Integrating Public Policy: The ICAP Market - Preliminary Findings

Meghan Castellano
Nathaniel Gilbraith, Ph.D.

Installed Capacity Working Group
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Agenda

- **Overview of the Integrating Public Policy Project and Phase 2**
  - IPP Project Description
  - Phase 2 Market Impact Assessment
- **ICAP Assumptions Overview**
- **Preliminary ICAP Results**
- **Discuss Potential Sensitivities**
- **Next steps**

Background

Date	Working Group	Discussion points and links to materials
08-17-16	Business Issue Committee (BIC)	First discussion of the possibility of an Integrating Public Policy Project
09-12-16	Budget & Priorities Working Group (BPWG)	Presentation of stakeholder feedback, proposed scope of the project
10-19-16	Market Issues Working Group (MIWG)	Presentation providing more detail on the scope and timeline of the project
11-22-16	Market Issues Working Group (MIWG)	Presentation updating project status -- consultant selection and goals of Phases 1 and 2
12-14-16	Market Issues Working Group (MIWG)	Consultant's Project Introduction and solicitation of input (Phase 1)
01-31-17	Market Issues Working Group (MIWG)	Integrating Public Policy Update (Phases 1 and 2)
2-16-17	Market Issues Working Group (MIWG)	Phase 2: Study Description and Assumptions Review
3-28-17	Market Issues Working Group (MIWG)	Phase 2: Study Description and Assumption Update
4-24-17	Market Issues Working Group (MIWG)	Phase 2: Preliminary DAM Results
06-01-17	Installed Capacity Working Group (ICAPWG)	Phase 2: ICAP Study Description and Assumptions
6-21-17	Market Issues Working Group (MIWG)	Phase 2: Real-time Study Description and Assumptions

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Overview of the Integrating Public Policy Project

With a focus on the Market Impact Assessment (Phase 2)

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Integrating Public Policy

Integrating Public Policy Project

The Brattle Group Work

PHASE 1: Incorporating the Cost of Carbon Study Study whether incorporating a state policy defined cost of carbon in the wholesale market would improve the overall efficiency of the NYISO energy and capacity markets

NYISO Work

PHASE 2: Market Impact Assessment Study the impacts of decarbonization goals on the current NYISO energy and capacity markets from the high penetration of low carbon or carbon-free resources

PHASE 3: Market Rule Assessment Study whether other market products or changes to the existing market structure will be necessary to meet the anticipated reliability needs

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Phase 2: Market Impact Assessment

- Today's presentation is focused on the capacity market and the effect of additional renewable capacity given today's ICAP market design and market rules
- NYISO's goal is to provide stakeholders with information regarding potential market dynamics related to the incorporation of additional renewable resources
  - This information will provide insight into what will be needed for the Phase 3: Market Rule Assessment
- The NYISO is evaluating these market dynamics with renewable resource additions sufficient to meet the CES goal of 50% renewable by 2030
- This study is not a planning study
  - The NYISO is considering only existing market rules and designs (i.e., will not consider potential market rules changes that might occur in the future)
  - The NYISO is considering only existing transmission (i.e., will not consider assumptions related to new or upgraded transmission)
- The study uses existing energy and capacity market tools.

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ICAP Assumptions Overview

Base Case Assumptions

- **Market parameters and conditions representative of current market conditions**
  - 2017 ICAP reference points, NYCA Minimum Installed Capacity Requirement, Locational Minimum Installed Capacity Requirements (LCRs), ICAP Load forecast, ICAP Demand Curves' respective zero crossing points
  - Estimated ICAP to UCAP translation factors
  - Representative levels of Generation, SCRs, UDRs, imports and exports, unoffered and unsold ICAP

Modeling the effect of additional renewable resources on the ICAP market

- ✓ **Identify the additional resources**
  - Quantity
  - Location
  - Characteristics (e.g., Unforced Capacity as a percentage of ICAP)
- ✓ **Model the effect of these resources on resource adequacy requirements**
  - Installed Reserve Margin (IRM)
  - LCRs
- ✓ **Model the effect of these resources on peak demand**
  - ICAP Load forecast
- ✓ **Model the effect of these resources on Demand Curve parameters**
  - Demand Curve reference points
    - Net Energy and Ancillary Services revenues of the Demand Curve peaking unit (i.e. $0/kW-y)
    - Winter-to-Summer ratio
  - NYCA and Locality translation factors

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‘Study Case’ Assumptions

- **Keep the same existing generation, SCR, UDR, capacity imports, exports, and unoffered, unsold capacity as the base case**
- **Add incremental renewable capacity, similar to the approach in the IPP - energy market study**
  - The intent is to have the same resources modeled in both the energy market and capacity market studies
  - The primary source of projections for the quantity and location of qualified CES renewable generation is the NYSDPS Final Supplemental Environmental Impact Statement (“Final EIS”) in CASE 15-E-0302 using the “Blend Base Case” http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={424F3723-155F-4A75-BF3E-E575E6B0AFDC}
  - Start with nameplate capacity values as ICAP and then convert into UCAP (*i.e.*, the product transacted in the NYISO ICAP market)

