Alternative Resource Adequacy Structures for New Jersey

DRAFT ECONOMIC IMPACT ESTIMATES

PREPARED BY

Kathleen Spees

Walter Graf

Samuel Newell

PREPARED FOR

New Jersey Board of Public Utilities

Investigation of Resource Adequacy Alternatives
Third Work Session: Economic Impact Assessment
Docket No. EO20030203

MARCH 19, 2021

Brattle

Economic Assessment of Resource Adequacy Structures

To inform the Board of Public Utilities' investigation of alternative resource adequacy structures, we conducted an analysis of customer costs and clean electricity outcomes across a range of alternative designs

- Design alternatives derived from those considered within this docket, including:
  - Status quo capacity market, with current Minimum Offer Price Rule (MOPR)
  - No-MOPR capacity market
  - Fixed Resource Requirement (FRR) alternatives
  - Integrated Clean Capacity Market (ICCM) alternatives
- Analyzed study years 2025 and 2030 to assess impacts under near- and longer-term market conditions

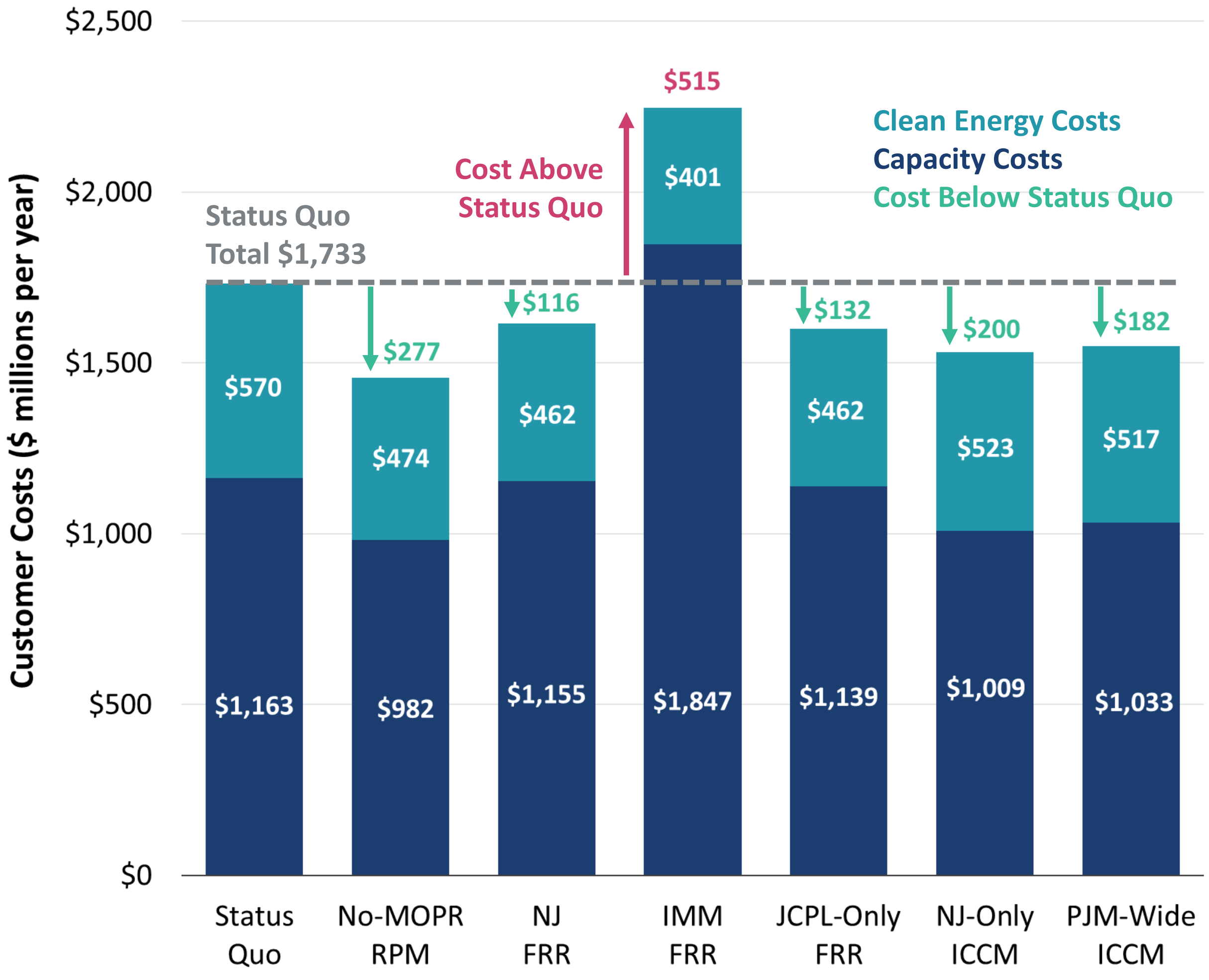
Alternative Resource Adequacy Structures Analyzed

Design	Description
Status Quo RPM with MOPR	New Jersey stays in PJM reliability pricing model (RPM) capacity market with MOPR applied PJM-wide to state-supported clean resources
No-MOPR RPM	New Jersey stays in the PJM capacity market, but MOPR is not applied anywhere in PJM to state-supported clean resources
Fixed Resource Requirement	**New Jersey FRR.** State-wide FRR option, where New Jersey leaves the PJM capacity market and conducts an FRR auction with near best-case competitive pricing outcomes at 5% above PJM Base Residual Auction (BRA) prices
	New Jersey FRR under Independent Market Monitor (IMM) pricing assumptions. State-wide FRR option, but with higher pricing outcomes in line with IMM assumptions at 78% of Net Cost of New Entry (Net CONE) to provide a near worst-case of potential cost outcomes under FRR
	Partial FRR. Consistent with a stakeholder proposal, only one distribution area (Jersey Central Power and Light) is placed under FRR and utilized as the approach to avoid MOPR application to New Jersey policy resources. The single utility zone utilizes an FRR auction and achieves near-best-case competitive pricing outcomes at 5% above PJM BRA prices
Integrated Clean Capacity Market	**New Jersey-Only ICCM.** New Jersey runs its own ICCM under a state-wide FRR, prompting greater competition among clean resources, with capacity pricing realized at 5% above BRA prices. Other states remain in the PJM BRA capacity market
	PJM-Wide ICCM. All states implement an integrated clean capacity market reflecting their existing RPS targets, with downward sloping demand for clean energy reflecting additional demand for clean at low prices, achieving the competitive benefits of a no-MOPR full RPM plus a regional clean energy marketplace

OVERVIEW

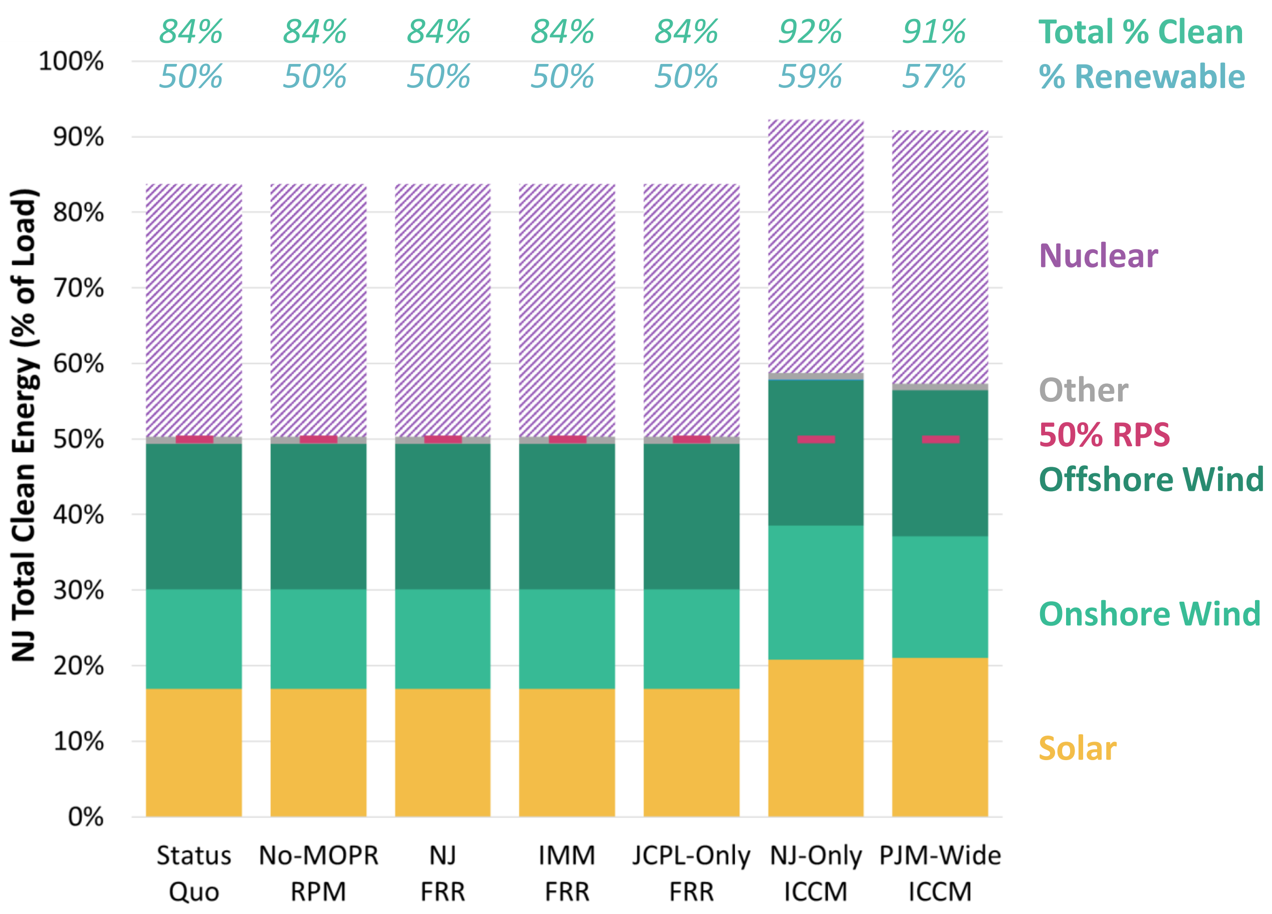
New Jersey Cost and Clean Energy Outcomes

