Performance Credit Mechanism (PCM) LSE Collateral

ERCOT Credit Finance Subgroup Meeting

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Energy+Environmental Economics

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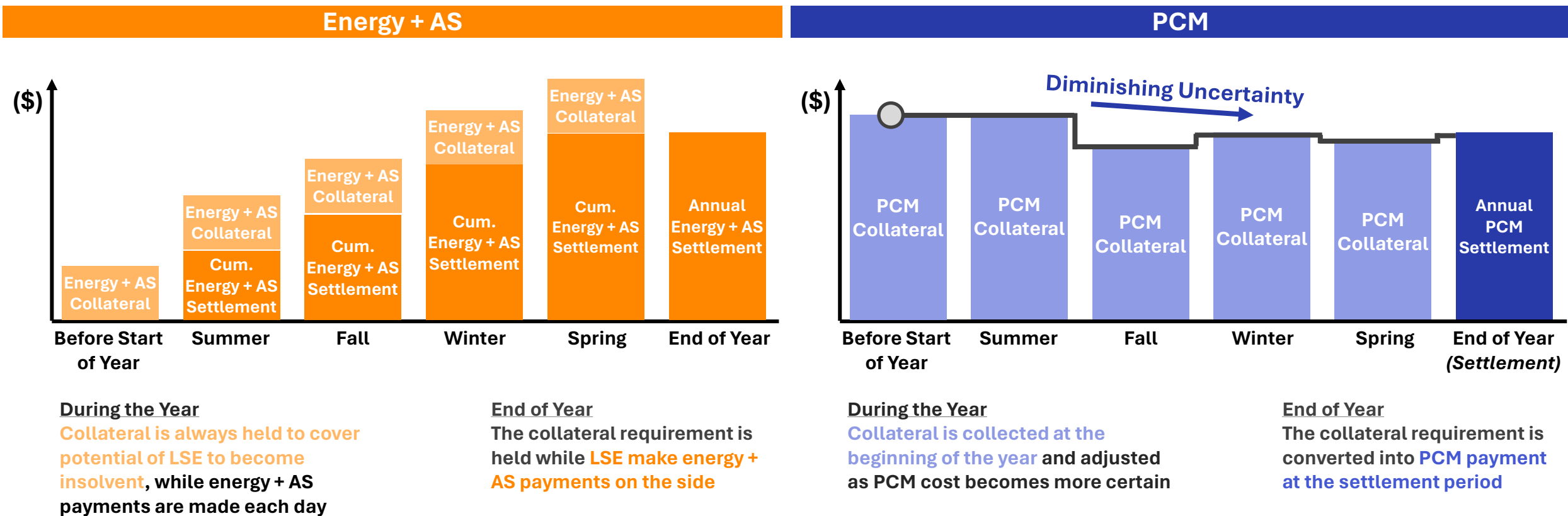# PCM Collateral Overview & Key Drivers

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PCM collateral is a pre-payment of end-of-year PCM costs, but it is structurally different from Energy + AS collateral

Energy + AS collateral is held to cover the unwinding period if an LSE becomes insolvent
PCM collateral is equivalent to paying for PCs upfront, when price and quantity are still uncertain, and will be structured similar to that of Congestion Revenue Rights (CRR)

Illustrative Quantity of Collateral + Payments Held by ERCOT Across Single Year

Energy + AS

PCM

During the Year
Collateral is always held to cover potential of LSE to become insolvent, while energy + AS payments are made each day

End of Year
The collateral requirement is held while LSE make energy + AS payments on the side

During the Year
Collateral is collected at the beginning of the year and adjusted as PCM cost becomes more certain

End of Year
The collateral requirement is converted into PCM payment at the settlement period

Annual PCM collateral obligation to loads will be based on the sum of the expected seasonal PCM costs to each LSE

Since collateral is a "pre-payment" of PCM payments, collateral for each season will be based on the expected seasonal PCM costs for each LSE...

