PC hours, ultimately increasing the PC target and PCM costs for the same reliability standard. Therefore, energy, ancillary services, and PC prices could increase, leading to higher system and customer electricity costs to meet the same reliability standard (relative to the "yes" option).

To the extent PCM is designed without a cap on energy-limited resources, the PUCT and ERCOT should develop additional market rules—beyond the design parameters originally presented—to ensure energy-limited resources do not economically withhold charge due to PCM.

Some stakeholders mentioned that PC generation for energy-limited resources should also be capped at their state of charge, not just their duration. E3 confirms that this is the case in the "default" design. The definition of "sum of available generating capacity by resource" mentioned in the Options Memo explicitly states that PC generation for energy storage resources is based on the "generation capacity that is both (1) not on outage (planned or forced) and (2) not energy-exhausted." The latter point would ensure that PCs generated by an energy-limited resource would be capped at the lower value of (a) its discharge capacity and (b) its current state of charge.

E3 intends to qualitatively evaluate both "yes" and "no" options. However, a quantitative evaluation of the "no" option cannot be performed since it would be hard to model in SERVM how energy-limited generators would change their bidding and dispatch behaviors without the PC generation cap.

2.7 Question 5: PC Requirement Determination

The "default" value for this parameter is **ex-ante**, meaning that the PC target—the average number of PCs a system that meets the reliability standard must have for each season—is determined in advance of the compliance year/season. By definition, determining something ex-ante—before it occurs—requires basing the analysis on forecasts of different variables, such as load, resource availability, and outages. However, these forecasts are developed from actual data of that variable for the historical years analyzed, 1980 to 2021. For instance, the load forecasts used when modeling of ERCOT's 2026 system in SERVM are based on adjusting the actual hourly load of historical years (1980 to 2021) to ERCOT's forecast of the median peak load in 2026. Moreover, the ex-ante approach is consistent with the methodology ERCOT is utilizing in its reliability standard analysis, which also uses historical data and median-expectation forecasts.

Stakeholders were generally in alignment with each other and agreed with the "default" parameter of having the PC requirement be determined ex-ante. The ex-ante and ex-post options will both lead to the same modeling outcome since there is no 2026 historical data that can be used to develop an "ex-post" model. However, E3 intends to qualitatively evaluate both options for this design parameter:

+ **Ex-ante** (default)
+ **Ex-post**

2.8 Question 5: Net CONE Determination

The original "default" value for this parameter was **ex-post**. Ex-post net CONE determination creates a negative correlation between energy / ancillary services prices and PC prices, such that when energy / ancillary services prices are high, PC prices will be low by definition. This negative correlation has two main benefits: (1) it ensures that loads would never face a year with extremely high prices in both the energy / ancillary services market <u>and</u> the PC market, and (2) it reduces the variability in total system cost and generator compensation since PC prices will decrease if energy and ancillary services prices increase (and vice versa). However, E3 also noted that determining the net CONE ex-post means that ERCOT would need to wait for the entire year before being able to clear the seasonal PC markets, increasing collateral requirements. That is, ex-post net CONE cannot be utilized if the PC markets will clear seasonally at the end of each season.

Stakeholders proposed three main frameworks to determine net CONE, which are listed below with E3's comments for each:

+ **Ex-post:** This option is equivalent to E3's current "default" parameter. Note that several stakeholders that proposed having net CONE calculated ex-post also proposed settling the seasonal PC markets at the end of each season. As mentioned earlier, *having an ex-post determination is inconsistent with seasonal settlements and lower collateral*.
+ **Ex-ante:** Proponents of ex-ante focused on the benefits of reduced collateral as well as a consistent and known price signal in advance of the year/season. E3 agrees that both are benefits of the ex-ante approach. However, ex-ante has the drawback of increasing total system cost volatility—and the associated resource compensation—since PC and energy / ancillary services prices will no longer be guaranteed to be negatively correlated. Therefore, a year with high energy and ancillary services prices can still have high PC prices since net CONE will be based on the average of many years rather than the net-CONE that specific year. E3 suggests that the decision on the value for this parameter should be based on the tradeoff of the lower variability in total system costs and compensation (ex-post) and the lower collateral requirements (ex-ante).
+ **Trailing twelve months ("TTM") ex-post:** Stakeholders also raised the possibility of trying to get the benefits of both ex-post and ex-ante by doing a combination of both methodologies. Based on stakeholders' comments, E3 and ERCOT devised another framework that could potentially reduce collateral while keeping most benefits of ex-post. This methodology, described as TTM ex-post net CONE, utilizes the net CONE from the previous twelve months to determine the final PC demand curve for that season. With this framework, the energy and ancillary services revenues from the current season will help determine the PC price—meaning that the negative correlation between both metrics exist—while also having an "annualized" net CONE value that can be used to settle the PC market at the end of the season. Given that SERVM only models one year (2026) multiple times rather than multiple subsequent years, there is no way to model TTM ex-post net CONE in advance. However, E3 will analyze this potential framework and expects to demonstrate that, in the long-term and over multiple years, the market outcomes of this methodology are equivalent to a fully ex-post framework.

