# New York State Resource Planning Analysis

## Draft – For Discussion Only

**Presentation to the NYISO's Electric System Planning Working Group**

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Wes Hall, General Electric

**October 25th 2016**

# Background and Assumptions

# Background

**New York State Department of Public Service initiated a State Resource Planning (SRP) study to examine the effects of various public policies on the State's bulk power system**

- **Study Goals:**
  - Evaluate the mix of resources (generation, transmission, and DER) that will need to be deployed by 2030 to meet various public policies and regulations while maintaining reliability.
  - Two initial policy drivers: EPA Clean Power Plan and New York State Energy Plan
  - CES mandate "50 by 30" requiring 50% of electric energy by 2030 be produced by renewable resources added as a subsequent policy driver
  - Identify bulk power system and other upgrades that would be required to maintain a reliable bulk power system
- **Study Participants:**
  - NYDPS, NYSERDA, NYDEC, NYISO, NYDOS (UIU) and NYTOs
- **Consultants**:
  - GE – Transfer Analysis (TARA), Resource Adequacy (GE MARS), Production Cost (GE MAPS)
  - ICF – Capacity Resource Mix (IPM)

# Scenarios Studied

| Base Case | Clean Energy Standard |
|---|---|
| **Base Case (Business As Usual)**<br>WNY and AC Proceeding Transmission Project Out | **CES Policy Case**<br>WNY and AC Proceeding Transmission Project In |
| **Sensitivities** | |
| BCS1 – Indian Point retires in 2019 | CES S1 – WNY and AC Transmission projects out |
| BCS2 – High Load, High Gas Prices | CES S2 – Indian Point retires in 2019 |
| BCS3 – No Minimum Oil Burn Requirement | CES S3 – Zone D loss of significant load |
| BCS4 – WNY and AC Transmission projects in | CES S4 – Incremental HQ Imports (1,000 MW HVDC line to Zone J) |
| BCS5 – IP retires and WNY and AC Transmission projects in | CES S5 – Clean Power Plan Compliance |
| | CES S6 – Reduction of load in adjoining control areas |
| | CES S7 – High Load (Alternate Policy Scenario) |

# Methodology

**The studies will be performed in three steps for each identified scenario**

1. Initial Modeling
   a. Develop Capacity Resource Mixes using IPM
   b. Transfer Analysis using TARA
   c. Resource Adequacy using GE MARS
2. Address Resource Adequacy violations if any are identified
   a. Examine Potential Options – Generation Shifts, Transmission Upgrades, and Combinations of the two
   b. Run GE MARS to determine which solutions solve the violation
   c. Select the least cost viable solution
3. Production Simulation
   a. Model the Final Reliable System in GE MAPS
   b. Generate System Data (Wholesale Energy Prices, Emissions, Production, etc.)

# Assumptions

**Base Case**

- **Modeling Regions:** NYISO, ISO-NE, PJM, other U.S. regions, and Canadian provinces
- **Statewide and Local Capacity Reserve Requirements:** Utilize 2016-2017 IRM approved by NYSRC and corresponding LCRs
- **Capacity Market Parameters:** Utilized 2015/2016 Demand Curves
- **Gas Price Forecast:** Use AEO's 2015 High Resource Case commodity prices
- **Load Forecast:** Use 2015 Gold Book forecast for 2015 through 2025 and extrapolate through 2030 using the growth rate from the last two years of this forecast
- **Load Duration Curve:** Utilize 2006 load shape for production models (IPM/MAPS) and 2002/2006/2007 multiple load shape model for reliability models (MARS)-consistent with CARIS & RNA assumptions.
- **Firm Additions and Retirements –** New builds, return to service and retirements based on latest known information
- **Nuclear Units:** All units remain in-service until license expiration, then assumed retired
- **Other Assumptions:**
  - Solar, wind and EE will grow at existing rates
  - RGGI cap for CO2 emissions to be extended at 2020 level
  - External systems will be modeled to preserve reserve margins

# Assumptions

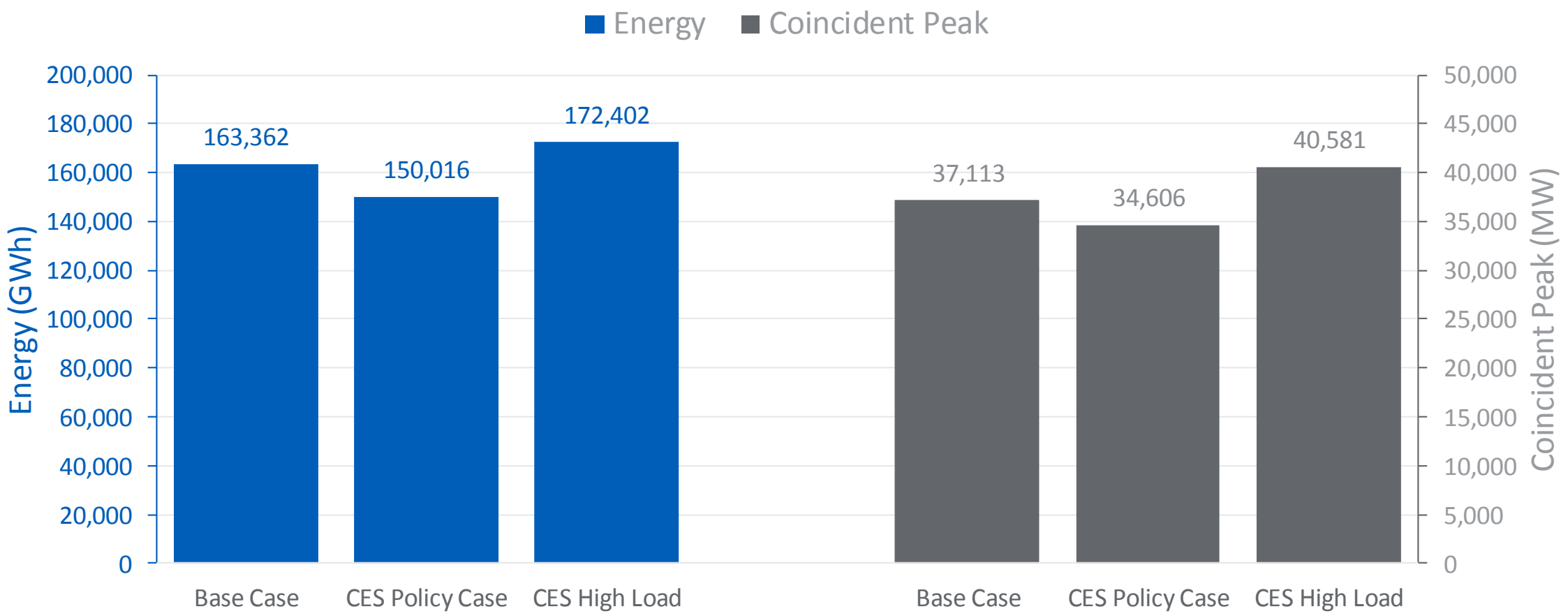
**Clean Energy Standard**

## All CES Case assumptions are the same as the Base Case, with the following exceptions:

- **Load Forecast:**
  - CES Policy Case peak load is 2,507 MW lower than the Base Case in 2030
  - CES Policy Case energy load is 13,346 GWh lower than the Base Case by 2030
- **Other Assumptions:**
  - Renewable generation additions by zone
    - 15,500 MW of renewable capacity added to NY in the CES Policy Case
    - 18,400 MW of renewable capacity added to NY in the CES High Load Case
  - Western New York and AC Transmission projects in-service