Collateral Obligation = Expected PC price x (Expected PC requirement – Forward market procurement)

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Collateral Obligation = **Expected PC price** x (**Expected PC requirement** – Forward market procurement)

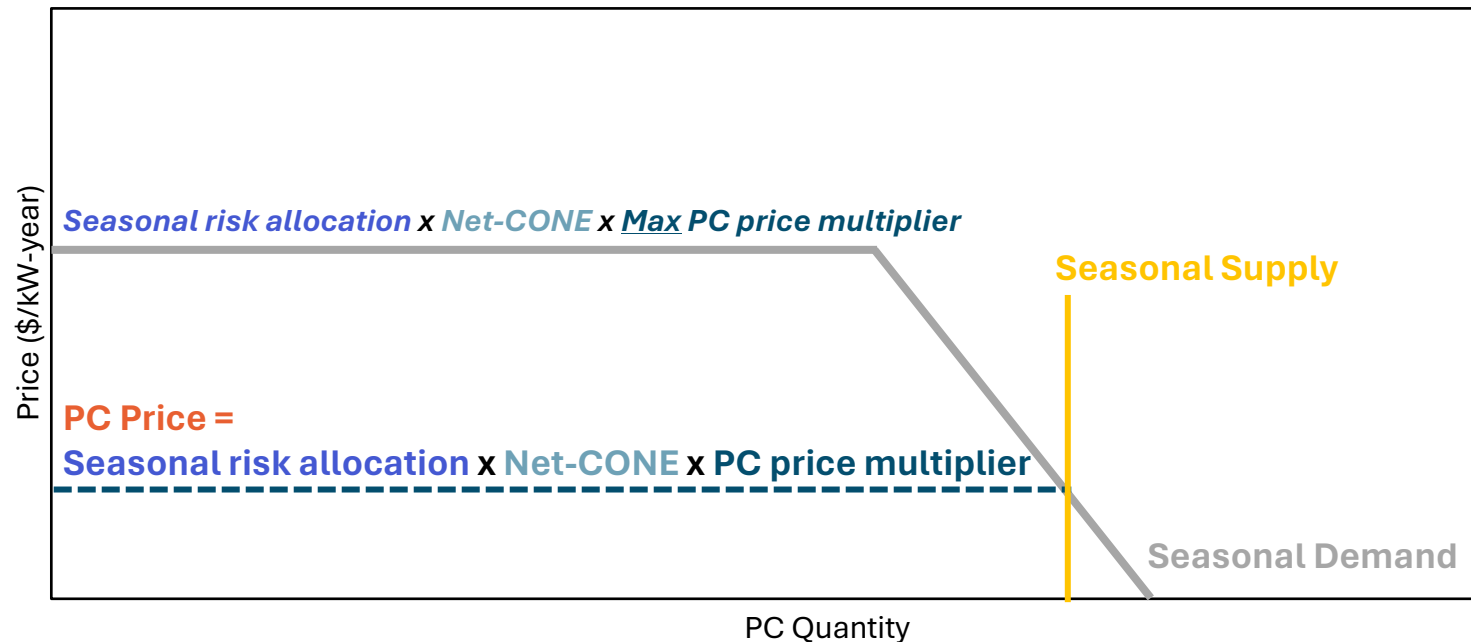**Expected PC Price** = (**Seasonal risk allocation** x **Net-CONE** x **PC price multiplier**)

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Collateral Obligation = **Expected PC price** x (**Expected PC requirement** – **Forward market procurement**)

Expected PC Price = (**Seasonal risk allocation** x **Net-CONE** x **PC price multiplier**)

Illustrative Clearing of PC Season

Seasonal risk allocation x Net-CONE x Max PC price multiplier

Seasonal Supply

PC Price =
Seasonal risk allocation x **Net-CONE** x **PC price multiplier**

Seasonal Demand

Price ($/kW-year)

PC Quantity

Seasonal Risk Allocation
Determined based on either actual risk across seasons at end of year (*ex-post*) or modeled risk (*ex-ante*)

Net-CONE
Determined based on either actual net-CONE at end of year (*ex-post*) or modeled net-CONE (*ex-ante*)

PC price multiplier
Determined based on where Seasonal Supply meets Seasonal Demand curve

How each of the different PC price drivers is determined will depend on final PCM strawman design

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Design Parameters that Affect Collateral

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PCM design parameters that impact collateral requirements and process

Category	#	Design Parameter	
PCM Seasons	1	Number of Seasons	
PC Demand	12	Net-CONE Determination Framework	**Focus of this session**
	14	Demand Curve – Seasonal Value Allocation	
Framework & Timeline of Forward PC Market	22	Cadence of Forward Market	
	25	Non-Performance Penalties for PCs Cleared in Forward Market	
	26	Non-Performance Penalties for PCs Offered but not Cleared 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	**Focus of this session**
	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	

Value and timeline / process of PC price determination will affect PCM collateral obligations

Since collateral is a "pre-payment" of PCM payments, collateral for each season will be based on the expected seasonal PCM payments for each LSE...

