MMU Comments on the 2019 CARIS Phase I Report

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Introduction

- NYISO conducted the Congestion Assessment and Resource Integration Study (CARIS) 2019 Phase I
  - ✓ CARIS is intended to study whether new transmission projects could economically reduce congestion
  - ✓ NYISO also focused attention on an informational scenario reflecting state targets under CLCPA by 2030
- The MMU provided a memorandum reviewing and commenting on the CARIS Phase I report as required by the NYISO tariff
  - ✓ We used data from CARIS runs to analyze how incentives for investment in renewables and storage might be affected in the '70x30' scenario
  - ✓ This presentation summarizes our analysis

Overview

- Key takeaways from 2019 CARIS I report
- Motivation for analysis of investment incentives
  - ✓ Role of wholesale market in state policy goals
  - ✓ Exposure to wholesale market under Index REC framework
- Methodology for estimating investment incentives in '70x30' case
- Results for renewables and energy storage resources
- Conclusions

2019 CARIS Key Takeaways

- No projects with positive benefit-cost ratio identified in Base Case
  - ✓ Restrictive inclusion rules do not contemplate state policies
  - ✓ Rules do not include all benefits (e.g., capacity value)
- New '70x30' scenario provides information on impacts of CLCPA targets
  - ✓ Increase in congestion on major interfaces
  - ✓ Significant local congestion and curtailment in renewable generation pockets
  - ✓ Conventional generators run less but cycle more often

Renewable Additions in 70x30 Case

70x30 Scenario Load				
2030 MW	OSW	LBW	UPV	BTM-PV
A		1,640	3,162	995
B		207	361	298
C		1,765	1,972	836
D		1,383		76
E		1,482	1,247	901
F			2,563	1,131
G			1,450	961
H				89
I				130
J	4,320			950
K	1,778		77	1,176
NYCA	6,098	6,476	10,831	7,542

Role of Markets in State Policy Goals

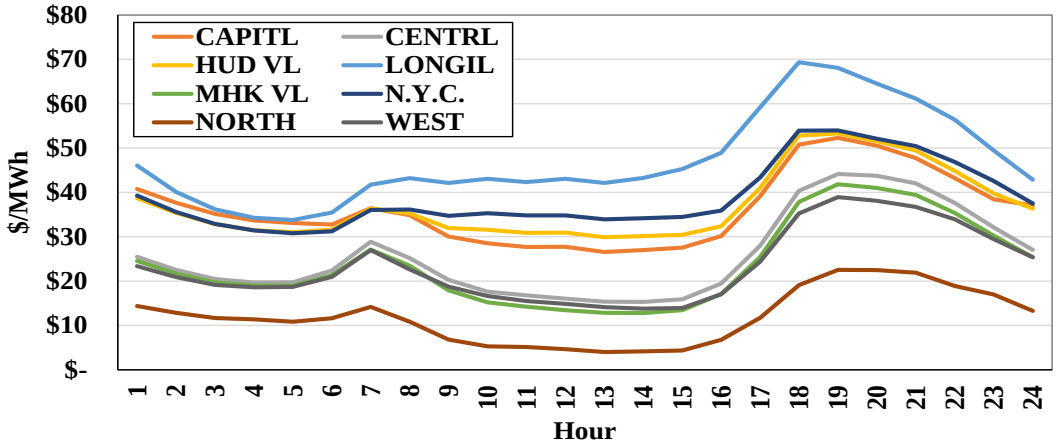
- Many possible combinations and locations of resources can satisfy state targets – some will be more effective than others
- Wholesale markets help guide investment in policy resources:
  - ✓ Reward flexible technologies as the penetration of renewables increases
  - ✓ Encourage renewable resources to locate where their output will be deliverable
  - ✓ Facilitate investment in renewables that produce electricity when it is most valuable
  - ✓ Identify where additional transmission would provide an efficient way to deliver more renewable generation to consumers
- CARIS 70x30 Case provides an opportunity to evaluate how wholesale markets may influence investment in renewables

Index RECs and Market Risk

- New York recently moved to offer Index REC contracts for Tier I and Offshore Wind solicitations
  - ✓ REC price is equal to a fixed Strike Price minus average zonal day-ahead energy and spot capacity prices
- Under Index REC, investors are hedged against average zonal prices but retain significant exposure to market-based risks:
  - ✓ Technology discount – price in hours when resource generates is below the simple average (all-hours) price
  - ✓ Nodal discount – price at resource's node is below the average price for the zone
- Developers will consider the risk that technology and nodal discounts will change over time when formulating REC offers