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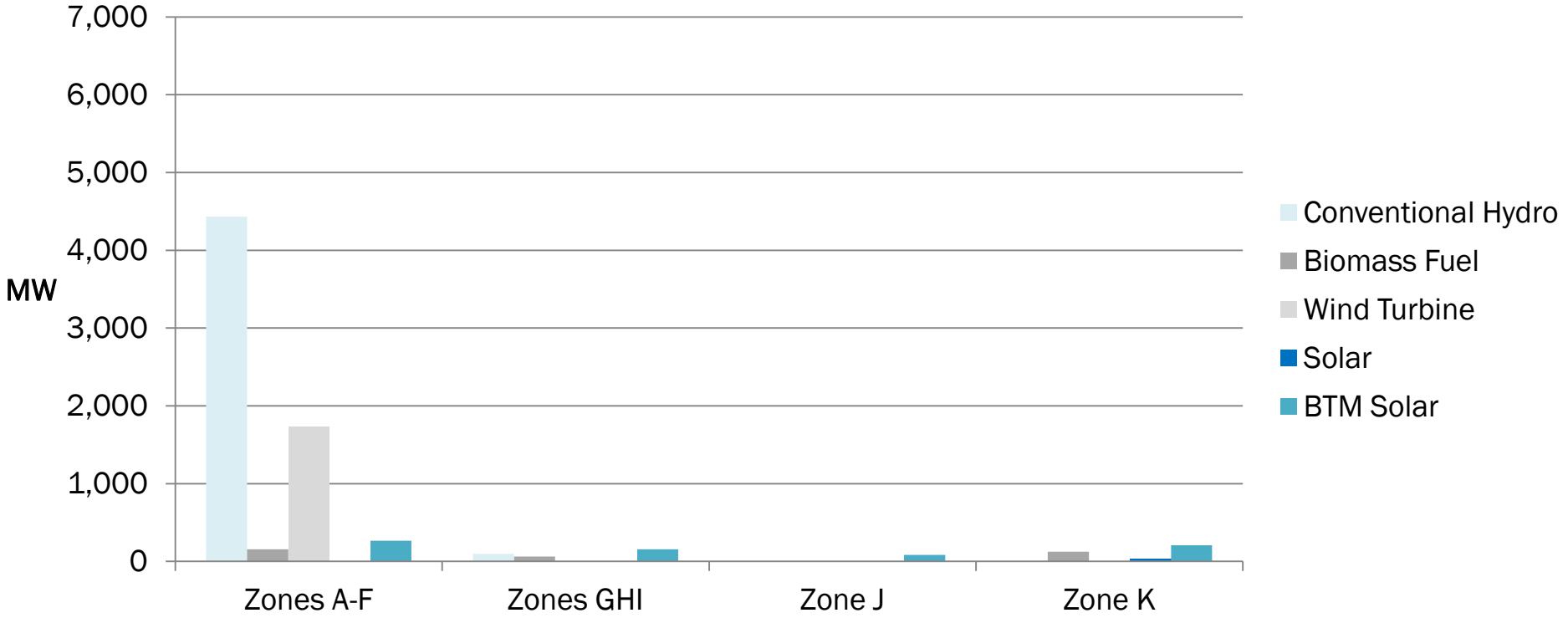
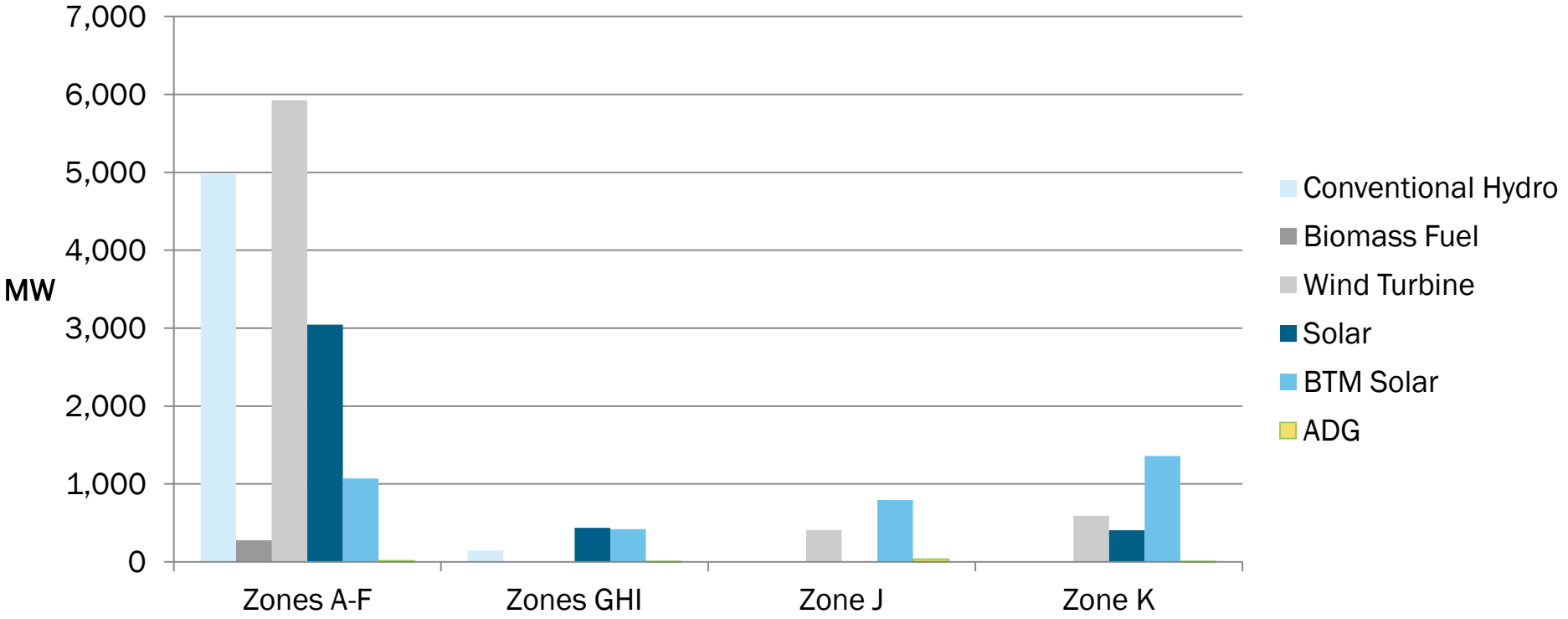
Renewable Capacity from the 2017 Gold Book (*i.e.*, Base Case)



BTM solar MW are consistent with values presented at 3/28 and 4/24 MIWG meetings

Renewable Capacity in the Study Case



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Study Case ICAP to UCAP derating factors