Collateral Obligation = Expected PC price x (Expected PC requirement – Forward market procurement)

Expected PC Price = (Seasonal risk allocation x Net-CONE x PC price multiplier)

| Seasonal risk allocation	Net-CONE	PC price multiplier
Dependent on Parameter... **14. Demand Curve – Seasonal Value Allocation**	**Dependent on Parameter...** **12. Net-CONE Determination Framework**	**Dependent on Parameter...** **1. Number of Seasons**

Seasonal value allocation will affect the ability to determine seasonal PC value in advance (*ex-ante*) or not

Since collateral is a "pre-payment" of PCM payments, collateral for each season will be based on the expected seasonal PCM payments for each LSE...

Collateral Obligation = **Expected PC price** x (Expected PC requirement – Forward market procurement)
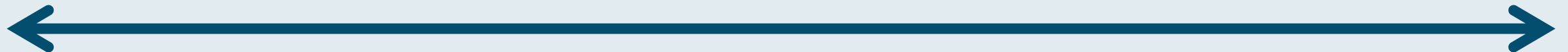
Expected PC Price = (**Seasonal risk allocation** x **Net-CONE** x **PC price multiplier**)

Seasonal risk allocation

Dependent on Parameter...
14. Demand Curve – Seasonal Value Allocation

Net-CONE

Dependent on Parameter...
12. Net-CONE Determination Framework

PC price multiplier

Dependent on Parameter...
1. Number of Seasons
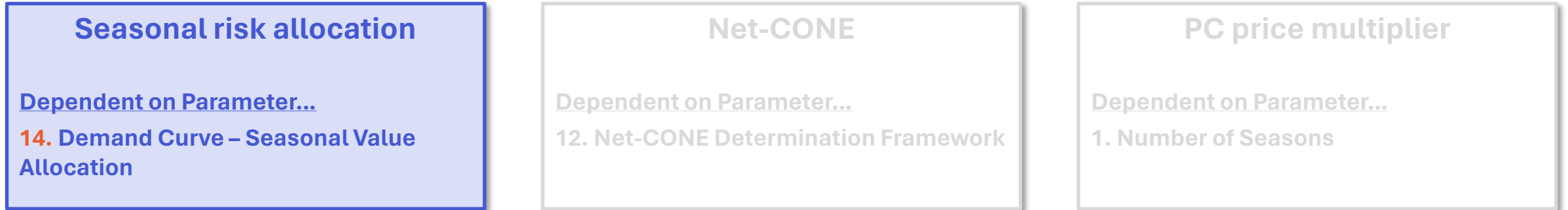
Tradeoffs

Ex-Post (Default)   **Ex-Ante**

⟵——⟶

- Signals for performance based on actual system needs rather than modeled needs
- Uncertain value allocation of PC incentivizes generators to be always available, increasing market efficiency

- Ability to know seasonal risk allocation in advance, which allows PCM collateral to be held seasonally rather than annually (depending on methodology utilized)

Uncertainty in seasonal risk allocation will require higher collateral requirements to cover potential PCM cost
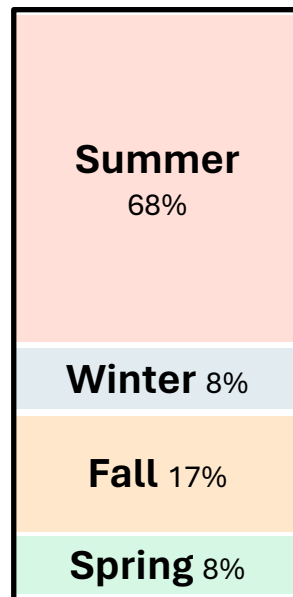
For each season...