Revenue Analysis Methodology

- We estimated generation-weighted prices and net revenues of hypothetical new renewable and ESR resources in the 70x30 Case
  - ✓ Reflects one scenario, not intended as a forecast of market conditions
- Estimated hourly DAM and RTM prices are derived from CARIS GE-MAPS output data (Scenario Load HRM case)
- ICAP prices assumed to be at 75 percent of Net CONE
- Index REC prices assume Strike Price equal to resource CONE



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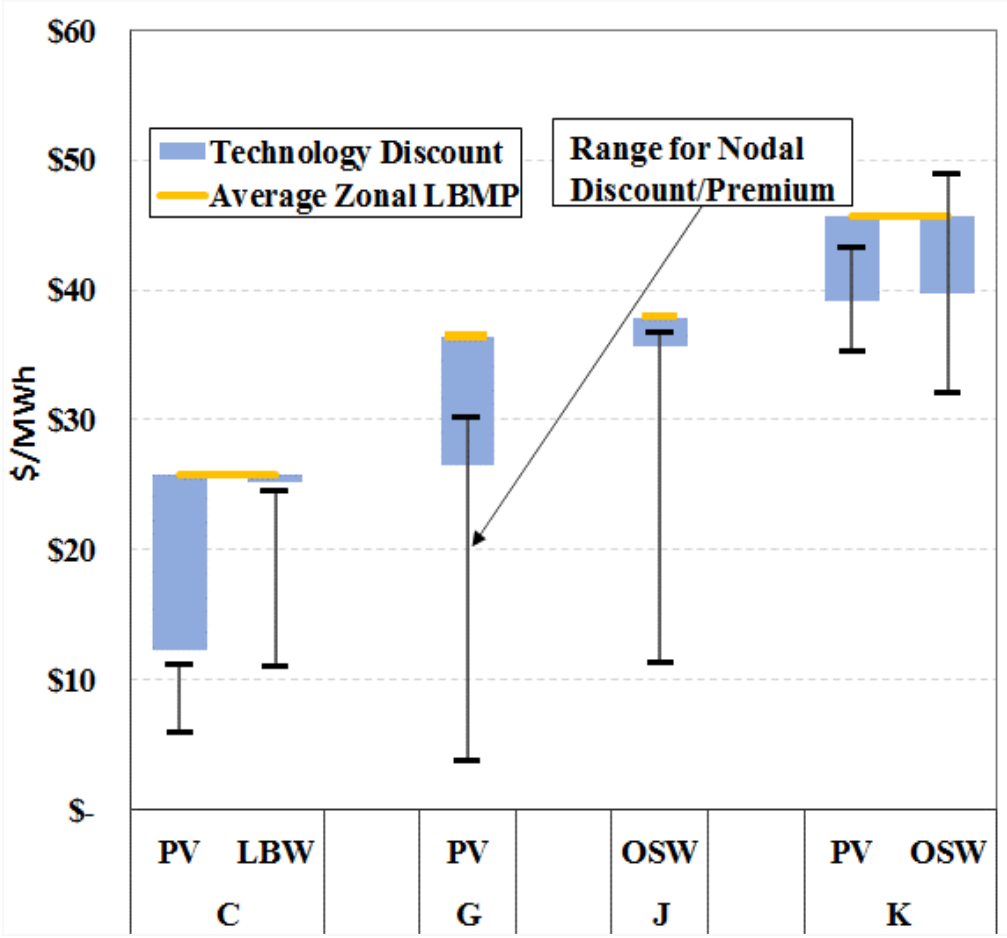
Technology and Nodal Discounts in 70x30 Case

- Prices in hours of solar generation are heavily discounted
- Prices in hours of offshore wind generation are moderately discounted
- Prices vary widely at nodes within a zone, as renewables cause local transmission bottlenecks in some places