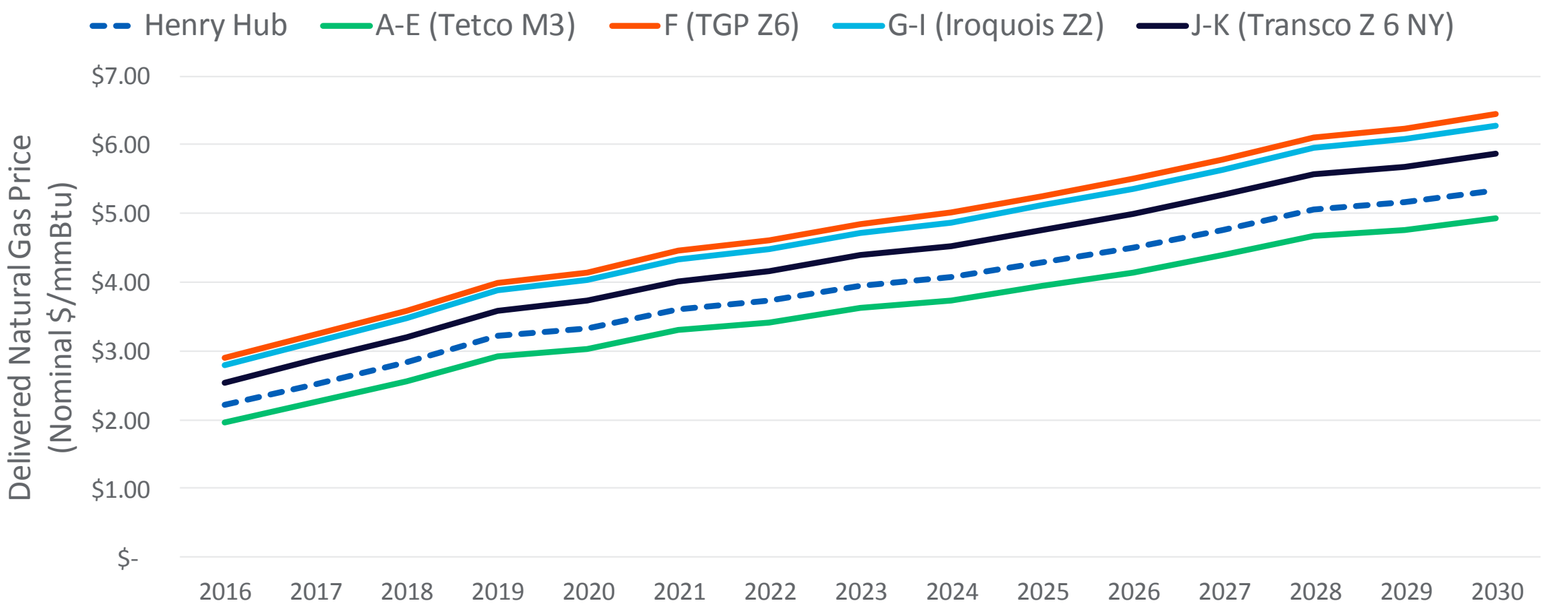
# NYISO Load Forecasts

**2030 Energy (GWh) and Coincident Peak (MW)**



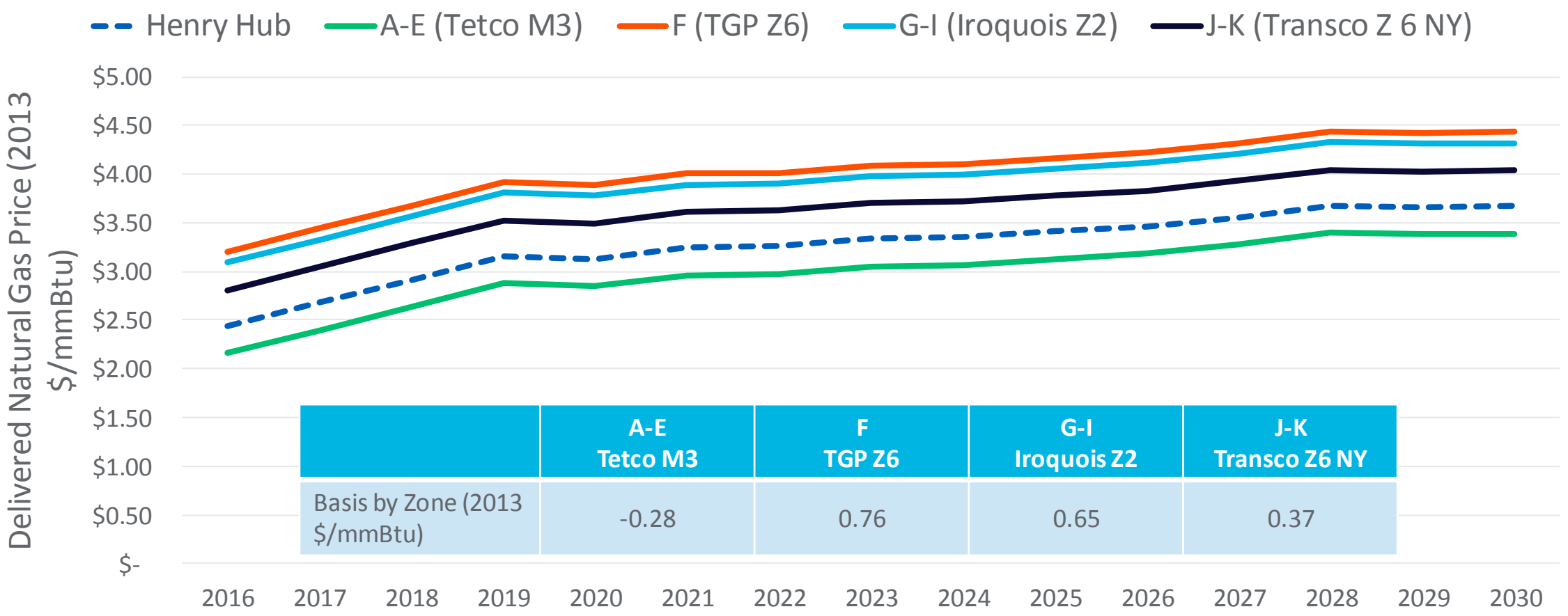
# Natural Gas Price Forecast

**Annual Average Delivered Price By Zone (Nominal $/mmBtu)**



# Natural Gas Price Forecast

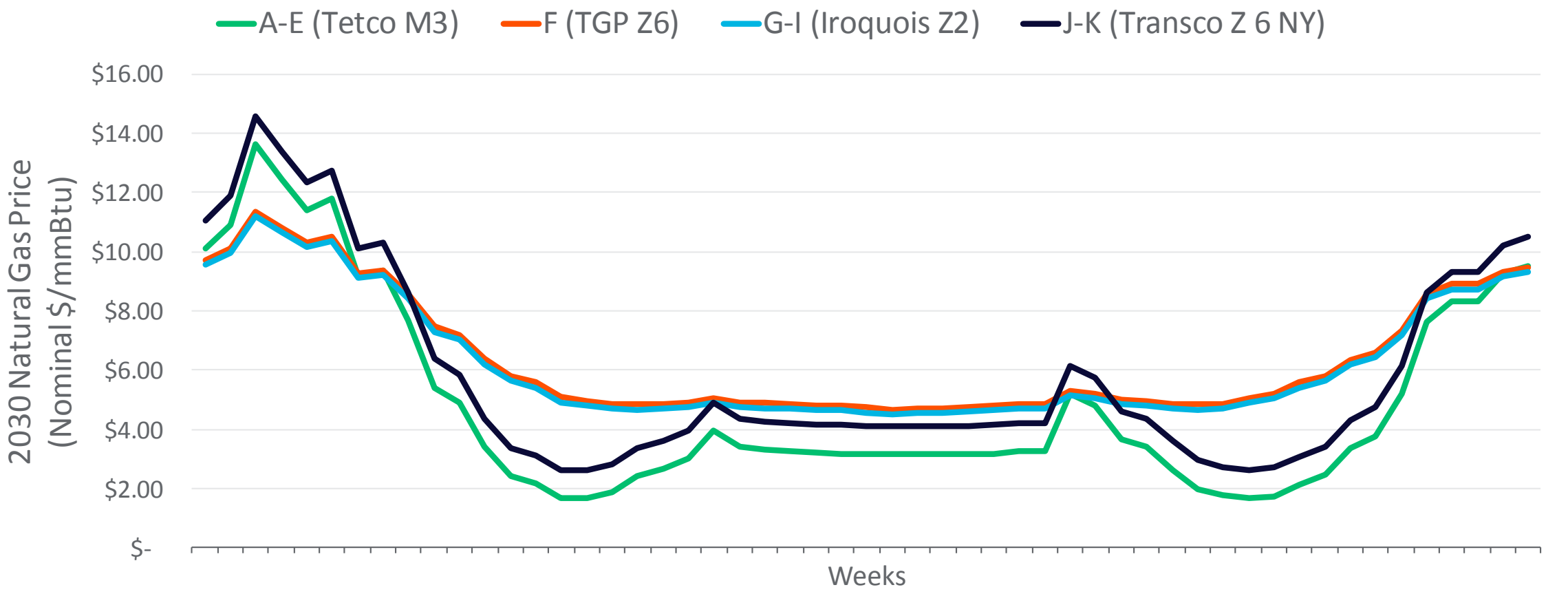
**Annual Average Delivered Price By Zone (2013 $/mmBtu)**




| | A-E Tetco M3 | F TGP Z6 | G-I Iroquois Z2 | J-K Transco Z6 NY |
|---|---|---|---|---|
| Basis by Zone (2013 $/mmBtu) | -0.28 | 0.76 | 0.65 | 0.37 |

# Natural Gas Price Forecast

**2030 Weekly Delivered Price By Zone (Nominal $/mmBtu)**



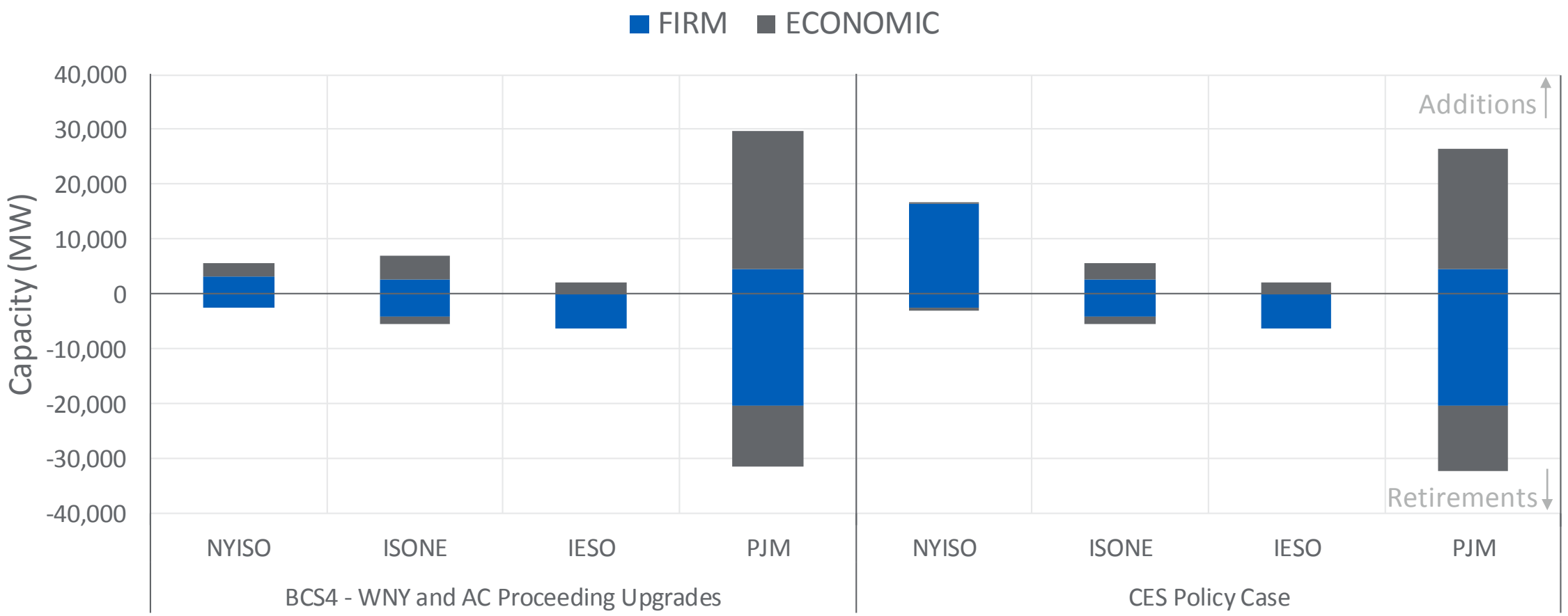
# Summary Of Preliminary Results

- For the CES Policy Case, resource adequacy criteria (LOLE) are met
- For CES Policy and Base Case sensitivities where LOLE violations occurred generation shifts, transmission upgrades and combined solutions were examined. Where available, generation solutions were found to be the least cost option for meeting resource adequacy.
- The EPA's proposed CPP targets for New York are met under the CES Policy Case and CES sensitivities
- Increases in exports and decreases in imports with PJM, Ontario, and ISO-NE occur under CES cases
- Lower LBMPs under CES compared to the Base Case
- Increased overloads on the 115 and 138 kV network under the CES compared to the Base Case Sensitivity 4 – Transmission projects in service
- In the CES Policy Case, NYCA generates and imports sufficient renewable energy to provide 50% of energy consumption by 2030.
- When accounting for renewable generation consumed in New York, exports may reduce the amount of renewables from the 50% target to 46% by 2030.

