Transmission Security in the Capacity Market
MMU Recommendations

Presented by:

Pallas LeeVanSchaick
Joe Coscia
NYISO Market Monitoring Unit
Potomac Economics

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Overview

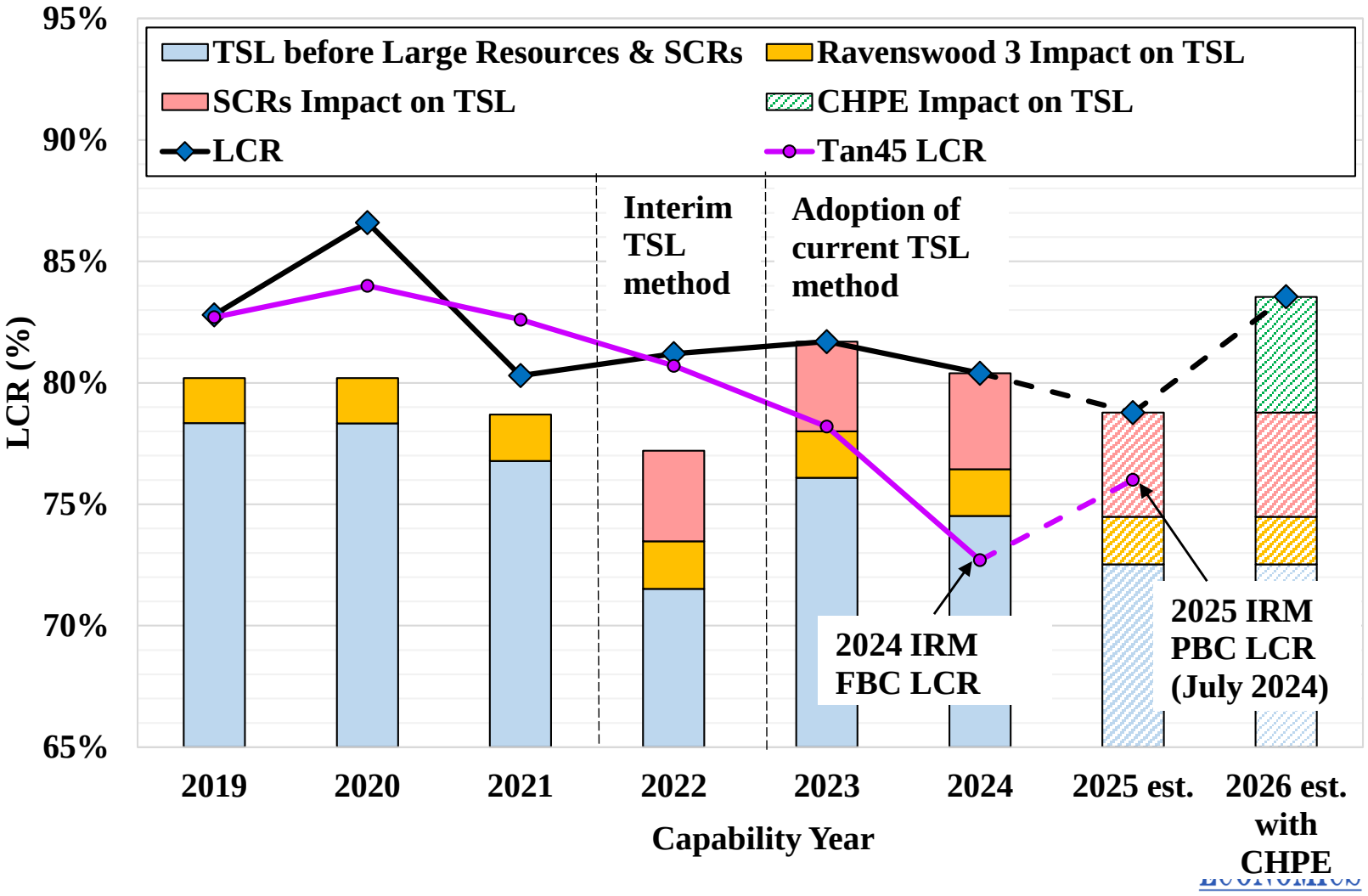
- Current market rules produce inefficient outcomes when LCRs are set based on transmission security limits (TSLs):
  - ✓ Current demand curves overvalue surplus capacity and set inefficiently high prices
  - ✓ Resources that don't help satisfy transmission security requirements are overcompensated
- This presentation discusses recommendations from our 2023 State of the Market[1] report to address these problems:
  - ✓ Use transmission security demand curves to appropriately value surplus capacity when LCRs are set by TSLs (#2023-4)
  - ✓ Pay capacity suppliers based on requirements they contribute to meeting (#2022-1)
- We estimate annual consumer savings of ~$380m with both recommendations