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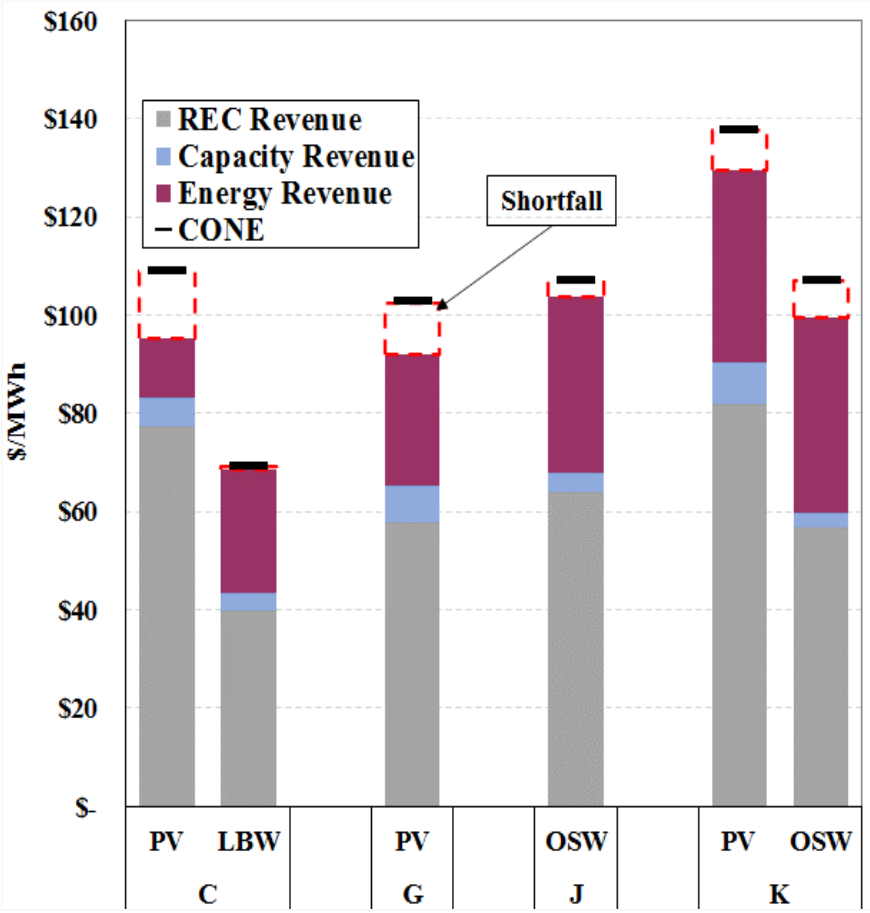
Net Revenue v CONE of Renewables in 70x30 Case

- Some resources (especially solar) fail to earn Index REC strike price due to technology and basis discounts
- Investors would either avoid saturated technologies and locations or require higher REC prices
- Willingness to invest today may be reduced if there is perceived risk that technology/location could become saturated using higher RECs in the future



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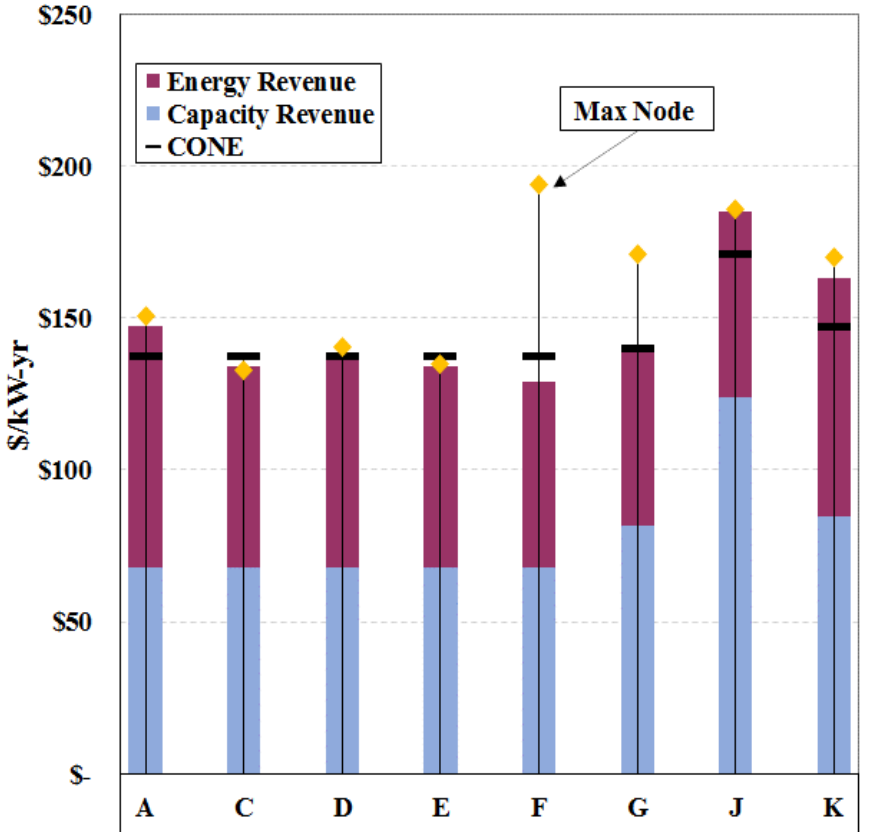
Net revenue v CONE of ESRs in 70x30 Case