# Capacity Additions and Retirements

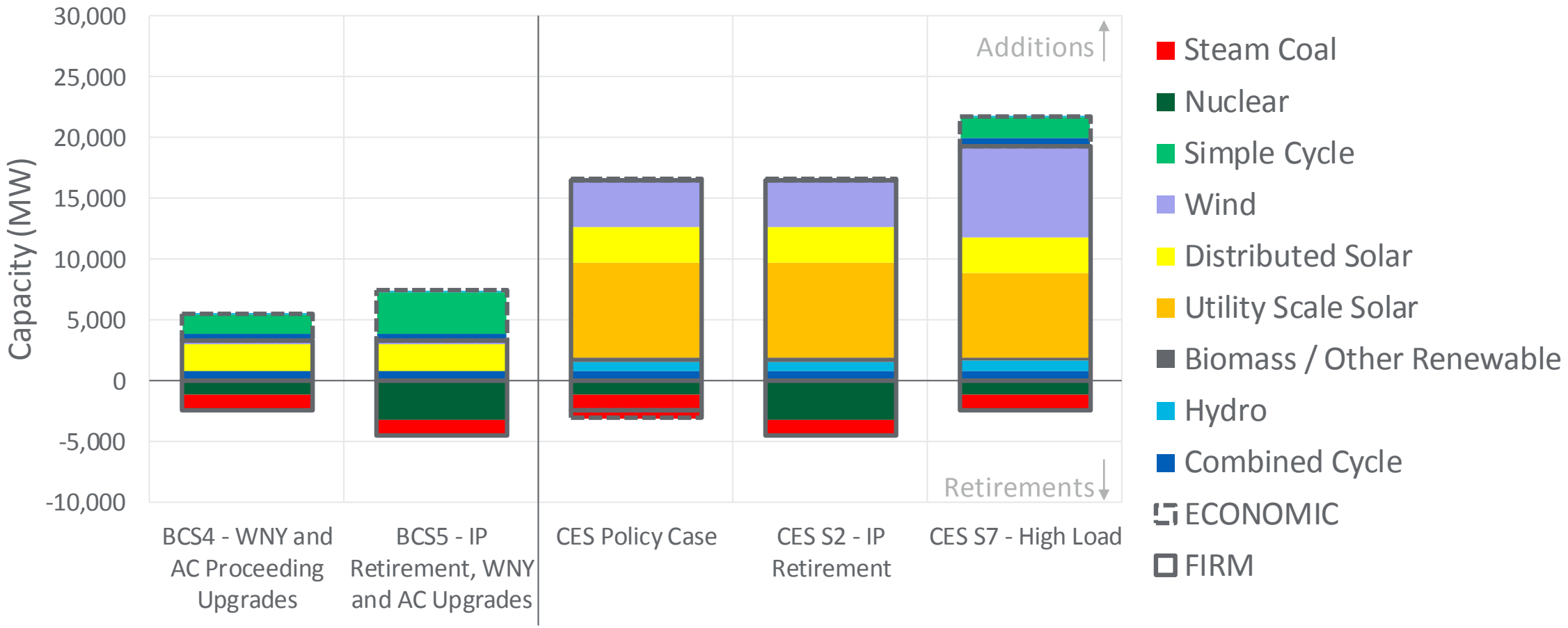
# Capacity Additions and Retirements

**Firm and Economic Additions and Retirements by Modeled Control Area by 2030**



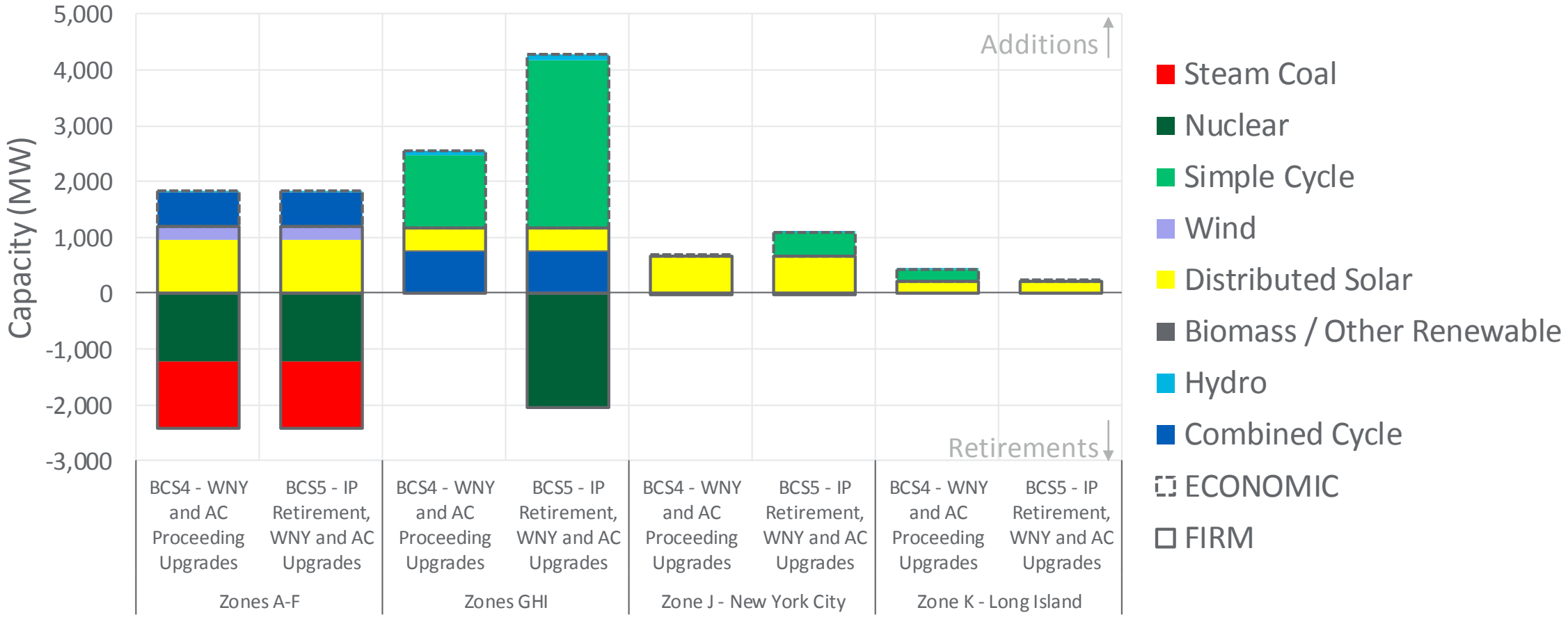
# Capacity Additions and Retirements

**NYCA Firm and Economic Capacity Additions and Retirements by Type by 2030**



# Capacity Additions and Retirements

**Base Case NYCA Firm and Economic Capacity Additions and Retirements by Type and Zone by 2030**



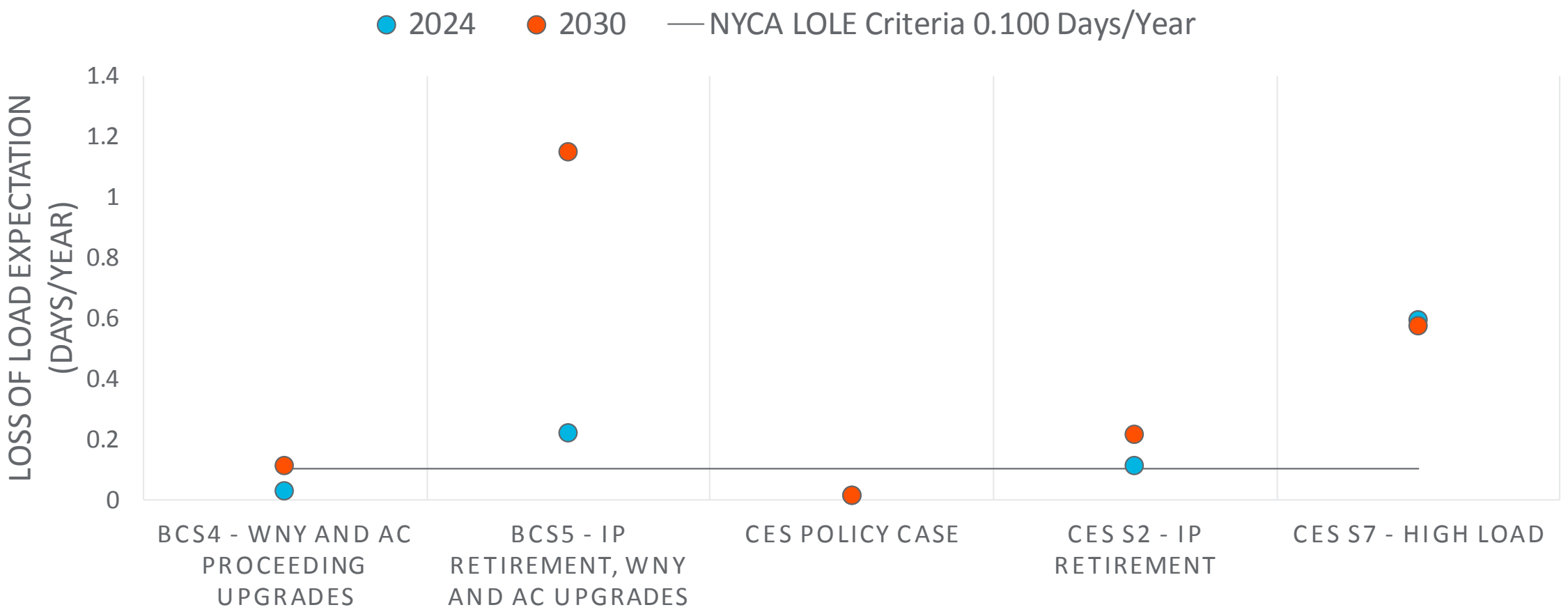
# Capacity Additions and Retirements

**CES Policy Case NYCA Firm and Economic Capacity Additions and Retirements by Type and Zone by 2030**

# Reliability

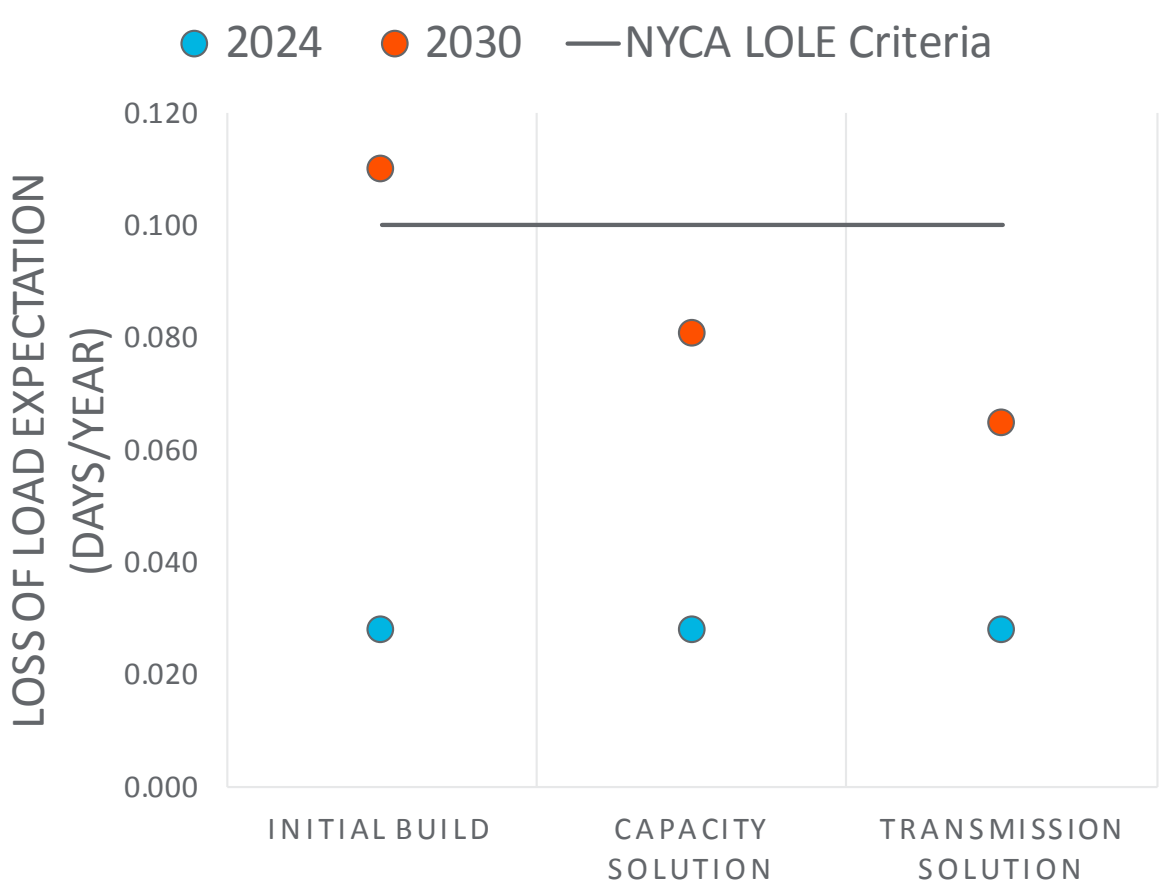