E3 intends to evaluate the three options for this design parameter, as listed below. As noted above, stakeholders' concerns on collateral combined with their general continued interest in the benefits of ex-post net CONE has caused E3 and ERCOT to agree on **changing the "default" parameter to TTM ex-post**.

- **TTM ex-post** (default)
- **Ex-post**
- **Ex-ante**

2.9 Question 5: Seasonal Value Allocation Determination

The original "default" value for this parameter was **ex-post**. Ex-post allows for PC prices to better correspond with the risk that the system encountered that year. Therefore, PCM would not be prescriptive as to which season should have higher PC compensation—that would be fully based on which seasons faced the highest reliability risk that specific year. However, E3 also noted that determining the seasonal value ex-post means that ERCOT would need to wait for the entire year before being able to clear the seasonal PC markets, increasing collateral requirements. That is, ex-post seasonal value allocation cannot be utilized if the PC markets will clear seasonally at the end of each season. Additionally, ex-post allocation has the likely impact of disassociating seasonal risk allocation from loss of load risk given that loss of load occurs very infrequently (generally much less than once per year). The model shows that, for ERCOT's system in 2026, the risk *during loss of load years* is highest in the winter, while the risk *during all years* is highest in the summer.

Ex-ante is also a valid option for this parameter. As mentioned in section *Question 5: PC Requirement Determination*, determining something ex-ante—before it occurs—requires basing the analysis on forecasts of ERCOT's system. However, these forecasts are developed using actual historical data of ERCOT's system. Moreover, the ex-ante approach is consistent with the methodology ERCOT is utilizing in its reliability standard analysis.

Stakeholders were generally aligned in proposing ex-ante seasonal allocation given the large collateral benefits that presents. Specifically, they proposed three alternatives of ex-ante seasonal value allocation:

- **Ex-ante based on modeled PC hours:** This option allocates value based on ex-ante modeled average annual risk. One viable way to implement this, as described in the workshop on April 17th, is to calculate the tightest 60 hours for each modeled year (using the same metric used to determine PC Hours) and calculate what fraction of hours lies within each season. The main drawback of this framework, as expressed by various stakeholders in their comments, is that the metric will average the risk distribution across all years, even if not all years actually have high reliability risk. In a system that meets a reliability standard such as the 0.1 days/year loss of load expectation ("LOLE"), it is expected that only one year every ten will have high system risk. Averaging one year of high risk with nine of no risk mutes the signal for efficient entry of resources in the seasons and hours when the system actually needs them.
- **Ex-ante based on loss of load ("LOL") hours:** Allocating based on LOL hours risk ensures that the market design is targeting the right seasons and hours where true system risk—i.e., loss of load—occurs. E3 agrees with the double benefit of this option of (1) reducing collateral and (2) aligning PCM value and reliability risk better. Results from the current SERVM model—which are aligned with the "Reliability Standard" work being performed by ERCOT—show that 96% of the loss of load risk occurs in the winter, 4% in the summer, and

none in the fall and spring. This risk allocation is aligned with ERCOT's intrinsic reliability risk, as shown by the models, of an extreme winter storm like Uri.

- **Ex-ante based on expected unserved energy ("EUE"):** This option is similar to the previous one, but using EUE to weight the seasonal value rather than just LOL. Therefore, it has the same benefits of (1) reducing collateral and (2) aligning PCM value and reliability risk better.
- **Ex-ante with equal allocation by season:** This option allocates the same value for PCs each season; for instance, a PCM design with four seasons will have 25% of the total annual PC value allocated to each season. Utilizing this framework will allocate value—and thus cost and compensation—across seasons in a way that is completely arbitrary and not correlated with system risk. Moreover, this approach is not dynamic and does not allow PCM to adjust over time as the periods of reliability risk change as the grid evolved. E3 believes the value of PCs within a season should be based on the inherent risk within that season and should be dynamic for the new product to actually support reliability. For example, if there is no reliability risk in the fall, then the value of a generator being "available" in the fall should be minimal (or even zero). On the other hand, if the risk is high in the winter, then the value of PCs that season should be higher to reward generators that are available during the times of system need.