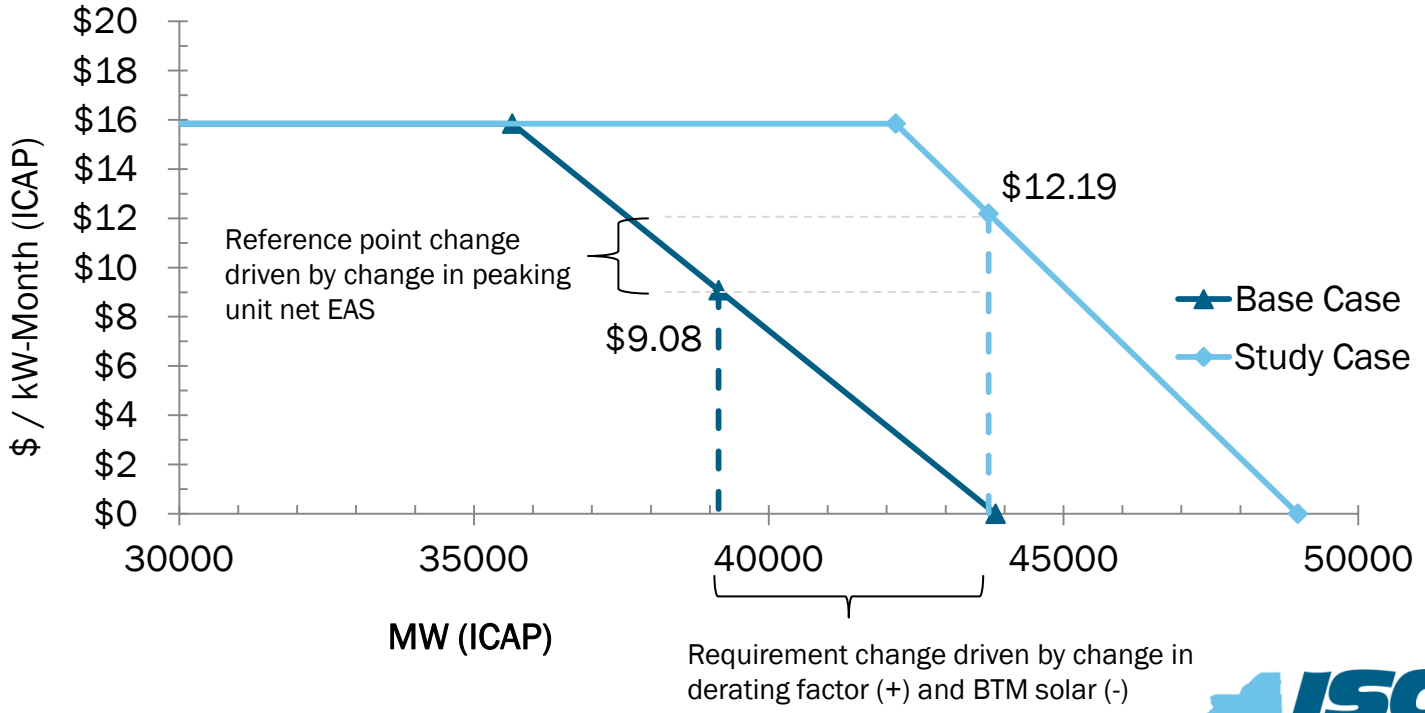
Resource	Summer DF	Winter DF	Source
On-shore wind	0.90	0.70	ICAP Manual, pg. 4-23
Off-shore wind	0.62	0.62	ICAP Manual, pg. 4-23
Solar (utility scale and BTM)	0.54	0.98	ICAP Manual, pg. 4-25
Run-of-River Hydro	0.50	0.40	Approximate NYCA average
Biomass/Landfill Gas	0.40	0.40	Approximate NYCA average

Preliminary ICAP Results

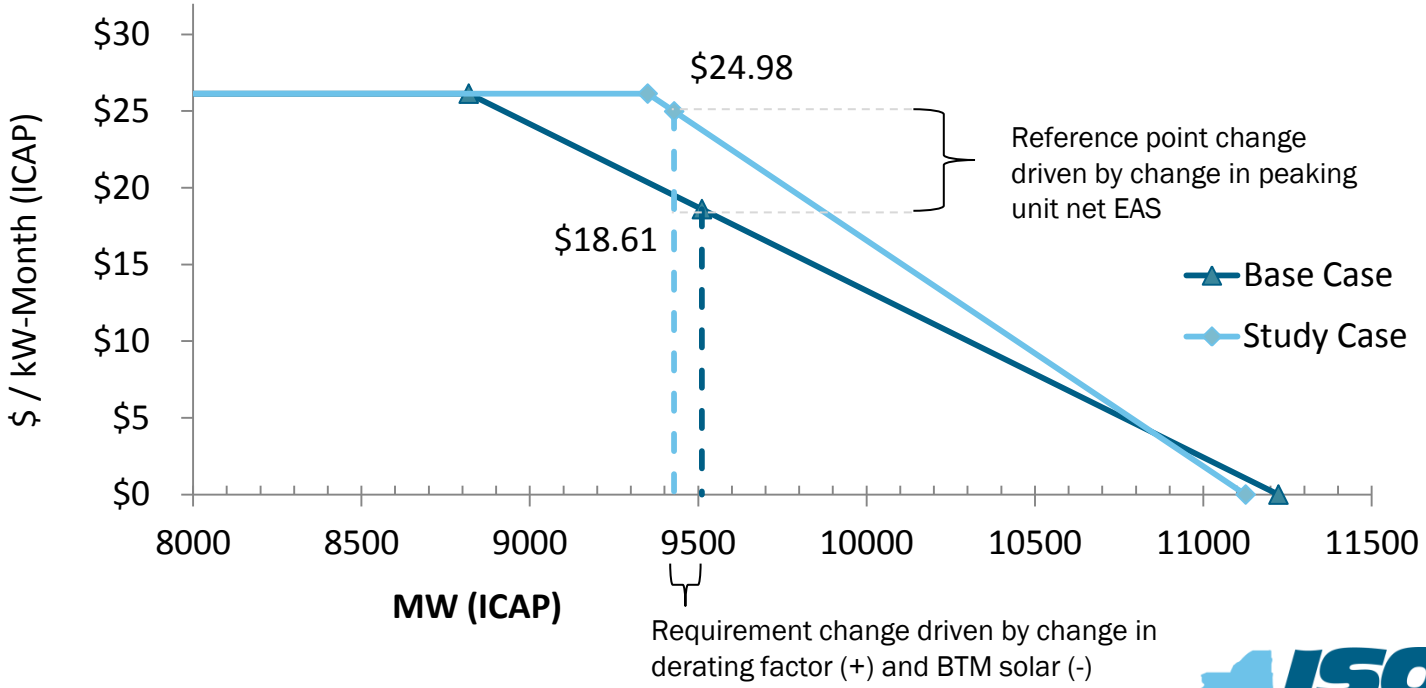
Effect of Incremental Renewable Resources – ICAP Demand Curves