- ESRs could earn levelized cost at many locations
- ESRs benefit from LBMP variability in high-renewable scenario
- Suggests that wholesale markets can support merchant storage under right conditions
- Well-functioning capacity market needed to encourage merchant entry of ESRs
- Entry of ESRs reduces risk for renewable projects



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Conclusions

- CARIS 70x30 Case is not intended as a forecast, but it shows NYISO market can guide investment to meet goals efficiently
  - ✓ Investors exposed to market risk via Index REC will select projects and sites to minimize technology and nodal basis risks
  - ✓ As intermittent capacity grows, price signals incentivize complementary investment in storage and transmission
- Stable wholesale market framework will help meet state targets
  - ✓ Procurement that saturates technologies or locations raises risks for investors and may increase REC strike prices
  - ✓ Potential entry of ESRs reduces risk for renewables
  - ✓ Extended suppression of capacity prices reduces incentive for market-based investment in ESRs

Appendix

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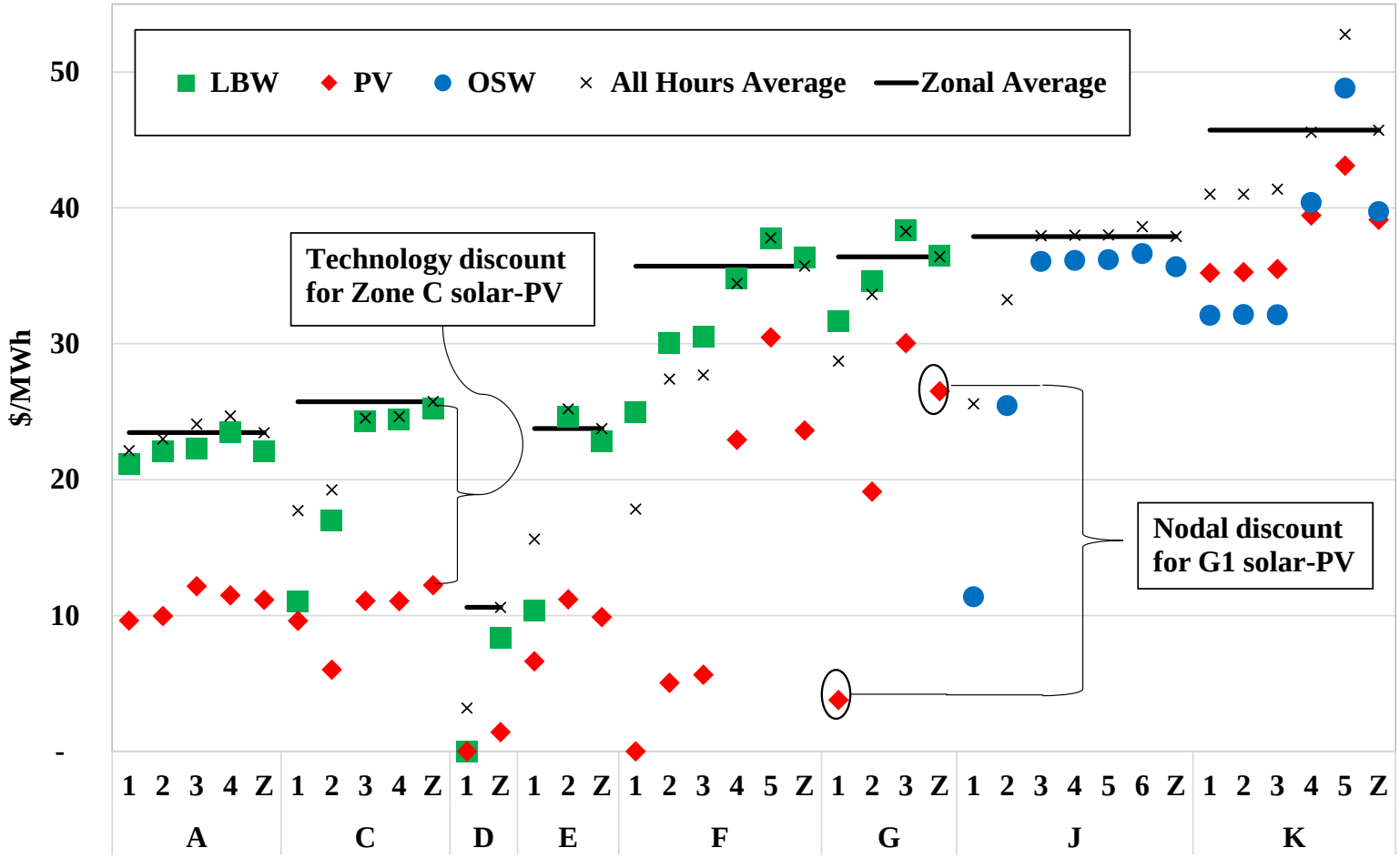
Generation-Weighted and Simple Average Prices by Node and by Zone in 70x30 Case