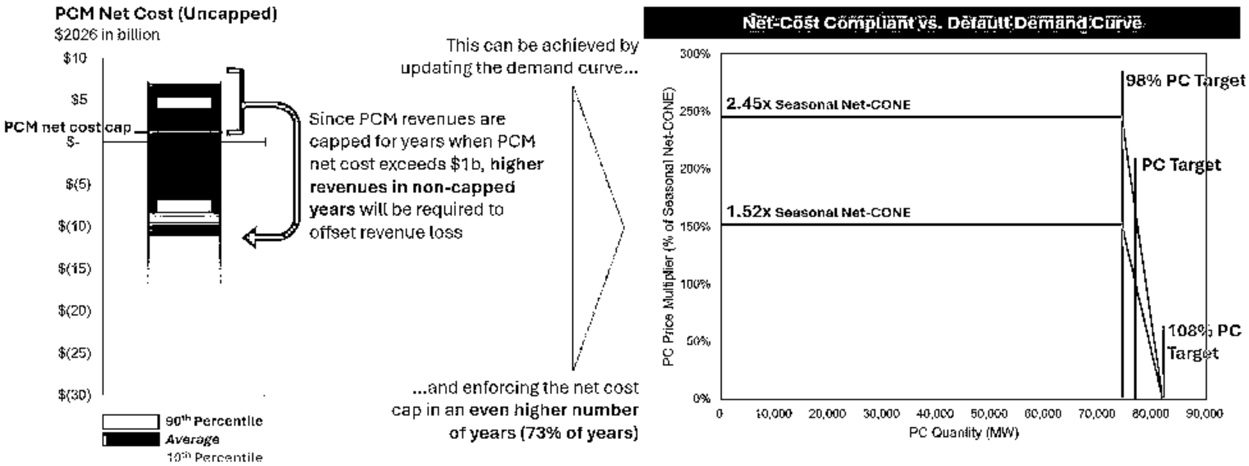
E3 intends to evaluate the four options for this design parameter, as listed below. E3 also notes that stakeholders' concerns with collateral and alignment between seasonal value allocation and loss of load risk has caused E3 and ERCOT to agree on **changing the "default" parameter to ex-ante based on LOL hours**.

- **Ex-ante based on LOL hours** (default)
- **Ex-ante based on EUE**
- **Ex-ante based on modeled PC hours**
- **Ex-post**

2.10 Question 7: Energy-Only Market Costs Counterfactual

PURA § 39.1594(a)(1) states that PCM cannot lead to a net system cost increase of more than $1 billion per year. This net cost cap ensures that ERCOT's system does not face a large electricity cost increase due to PCM in a given year. However, the net cost cap also leads to changes in the PC demand curve shape—specifically the maximum PC price—to ensure that the reliability target is met. As seen in Figure 1, abiding by the net cost cap means that PC prices will need to be capped in several years. To compensate for the loss of revenue during those years, PC prices will need to be higher in the years where the net cost cap is not triggered, which is done by increasing the height of the demand curve. <u>**Ultimately, this means that, if PCM abides by the net cost cap *and* meets the reliability standard, the maximum PC price will need to be approximately 2.5 times net CONE (versus 1.5 times without the net cost cap)**</u>. One of the main consequences of the higher PC price cap is that total system cost variability will increase due to the net cost cap, driven by the higher volatility in PC prices. With the net cost cap, PC prices can be as high as 2.5 times net CONE in certain years and be very low other years when the net cost cap is triggered. The high PC prices are therefore needed to make up for the PC revenues lost in the years the net cost cap is triggered to meet the reliability standard that cannot otherwise be realized because of the existence of the cap.

Figure 1. Illustrative Effect of Net Cost Cap on Maximum PC Price



To understand if the net cost cap is triggered, the total system costs under PCM will need to be compared with a counterfactual of what total system costs without have been in that year if PCM did not exist. The selection of what is the correct counterfactual scenario to compare PCM against is the basis of this design parameter.

The "default" value for this parameter is **market equilibrium reserve margin (MERM)**, such that the total energy, ancillary services, and PCM costs under a PCM market design will be compared with the energy and ancillary services costs under an Energy-Only market in MERM. Comparing both systems would allow ERCOT and PUCT to ensure that the PCM market design meets with the statutory $1 billion absolute annual net cost cap implemented by the Texas Legislature. MERM modeling and studies are currently developed by Astrapé for ERCOT to understand how the system would look if it were in long-run equilibrium. Accordingly, it is an accepted, understood, and easy-to-model scenario.