- **ICAP reference points increased**
  - Driven by the use of the assumption that the Demand Curve peaking unit receives 0$/kW-y net EAS
- **ICAP minimum requirements increased for the NYCA, remained nearly flat for the Localities**
  - Adding renewable resources increases the derating factor (locational EFORd) and thus increases the requirement
  - Adding BTM solar decreases peak load and thus decreases the requirement
- **Demand Curves became steeper**
  - Driven by higher reference points
- **The NYCA and NYC ICAP Demand Curves are shown on the next slides**
  - Other Locality Demand Curves are shown in the appendix

NYCA ICAP Demand Curves



New York City ICAP Demand Curves



Effect of Incremental Renewable Resources – UCAP Demand Curves

- **The NYCA and Locality derating factors increased**
  - Renewable resources tended to have above average individual derating factors, which increased the location-wide average derating factor
  - Derating factor changes were similar for the Summer and Winter Capability Periods
- **Brief review of UCAP calculations**
  - UCAP Ref. Point = ICAP Ref. Point / (1 – derating factor)
    - In practice, UCAP Ref. Point is higher than ICAP Ref. Point
  - UCAP Req. = ICAP Req. * (1 – derating factor)
    - In practice, UCAP Req. is lower than ICAP Req.
- **Absent BTM solar, UCAP requirements would have remained relatively stable**
  - UCAP Requirements fell in all locations largely due to BTM solar
- **UCAP reference points increased in all locations due to the higher derating factors**
- **The next slides show the NYCA UCAP Demand Curve**
  - Locality UCAP Demand Curves are in the Appendix

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NYCA Demand Curve Parameters

	Units	Base - Summer	Study Case - Summer	Delta	Base - Winter	Study Case - Winter	Delta
Load Forecast 2017	MW	33,177.8	31,503.5	-1,674.3	Same as Summer		
IRM/LCR Percentage	%	118.0%	138.8%	20.8%			
ICAP Reference Point	$/kW-mo_ICAP	$9.08	$12.19	$3.10			
ICAP/UCAP Derating Factor	%	9.68%	21.58%	11.90%	7.90%	20.95%	13.06%
UCAP Reference Point	$/kW-mo_UCAP	$10.05	$15.54	$5.50	$9.86	$15.42	$5.60
UCAP Requirement	MW_UCAP	35,361.4	34,290.5	-1,070.9	36,058.8	34,565.0	-1,493.8
Demand Curve ZCP	%	112.0%	112.0%	0.0	Same as Summer		
UCAP at $0	MW_UCAP	39,604.8	38,405.4	-1,199.4	40,385.9	38,712.8	-1,673.1
Demand Curve Slope	($/kW-mo_UCAP)/100MW_UCAP	$(0.2369)	$(0.3778)	$(0.1409)	$(0.2278)	$(0.3718)	$(0.1440)

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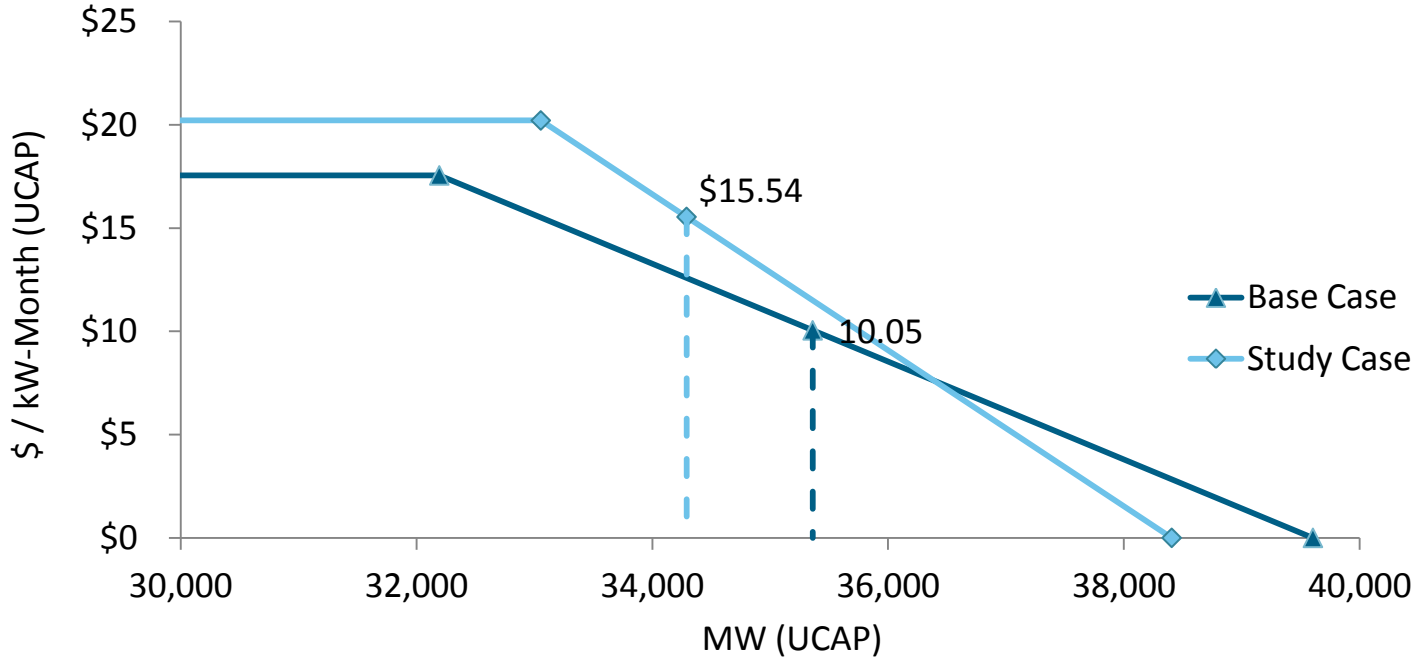
NYCA UCAP Demand Curves