Expected PC Price = (**Seasonal risk allocation** x **Net-CONE** x **PC price multiplier**)

Illustrative Year with Extreme Winter & Mild Summer

Ex-Ante

Seasonal risk allocation is known upfront, this makes the collateral obligation easier to calculate

Summer 68%

Winter 8%

Fall 17%

Spring 8%

Beginning of Year → **Ex-post Settlement**

Ex-Post (Default)

Seasonal risk allocation is estimated upfront using either (1) maximum (100%) or (2) ex-ante method

Summer

Winter

Fall

Spring
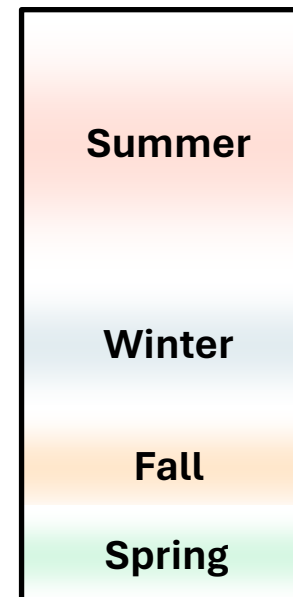
Risk allocation estimates can be updated after each season

Summer

Winter

Fall

Spring

...

Summer 10%

Winter 88%
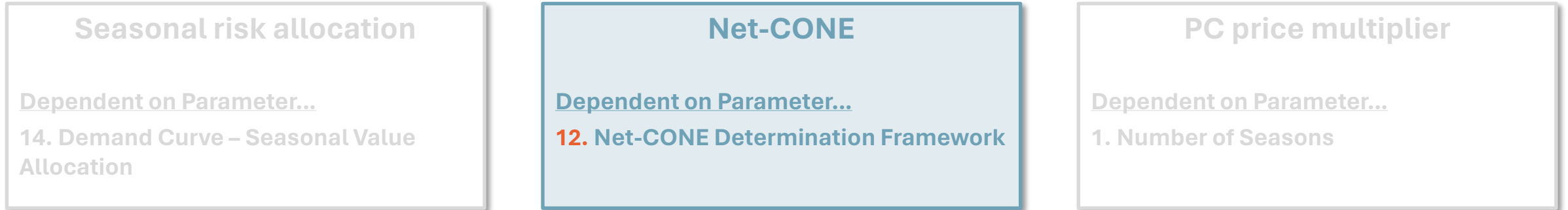
Fall 1%

Spring 1%

Beginning of Year → **End of Summer** → **Ex-post Settlement**

Net-CONE determination framework will affect the ability to determine net-CONE value in advance or not

Since collateral is a "pre-payment" of PCM payments, collateral for each season will be based on the expected seasonal PCM payments for each LSE...

Collateral Obligation = Expected PC price x (Expected PC requirement – Forward market procurement)

Expected PC Price = (Seasonal risk allocation x Net-CONE x PC price multiplier)