[1] See Section VIII.E of our 2023 SOM Report

LCR and TSL Background

- Locational capacity requirements (LCRs) are designed to satisfy reliability criteria:
  - ✓ **Resource Adequacy (RA):** probabilistic, satisfy 0.1 days/year LOLE criterion, use LCR Optimizer in GE-MARS
  - ✓ **Transmission Security (TS):** deterministic, secure against largest contingencies, spreadsheet calculation
- Capacity market LCRs are determined using LCR Optimizer subject to minimum value based on TS analysis ("TSL-floors")
- In recent years, LCRs increasingly set by TS requirements
  - ✓ TSL-floors are expected to increase further in coming years due to entry of resources that have lower TS value

Evolution of NYC LCR and TSL



Problems when LCR set by TSL

- **The accreditation of some resources exceeds their value in TS studies**
  - ✓ LCRs must be increased to offset the over-accreditation of these resources
  - ✓ Examples: SCRs, very large generator, offshore wind
  - ✓ These resources are over-compensated and lack incentives to improve TS value

- **Prices are inefficiently high when there is surplus capacity**
  - ✓ LCR at TSL-floor *already* secures against very unlikely scenario
  - ✓ Additional surplus likely has little value
  - ✓ Current demand curves set inefficiently high prices for surpluses

See Section VIII.E of our 2023 SOM Report

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Recommendations Related to Transmission Security in the Capacity Market

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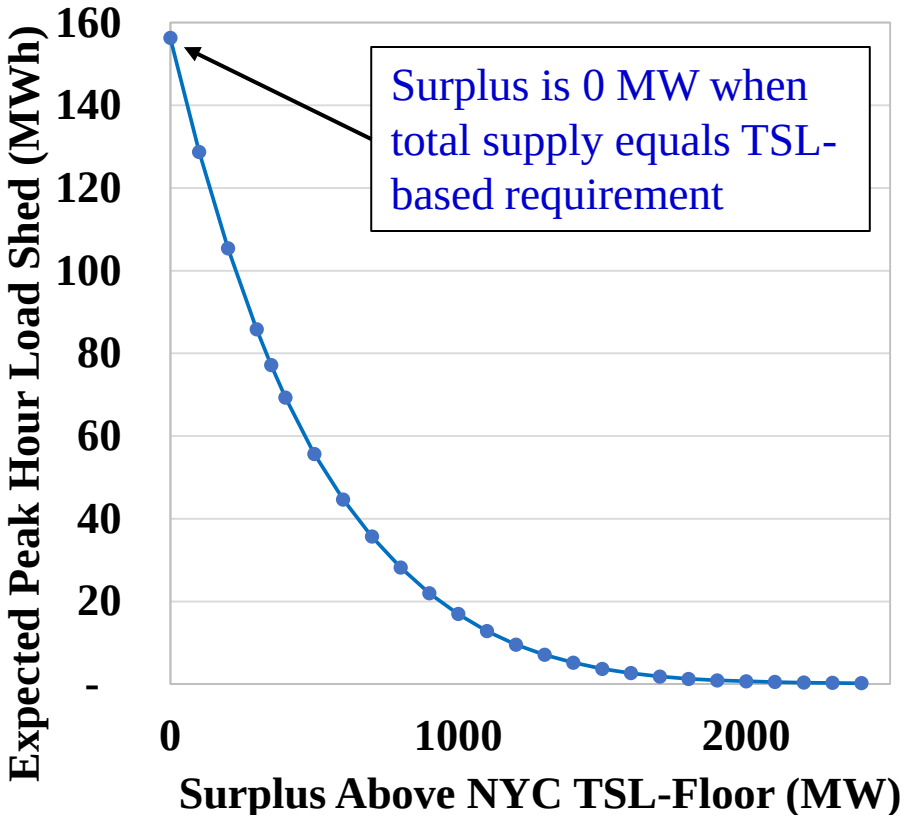
Overview of Transmission Security Recommendations

- **Pay resources for capacity based on requirements they contribute to meeting (2022-1)**
  - ✓ Eliminates overpayment to resources that drive up transmission security requirements
- **Implement sloped demand curves that reflect the marginal value of capacity for transmission security (2023-4)**
  - ✓ Avoids excessively high prices caused by applying current demand curves to LCRs set by transmission security
- These recommendations are complementary and should be adopted together
  - ✓ The remaining slides explain both recommendations and their interaction

Recommendation #2023-4
Determining TS Demand Curves

- TS Demand Curve shape should reflect value of additional surplus towards reliability needs addressed by TS
- TS analysis considers:
  - ✓ Deterministic contingencies
  - ✓ 'Credible combinations' of other system conditions
    - Load, generator outages, intermittent output, etc
- Surplus capacity has incremental value for TS if more severe 'credible combinations' are plausible
  - ✓ Construct demand curve by calculating conditional expected load shed at each surplus level in TS contingency scenario
  - ✓ This value is sharply diminishing because baseline TS analysis already considers an extreme scenario

Recommendation #2023-4
Illustration of TS Demand Curve Shape



- Model peak hour considered in TS analysis
- Model distribution of load forecast and gen outages
- Calculate conditional unserved energy given design contingencies have occurred and total supply satisfies TSL-floor
- Expected load shed is positive because load and outage values may exceed assumptions from TS analysis

