Granular product type for Congestion Revenue Rights Time of Use (CRR TOU)

April 14, 2025

CMWG Discussion

Executive Summary

We recommend exploring the **deployment of a more granular CRR TOU blocks** to align with (1) **latest market changes** and (2) **improve auction speed and efficiency:**

1. **Increase in intermittent renewables** has changed generation and congestion patterns in the system:
   - Current blocks (especially 5x16 and 2x16) show **significant price variability** due to differences between **solar and non-solar hours..**
   - **…**with **congestion values** frequently **shifting between positive and negative within block**

2. **There is an opportunity to explore a more targeted congestion product, which would benefit market participants**
   - Current setup **complicates flat hedging decisions** since it is difficult to establish the **correct volume, driving many players to prioritize Options over Obligations**
   - **More granular blocks would allow players to hedge more efficiently with Obligations…**
   - **…which require less computational resources** for CRR auction clearing, speeding up process and efficiency

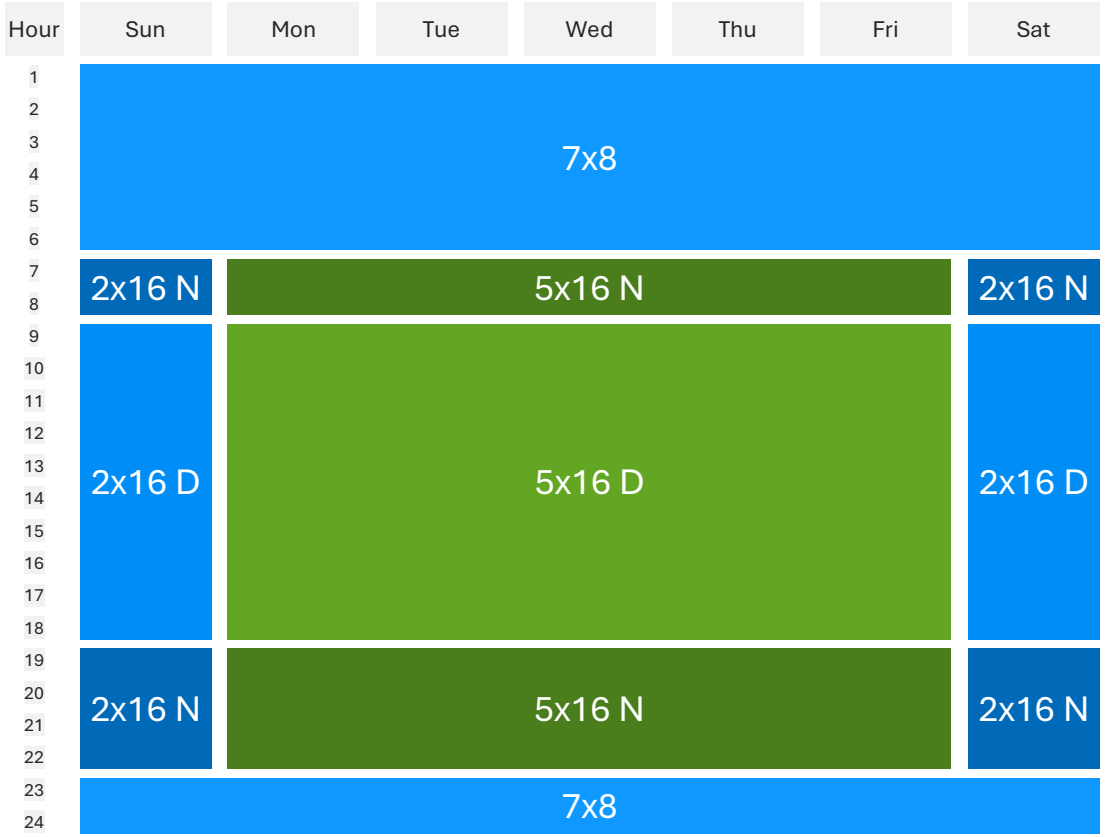
Proposal is for a more targeted products divided between solar and non-solar hours which can be used to target specific congestion to hedge

Current blocks

Currently, CRR is traded as weekday/weekend peak, and off-peak with no opportunity to further shape hedges

Proposed blocks with additional solar/non-solar split

New blocks will further divide blocks between solar and non-solar hours, providing a more targeted product