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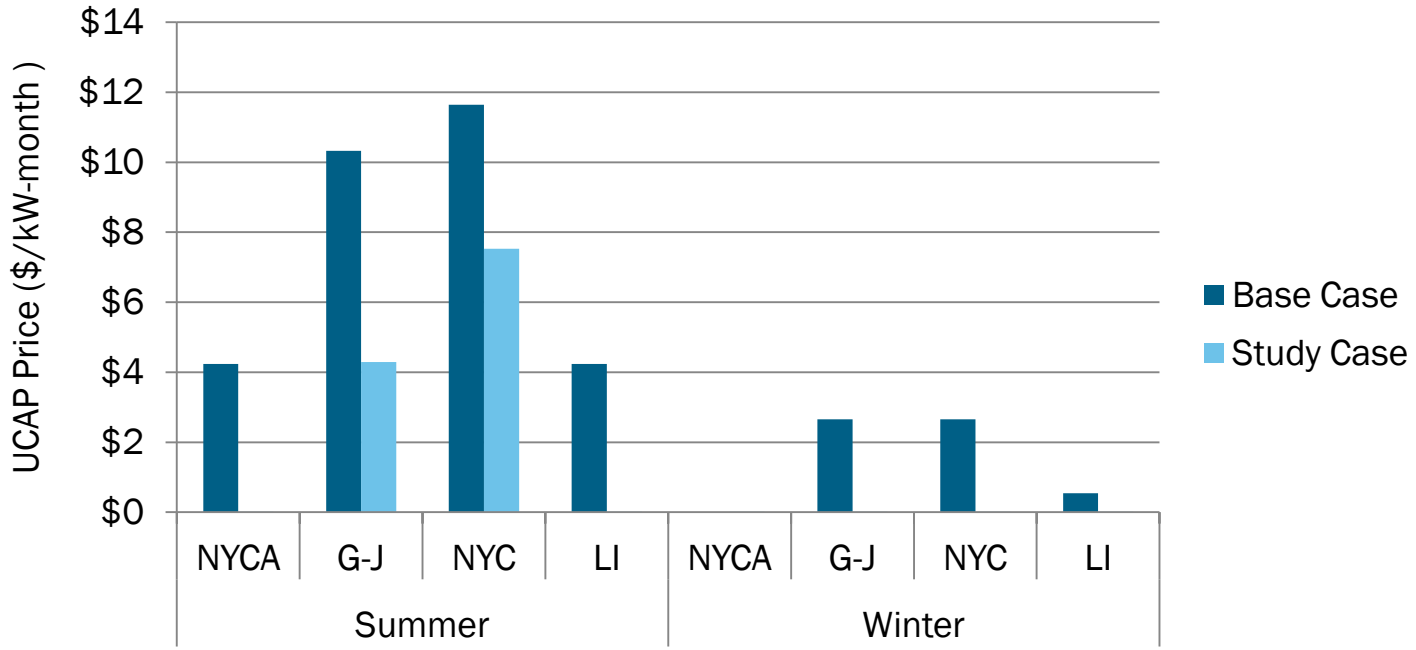
Market dynamics

- **Summer supply and demand balances shift most dramatically in the NYCA and Long Island**
  - Due to additional MW of renewable capacity (both wholesale and BTM) in these locations
- **Winter supply exceeds the zero crossing point in all locations**

UCAP Price in the Base and Study Cases



Sensitivity Cases Being Considered

- NYISO estimates for various parameters were based on currently available information
- Sensitivities are being considered to test potentially uncertain or important parameters
  - Sensitivity to off-shore wind resource capacity factors
  - Sensitivity of LCRs to incremental renewable capacity
  - Renewable resource derating factor (e.g., BTM solar)
    - Current derating factor method is based on resource performance during the previous year
- Assess the feasibility of performing a capacity exit sensitivity

Next steps

- Select and perform sensitivities
- Present final results and sensitivities to stakeholders
- Write draft whitepaper