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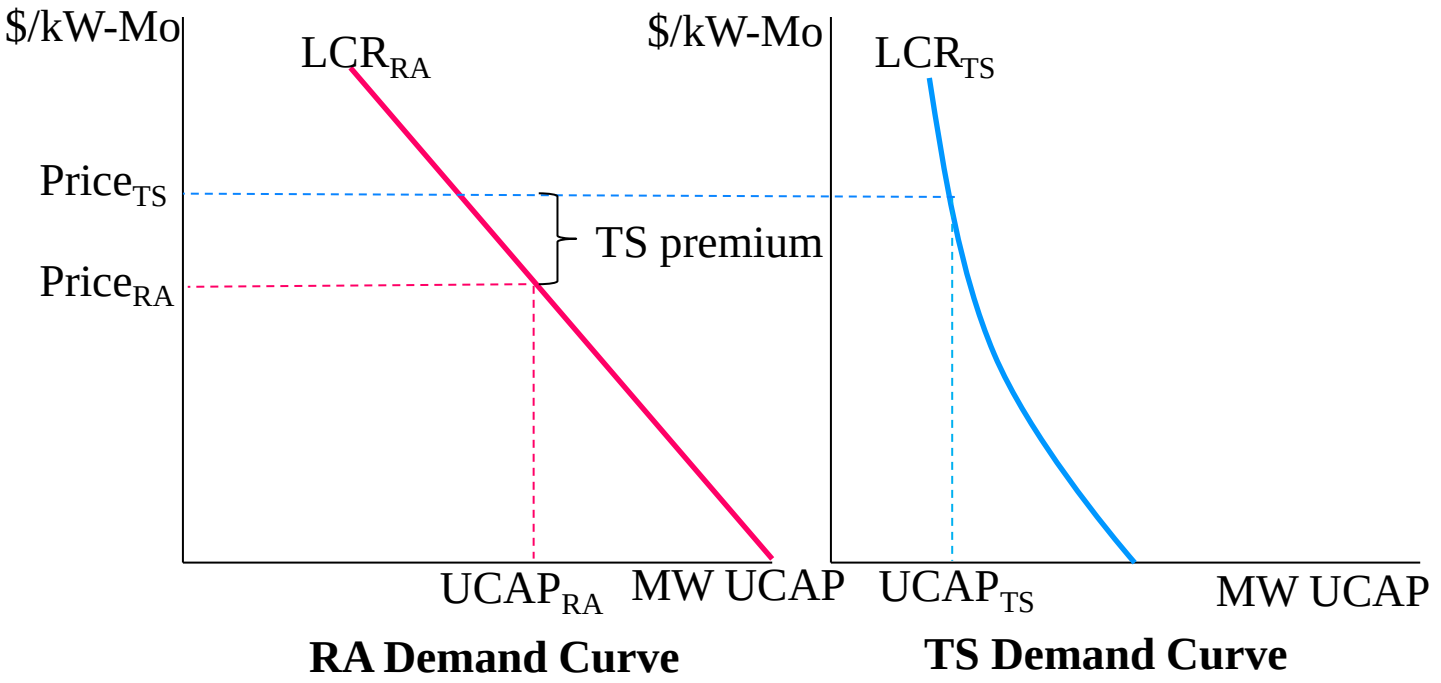
Implementing Recommendation #2022-1

- **Overview**: determine RA and TS prices using separate demand curves with appropriate shapes. Pay each resource based on its contribution to each requirement and the corresponding price.
- **Key steps:**
  - ✓ Determine separate LCRs for RA and TS
  - ✓ Determine separate resource UCAP values for RA and TS
  - ✓ Clear spot market for both RA and TS demand curves and supply quantities, resulting in two prices
  - ✓ Pay each resource a two part rate:

    (RA UCAP MW · RA price) + (TS UCAP MW · TS Premium)

    where TS Premium = TS Price – RA Price

Illustration of Spot Auction Implementing Both Recommendations



Resource X is paid:

- RA UCAP $MW_x \cdot Price_{RA}$, plus
- TS UCAP $MW_x \cdot$ TS Premium

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Additional Design Details

- How to determine RA LCRs
- What ICAP/UCAP translation is used for demand curves
  - ✓ Needs to consider lower TS UCAP compared to RA UCAP for some resources
- Treatment of resources with greater TS UCAP than RA UCAP
  - ✓ Ensure that all resources are fully compensated based on the value they provide to all requirements
- Determination of winter and summer demand curves
- **We discuss these topics in the Appendix to this presentation**