# Resource Adequacy – Initial Build

**NYCA Loss of Load Expectation (Days / Year)**



# BCS4 – WNY and AC Proceeding Upgrades

**NYCA Loss Of Load Expectation (Days/Year)**




**Solutions Evaluated**

## Capacity Solution

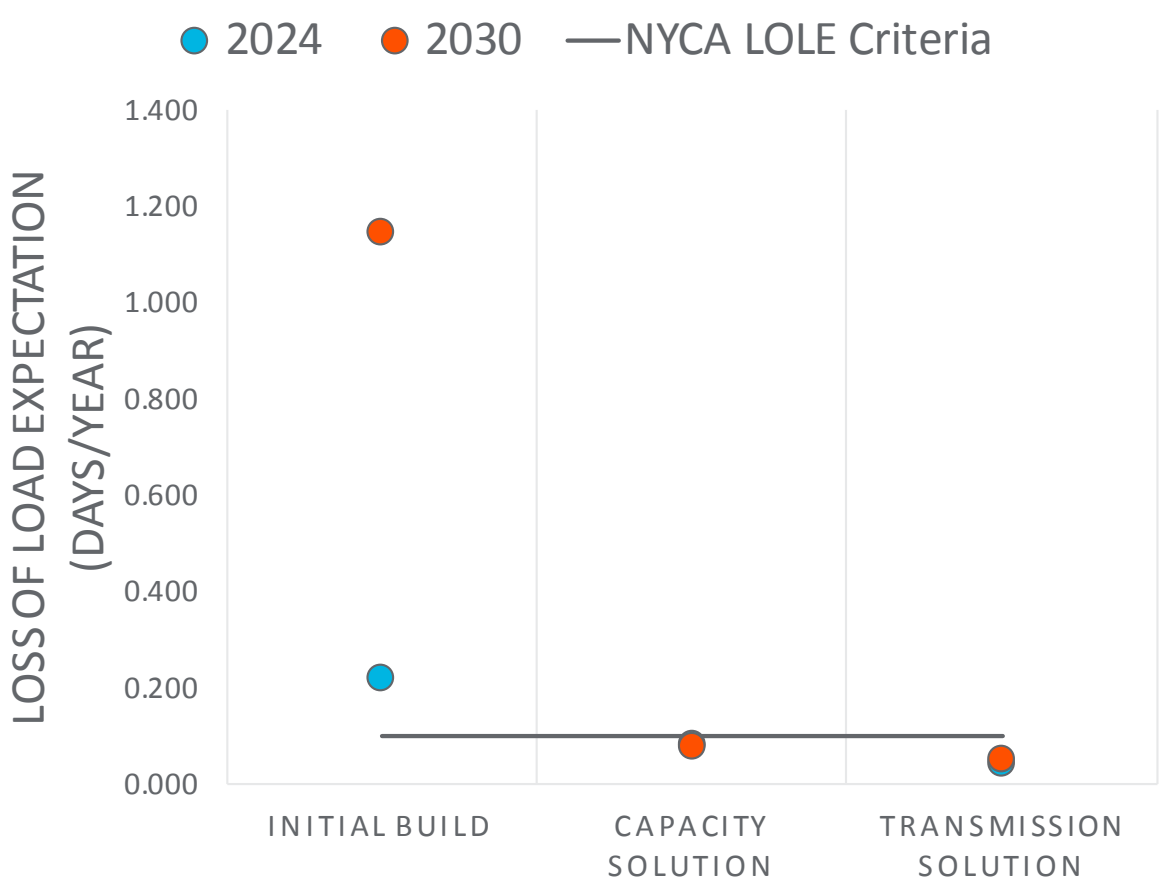
Shift 1 GT from Zone G to Zone J

## Transmission Solution

Relax Dunwoodie South

# BCS5 – IP Retired WNY and AC Proceeding

**NYCA Loss Of Load Expectation (Days/Year)**




**Solutions Evaluated**

## Capacity Solution

Shift 8 GT from Zone G to Zone H

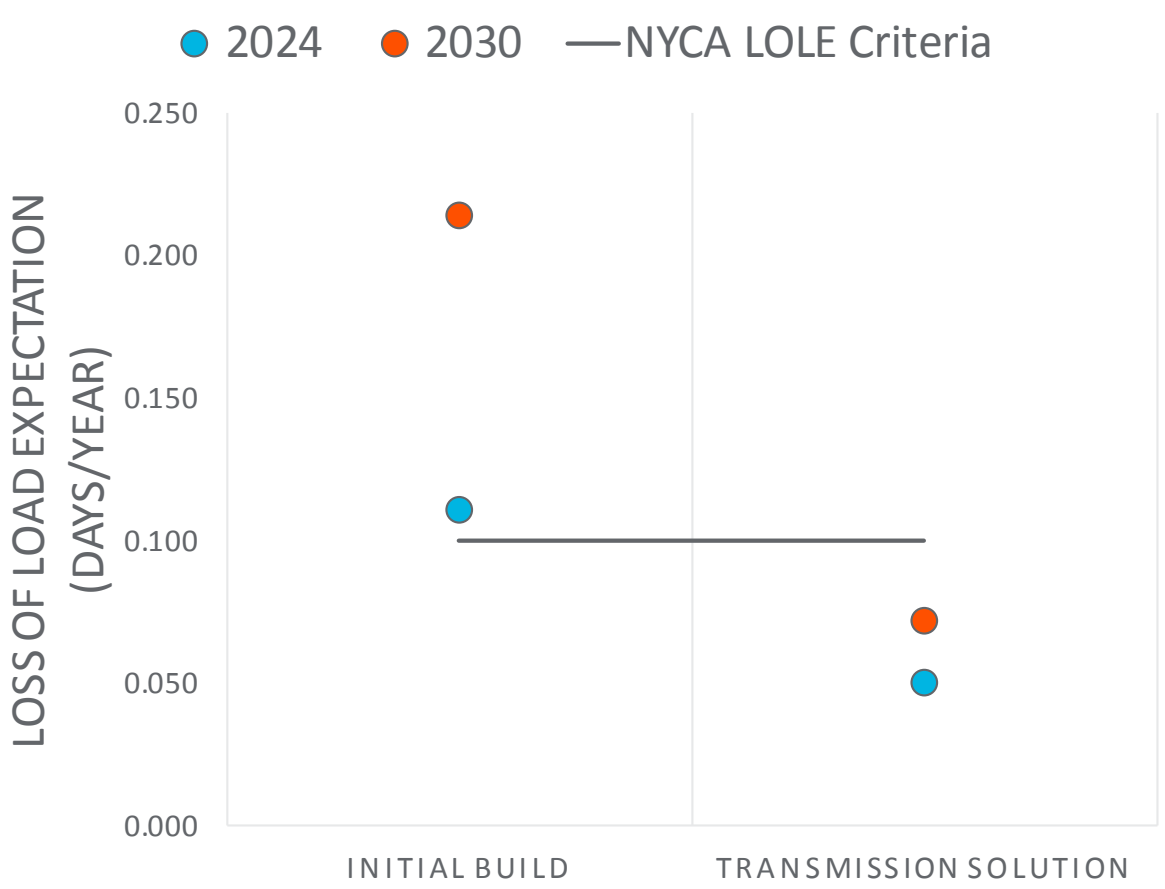
Shift 2 GT from Zone G to Zone J

## Transmission Solution

Relax UPNY-ConEd and Dunwoodie South

# CES S2 – Indian Point Retired

**NYCA Loss Of Load Expectation (Days/Year)**




**Solutions Evaluated**

## Capacity Solution

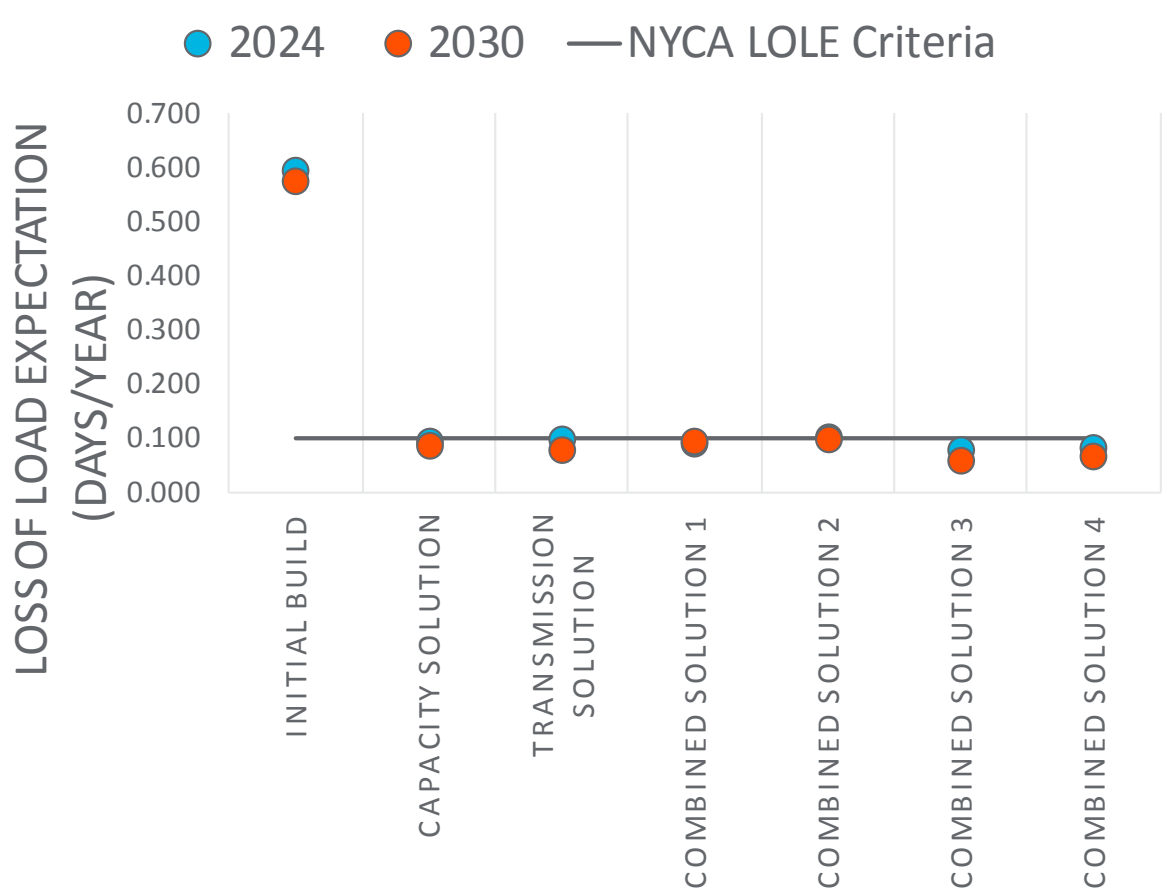
No Capacity Built in IPM

## Transmission Solution

Relax UPNY-ConEd (600 MW HVDC from Pleasant Valley to Sprainbrook)