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system

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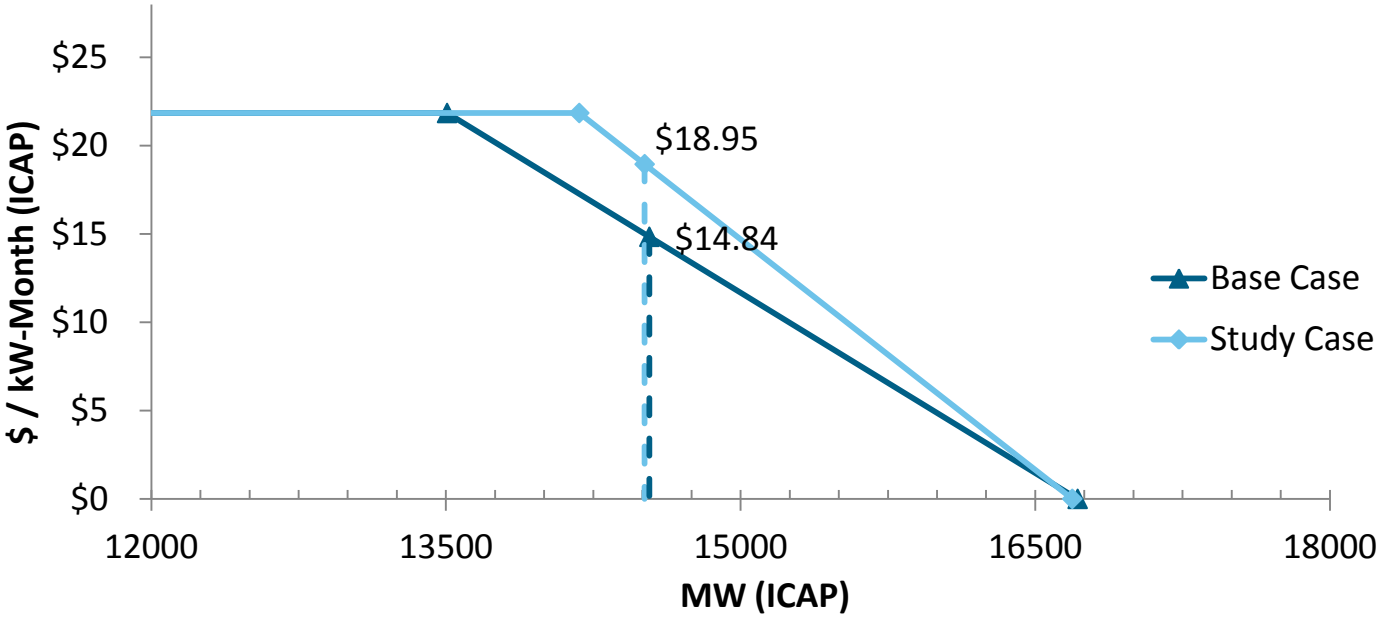
Appendix

ICAP Demand Curves

G-J Locality ICAP Demand Curves



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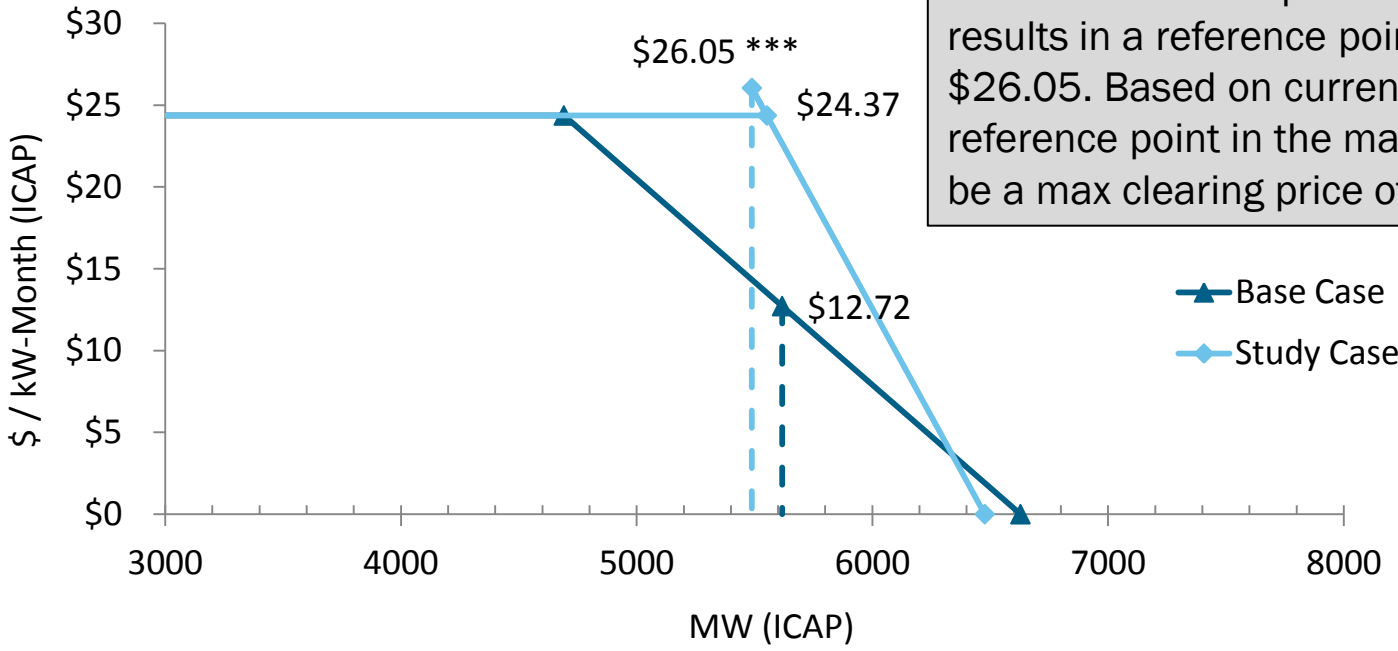
Long Island ICAP Demand Curves



***The reference point formula results in a reference point of $26.05. Based on current rules, the reference point in the market would be a max clearing price of $24.37

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Long Island ICAP Demand Curves

- The reference point exceeds the max clearing price due to the $0/kW-y net EAS assumption used and the effect of accounting for the level of excess in the reference point formula

UCAP Demand Curves

New York City UCAP Demand Curves

	Units	Base - Summer	Study Case - Summer	Delta	Base - Winter	Study Case - Winter	Delta
Load Forecast 2017	MW	11,670.0	11,305.3	-364.7			
IRM/LCR Percentage	%	81.5%	83.4%	1.9%	Same as Summer		
ICAP Reference Point	$/kW-mo_ICAP	$18.61	$24.98	$6.4			
ICAP/UCAP Derating Factor	%	4.36%	6.75%	2.39%	5.29%	7.40%	2.11%
UCAP Reference Point	$/kW-mo_UCAP	$19.46	$26.79	$7.3	$19.65	$26.98	$7.3
UCAP Requirement	MW_UCAP	9,096.0	8,792.2	-303.8	9,008.4	8,731.2	-277.2
Demand Curve ZCP	%	118.0%	118.0%	0.0	Same as Summer		
UCAP at $0	MW_UCAP	10,733.3	10,374.8	-358.5	10,629.9	10,302.8	-327.1
Demand Curve Slope	($/kW-mo_UCAP)/100MW_UCAP	$(1.1885)	$(1.6927)	$(0.5042)	$(1.2117)	$(1.7164)	$(0.5047)