2030 New Jersey Customer Costs



2030 Share of New Jersey Load Met by Clean Energy

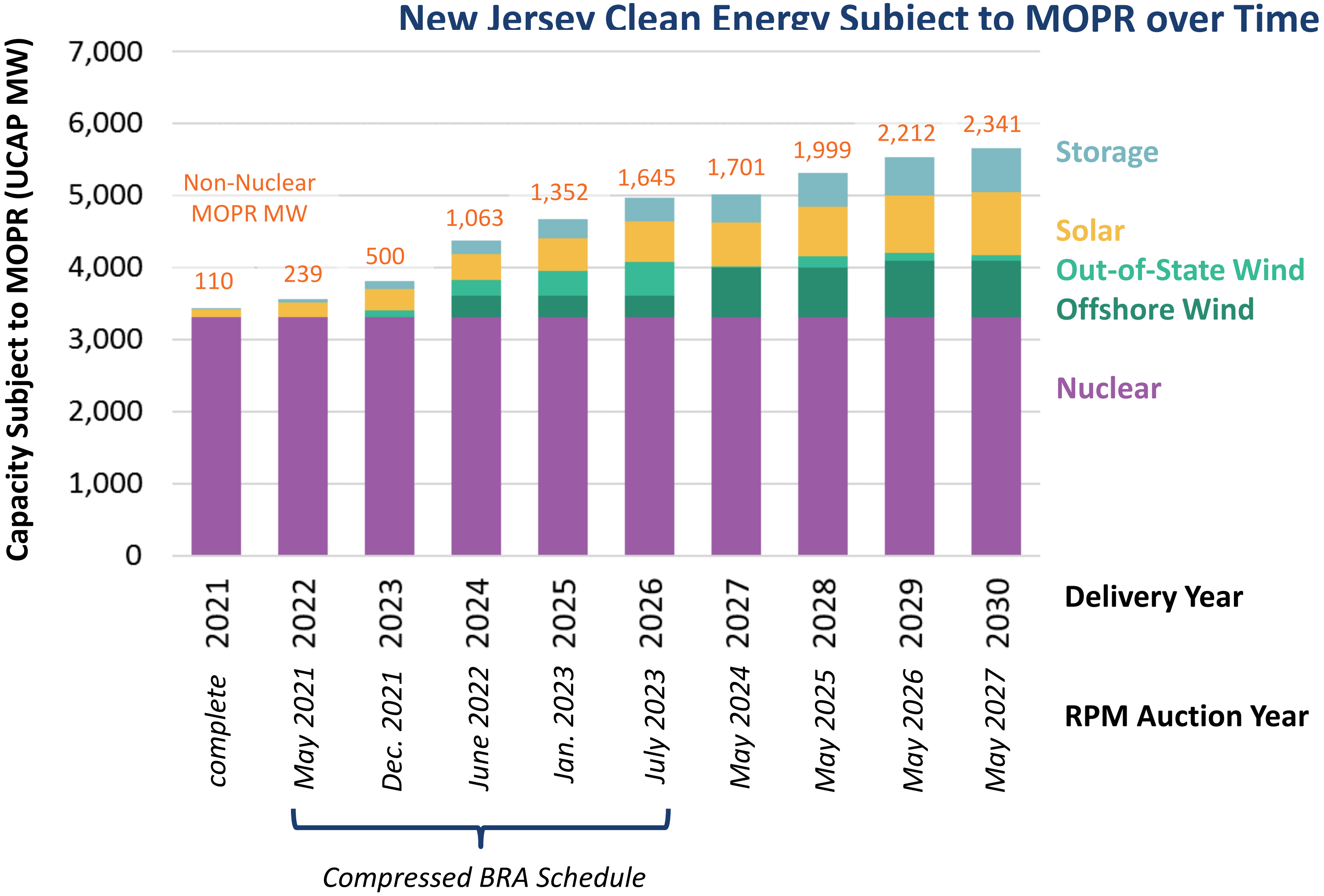
(includes new and existing clean energy resources)



Analysis of Economic and Clean Energy Outcomes

MOPR: Resources Subject to MOPR Grow Substantially to 2030

- Status quo MOPR would exclude state-supported resources from clearing the capacity market
  - 3,300 UCAP MW of nuclear currently face MOPR floor of $0/MW-day, so they would likely continue to clear in the near term (but this could change if the MOPR floor rises over time)
  - Up to 2,350 UCAP MW of NJ-supported clean resources may not clear by 2030
- Ongoing litigation, PJM workshops, and FERC policy may lessen or eliminate MOPR impacts (more clarity anticipated by mid/late 2021)

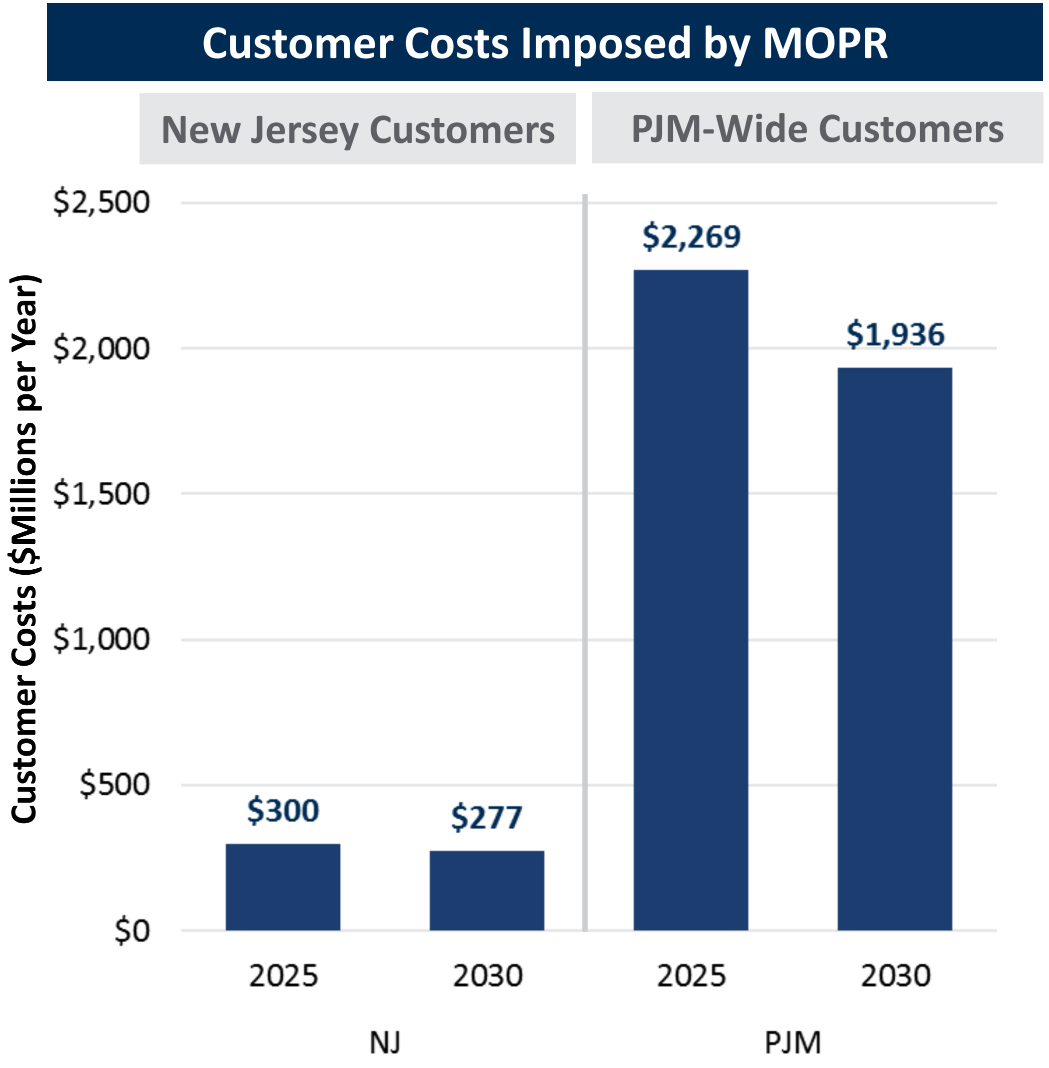


Note: Capacity subject to MOPR reflects new resources to meet New Jersey's offshore wind procurements, storage targets, and RPS targets. Most RPS growth is met by solar (assumed to increase by 250 MW each year) and offshore wind; we assume the remainder is met by out-of-state onshore wind. UCAP reflects declining capacity value of intermittent resources as PJM-wide penetration grows.