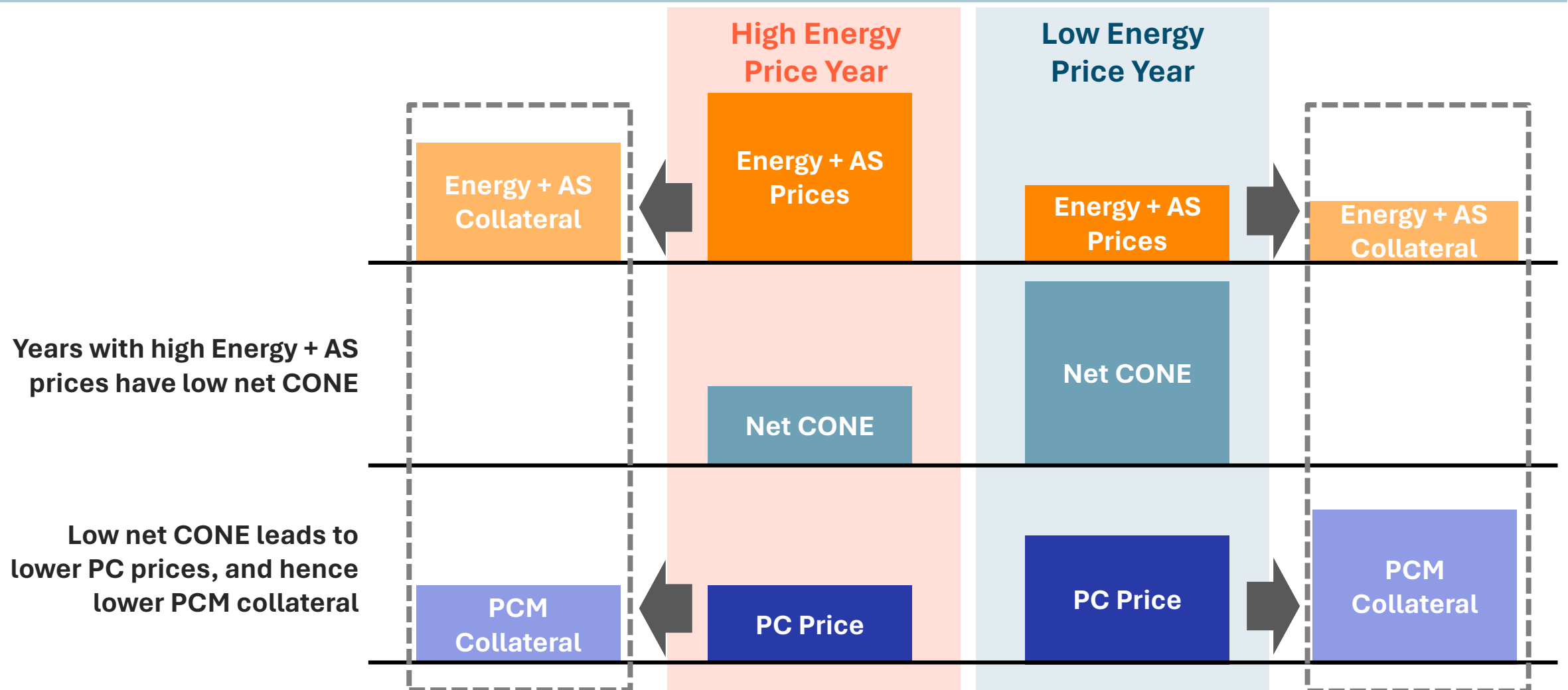| Seasonal risk allocation	Net-CONE	PC price multiplier
Dependent on Parameter... 14. Demand Curve – Seasonal Value Allocation	Dependent on Parameter... **12. Net-CONE Determination Framework**	Dependent on Parameter... 1. Number of Seasons

Tradeoffs

Ex-Post (Default) ← → **Ex-Ante**

- Lower total system cost variability given negative correlation between energy + AS prices and ex-post net-CONE
- Negative correlation also mitigates total collateral requirement across energy + AS and PCM

- Ability to know net-CONE gives more certainty on PC prices and thus could reduce PCM collateral (depending on methodology utilized)

If net-CONE is determined *ex-post*, years requiring higher Energy + AS collateral have lower PCM collateral

High Energy Price Year

Low Energy Price Year

Energy + AS Collateral

Energy + AS Prices

Energy + AS Prices

Energy + AS Collateral

Years with high Energy + AS prices have low net CONE

Net CONE

Net CONE

Low net CONE leads to lower PC prices, and hence lower PCM collateral

PCM Collateral

PC Price

PC Price

PCM Collateral

Given negative correlation, PCM and energy + AS collateral requirements can potentially be pooled together

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14

Number of seasons will affect the cadence of determination of the PC price multiplier

Since collateral is a "pre-payment" of PCM payments, collateral for each season will be based on the expected seasonal PCM payments for each LSE...

Collateral Obligation = Expected PC price x (Expected PC requirement – Forward market procurement)

Expected PC Price = (Seasonal risk allocation x Net-CONE x PC price multiplier)

Seasonal risk allocation	Net-CONE	PC price multiplier
Dependent on Parameter... 14. Demand Curve – Seasonal Value Allocation	**Dependent on Parameter...** 12. Net-CONE Determination Framework	**Dependent on Parameter...** 1. Number of Seasons

Tradeoffs

Low number of seasons   **High number of seasons**

- Lower number of annual PC hours, meaning there is better alignment between PC hours and high-risk hours

- Simpler overall PCM process and lower administrative burden, given lower number of PC markets

- Ability to clear seasonal supply and demand more frequently and determine seasonal PC price multiplier, potentially lowering PCM collateral (depending on methodology utilized)

PCM Collateral Requirement Determination Methodologies

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If variables are determined *ex-post*, different PCM collateral methodologies can be utilized to manage collateral

Since collateral is a "pre-payment" of PCM payments, collateral for each season will be based on the expected seasonal PCM payments for each LSE...