Estimated Impact of Proposals

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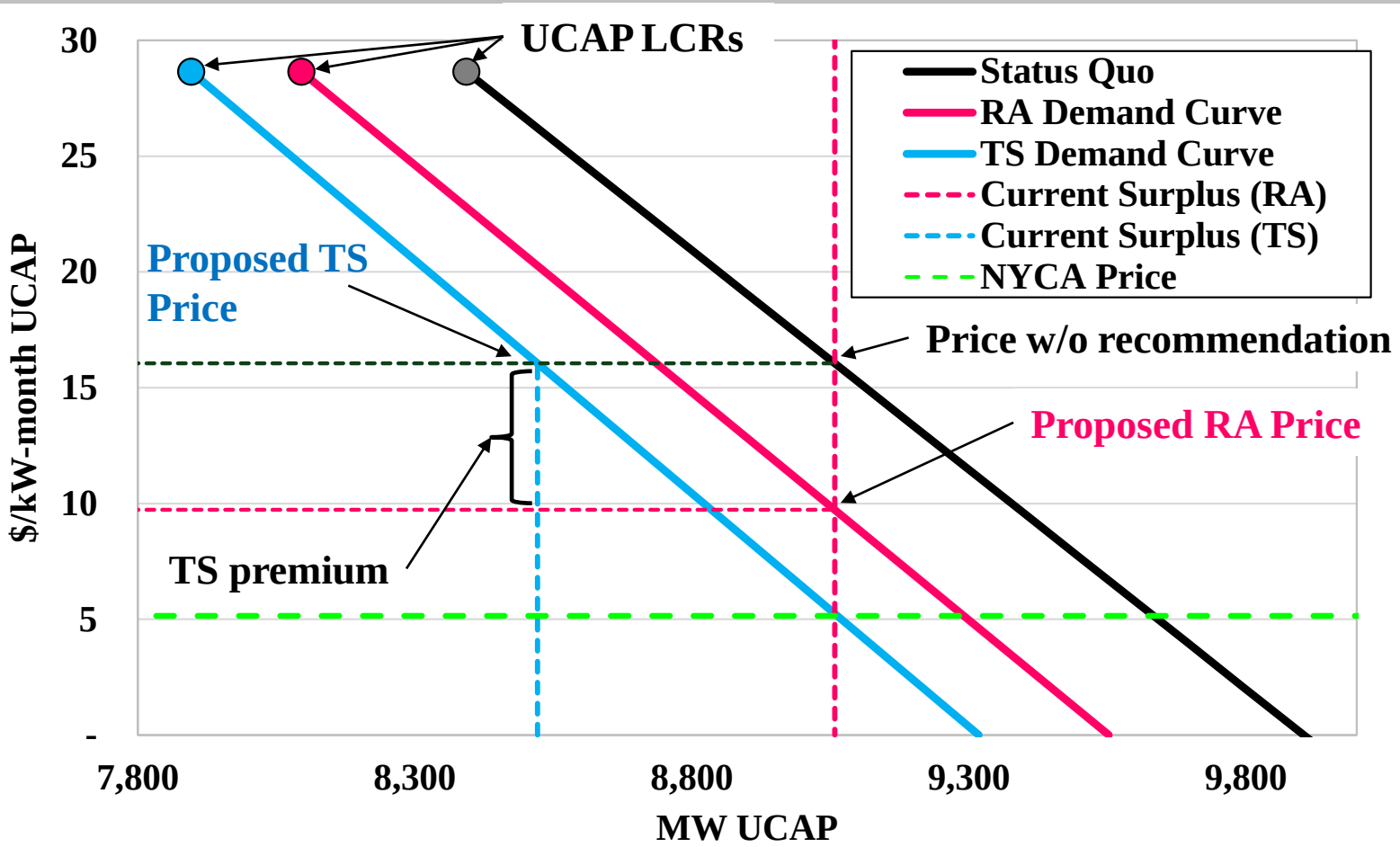
Consumer Impact Assumptions

- We estimated the potential change in consumer payments in recent market conditions if both recommendations were implemented.
- Key assumptions:
  - ✓ 78.8% TS LCR in NYC based on 2025/26 prelim LCR
  - ✓ 76.0% RA LCR for NYC based on 2025 IRM PBC Tan45
  - ✓ Current resource mix (~7.9% surplus in NYC)
  - ✓ DC reference points based on DCR preliminary recommendation
  - ✓ TS demand curve shape estimated by MMU using 2025/26 TSL floor assumptions, using method described on slide 9
  - ✓ Average NYC locality derating factor 4.6% (RA), 10.3% (TS)
- **Slide 15 shows summer prices in NYC with only Rec #2022-1. Slide 16 shows prices with both recommendations.**