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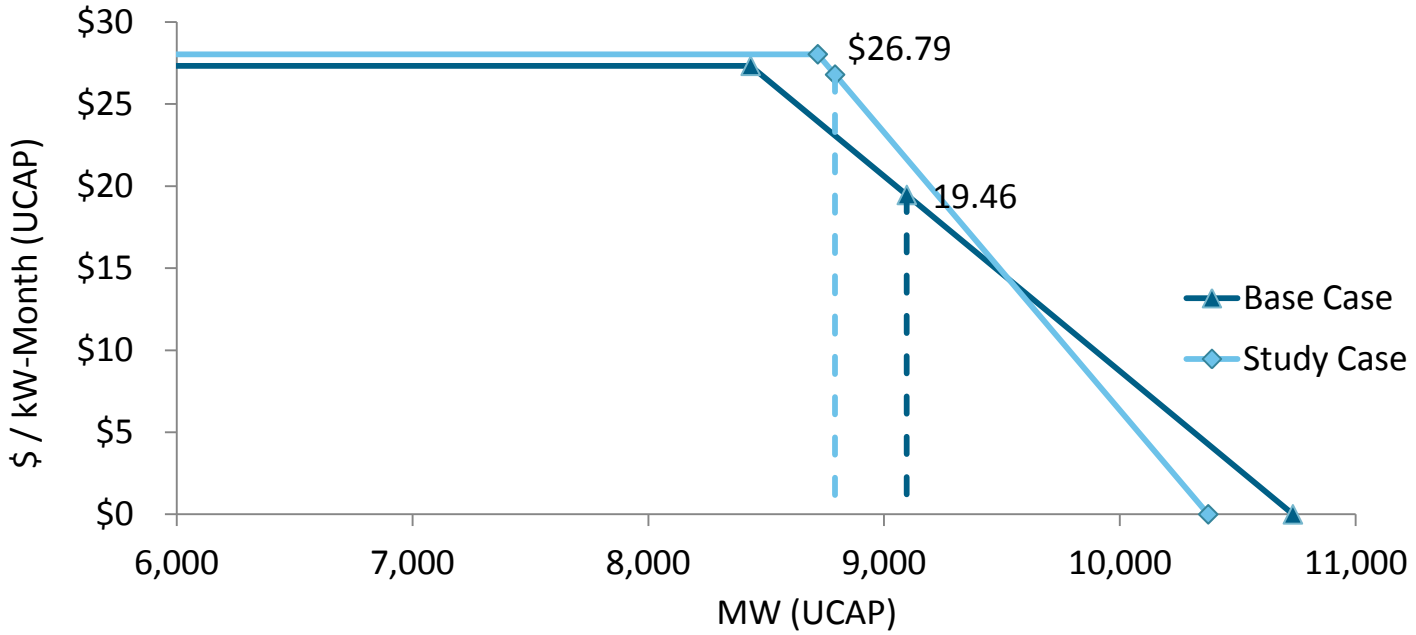
New York City UCAP Demand Curves



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G-J Locality UCAP Demand Curves

	Units	Base - Summer	Study Case - Summer	Delta	Base - Winter	Study Case - Winter	Delta
Load Forecast 2017	MW	16,061.3	15,503.9	-557.4	Same as Summer		
IRM/LCR Percentage	%	90.5%	93.6%	3.1%			
ICAP Reference Point	$/kW-mo_ICAP	$14.84	$18.95	4.1			
ICAP/UCAP Derating Factor	%	7.34%	10.22%	2.87%	5.69%	9.53%	3.84%
UCAP Reference Point	$/kW-mo_UCAP	$16.02	$21.11	5.1	$15.74	$20.95	5.2
UCAP Requirement	MW_UCAP	13,468.1	13,029.2	-438.9	13,708.2	13,128.8	-579.4
Demand Curve ZCP	%	115.0%	115.0%	0.0	Same as Summer		
UCAP at $0	MW_UCAP	15,488.3	14,983.6	-504.7	15,764.4	15,098.1	-666.3
Demand Curve Slope	($/kW-mo_UCAP)/100MW_UCAP	$(0.7928)	$(1.0799)	$(0.2871)	$(0.7653)	$(1.0636)	$(0.2984)

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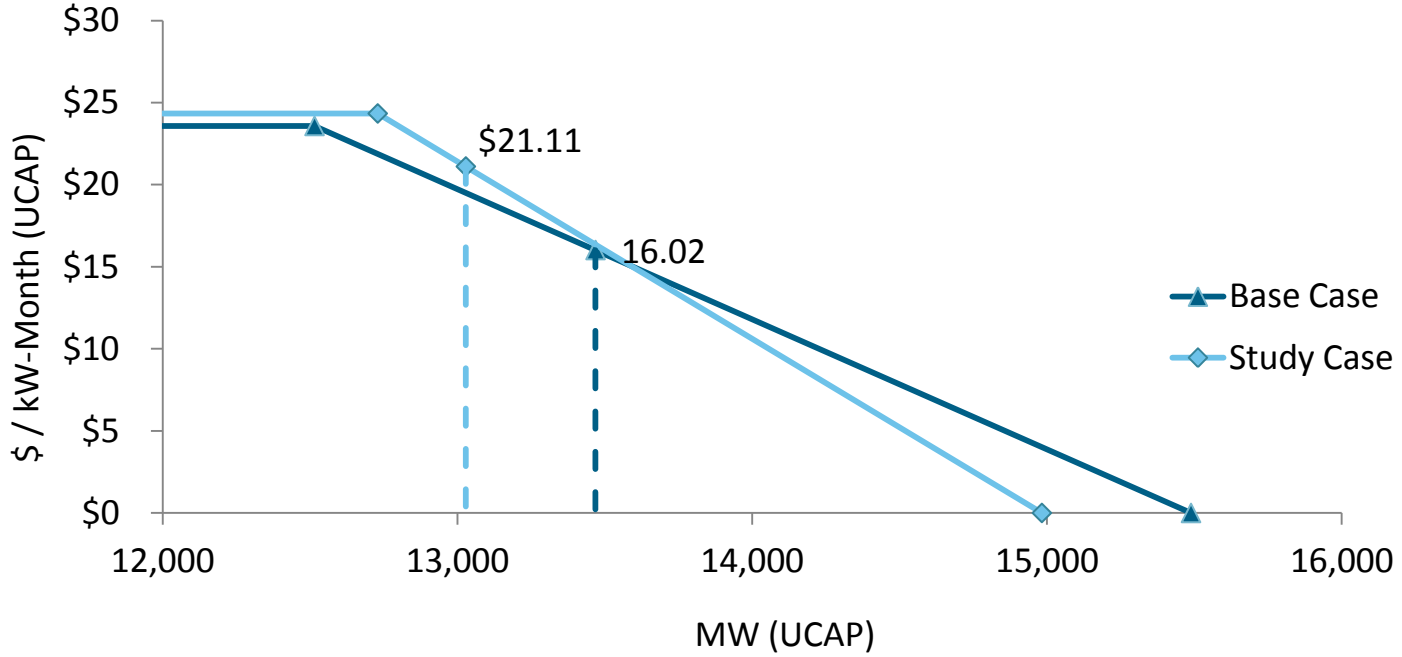
G-J Locality UCAP Demand Curves