Collateral Obligation = Expected PC price x (Expected PC requirement – Forward market procurement)

Expected PC Price = (Seasonal risk allocation x Net-CONE x PC price multiplier)

Net-CONE multiplier	Net-CONE	Seasonal risk allocation	Net Exp. PC quantity

Potential Starting Values
 	
1. **Maximum**
  A. Max Multiplier
2. **Expected**
  A. Max 3-year historical lookback
 	
Periodic Adjustments
 	
• At end of season, update to actual clearing PC price multiplier *(minimal impact if seasonal risk allocation is ex-post)*
	Potential Starting Values
	
	1. **Maximum**
	  A. CONE
	2. **Expected**
	  A. Modeled net-CONE
	  B. Trailing 12 months net-CONE
	
	Periodic Adjustments
	
	• Adjust every period (week / month / season) as peaker net margin changes
		Potential Starting Values
		
		1. **Maximum**
		  A. 100%
		2. **Expected**
		  A. Modeled seasonal risk
		  B. Trailing 12 months seas. risk
		
		Periodic Adjustments
		
		• Adjustment is limited if ex-post since need full-year results to know where relative risk occurred
		• *Potential high risk if not starting at 100% for each season*
			Potential Starting Values
			
			1. **Maximum**
			  A. Max 3-year historical lookback (minus PCs in forward market)
			2. **Expected**
			  A. Avg. 3-year historical lookback (minus PCs in forward market)
			
			Periodic Adjustments
			
			• Adjust with both (1) actual PC generation and (2) actual load ratio share during PC hours, at the end of the season

PCM collateral methodology for LSEs is design parameter #32 (LSE PC Market Collateral Requirement)

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Potential PCM collateral methodologies face tradeoffs between risk and cost

Maximum Cost: Starting each year with maximum PC cost mitigates costs from potential insolvency risk
Expected Cost: Starting with a historically informed expected PC cost incurs lower carrying costs to loads

Total LSE Collateral Obligation
($)

Maximum Methodology (Safer)

Obligation based on market clearing at price cap in each season, less LSE's forward market purchases

Reduce obligation based on PC mult., net-CONE, and seasonal risk, as year moves away from "worst case"

repeat for prior season

repeat for prior season

repeat for prior season

Expected Methodology (Cheaper)

Obligation based on ex-ante modeled / historical net-CONE and seasonal risk, less LSE's forward market purchases

Update PC mult., net-CONE, and seasonal risk as year progresses

Final PCM obligation

Diminishing Uncertainty

| Summer | Fall | Winter | Spring | Year End |

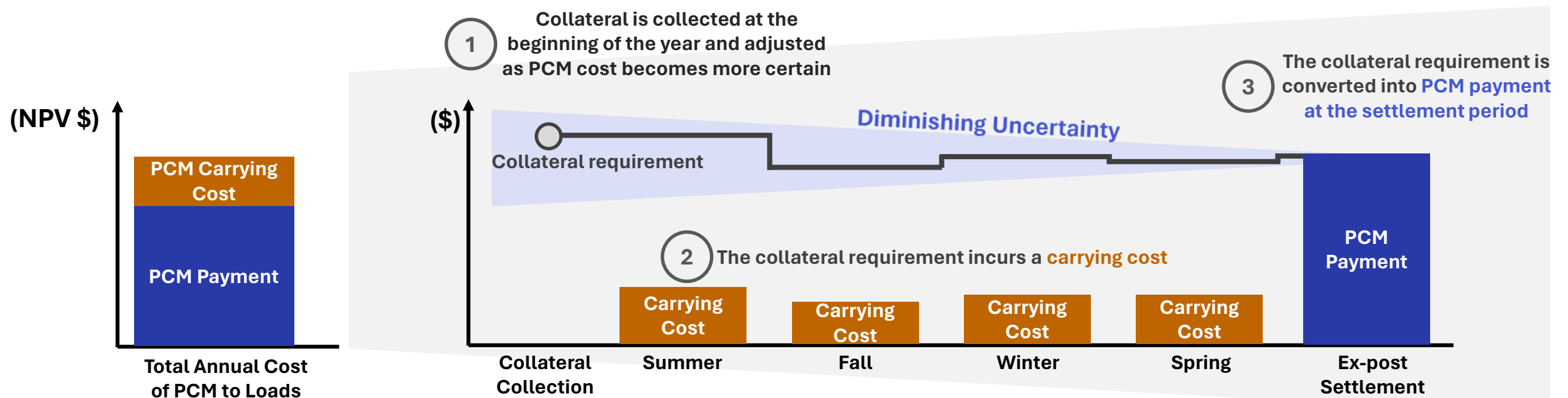# PCM Collateral Carrying Costs Methodology