MOPR: Imposes Additional Costs on Customers

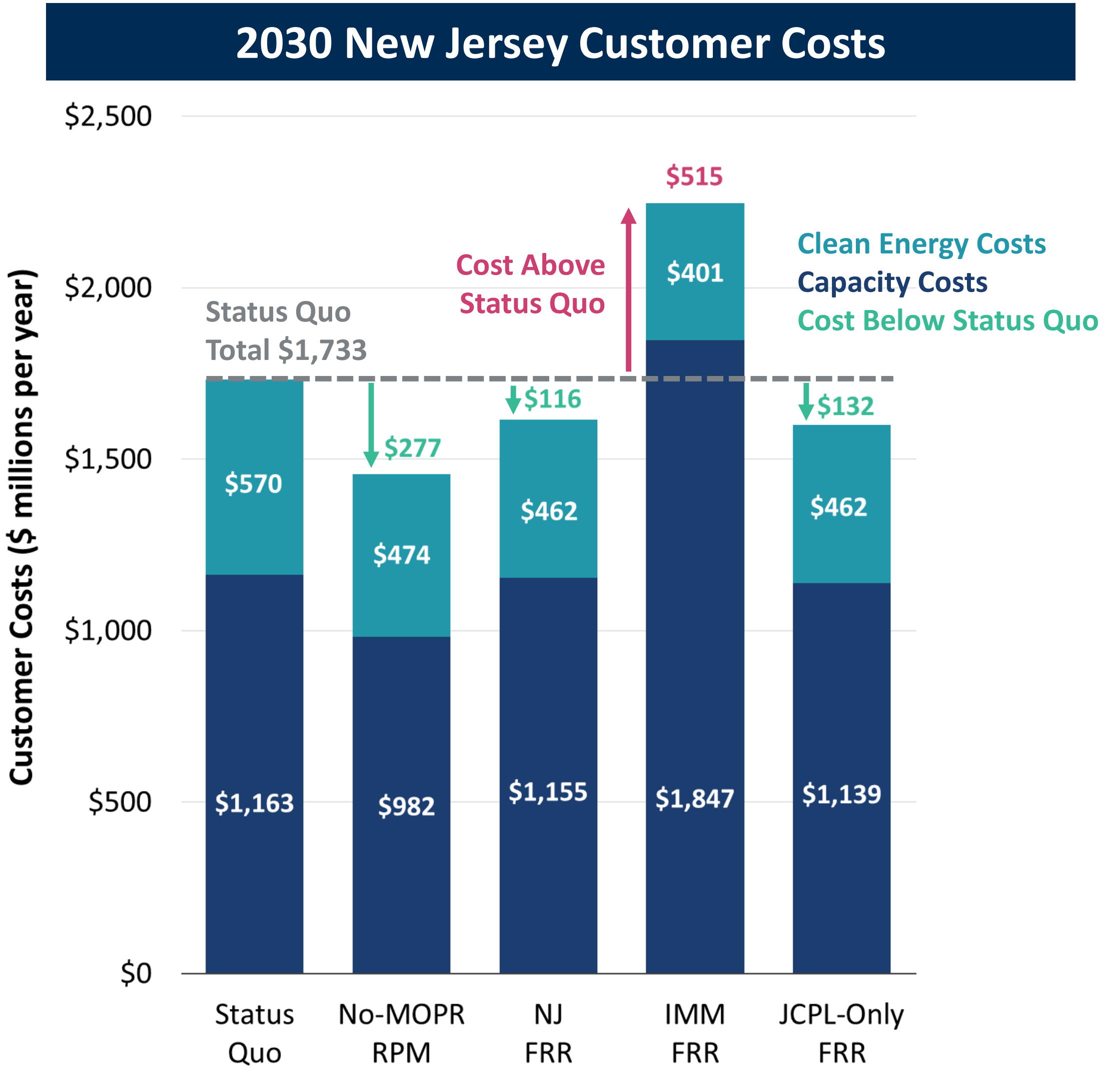
Compared to a no-MOPR capacity market, the expansive MOPR as applied to policy resources would:

- Impose approximately $280-$300 million per year in excess costs on New Jersey customers
- Impose approximately $1,900-$2,300 million per year in excess costs to customers across the PJM footprint
- Induce these higher costs in two ways by: (1) producing higher capacity prices, and (2) requiring customers to “pay twice” for capacity (once for clean energy resources that are precluded from clearing, and a second time through the capacity market)



FRR: Mitigates Costs of MOPR but with Implementation Risks

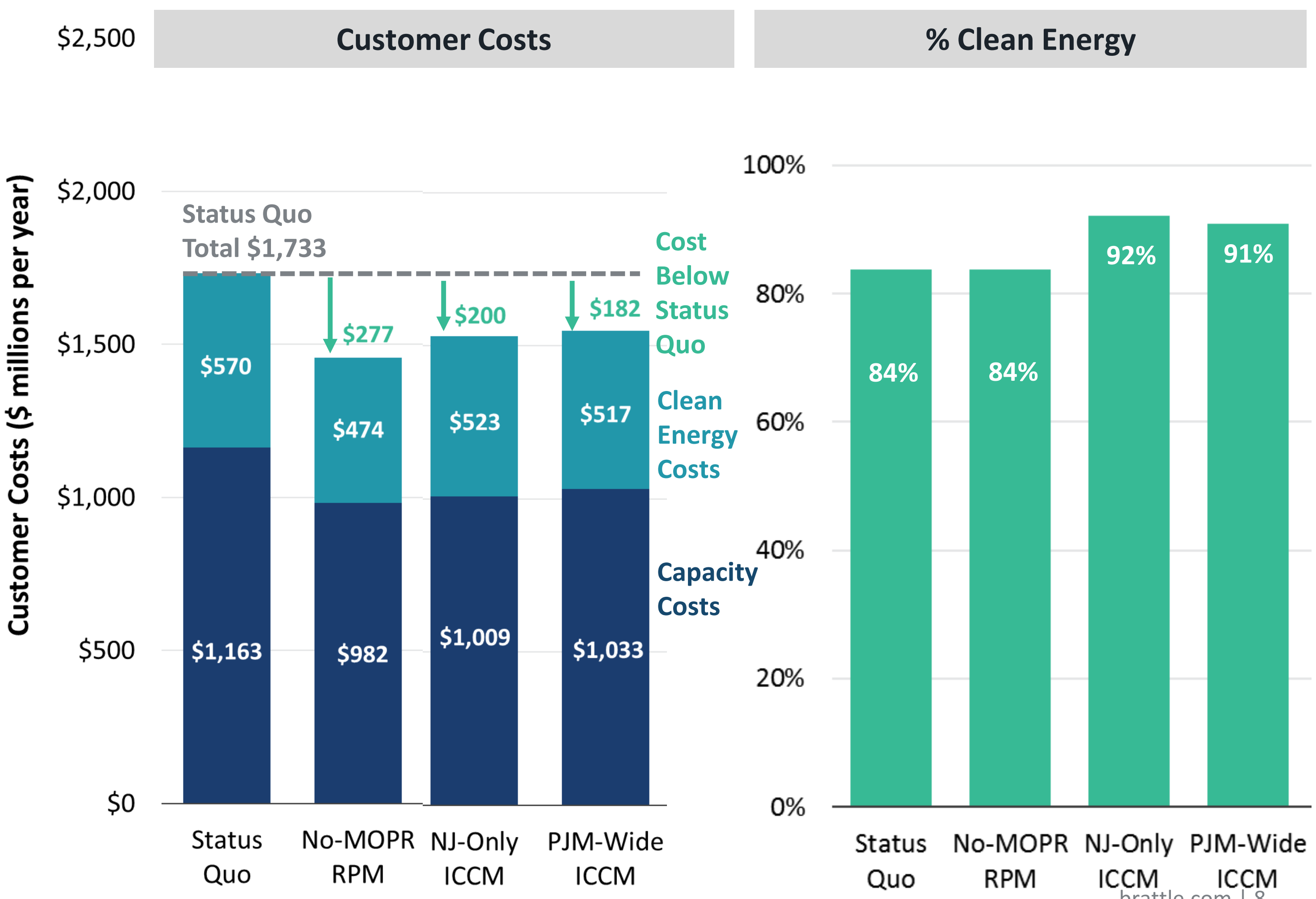
- Depending on design chosen (NJ-wide FRR or partial FRR), electing FRR could save 30-50% of the NJ customer costs from MOPR under near-best-case implementation assumptions
- But FRR does introduce implementation and design risks. An inefficient FRR could exceed status-quo MOPR and RPM costs (e.g. if multi-year capacity contracts are signed at above-market prices)