Points on X-axis indicate individual nodes within zone, Z points indicate zonal price

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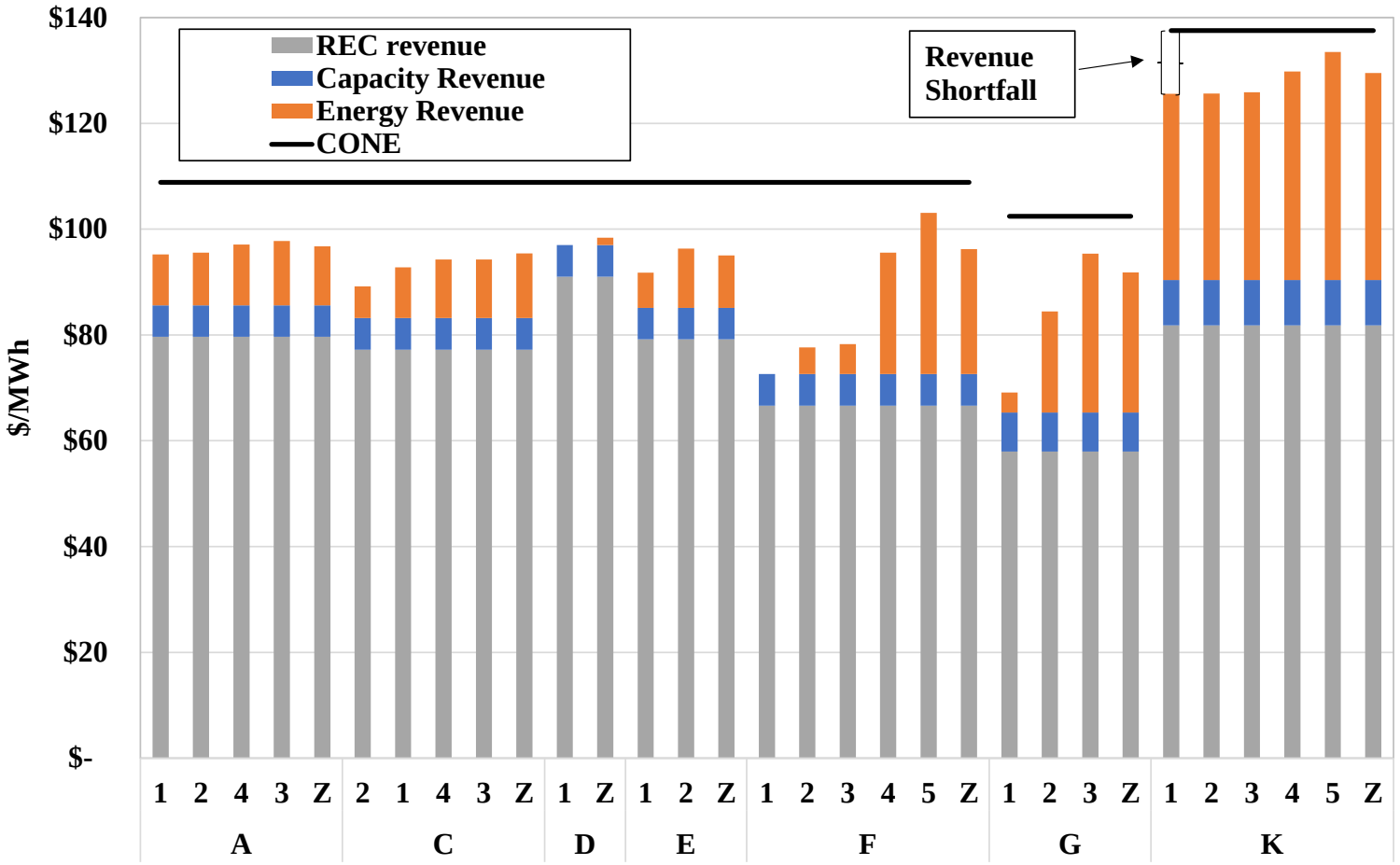
Net Revenue by Node in 70x30 Case
Solar PV