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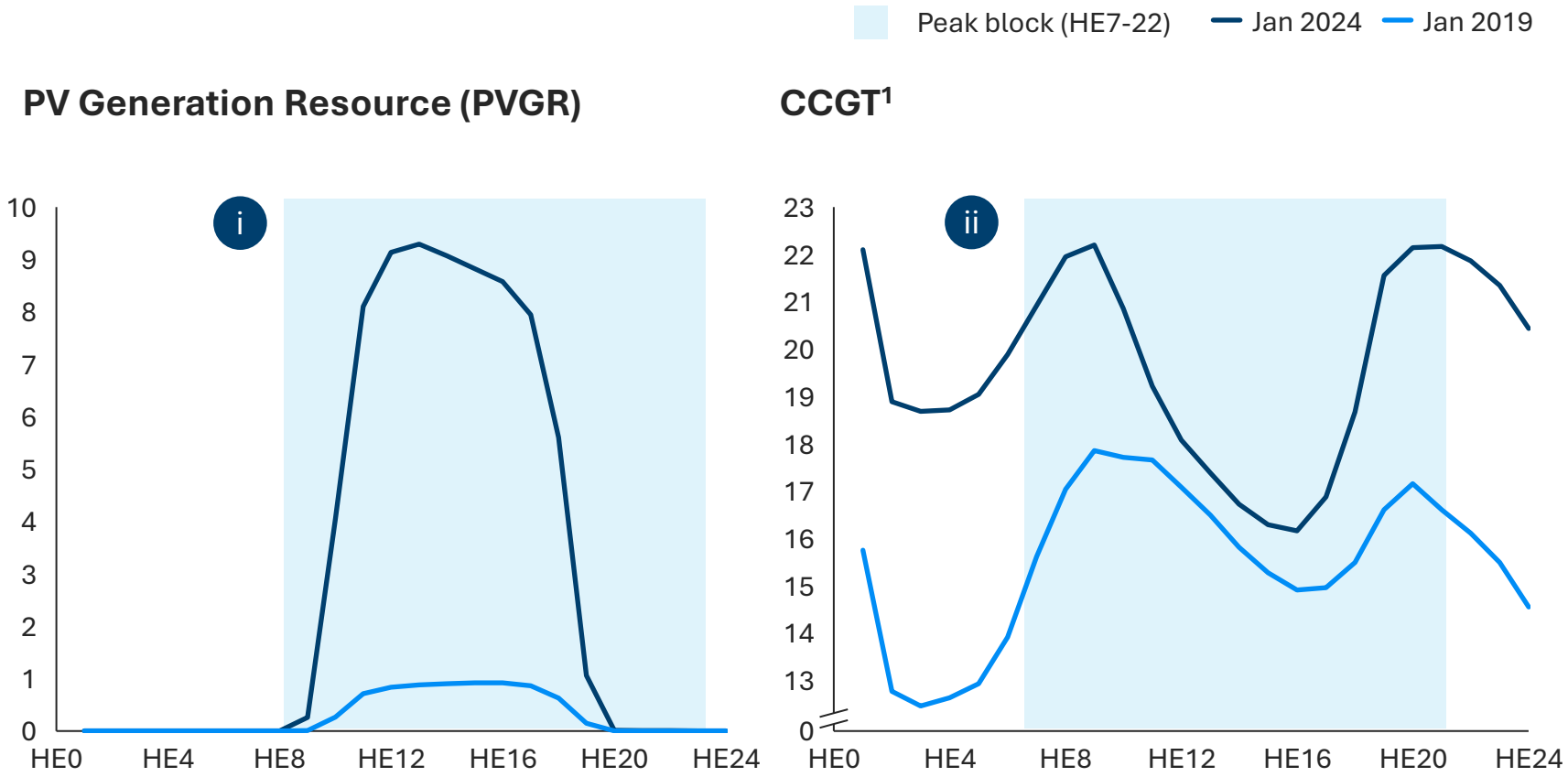
1. Proposal is motivated by changes in dispatch level due to increase in intermittent renewables

Average generation by technology, in GW



Key takeaways

i Dispatch of different generation technologies has evolved in recent years as **solar has become a larger part of the ERCOT system**

ii Average generation varies significantly between **solar and non-solar periods**