Stakeholders proposed three different alternatives for this design parameter:

- **MERM:** This option is equivalent to E3's current "default" parameter.
- **Cost of retention equilibrium:** This option compares the system with PCM to the Energy-Only system using a lower cost of the marginal resource—the cost of retaining a new marginal resource in the market (go-forward costs)—rather than the cost of new entry. The cost of retention equilibrium case is only relevant in a system that is capacity long; in such a system, resources only need to cover their go-forward costs to remain in the market and not retire. However, if the system is capacity short and needs new generation, then adding capacity will mean incurring the cost of new entry. Furthermore, determining an accurate and representative go-forward cost is complex and subjective. The precise way to determine cost of retention is to calculate a different go-forward costs for each generator, since go-forward costs can vary greatly by technology, vintage, age, and historical maintenance. This would be a very long, convoluted, and subjective process where plant owners will have

differing views. On the other hand, cost of new entry is just one value that can be agreed upon by most stakeholders and is already part of the regulatory process in Texas. Therefore, studies in ERCOT—like the MERM study—have historically focused on equilibration to CONE because of these reasons.

+ **Firm $1 billion *gross* cost cap:** Proponents of this option focus on the benefits that using a *gross* cost cap would have on (1) reducing the administrative complexity of implementing the cost cap and (2) reducing the reliance of the PCM market on assumptions and models. While these benefits are accurate, there are also drawbacks to this proposal that need to be considered. First, the statutory cost cap is a *net* cost cap, as clearly stated in PURA § 39.1594(a)(1): "the net cost to the ERCOT market of the credits does not exceed $1 billion annually."[1] Second, constraining the PCM market to only $1 billion in total annual costs will mean that the reliability target set by ERCOT will not be able to be met through PCM. The gross $1 billion cap would decrease resource compensation—relative to a net cost cap construct—since it would lower PC compensation across most years. Lower resource compensation, especially for gas combustion turbines ("CTs"), will lead to lower resource entry and/or more resource exit and, ultimately, lower system reliability. Even if the maximum PC price is adjusted such that the PC market costs $1 billion *all* years, there would not be enough money in the market for it to meet the reliability standard. Resource entry—incentivized by the $1 billion additional revenue pool from PCM—would depress resource compensation (by lowering energy and ancillary services prices) without the ability of PCM to fill in the "missing money."

E3 intends to quantitatively evaluate the "default" parameter for the strawman design given the timeline required to develop a cost of retention sensitivity, but will qualitatively evaluate both options:

+ **MERM** (default)
+ **Cost of retention**

2.11 Question 8: PC Market Settlement

The original "default" option for this parameter was that the PCM market would **settle at the end of the year for all seasons simultaneously**. The original "default" PCM design valued the benefits of determining net CONE and seasonal PC value on an ex-post basis. This inherently means that the PCM market will need to settle at the end of the year, once the net CONE and seasonal value allocation for the compliance year is determined.

Stakeholders were generally aligned that the PC market should settle at the end of the season to minimize collateral. As mentioned earlier, several stakeholders that proposed having net CONE calculated ex-post also proposed settling the seasonal PC markets at the end of each season, which

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[1] Tex. H.B. 1500 § 23, 88th Leg., R.S. (2023) (PURA § 39.1594).

is infeasible. As mentioned earlier, ***having an ex-post determination is inconsistent with seasonal settlements and lower collateral.***

E3 intends to evaluate the two options for this design parameter, as listed below. E3 also notes that stakeholders' concerns on collateral has caused E3 and ERCOT to agree on **changing the "default" parameter to having each seasonal PC market settle at the end of the season**.

+ **Settle at the end of each season** (default)
+ **Settle at the end of the year for all seasons simultaneously**

3 Recommended Changes to Default Design

E3 appreciates the thoroughness and insights from stakeholders when filing their comments. Based on stakeholders' feedback on PCM, ERCOT and E3 recommend modification of the default value of the following design parameters:

12. Net CONE Determination Framework. The original "default" value was to calculate net CONE ex-post. **The new "default" value is to calculate net CONE based on a TTM ex-post** in order to be able to settle the market at the end of the season and minimize collateral.

14. Seasonal Value Allocation. The original "default" design allocated value of PCs across the seasons based on an ex-post calculation using the 60 tightest hours of the year. **The new "default" value is to allocate seasonal value ex-ante based on modeled LOL hours** in order to both (1) better align PCM value with true system risk (i.e., loss of load) and (2) be able to settle at the end of the season to reduce collateral.

22. Cadence of Forward Market. The original "default" cadence for the forward PC market was to include all seasons at the beginning of the year. **The new "default" value is to run the forward PC market at the beginning of each season**, given that (1) the participants have more information before each season and (2) settlement in this market occurs closer to the season.

31. Timing of Seasonal PC Market Settlement. The original "default" value was for the PC market to settle at the end of the year for all seasons simultaneously. **The new "default" value is to settle the PC market at the end of each season**, since in the new "default" PCM design for the net CONE and the seasonal value allocation are known by the end of the season. This change will help reduce collateral.