2024 New Jersey Energy Master Plan

Executive Summary DRAFT

March 13, 2025

DRAFT & DELIBERATIVE

Energy+Environmental Economics

Group Agreements

Be mindful of the time.

Please stick to your allotted time (3 min) for comment. A member of our team will mute participants who exceed time.

Focus on ideas, not individuals.

Please share feedback on concepts or content, not individuals.

We share a commitment to progress.

We're all here to improve our communities . Approach the discussion with openness and empathy.

Share your thoughts.

Feel free to drop comments or questions in the chat when it is not your time to speak.

Assume good intentions.

Everyone is here because they care about the issue. Disagreement doesn't mean disrespect.

Table of Contents

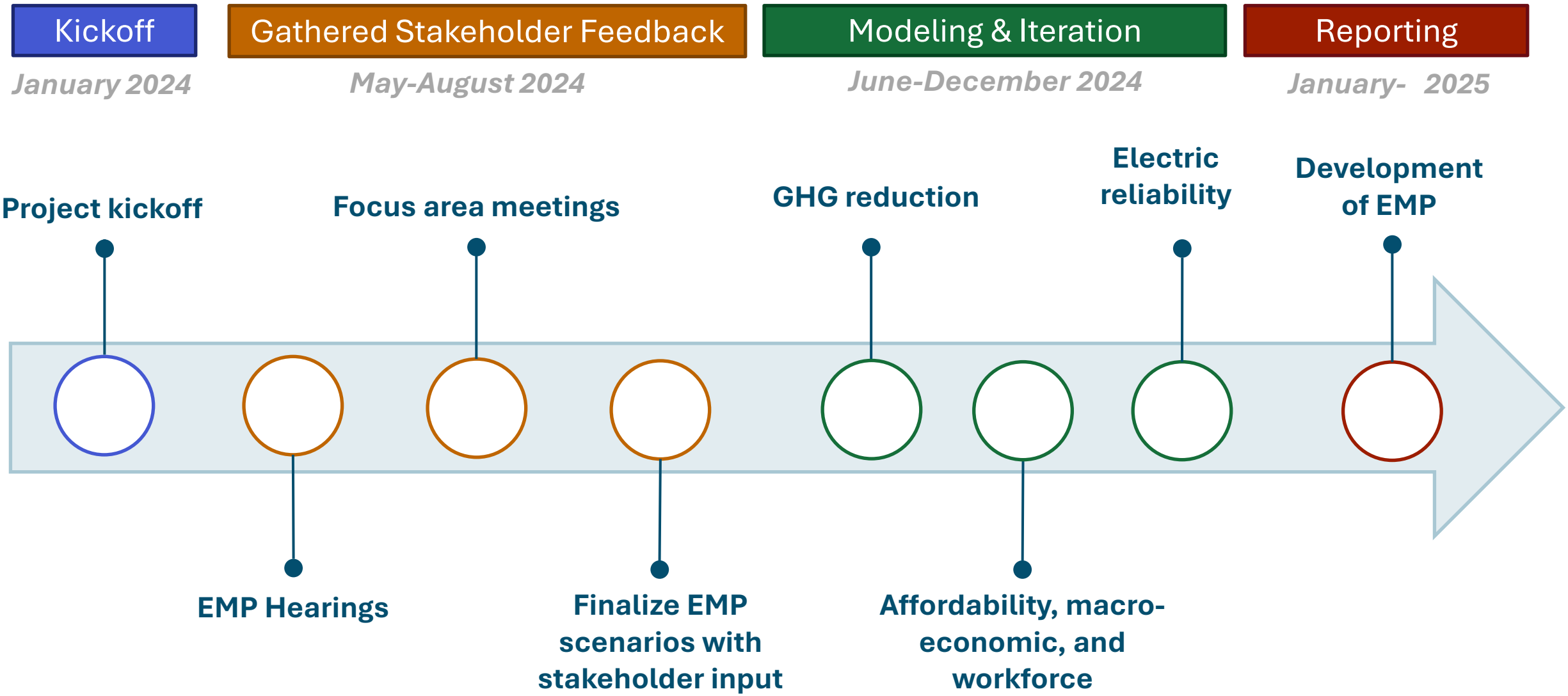
New Jersey Energy Master Plan Goals

The overarching goal of this study was to create New Jersey's 2024 Energy Master Plan (EMP), which outlines the state's strategic use, management, and development of energy. The EMP reflects the State's accelerated goal of reaching 100% clean energy by 2035.