- Variability has made it more difficult to determine the appropriate amount of peak hedge to purchase across technologies

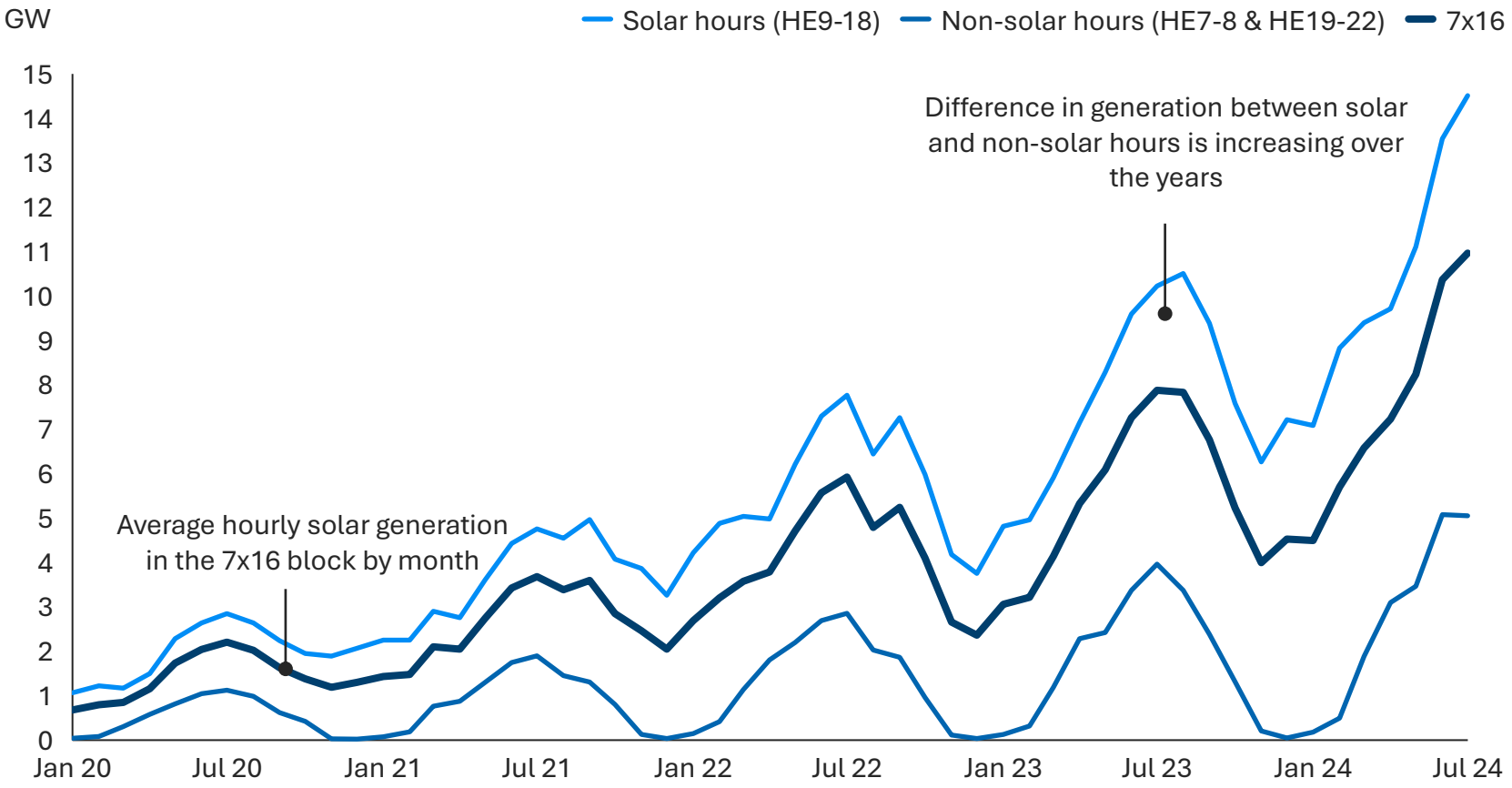
1. CCGT 90

Source: ERCOT Fuel Mix Publications

1. Difference in generation between solar and non-solar hours have been increasing and will continue to grow

Average hourly generation during solar and non-solar hours in ERCOT[1] for 7x16