# CES S7 – High Load

**NYCA Loss Of Load Expectation (Days/Year)**




**Solutions Evaluated**

### Capacity Solution

Shift 1 GT from Zone E to Zone I, 3 GT and 1 CC from Zone E to Zone J, 2 GT from Zone E to Zone K

### Transmission Solution

Relax Marcy South, UPNY-ConEd, UPNY-SENY, Dunwoodie South, and Y49/Y50

### Combined Solution 1

Relax UPNY-ConEd, Shift 3 GT from Zone E to Zone J, and 2 GT from Zone E to Zone K

### Combined Solution 2

Relax UPNY-ConEd and Y49/Y50, Shift 4 GT from Zone E to Zone J

### Combined Solution 3

Relax UPNY-ConEd and Dunwoodie South, Shift 3 GT from Zone E to Zone K

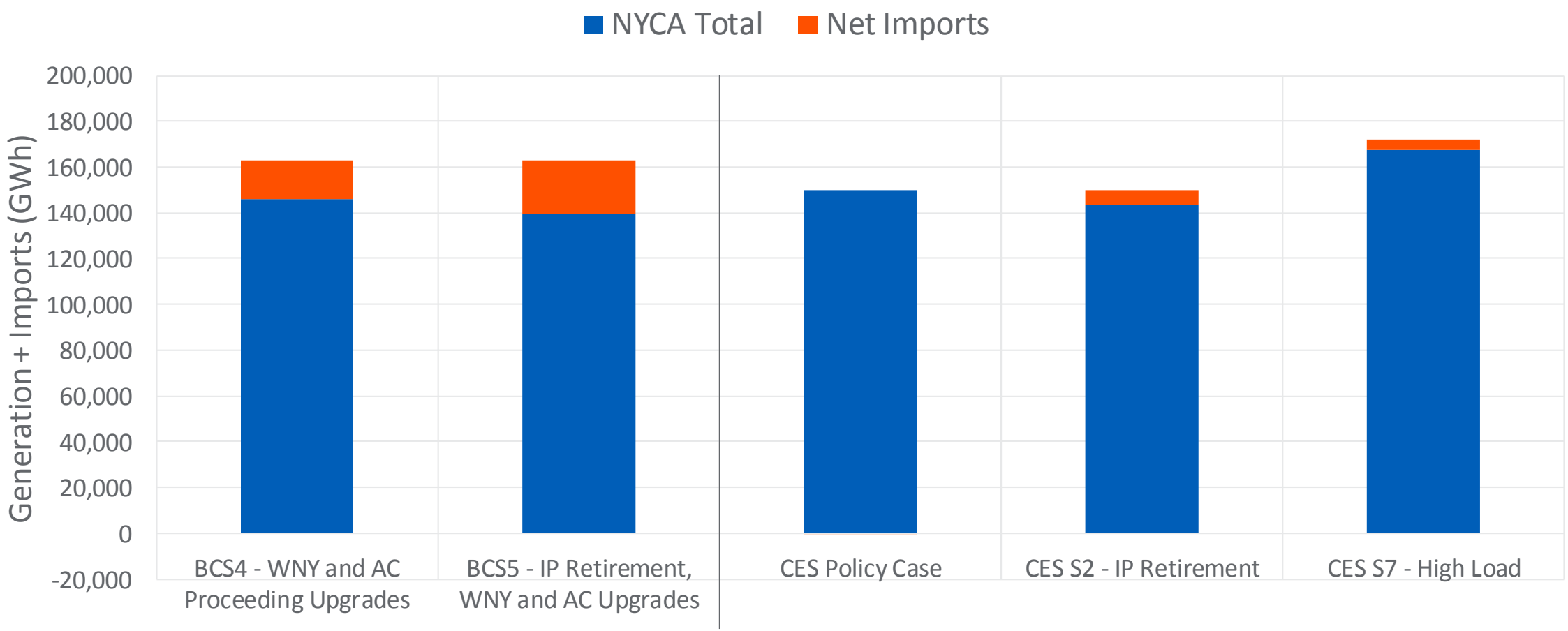
### Combined Solution 4

Relax UPNY-ConEd, Dunwoodie South, and Y49/Y50, Shift 2 GT from Zone E to Zone J, and 1 GT from Zone E to Zone K