Estimated Summer Demand Curves and Prices

Rec. #2022-1 Only – New York City



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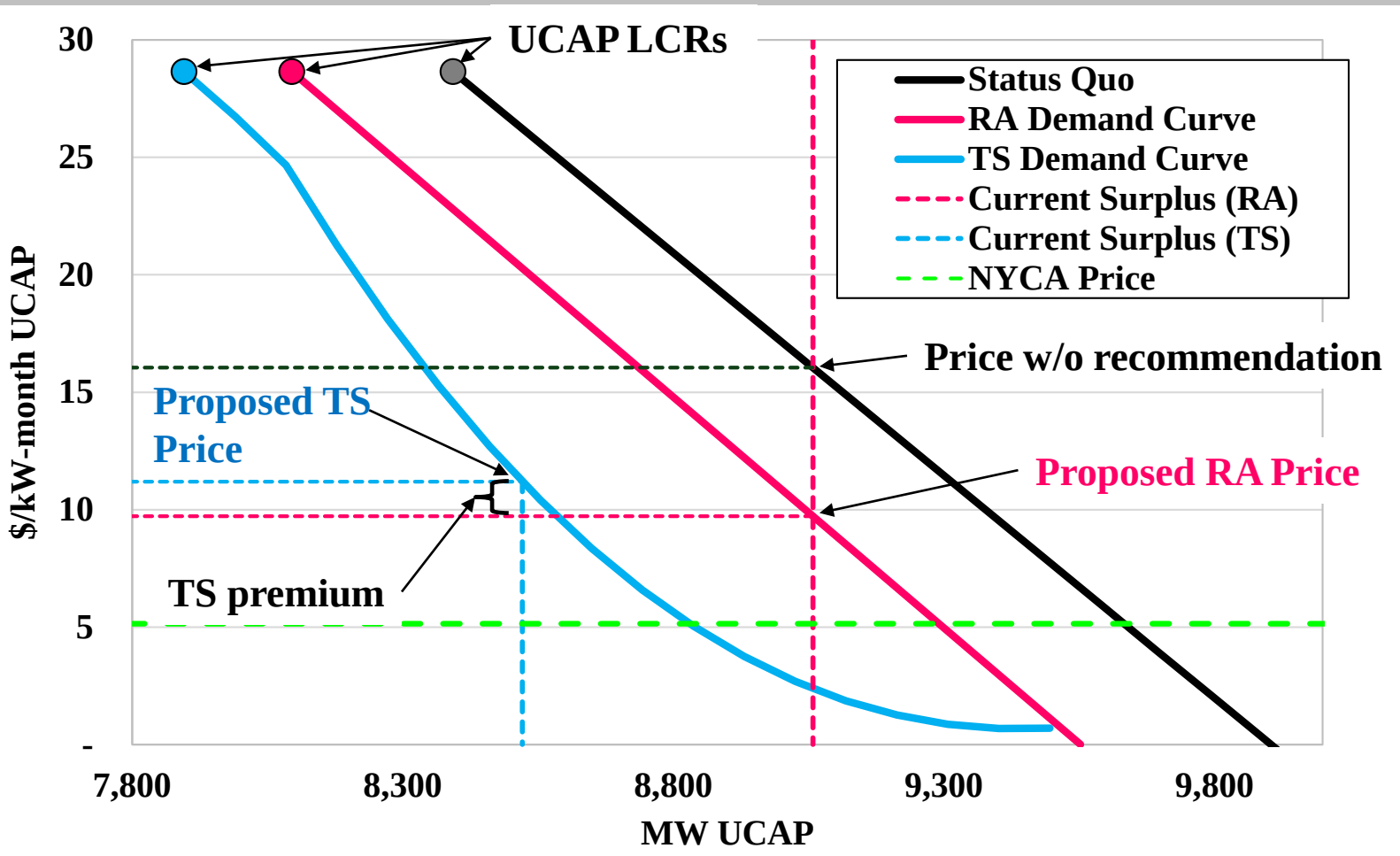
Estimated Summer Demand Curves and Prices

Both Recommendations – New York City



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Summary of Outcomes

- Annual 2025/26 NYC capacity payment impact: **$380m (30%)**
  - ✓ Includes elimination of $33m overpayment to SCRs and large-contingency resources (Rec. #2022-1)
- At current surplus, prices fall by $6.3 summer and $1.4 winter

Prices ($/kW-mo)	Summer	Winter
Status Quo	$16.05	$7.32
TS Price (proposal)	$11.19	$5.48
RA Price (proposal)	$9.72	$1.70

- Entry of CHPE and offshore wind will increase both TSL and capacity surplus, leading to larger cost savings under proposal

Conclusions

- To improve efficiency of capacity market outcomes when LCRs are set by TSL-floors, we recommend to:
  - ✓ Pay each resource based on the requirements it contributes to meeting (#2022-1)
  - ✓ Use TS demand curves to appropriately value surplus capacity when LCRs are set by TSL-floors (#2023-4)
- Adopting these recommendations will:
  - ✓ Reduce consumer payments without compromising reliability
  - ✓ More efficiently signal the locations and types of capacity that improve system reliability

Appendix
Detailed Design Considerations

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Potential Process to Determine RA LCRs

Considerations:

- RA LCR in a locality with binding TSL-floor should reflect optimal capacity requirement in the absence of any TSL-floors
- Avoid setting RA LCRs such that LOLE < 0.1 if capacity is equal to max of RA LCRs and TS LCRs (e.g. requirements targeted by market)