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Since PCM collateral is an up-front payment of year-end PCM costs, it will lead to carrying costs to LSEs

PCM collateral will lead to carrying costs to LSEs for the opportunity cost of the capital that LSEs are posting for PCM payments at the beginning of the year

But PCM will also decrease energy + AS carrying costs by (1) reducing energy + AS prices and (2) shifting energy + AS payments (paid during the year) into PCM (paid at the end of the year)

How PCM Collateral Works

1 Collateral is collected at the beginning of the year and adjusted as PCM cost becomes more certain

3 The collateral requirement is converted into PCM payment at the settlement period

Diminishing Uncertainty

Collateral requirement

2 The collateral requirement incurs a carrying cost

(NPV $)

PCM Carrying Cost

PCM Payment

Total Annual Cost of PCM to Loads

($)

Collateral Collection	Summer	Fall	Winter	Spring	Ex-post Settlement
	Carrying Cost	Carrying Cost	Carrying Cost	Carrying Cost	PCM Payment

In each period,
Collateral Carrying Cost = Cost of Capital x Collateral Requirement

Net carrying cost of collateral can be calculated by looking at (1) new PCM collateral and (2) decrease in energy + AS collateral
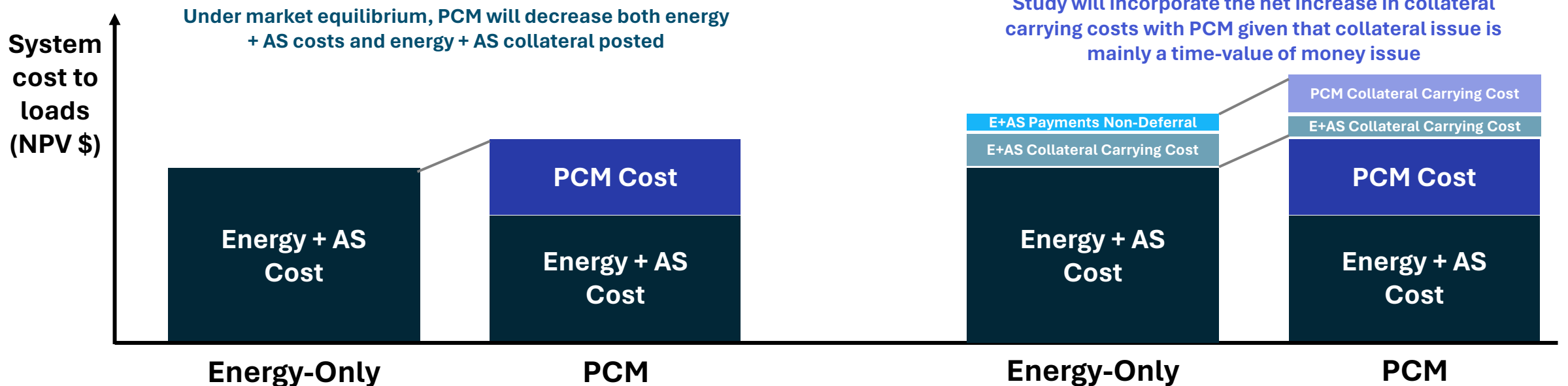
E3 is planning to incorporate the net carrying cost of collateral in future modeling, using the following formula:

Net Collateral Cost = **Cost of Capital x (New PCM Collateral** – **Decrease in E+AS Collateral** – **Deferral of E+AS Payments)**

Annual System Cost to Loads

Without Collateral & Carrying Costs
Current Study Results

With Collateral & Carrying Costs
Future Study Results

Under market equilibrium, PCM will decrease both energy + AS costs and energy + AS collateral posted

Study will incorporate the net increase in collateral carrying costs with PCM given that collateral issue is mainly a time-value of money issue

System cost to loads (NPV $)

PCM Collateral Carrying Cost

E+AS Payments Non-Deferral

E+AS Collateral Carrying Cost

E+AS Collateral Carrying Cost

PCM Cost

Energy + AS Cost

Energy + AS Cost

Energy + AS Cost

PCM Cost

Energy + AS Cost

Energy-Only

PCM

Energy-Only

PCM

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Additional questions or comments?

Are there areas you would like us to expand on?

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Thank You

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