ICCM: Addresses MOPR Costs while Accelerating Clean Energy

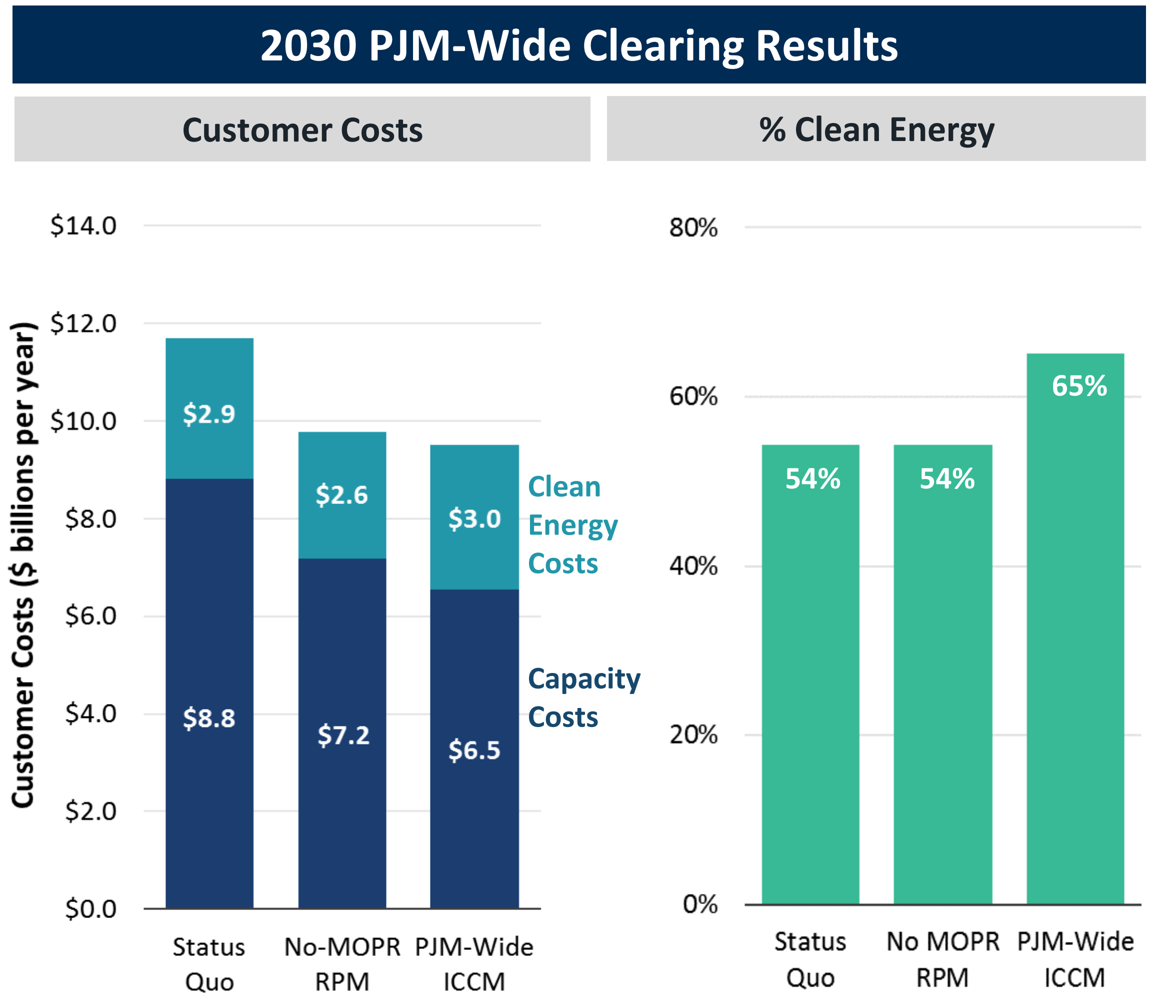
- Either a NJ-only or PJM-wide ICCM could mitigate the majority (65-85%) of the costs of MOPR to New Jersey customers
- ICCM could also substantially increase the amount of clean energy NJ procures, potentially accelerating NJ clean electricity from 84% to 92% of demand by 2030

2030 New Jersey Clearing Results



ICCM: PJM-Wide ICCM Offers Regional Benefits

- PJM-wide adoption of ICCM would extend economic benefits across all states in the region, including those that have no clean goals or 100% clean goals
- PJM-wide total clean generation could increase from 54% to 65% of PJM load by 2030



Takeaways

Takeaways

Minimum Offer Price Rule

- 3,300 UCAP MW nuclear subject to MOPR, but their default MOPR floor is currently $0/MW-day, so they would likely continue to clear
- Approximately 1,350 UCAP MW of clean supply could fail to clear by 2025 (up to 2,350 UCAP MW by 2030)
- Imposes excess costs to NJ customers of $280-$300M per year

Fixed Resource Requirement

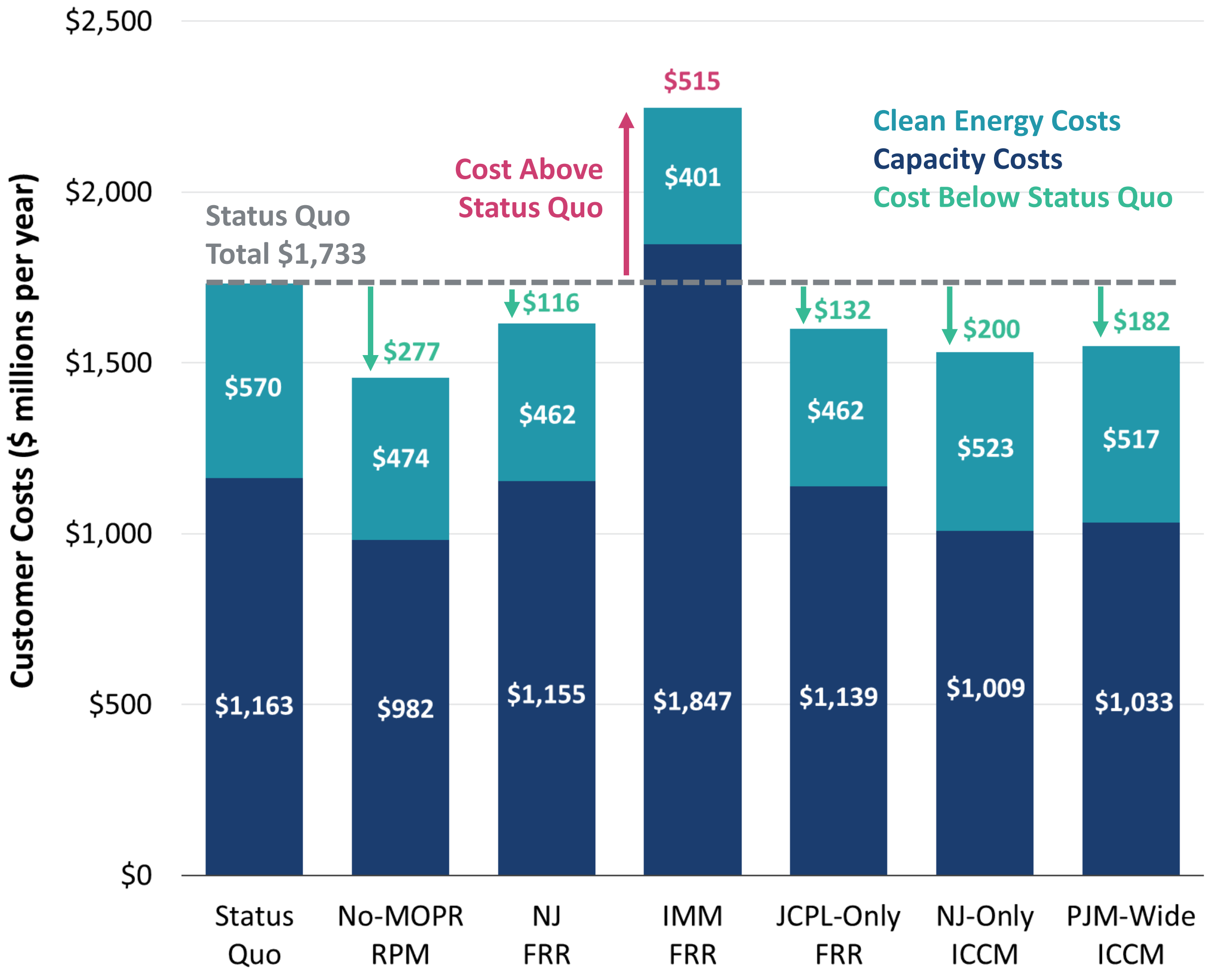
- Saves approximately 30-50% of the NJ ratepayer costs from MOPR if implemented efficiently (no design flaws)
- Introduces implementation and design risks to NJ ratepayer; an inefficient FRR could exceed status-quo MOPR and RPM costs (e.g. if multi-year capacity contracts are signed at above-market prices)

Integrated Clean Capacity Market

- Saves approximately 65-85% of the NJ ratepayer costs from MOPR, and shifts investment signals from fossil toward clean energy
- Accelerates NJ clean electricity from 84% to 92% of load by 2030
- PJM region-wide ICCM could accelerate clean energy from 54% to 65% of PJM load by 2030
- Some implementation risks remain