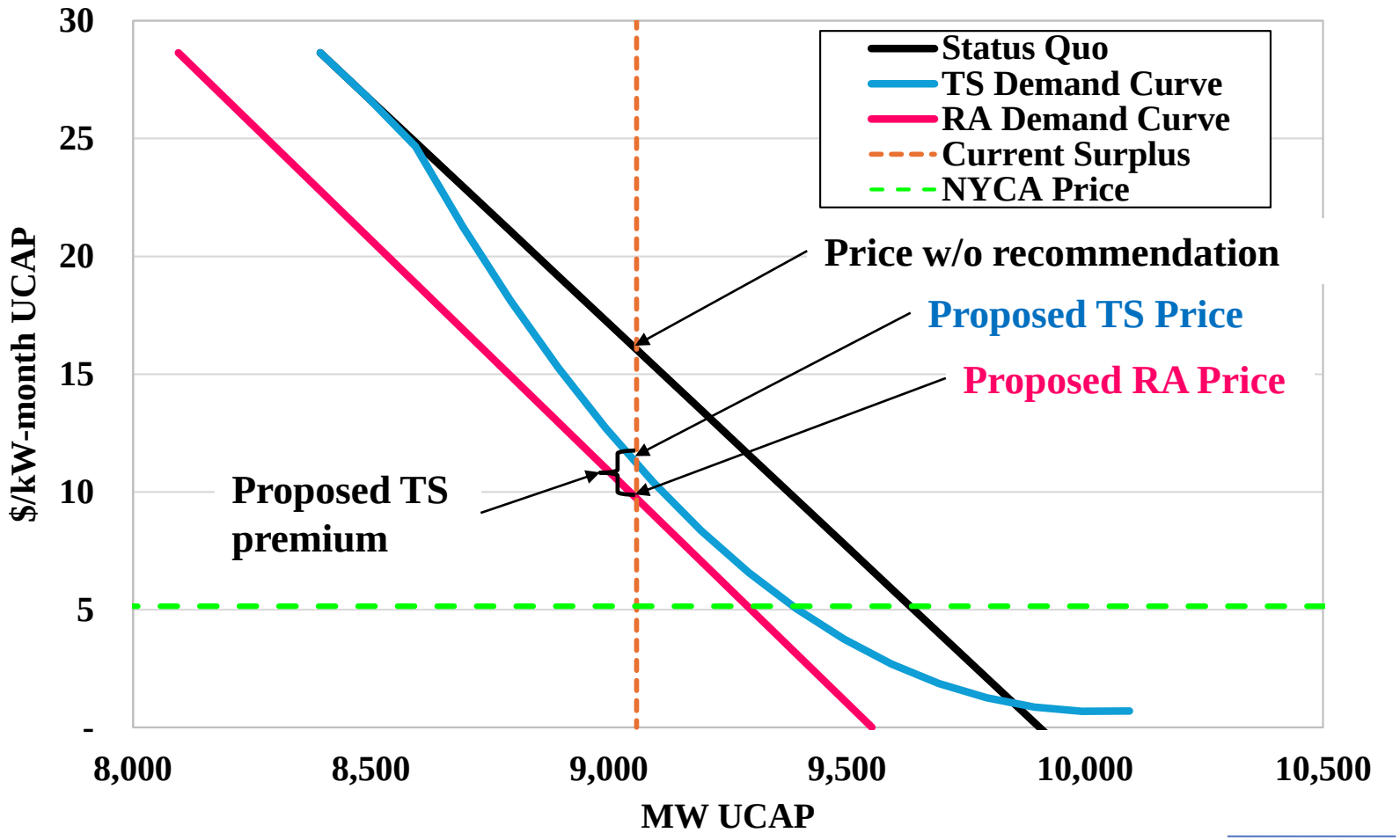
Detailed Process:

1. NYCA IRM is set based on NYSRC IRM process
2. TS LCRs are set at TSL-floor for all localities
3. Determine initial RA LCRs using LCR Optimizer with TSLs enforced
   a) For localities that are not set at TSL-floor, this is the final RA LCR
4. If (3) sets any LCR at TSL-floor:
   a) Rerun LCR Optimizer without TSLs enforced. For areas with LCRs set at the TSL in (3), final RA LCR is the minimum of the Optimizer result from this step and the TSL-floor

Translating to UCAP Demand Curves

- Single UCAP Method
  - ✓ Translate both RA and TS demand curves to UCAP using existing (RA-based) UCAP ratings
  - ✓ Apply settlement adjustment to payments of resources with different RA and TS contributions
    - This is necessary because some resources have RA UCAP values that exceed their TS contributions
- Multiple UCAP Method
  - ✓ Determine $UCAP_{RA}$ and $UCAP_{TS}$
    - $UCAP_{RA}$ uses existing methods, $UCAP_{TS}$ reflects assumed contribution in TS analysis
  - ✓ Translate RA and TS demand curves to UCAP separately and clear using resources' respective $UCAP_{RA}$ and $UCAP_{TS}$ ratings
- Both methods produce similar market outcomes and settlements
  - ✓ The examples on Slides 15 and 16 use the Multiple UCAP method. The following slide shows the same example using the Single UCAP method