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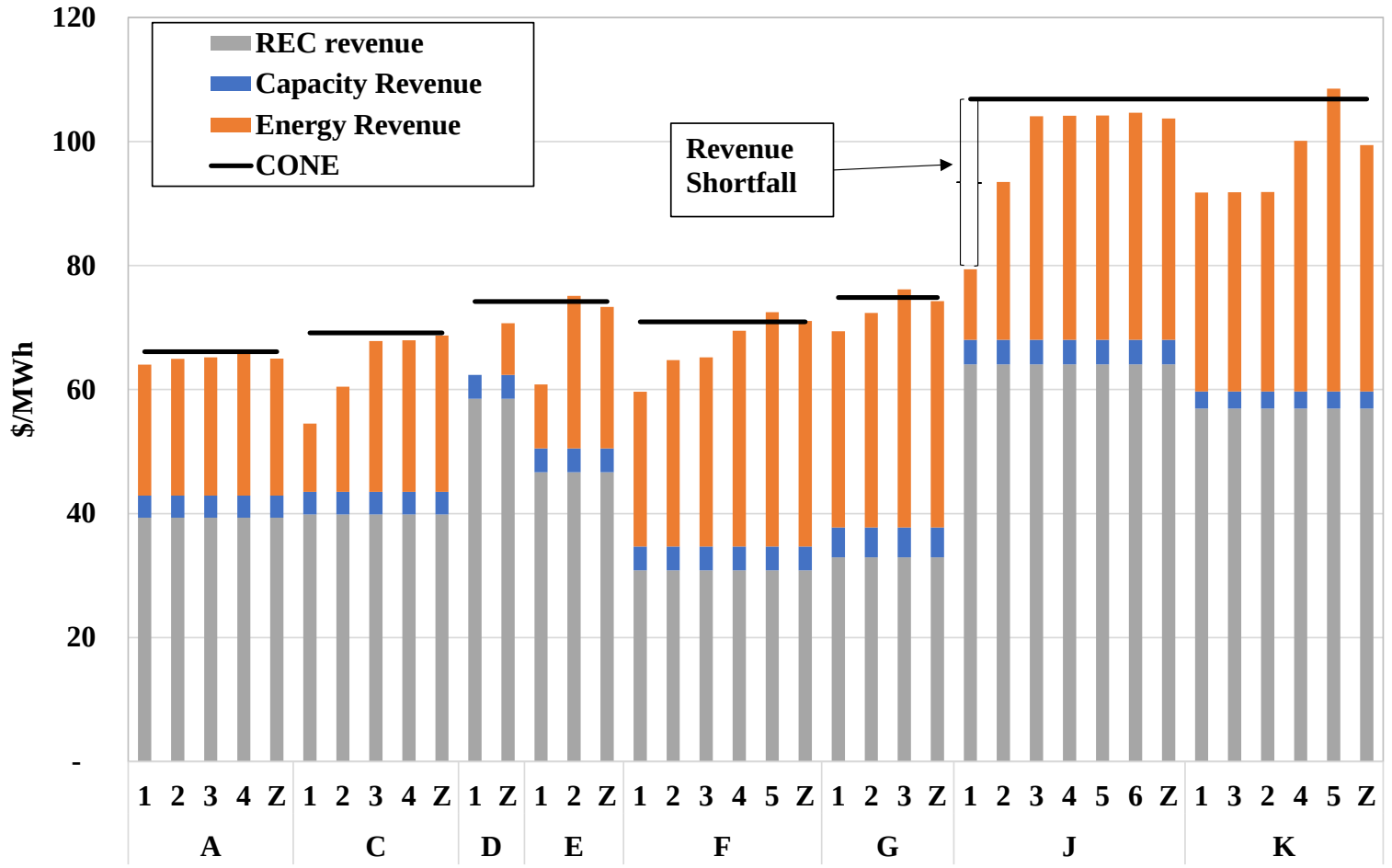
Net Revenue by Node in 70x30 Case
Land-based and Offshore Wind