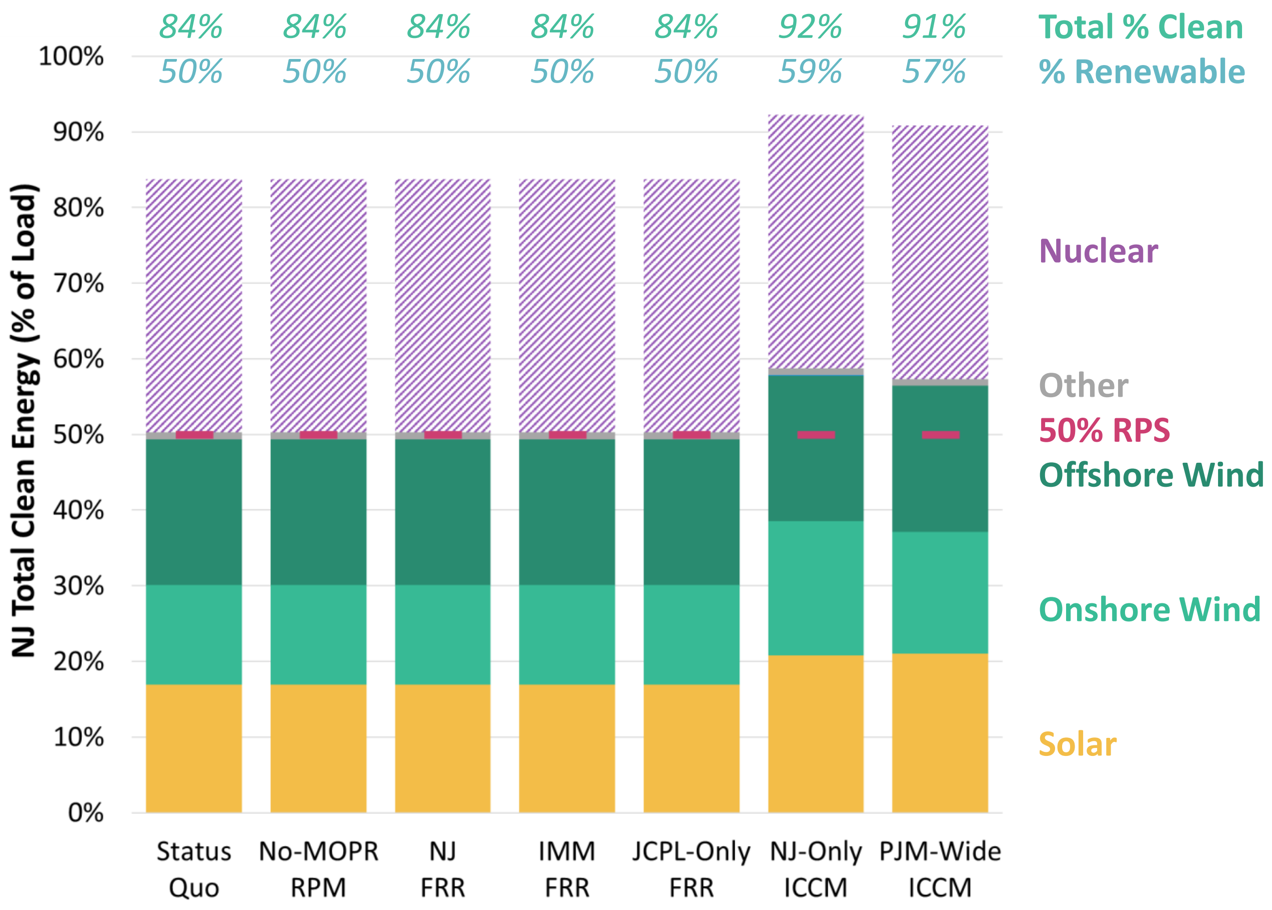
New Jersey Cost and Clean Energy Outcomes

2030 New Jersey Customer Costs



2030 Share of New Jersey Load Met by Clean Energy

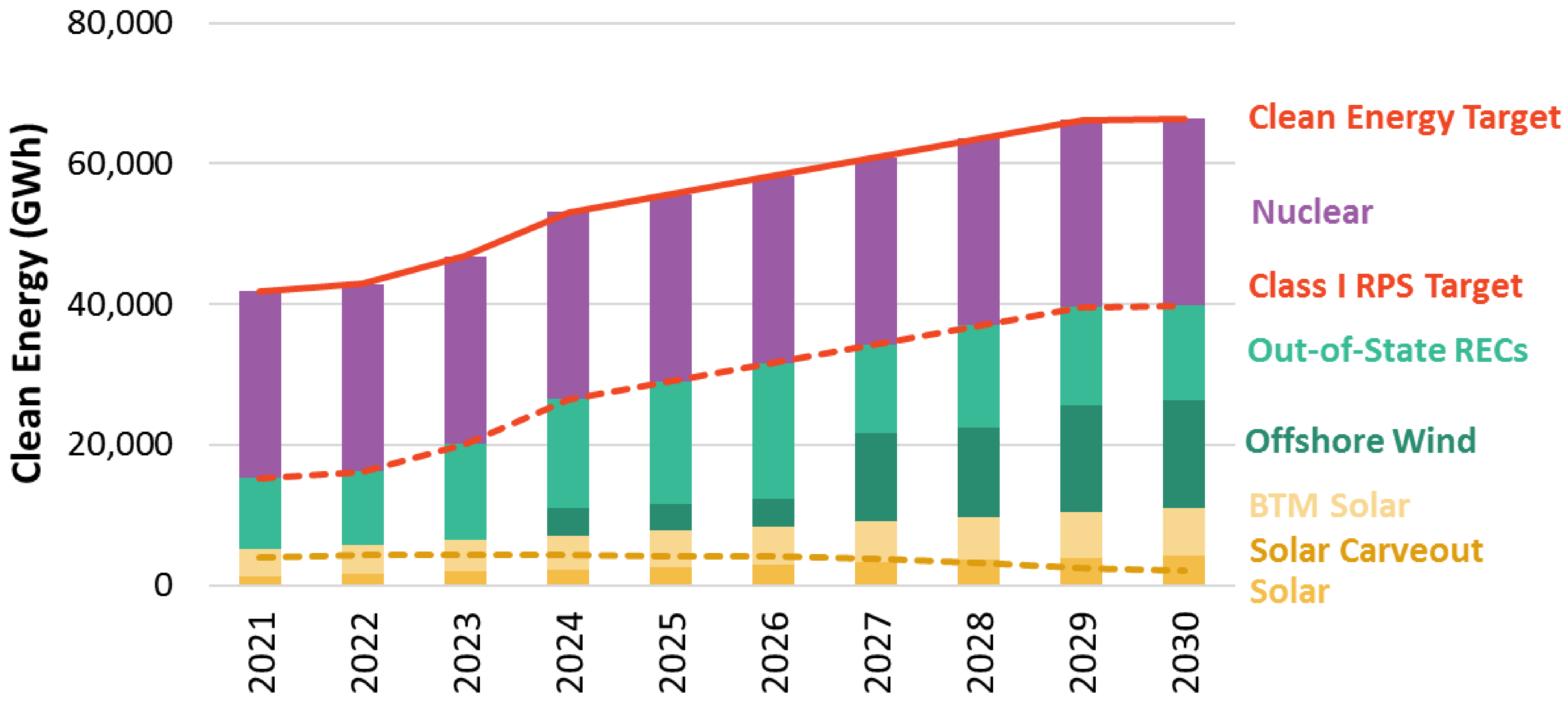
(includes new and existing clean energy resources)



Questions & Discussion

Appendix

Resources to Meet 50% RPS by 2030 (84% total clean)



Capacity Value of Intermittent Resources Over Time

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Offshore Wind	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	23.5%	23.5%	22.4%	22.4%
Onshore Wind	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%
Solar	40.4%	38.9%	38.9%	37.5%	37.5%	37.5%	35.1%	35.1%	35.1%	35.1%
Battery Storage	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%

Note: We assume the capacity value of battery storage is unchanged at the current level; this is likely to change as PJM is currently exploring ELCC methods to accredit storage (and other resource types).