Long Island UCAP Demand Curves

	Units	*Base - Summer*	*Study Case - Summer*	*Delta*	*Base - Winter*	*Study Case - Winter*	*Delta*
Load Forecast 2017	MW	5,427.1	4,802.1	-625.0			
IRM/LCR Percentage	%	103.5%	114.3%	10.8%	Same as Summer		
ICAP Reference Point	$/kW-mo_ICAP	$12.72	$26.05	13.3			
ICAP/UCAP Derating Factor	%	6.90%	14.58%	7.69%	6.91%	16.51%	9.59%
UCAP Reference Point	$/kW-mo_UCAP	$13.66	$30.50	16.8	$13.66	$31.20	$17.5
UCAP Requirement	MW_UCAP	5,229.6	4,688.3	-541.3	5,228.7	4,582.7	-646.0
Demand Curve ZCP	%	118.0%	118.0%	0.0	Same as Summer		
UCAP at $0	MW_UCAP	6,170.9	5,532.2	-638.7	6,169.9	5,407.6	-762.3
Demand Curve Slope	($/kW-mo_UCAP)/100MW_UCAP	$(1.4514)	$(3.6139)	$(2.1625)	$(1.4519)	$(3.7824)	$(2.3305)

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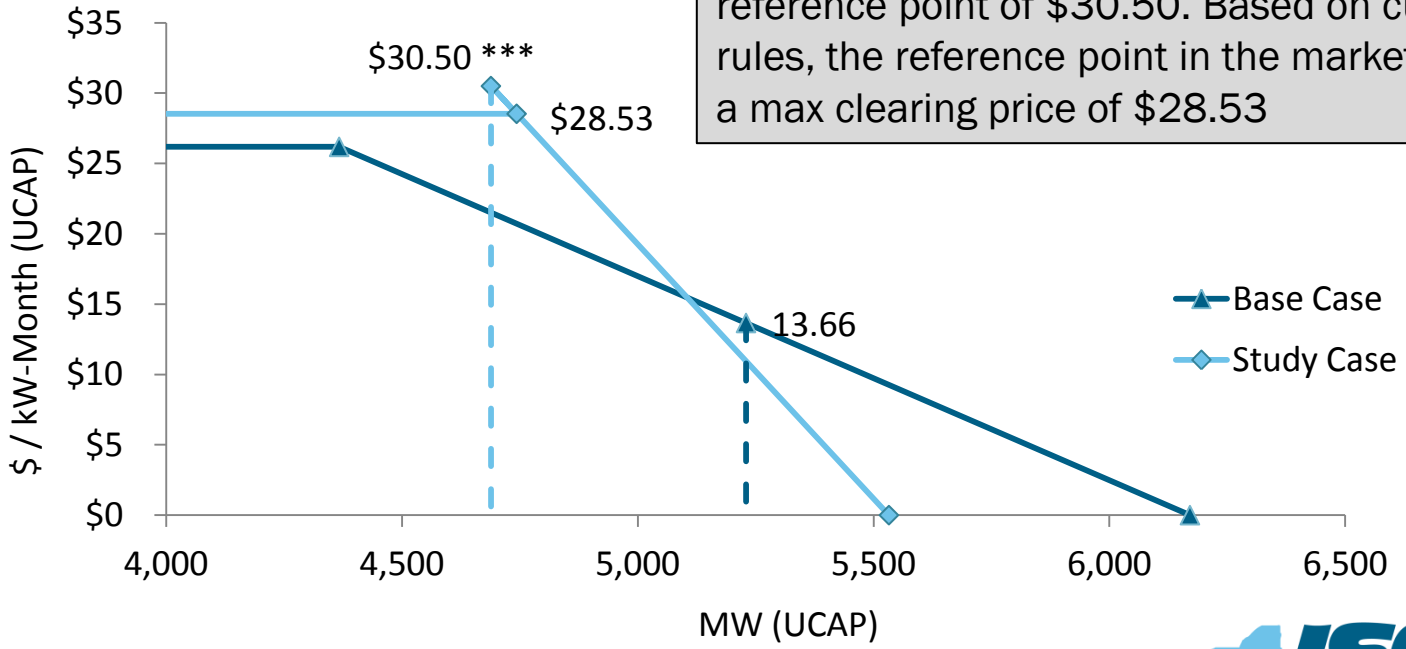
Long Island UCAP Demand Curves

***The reference point formula results in a reference point of $30.50. Based on current rules, the reference point in the market would be a max clearing price of $28.53



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Long Island UCAP Demand Curves

- The reference point exceeds the max clearing price due to the $0/kW-y net EAS assumption used and the effect of accounting for the level of excess in the reference point formula