Nodes in zones J and K depict offshore wind, all others depict land-based wind

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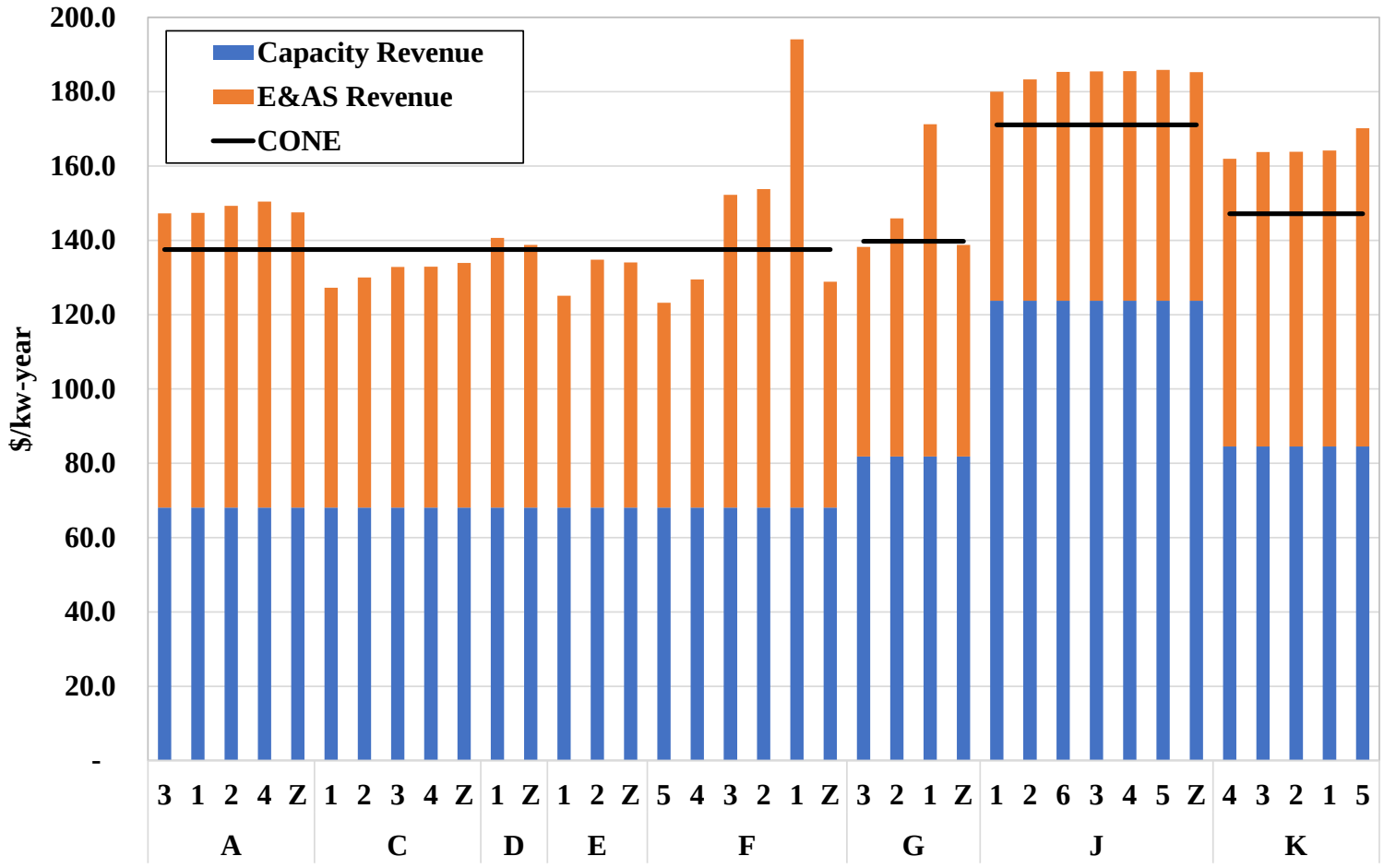
Net Revenue by Node in 70x30 Case
Energy Storage, 4-hour



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