FRR Demand Parameters

New Jersey FRR Demand

2025

	FRR Obligation	FRR Minimum Internal Resource Requirement	FRR Minimum Internal Resource Requirement
RTO	20,413	n/a	n/a
MAAC	20,413	20,413	100%
EMAAC	20,413	16,637	82%
PSEG	10,858	4,365	40%
PS-NORTH	5,525	2,453	44%

2030

	FRR Obligation	FRR Minimum Internal Resource Requirement	FRR Minimum Internal Resource Requirement
RTO	20,988	n/a	n/a
MAAC	20,988	20,988	100%
EMAAC	20,988	17,105	82%
PSEG	11,133	4,476	40%
PS-NORTH	5,665	2,515	44%

JCPL-Only FRR Demand

2025

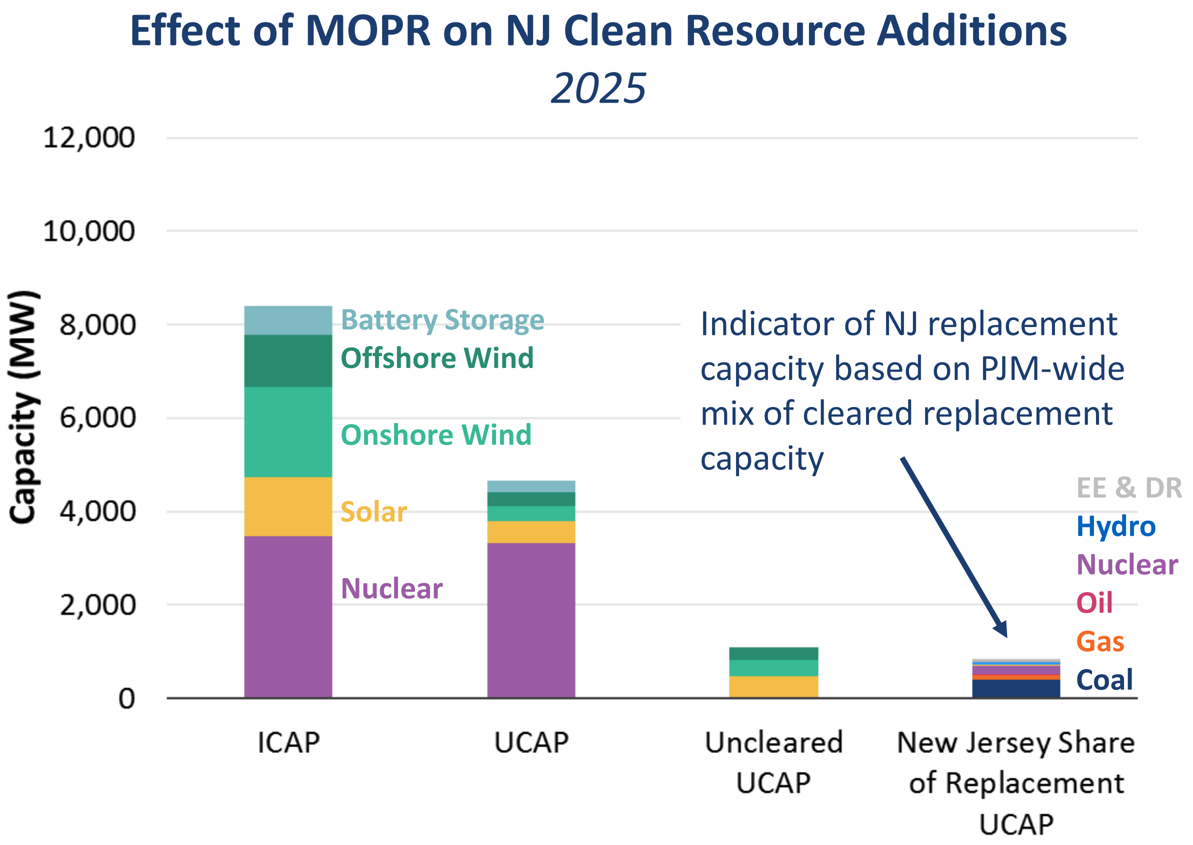
	FRR Obligation	FRR Minimum Internal Resource Requirement	FRR Minimum Internal Resource Requirement
RTO	6,431	n/a	n/a
MAAC	6,431	6,431	100%
EMAAC	6,431	5,241	82%
PSEG	0	0	0%
PS-NORTH	0	0	0%

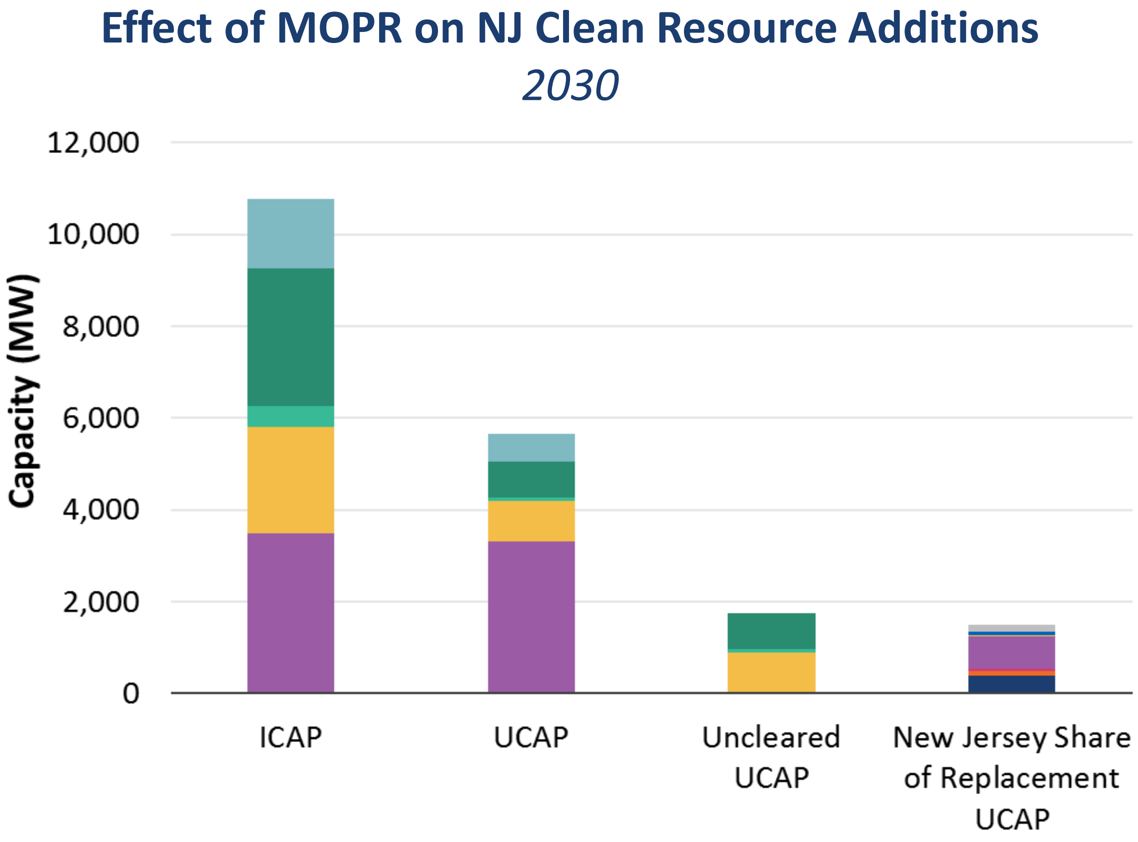
2030

	FRR Obligation	FRR Minimum Internal Resource Requirement	FRR Minimum Internal Resource Requirement
RTO	6,645	n/a	n/a
MAAC	6,645	6,645	100%
EMAAC	6,645	5,416	82%
PSEG	0	0	0%
PS-NORTH	0	0	0%

Status-Quo MOPR Retains Fossil Resources to Meet New Jersey Capacity Needs

Approximately 1,350 MW UCAP of New Jersey's clean energy resource additions are uncleared due to MOPR in 2025; 50% are replaced by retained fossil (coal, gas, and oil)