2020-24, GW

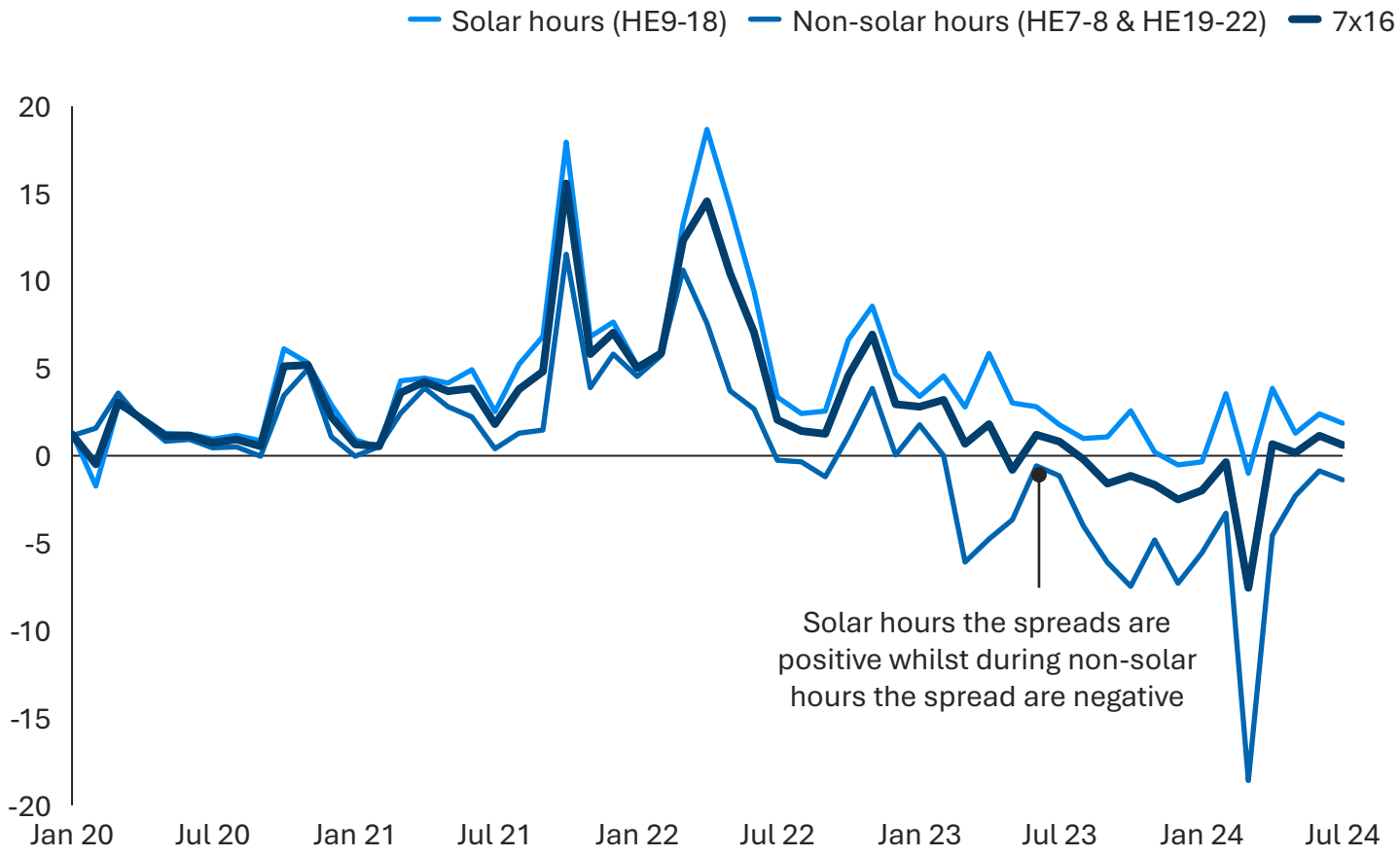


Key takeaway

- Within **7x16** hours, there is a significant difference in generation between **solar and non-solar hours**
- Market participant trying to hedge output of a plant has a **challenging decision due to divergence within CRR 5x16 and 2x16 blocks**
- This **divergence has been increasing** over the years and will remain a challenge