# Generation, Emissions, and Spot Prices

# Generation

**2030 NYCA Total Generation + Net Imports (GWh)**



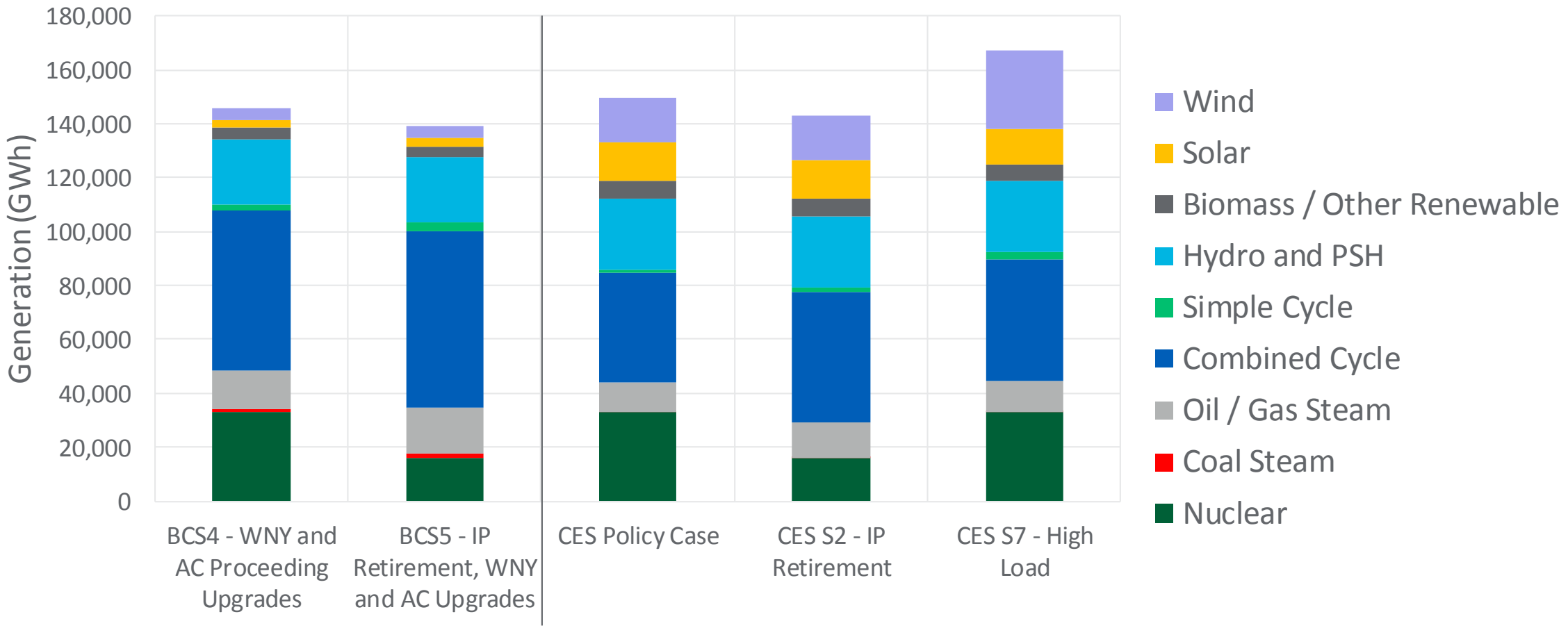
# Import / Export

**2030 NYCA Imports and Exports by Interface (GWh)**

| | Imports (GWh) | | Exports (GWh) | | Net Imports (GWh) | |
|---|---|---|---|---|---|---|
| Interface | Base Case S4 | CES Policy Case | Base Case S4 | CES Policy Case | Base Case S4 | CES Policy Case |
| PJM West | 731 | 153 | 3,009 | 5,131 | -2,277 | -4,978 |
| PJM East | 2,833 | 1,574 | 1,048 | 2,205 | 1,785 | -631 |
| Ontario | 1,328 | 461 | 619 | 2,544 | 708 | -2,082 |
| Quebec (Chat.) | 9,605 | 9,581 | 35 | 35 | 9,570 | 9,546 |
| Quebec (Cedars) | 1,111 | 1,110 | 12 | 12 | 1,099 | 1,099 |
| Neptune | 2,419 | 886 | 0 | 0 | 2,419 | 886 |
| New England | 3,173 | 839 | 3,691 | 7,136 | -519 | -6,297 |
| Cross Sound Cable | 2,240 | 2,067 | 0 | 0 | 2,240 | 2,067 |
| HTP | 557 | 103 | 0 | 0 | 557 | 103 |
| VFT | 268 | 6 | 38 | 654 | 230 | -648 |
| Northport Norwalk Cable | 1,255 | 1,137 | 233 | 371 | 1,022 | 766 |
| **NYCA Total** | **25,520** | **17,917** | **8,684** | **18,087** | **16,836** | **-170** |