Capacity Clearing Prices

Clearing Prices by Scenario

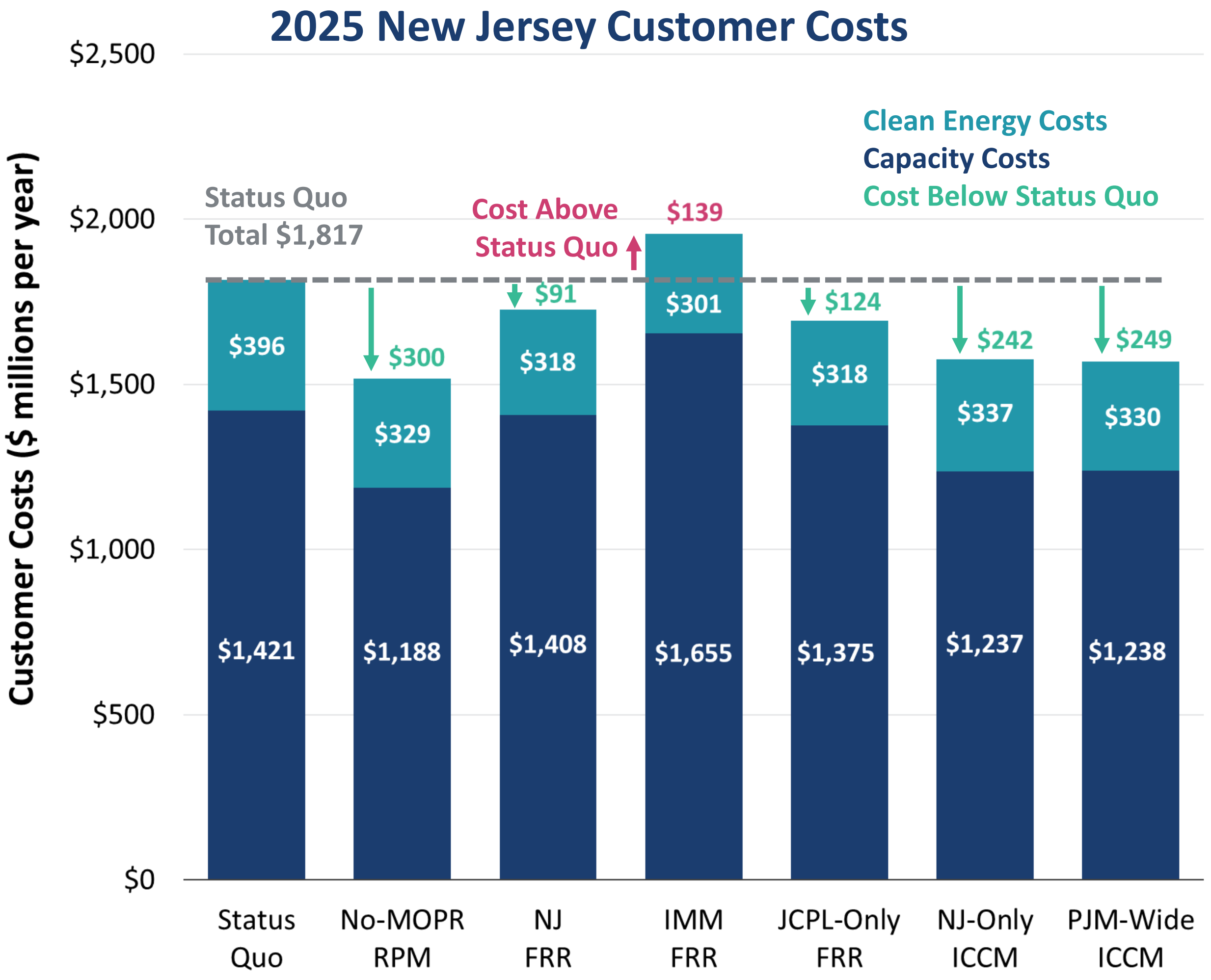
2025

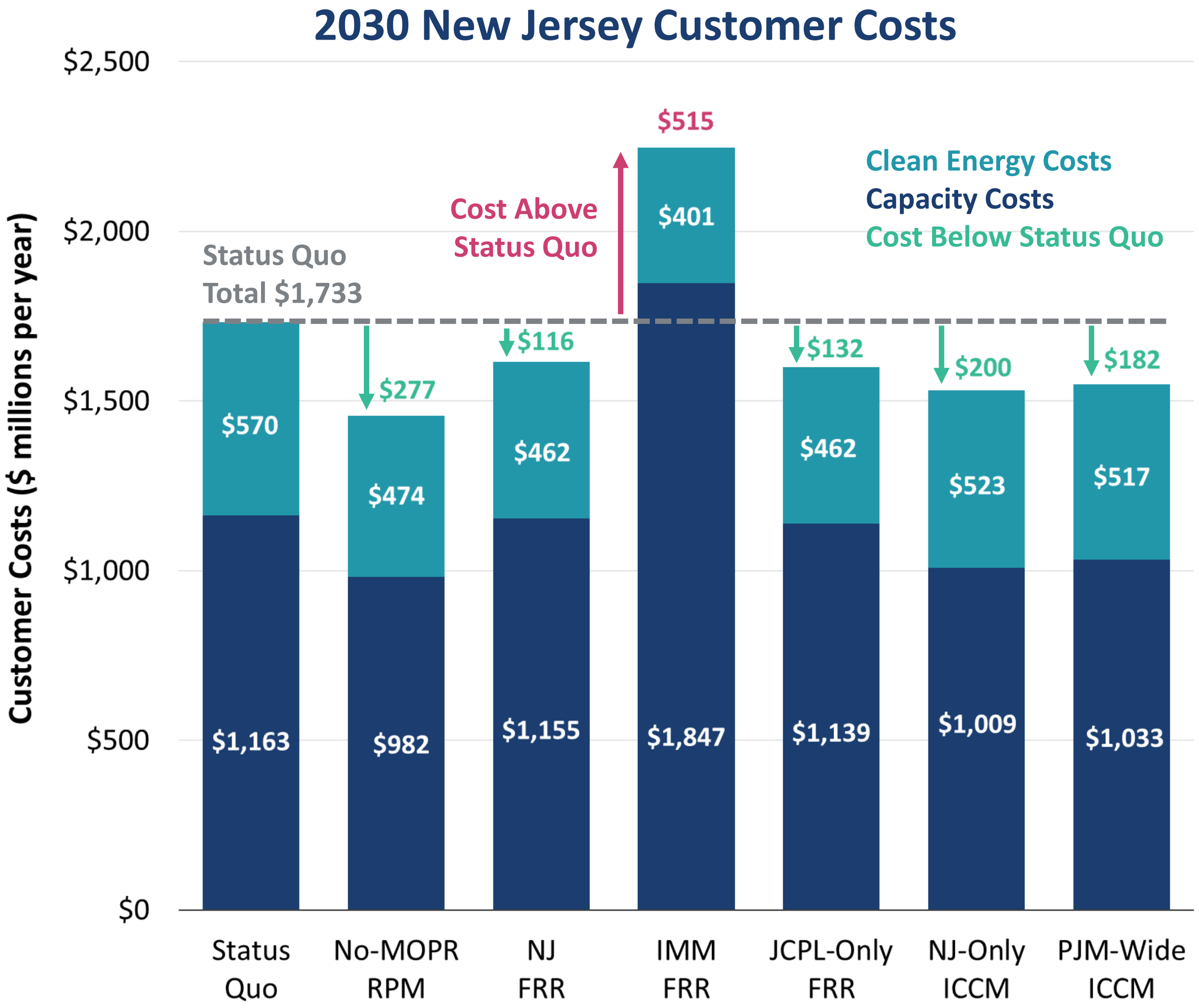
	Status Quo	No-MOPR RPM	State-Wide FRR		IMM FRR		JCPL-Only FRR		State-Wide ICCM		PJM-Wide ICCM
			FRR	RPM	FRR	RPM	FRR	RPM	FRR	RPM	
RTO	$188	$151	n/a	$180	n/a	$180	n/a	$180	n/a	$158	$117
MAAC	$188	$151	$189	$180	$222	$180	$189	$180	$166	$158	$151
EMAAC	$188	$151	$189	$180	$222	$180	$189	$180	$166	$158	$163
PSEG	$188	$181	$189	n/a	$222	n/a	n/a	$180	$166	n/a	$181
PS-NORTH	$188	$181	$189	n/a	$222	n/a	n/a	$180	$166	n/a	$181

2030

	Status Quo	No-MOPR RPM	State-Wide FRR		IMM FRR		JCPL-Only FRR		State-Wide ICCM		PJM-Wide ICCM
			FRR	RPM	FRR	RPM	FRR	RPM	FRR	RPM	
RTO	$148	$115	n/a	$144	n/a	$144	n/a	$144	n/a	$125	$90
MAAC	$148	$124	$151	$144	$241	$144	$151	$144	$132	$125	$131
EMAAC	$148	$124	$151	$144	$241	$144	$151	$144	$132	$125	$131
PSEG	$148	$124	$151	n/a	$241	n/a	n/a	$144	$132	n/a	$131
PS-NORTH	$148	$124	$151	n/a	$241	n/a	n/a	$144	$132	n/a	$131

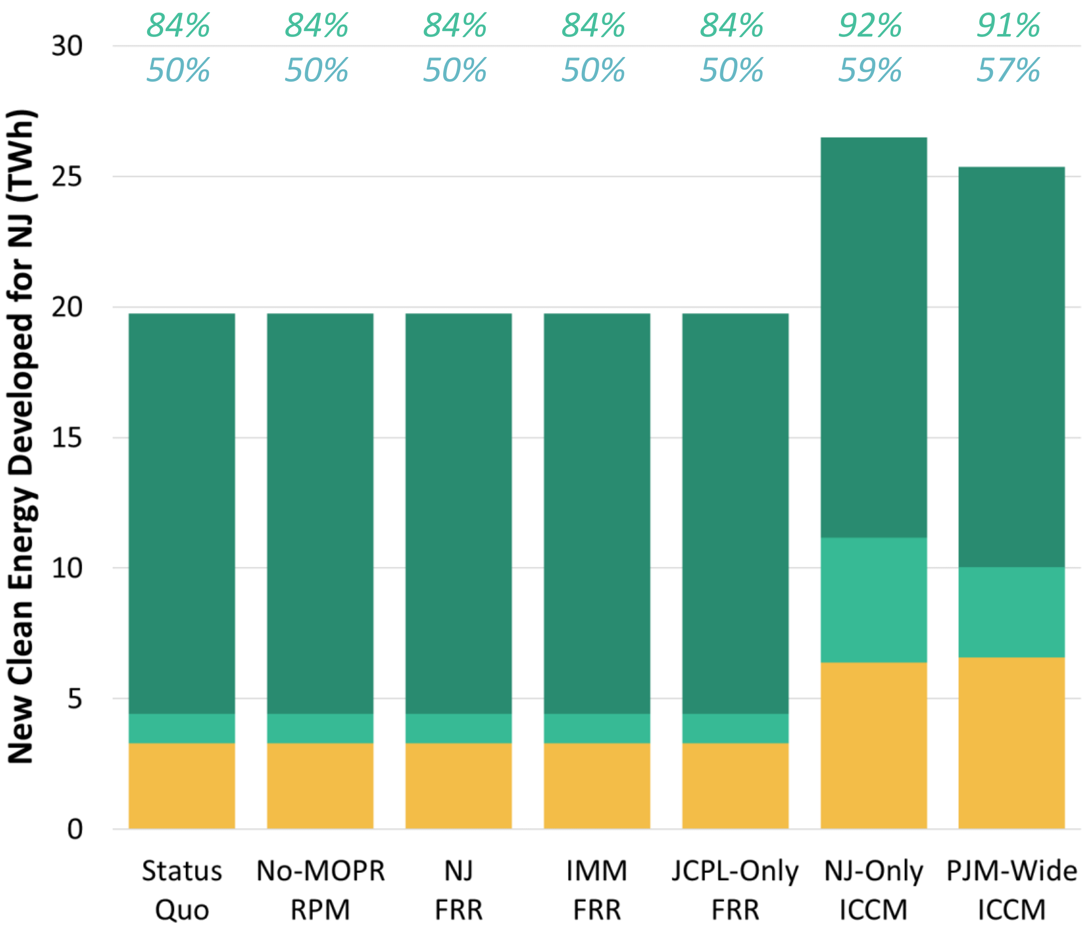
New Jersey Customer Costs by Structure and Study Year