1. Similar effects can be seen between hubs where prices diverge between solar and non-solar hours

Spread between North and West hub LMP during solar and non-solar hour for block 7x16 in ERCOT , 2020-24, $/MWh

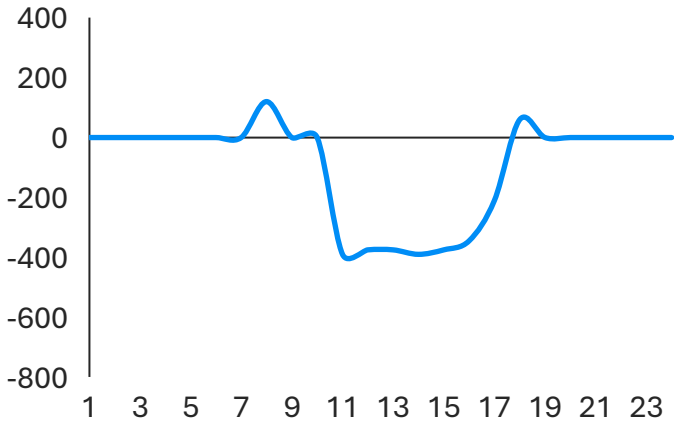
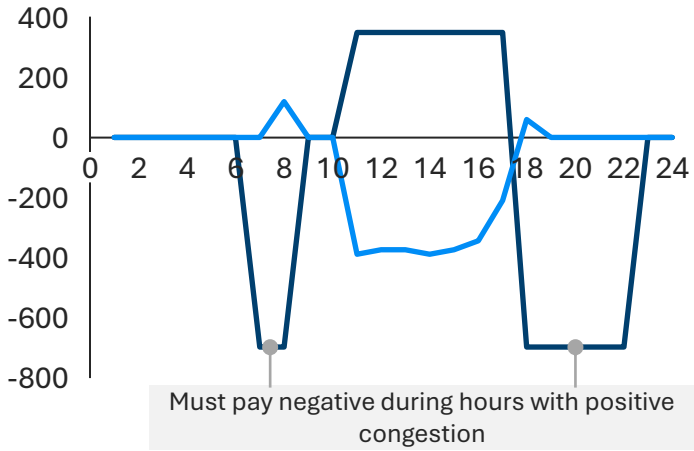
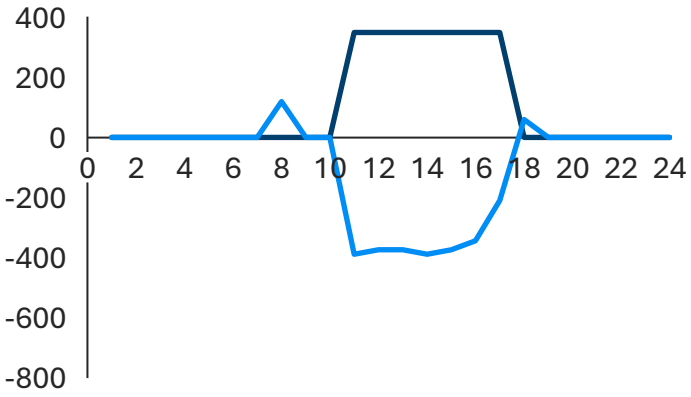


Insights

- Along with generation, **LMP also swings between solar and non-solar** within 7x16 block
- Spread between North and West is driven by **West hub having more solar generation**
- **Congestion changes direction during 7x16**. Spreads are **positive during solar hours**, however, become **negative during non-solar hours**

2. Changes in congestion pattern during peak blocks has made using CRR Obligations challenging increasing demand for Options

Illustrative example of hedging renewable generation asset using 5x16 CRR

Scenario	Congestion costs without hedging	Hedging with Obligation	Hedging with Option
	Hourly unit congestion cost for solar	Hourly payoff of a 5x16 CRR Obligation	Hourly payoff of a 5x16 CRR Option
Hourly payoff ($)			
Congestion cost, $	-2280	-2280	-2280
Hedging adjustment , $	0	-2450	+2450
Total cost , $	-2280	-4730	+170