Estimated Summer Demand Curves and Prices
New York City



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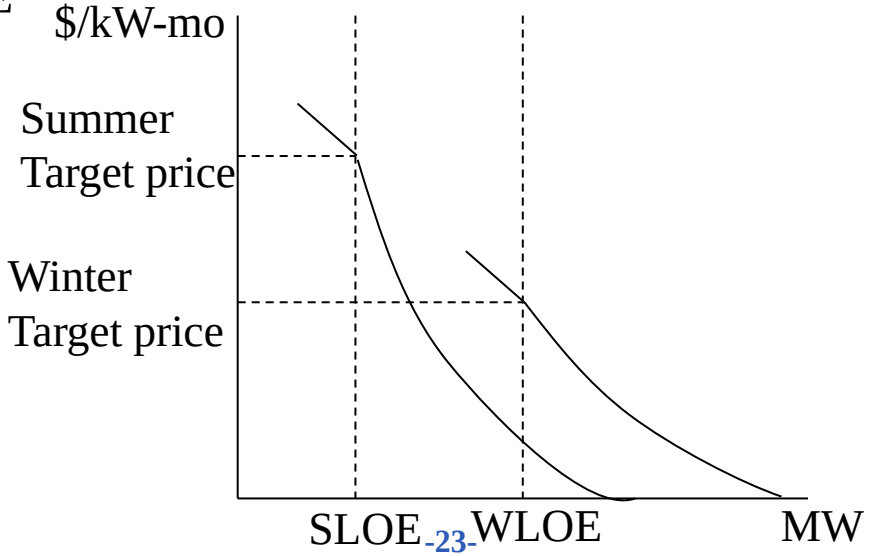
Summer and Winter TS Demand Curves

- Under recently approved Seasonal Reference Point framework, current demand curves target seasonal shares of the demand curve unit's annual reference value to be recovered at "SLOE" and "WLOE" surplus levels
  - ✓ WLOE considers demand curve unit size and winter-summer ratio
- We propose to calculate TS demand curves such that price is equal to the target seasonal revenue at SLOE or WLOE, and points to the right are derived from the relative TS value at that surplus compared to SLOE/WLOE



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Proposed Combined Process (1)

1. Determine ICAP requirements:
   a) For TS: based on TSL-floors
   b) For RA: using LCR Optimizer without TSL-floors
2. Determine $UCAP_{TS}$ and $UCAP_{RA}$ for all resources:
   a) For TS: using value attributed to resource in TS analysis
   b) For RA: using CAF and resource-specific derating factors under existing procedures
3. Determine UCAP requirements and demand curves for RA and TS using average ICAP/UCAP ratio
   a) Use existing demand curve shape for RA and proposed TS demand curve shape for TS
4. Determine $Price_{RA}$ and $Price_{TS}$ ($/kW-mo UCAP) by intersection of UCAP supply and demand curve for RA and TS separately

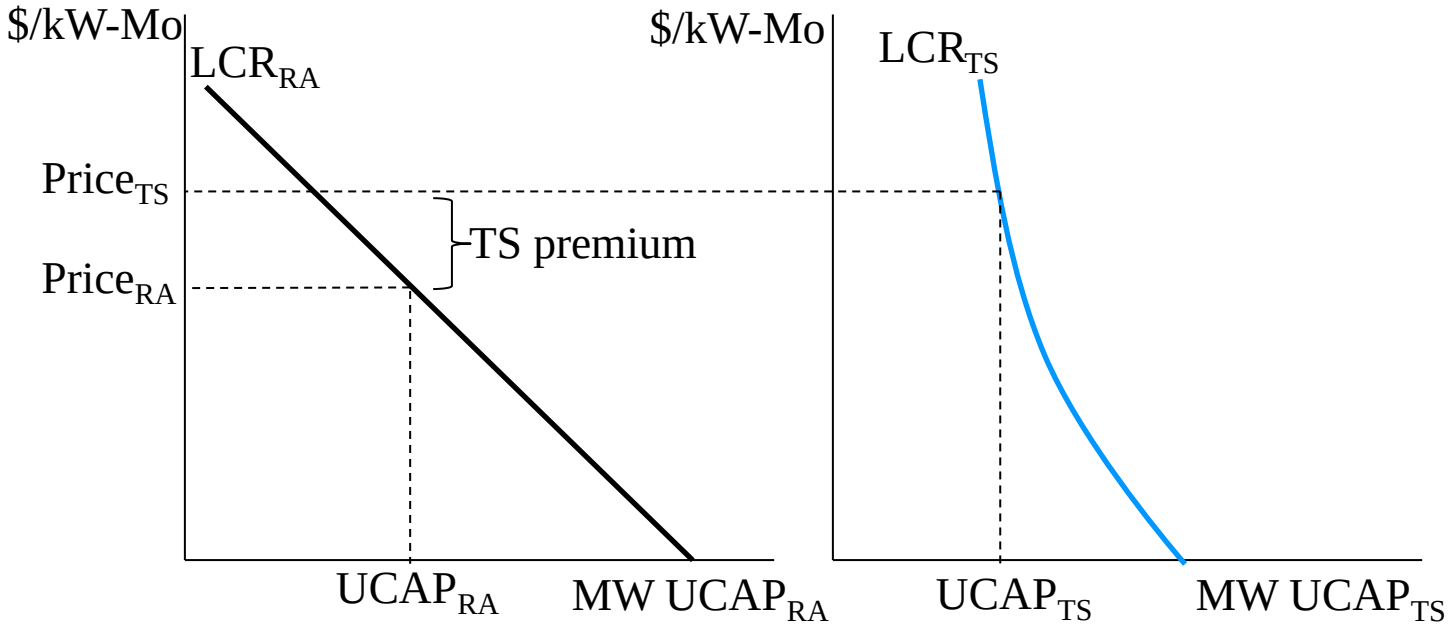
Proposed Combined Process (2)