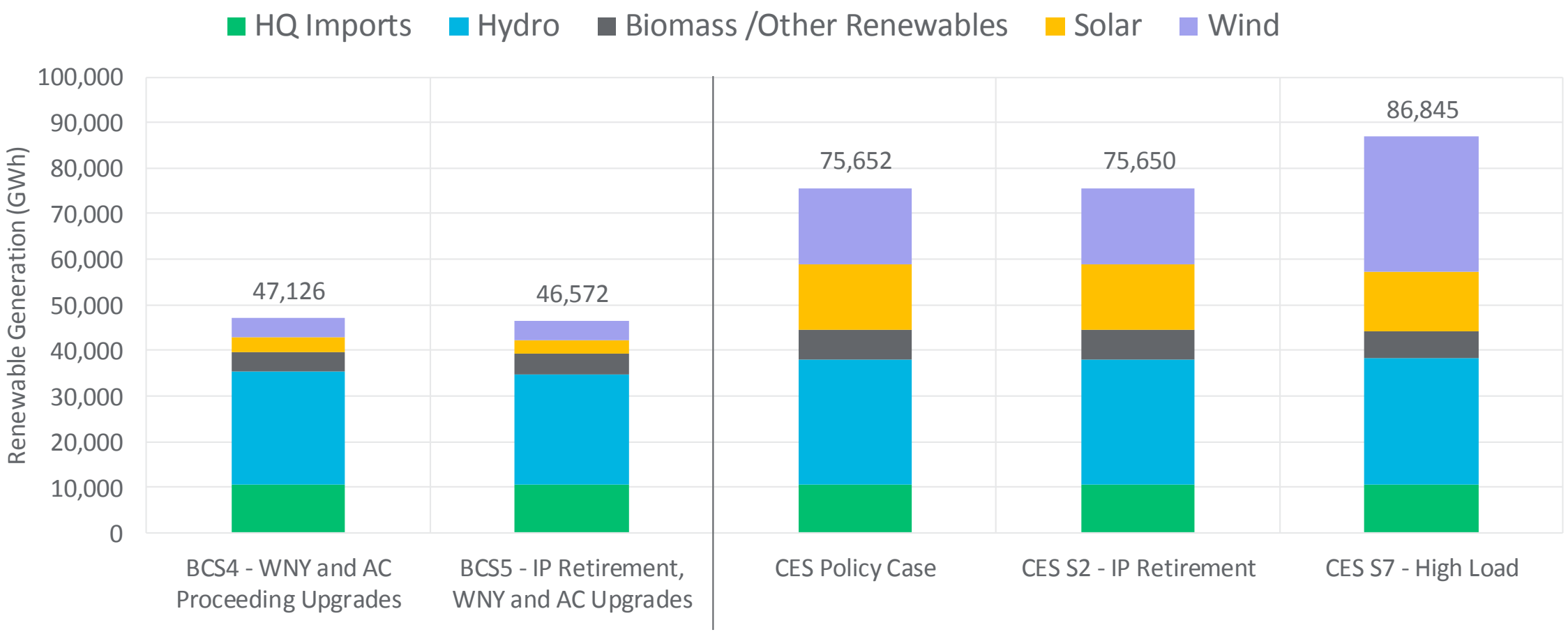
# Generation

**2030 NYCA Generation by Type (GWh)**



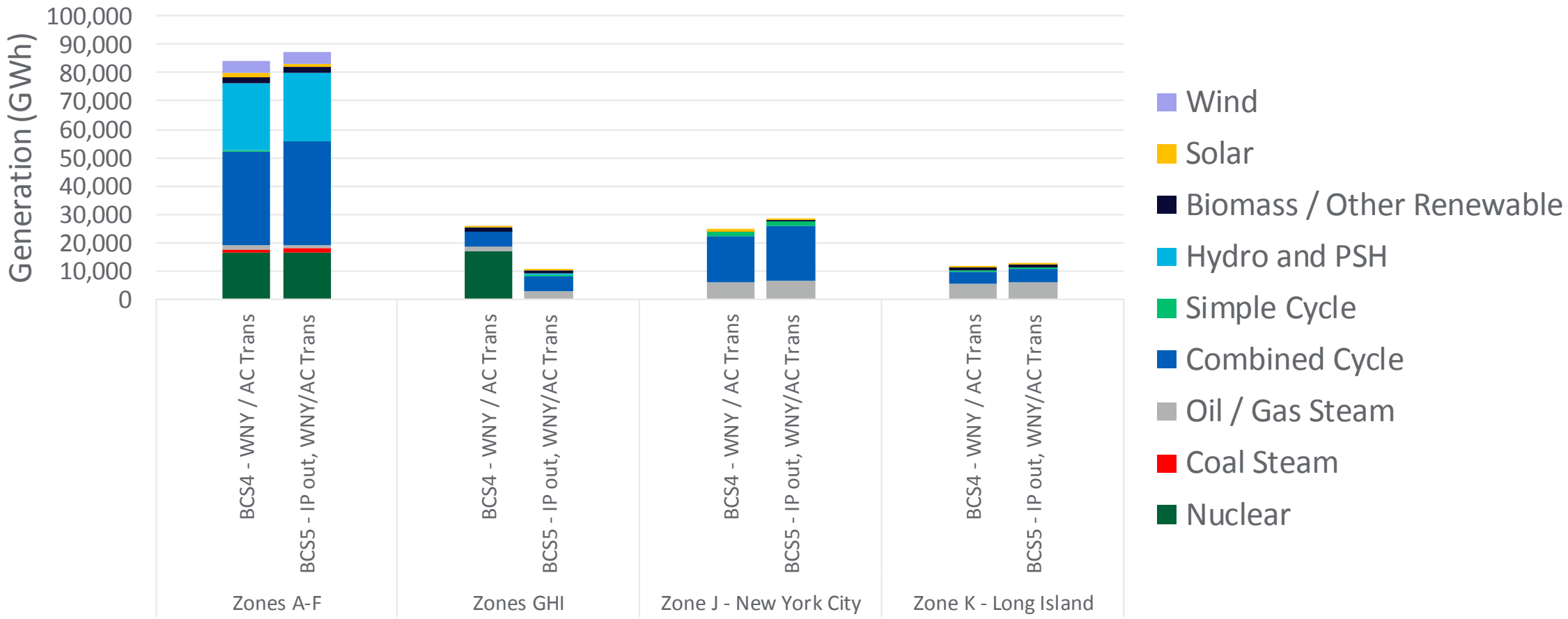
# Renewable Generation

**2030 NYCA Renewable Generation and HQ Imports (GWh)**



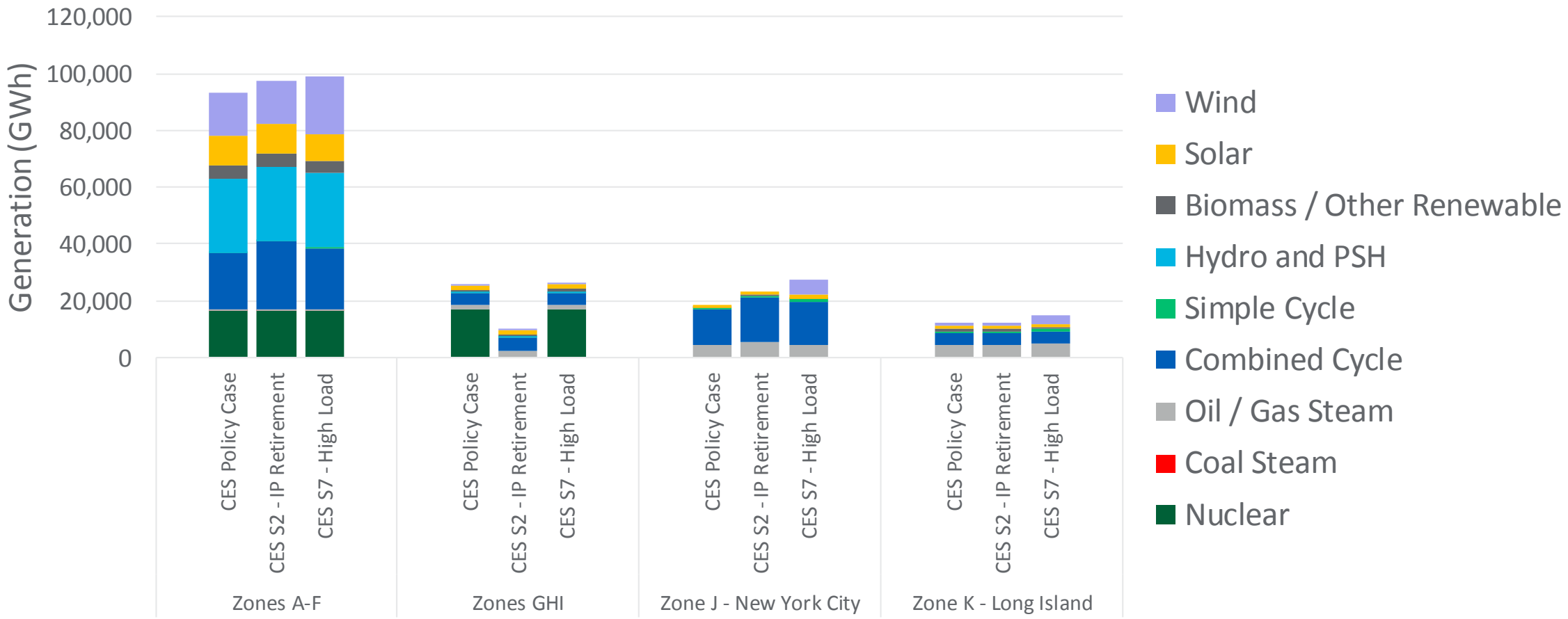
# Generation

**2030 Base Case NYCA Generation By Type by Zone**



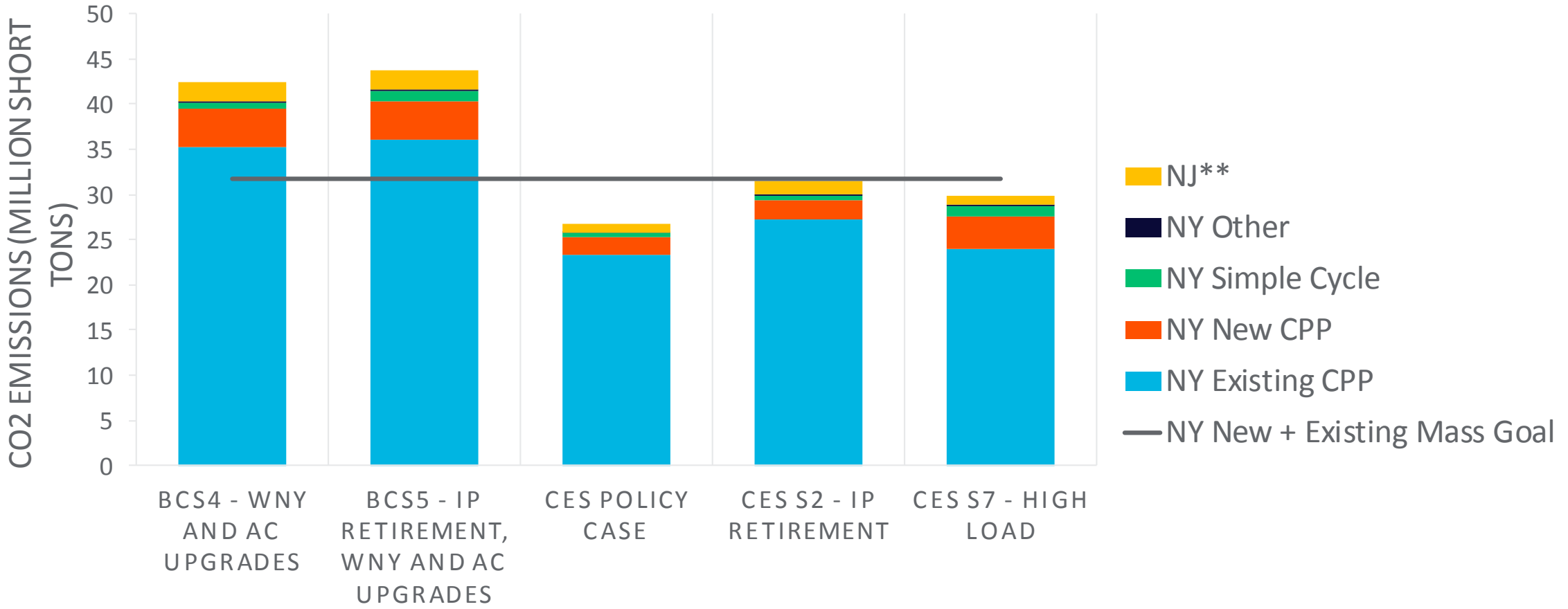
# Generation

**2030 CES Policy Case NYCA Generation By Type by Zone**



# $CO_2$ Emissions

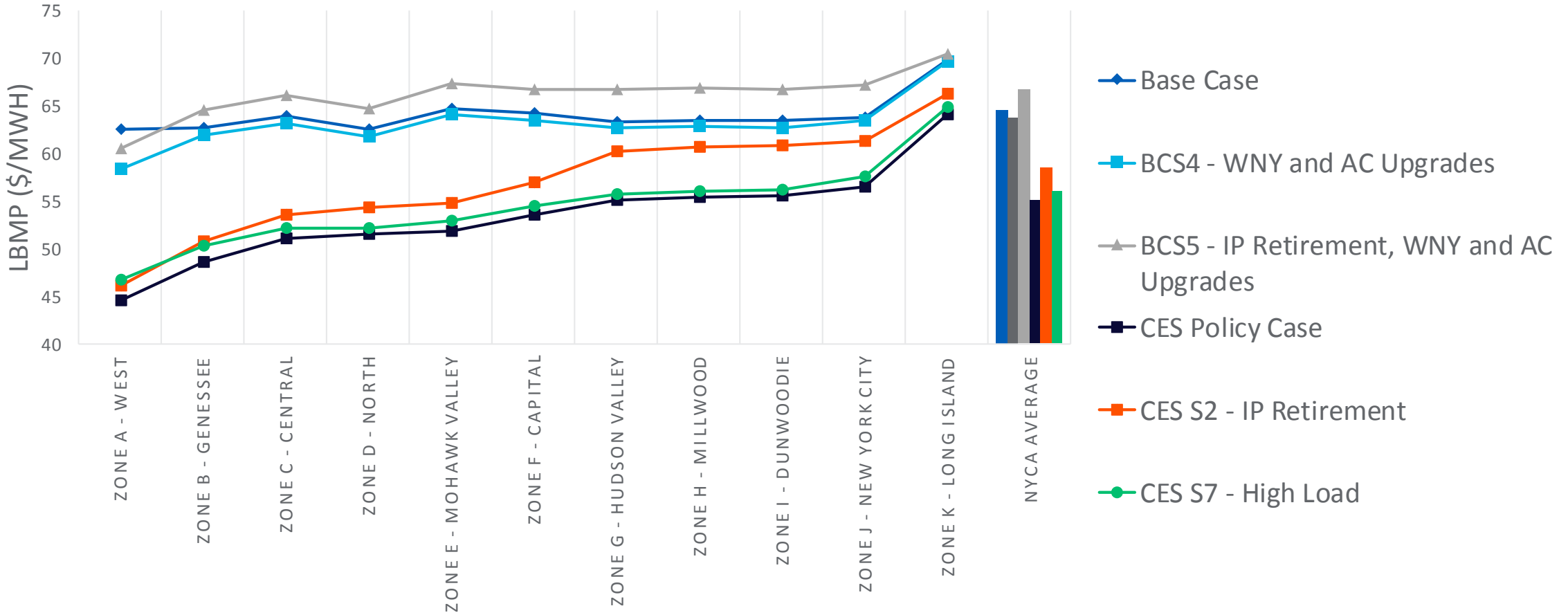
**2030 NYCA $CO_2$ Emissions (Million Short Tons)**