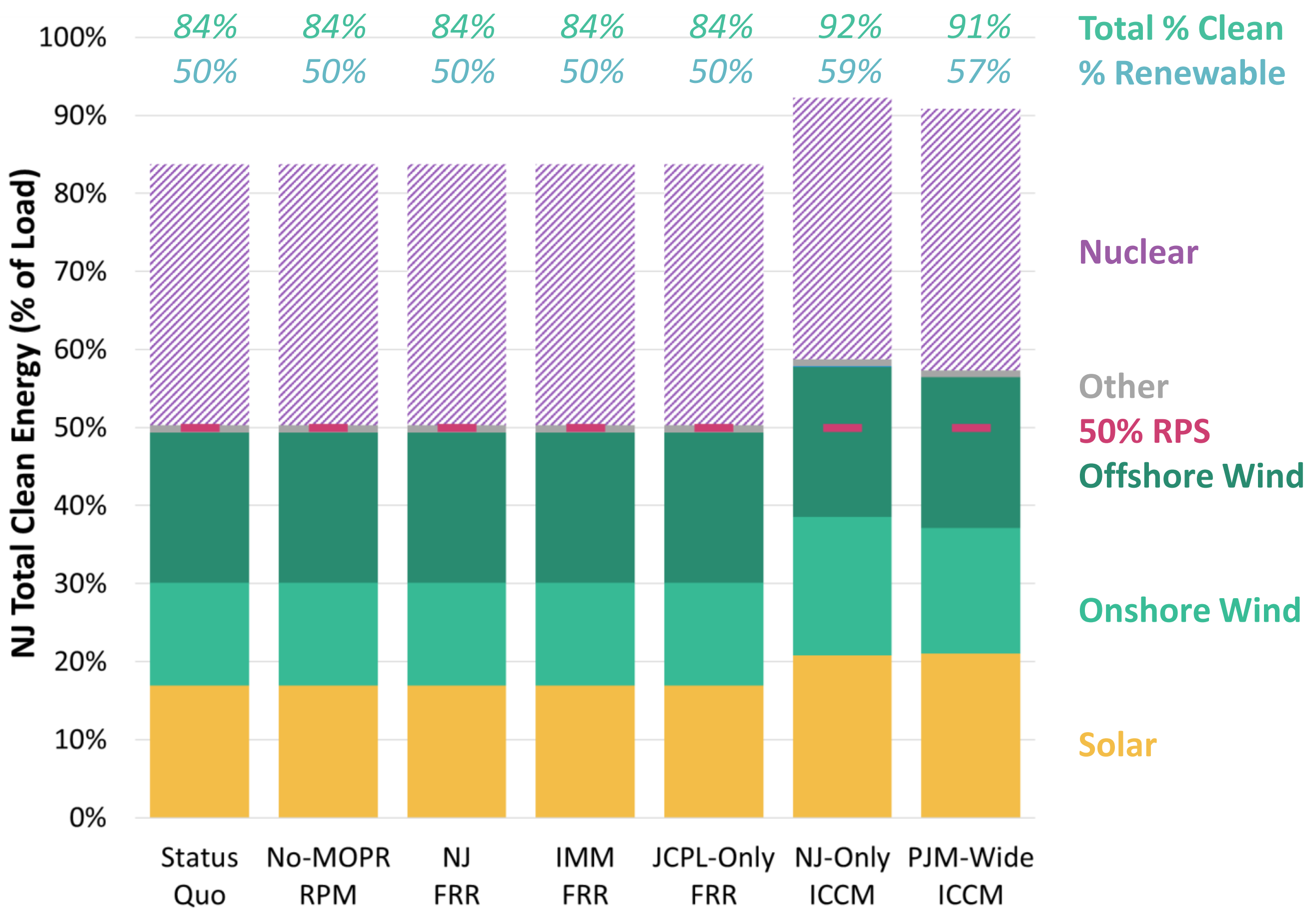




Notes: Clean energy resource costs include payments to new onshore wind, offshore wind, and utility-scale solar resources in excess of their energy and capacity revenues. Capacity costs include New Jersey's share of PJM capacity costs (when participating in the PJM auction) or the New Jersey FRR cost (when not). This analysis does not directly account for how offer behavior might change over time to reflect different patters under each scenario. 2025 capacity supply reflects latest PJM capacity auction offers; we assume increased supply elasticity in 2030 to better reflect the long-run costs of capacity.

New Jersey Clean Energy Supply in 2030





Notes: "Other" includes Landfill Gas, Municipal Solid Waste, Agriculture Waste, Black Liquor, Other Biomass Gas, Wood/Waste Solids, and Geothermal currently providing RECs to meet New Jersey's RPS target.

Customer Costs Detail

		2025							2030						
		Status Quo	No-MOPR RPM	NJ FRR	IMM FRR	JCPL-Only FRR	NJ-Only ICCM	PJM-Wide ICCM	Status Quo	No-MOPR RPM	NJ FRR	IMM FRR	JCPL-Only FRR	NJ-Only ICCM	PJM-Wide ICCM
New Jersey Customer Costs (Reported in nominal $)															
Capacity															
Cleared UCAP MW	*(UCAP MW)*	20,682	20,858	20,413	20,413	20,604	20,413	21,020	21,535	21,678	20,988	20,988	21,368	20,988	21,787
Uncleared NJ MOPR Resources	*(UCAP MW)*	1,951	0	0	0	0	0	0	2,638	0	0	0	0	0	0
Average NJ Capacity Price	*($/MW-day)*	$188	$156	$189	$222	$183	$166	$161	$148	$124	$151	$241	$146	$132	$130
Capacity Costs	*($ Millions/yr)*	$1,421	$1,188	$1,408	$1,655	$1,375	$1,237	$1,238	$1,163	$982	$1,155	$1,847	$1,139	$1,009	$1,033
Contracts and Clean Energy															
Renewable Energy Supply	*(% of Load)*	38%	38%	38%	38%	38%	49%	49%	50%	50%	50%	50%	50%	59%	57%
Clean Energy Supply	*(% of Load)*	73%	73%	73%	73%	73%	84%	83%	84%	84%	84%	84%	84%	92%	91%
Contracts and Clean Energy Costs	*($ Millions/yr)*	$396	$329	$318	$301	$318	$337	$330	$570	$474	$462	$401	$462	$523	$517
Total New Jersey Customer Costs	***($ Millions/yr)***	**$1,817**	**$1,517**	**$1,726**	**$1,956**	**$1,693**	**$1,575**	**$1,568**	**$1,733**	**$1,456**	**$1,616**	**$2,248**	**$1,601**	**$1,532**	**$1,550**
Change vs. Status Quo	*($ Millions/yr)*	*n/a*	*($300)*	*($91)*	*$139*	*($124)*	*($242)*	*($249)*	*n/a*	*($277)*	*($116)*	*$515*	*($132)*	*($200)*	*($182)*

Interesting & notable results:

- FRR saves substantial portion of MOPR costs due to (1) ~3% lower capacity procurement with no sloping demand curve; (2) FRR enables thousands of MW of non-NJ EMAAC and MAAC resources subject to MOPR to offer capacity, lowering capacity prices
- Partial FRR has similar outcomes as full NJ FRR as prices still drop substantially by enabling thousands of MW of capacity in PJM footprint
- ICCM result in substantially more clean resources due to economic entry and sloping CEAC demand curve, and costs are nearly as low as in no-MOPR case due to low capacity prices (as willingness to pay for additional clean beyond RPS target enables lower marginal capacity costs)
- PJM-wide ICCM cases have less clean energy than NJ-only ICCM, as incremental clean is more expensive when other states also procure more clean due to declining ELCC of intermittent resources leading to lower capacity revenues for those resources, necessitating higher CEAC prices