5. Determine payments to suppliers:
   a) Each supplier earns the highest price among requirements (RA and TS) it contributes to meeting
   b) When the TS price exceeds the RA price, suppliers with lower TS value are paid based on their RA value plus their TS contribution times the TS price premium

Payment for an individual supplier:

$$\text{Max}[\text{UCAP}_{RA} \cdot \text{Price}_{RA} + \text{UCAP}_{TS} \cdot \text{Max}(0, \text{Price}_{TS} - \text{Price}_{RA}),$$
$$\text{UCAP}_{TS} \cdot \text{Price}_{TS} + \text{UCAP}_{RA} \cdot \text{Max}(0, \text{Price}_{RA} - \text{Price}_{TS})]$$

Illustration with TS Price Premium



Example resource payments:

- Conventional resource with same $UCAP_{RA}$ and $UCAP_{TS}$: $Price_{TS} \cdot UCAP_{TS}$
- SCR: $Price_{RA} \cdot UCAP_{RA}$
- Large-contingency unit or intermittent resources with lower TS value:
  $Price_{RA} \cdot UCAP_{RA}$ + TS Premium * $UCAP_{TS}$

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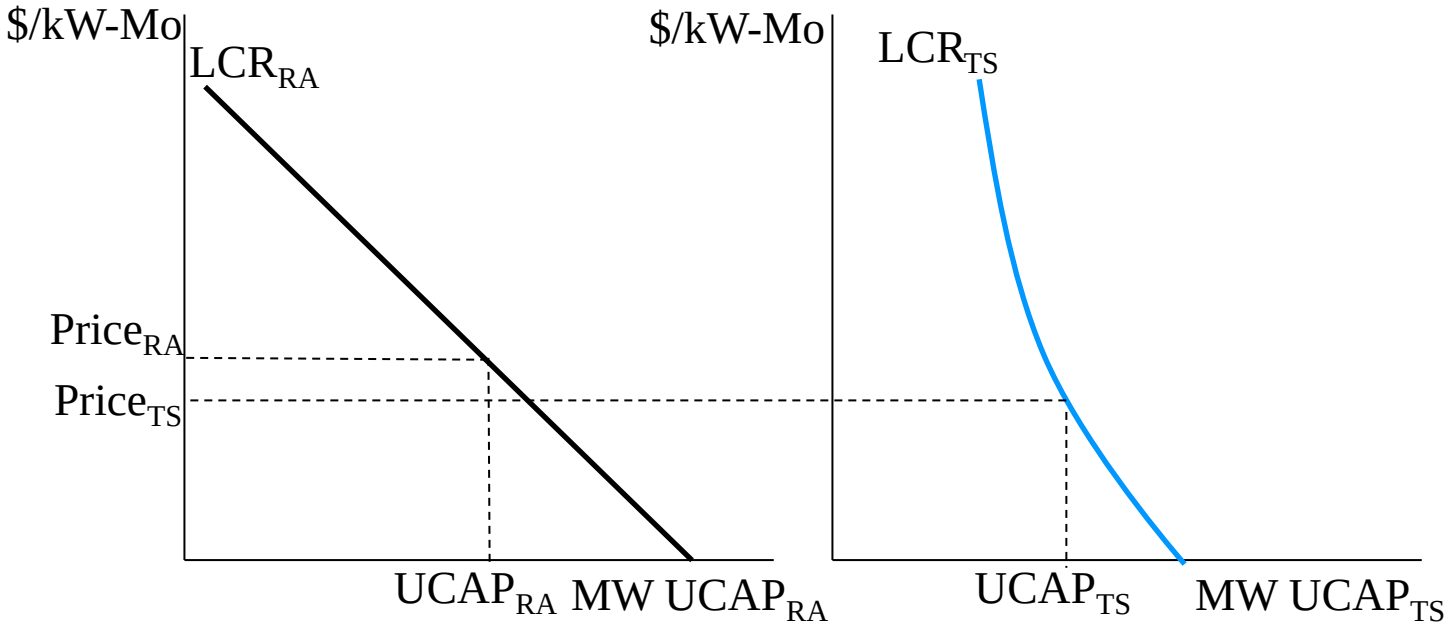
Illustration with No TS Price Premium



Example resource payments:

- Conventional resource with same $UCAP_{RA}$ and $UCAP_{TS}$: $Price_{RA} \cdot UCAP_{RA}$
- SCR: $Price_{RA} \cdot UCAP_{RA}$
- Large-contingency unit or intermittent resources with lower TS value: $Price_{RA} \cdot UCAP_{RA}$

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