Hedging congestion cost using Option is the most beneficial

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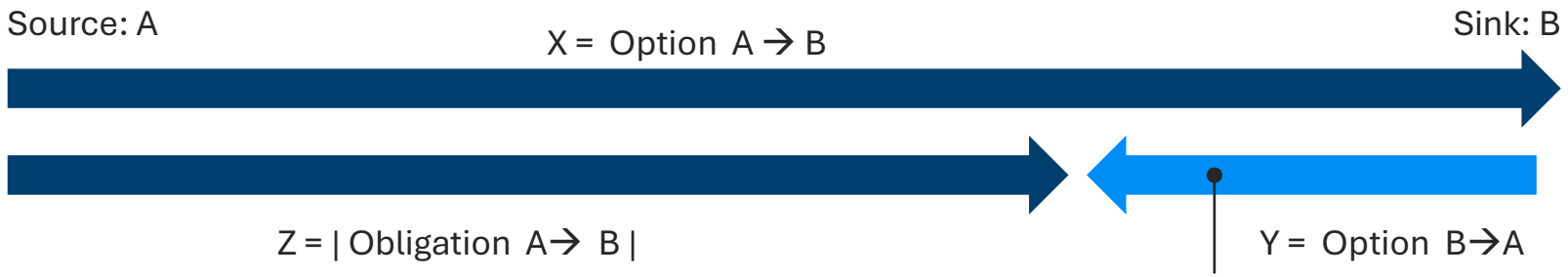
3. We define the Obligation Capture Ratio (OCR) as a metric to numerically analyse directional congestion volatility of auctions

Concept and equations

Absolute value of Obligation from A to B is defined as sum of Option A to B minus Option B to A when B > A