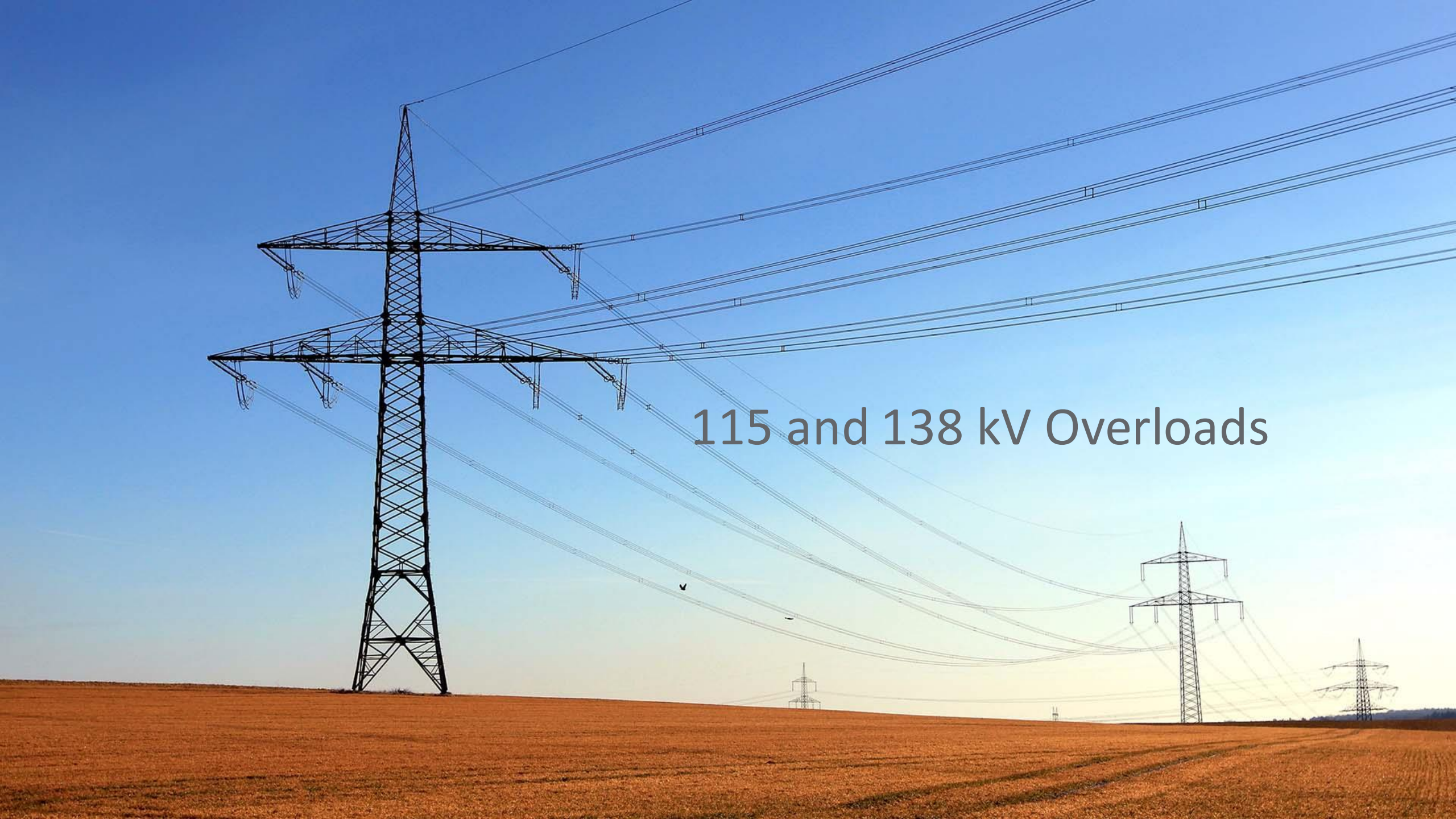



** Units physically located in NJ, but electrically connected to NY

# Locational Prices

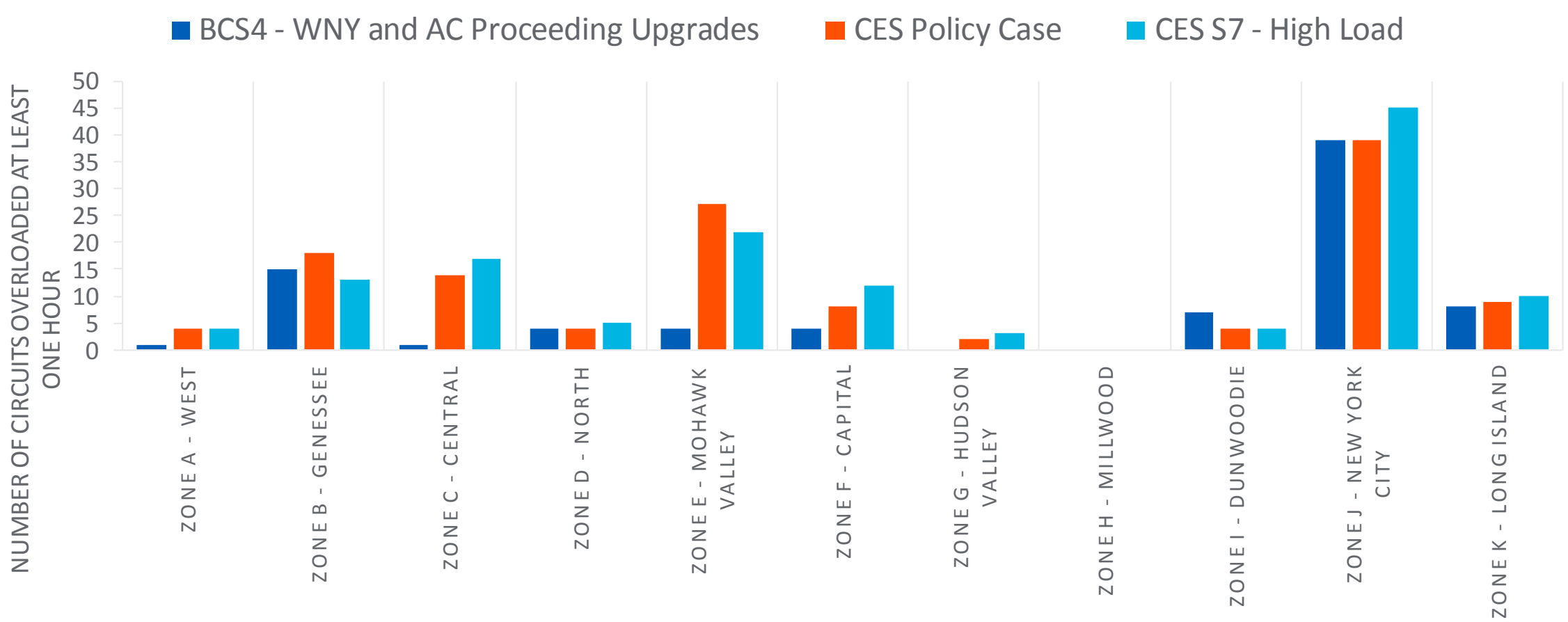
**2030 NYCA LBMP by Zone and NYCA Average**




115 and 138 kV Overloads

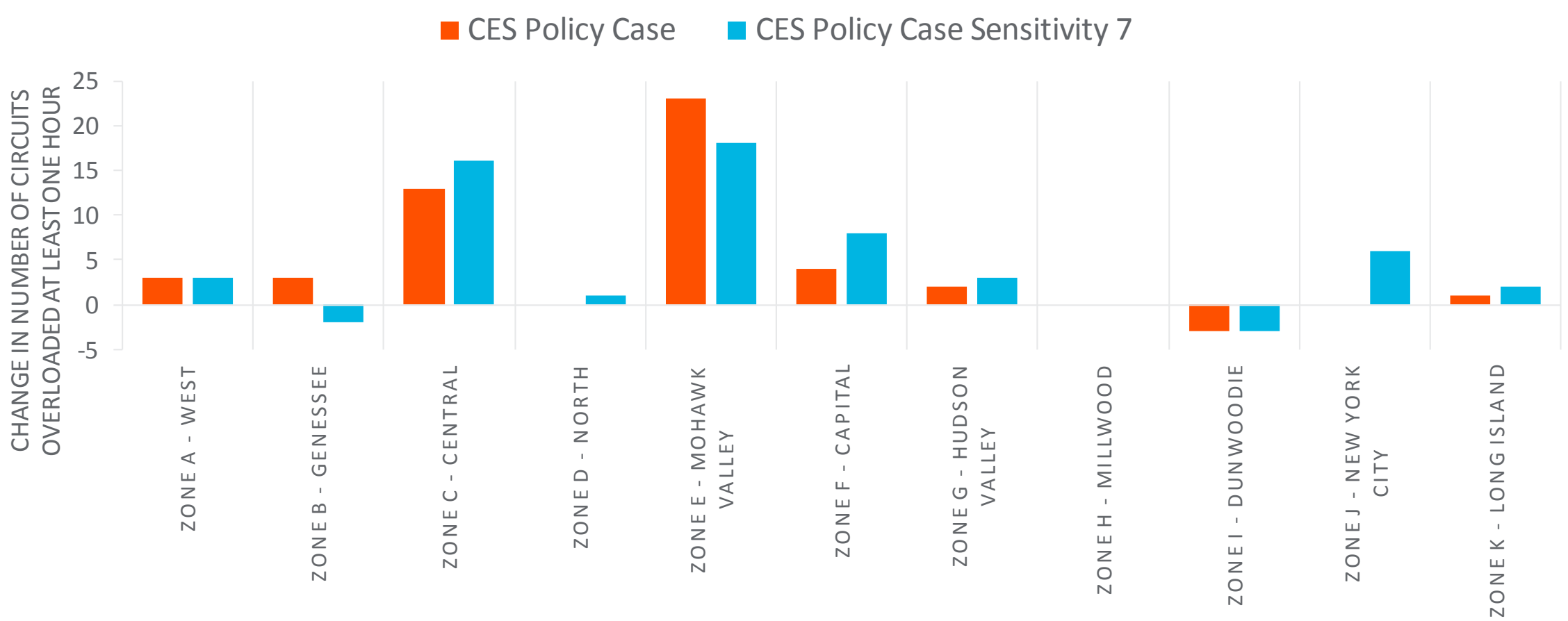
# 115 and 138 kV Line Overloads

**Number of Circuits Overloaded by Sending Area in 2030**



# 115 and 138 kV Line Overloads

**Incremental Number of Circuits Overloaded in 2030 Relative to Base Case Sensitivity 4**



# Next Steps

# Next Steps

- Collect stakeholder comments on today's presentation

  Comments can be sent to Leka Gjonaj at Leka.Gjonaj@dps.ny.gov
- Complete current scope of work with Interim Report first quarter 2017
- Collect stakeholder comments on Interim Report
- Additional Analysis Under Consideration

# Potential Additional Analysis

- **Further evaluate the drivers for increased exports to PJM, Ontario, and ISO-NE under the CES cases.**
- **Assess whether there are Transmission Security issues in the CES cases.**
- **Analyze the extent of renewable resource bottling, if any, due to 115 and 138 kV overloads and determine what upgrades may be necessary.**
- **Economic generator retirements in New York State are minimal, despite increasing capacity surplus under CES and aging generator fleet. Further evaluate impact on reliability with higher generation retirements.**
- **Examine the impacts to New York if neighboring regions adopt similar renewable goals.**
- **Examine the implications of using fixed demand curves, IRMs and LCRs and the need to adjust them.**