As Y approaches 0, congestion becomes uniform with no variability

Therefore, Obligation Capture Ratio is defined by the following equation

$$OCR_{A \to B} = \frac{Z}{(X + Y)}$$

Ratio of 1 indicates no congestion variability

Z: Absolute Value of CRR Obligation Revenue from A to B

X : CRR Option Revenue from A to B

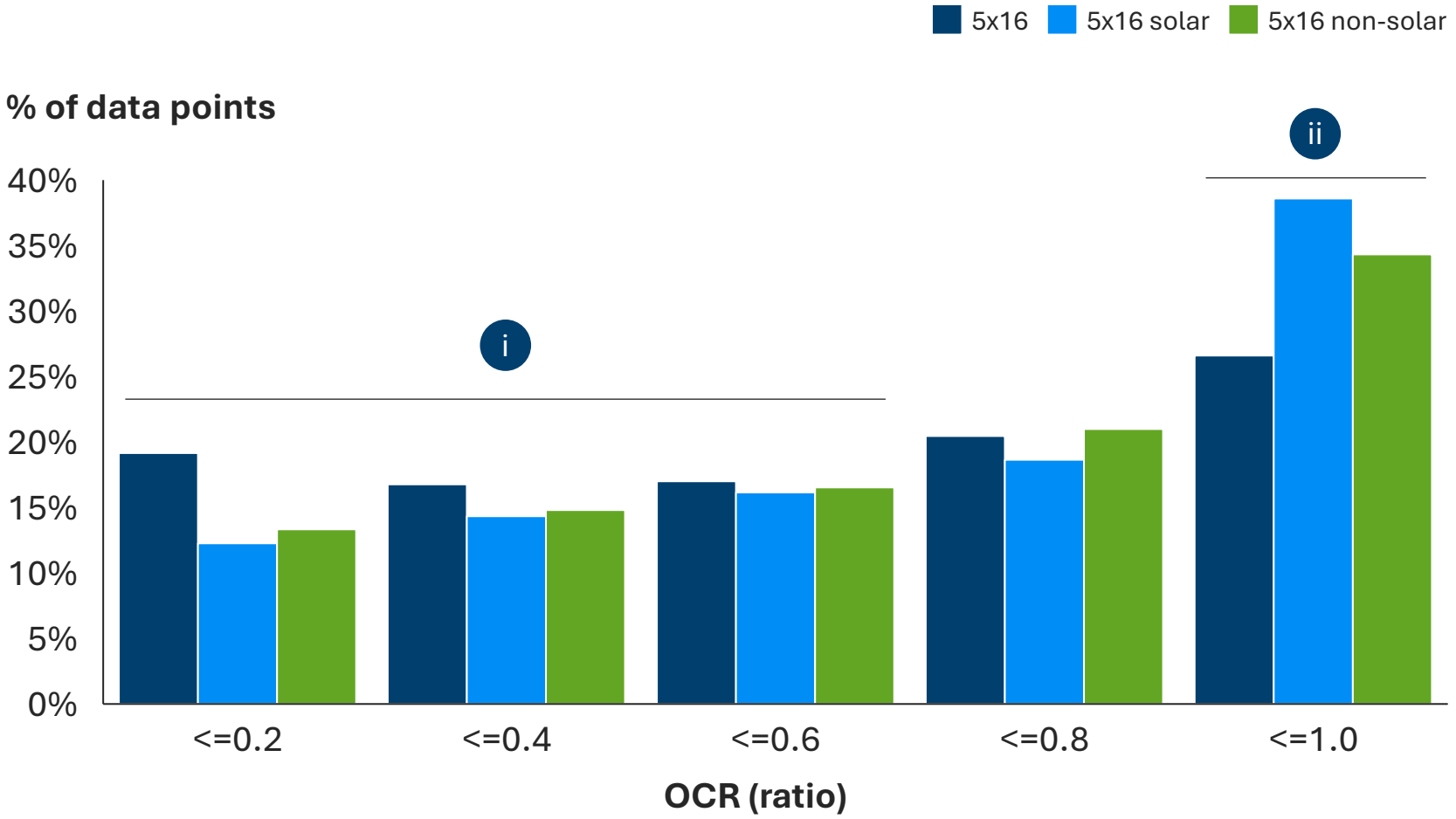
Y: CRR Option Revenue from B to A

Key Takeaway

- For each source/sink pair, **OCR is calculated** to determine **congestion variability**
- **OCR of 1** means **no directional change to congestion** within the month for a given sink/source pair; hence, **participants are likely to hedge with Obligation**
- OCR can be used as a **proxy for the congestion directional volatility** in the auction process as **higher the OCR more likelihood of Obligation being used** instead of Options

3. Limiting changing congestion pattern within a block increases overall OCR

Distribution of monthly average OCR by blocks[1], 2024



1. Obligation and Option for 626 source to sink (HB hub average) , Ratio was calculated at monthly granularity

Source: ERCOT DAM SPP

Key takeaway

- i 5x16 has higher instances with lower OCR, hence, higher likelihood of an Option being used by participants
  - Block 5x16 has ~10% more OCR < 0.6 compared to solar/non-solar block
- ii Splitting 5x16 into solar and non-solar, increases instances of no directional variability; hence, Obligation can be used
  - 5x16 solar has ~12 % and 5x15 non-solar has ~8% more instances where OCR = 1

Questions/Feedback

Appendix

Unit Congestion, CRR Obligation and Option scenario calculation

Hours	Generation (MW)	FTR (MW)	Source Price ($/MWh)	Sink Price ($/MWh)	Spread ($/MWh)	Unit Congestion ($)	Revenue Obligation ($)	Revenue Option ($)	Unit + Obligation ($)	Unit + Option ($)
1	0		45	25	20	0	0	0	0	0
2	0		45	25	20	0	0	0	0	0
3	0		45	25	20	0	0	0	0	0
4	0		45	25	20	0	0	0	0	0
5	0		45	25	20	0	0	0	0	0
6	0		45	25	20	0	0	0	0	0
7	0	35	45	25	20	0	-700	0	-700	0
8	6	35	45	25	20	120	-700	0	-580	120
9	28.5	35	25	25	0	0	0	0	0	0
10	39	35	25	25	0	0	0	0	0	0
11	39	35	15	25	-10	-390	350	350	-40	-40
12	37.5	35	15	25	-10	-375	350	350	-25	-25
13	37.5	35	15	25	-10	-375	350	350	-25	-25
14	39	35	15	25	-10	-390	350	350	-40	-40
15	37.5	35	15	25	-10	-375	350	350	-25	-25
16	34.5	35	15	25	-10	-345	350	350	5	5
17	21	35	15	25	-10	-210	350	350	140	140
18	3	35	45	25	20	60	-700	0	-640	60
19	0	35	45	25	20	0	-700	0	-700	0
20	0	35	45	25	20	0	-700	0	-700	0
21	0	35	45	25	20	0	-700	0	-700	0
22	0	35	45	25	20	0	-700	0	-700	0
23	0		45	25	20	0	0	0	0	0
24	0		45	25	20	0	0	0	0	0