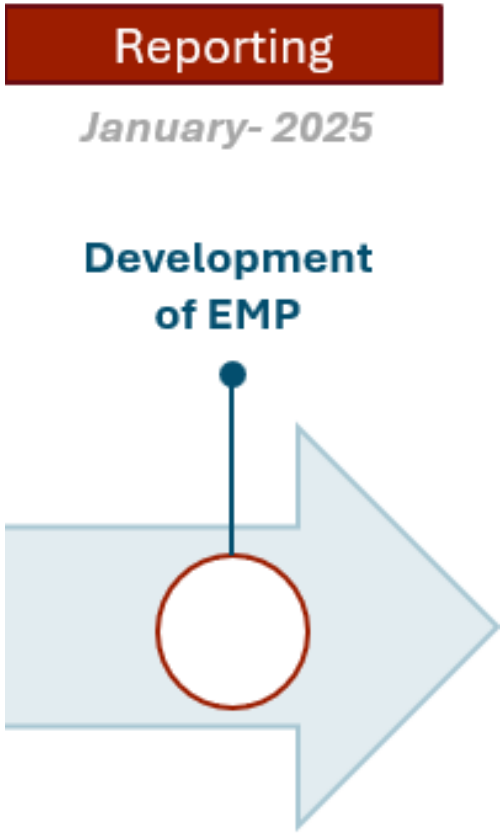
The EMP consists of several elements:

- A progress report on New Jersey's successes and barriers toward meeting 2019 EMP goals
- A policy analysis that includes a literature review of national best practices, executive orders, funding opportunities, and actions to inform the decarbonization scenarios
- An Integrated Energy Plan based on economy-wide energy system modeling of New Jersey's pathways for meeting long-term climate goals
- An analysis of the impact that electrification and decarbonization will have on customer costs
- Strategic stakeholder engagement and incorporation of feedback throughout the EMP process

EMP Timeline



Stakeholder Feedback Process



1. Today we will answer clarifying questions with respect to the analysis. Please submit questions in the chat throughout the presentation.
2. At the end of the presentation, stakeholders registered to speak can provide commentary for up to three minutes per person.
3. We will release the slides for feedback from stakeholders. **Stakeholder comments are due 5/1/25.**
4. By scanning the QR code, you will be guided to the Docket (QO24020126) to submit comments.

Progress and Policy

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New Jersey has made significant strides toward its 2019 goals

ENERGY EFFICIENCY (EE)

- $1.6B investment in NJ's Clean Energy Program and utility EE programs (e.g., LMI-focused Comfort Partners, C&I Large Energy Users, C-PACE)
- **Integrated home energy, health, and safety upgrades for LMI homes established in Whole House Pilot**
- New Construction Program and adoption of IECC 2021 building code to increase efficiency and environmental performance of new buildings

TRANSPORTATION

- **>200k light duty EVs on the road, partially incentivized through Charge Up NJ**
- **4200+ charging stations installed**, incl. 1100 chargers through It Pay$ to Plug In program and more
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- **~250 MW Community Solar approved in LMI communities**
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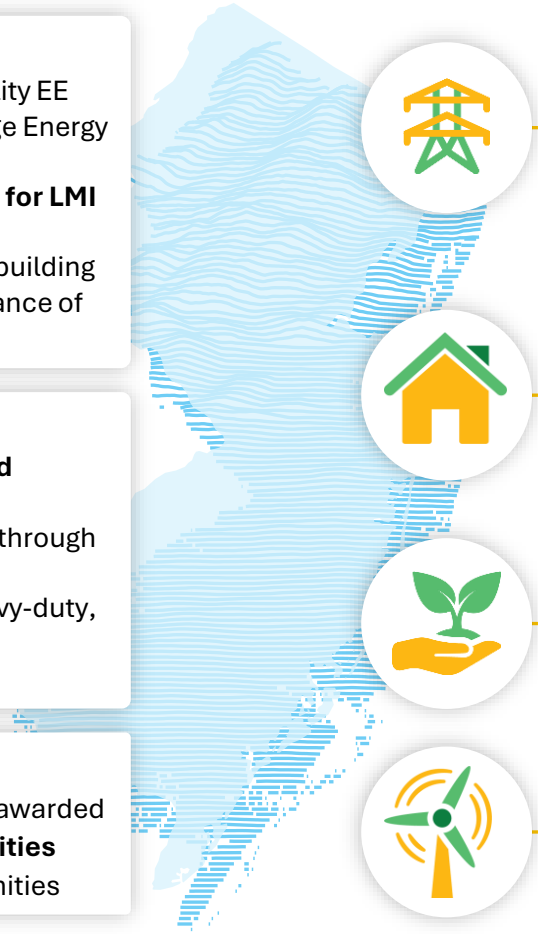

MODERNIZATION

- **Clean Energy Program and utility EE building decarbonization start-up programs established**
- NJ Cool incentive program for commercial building electrification established

AFFORDABILITY and WORKFORCE

- **Low-cost green financing through NJ Green Bank and Clean Energy Loans**
- Offshore wind manufacturing hubs in NJ Wind Port and Paulsboro
- Workforce development and R&D at NJ Wind Institute

INNOVATION

- **5 GW of approved offshore wind capacity**
- Advanced metering infrastructure deployment

CLEAN ENERGY

- **~5 GW of installed solar capacity, >1GW of planned capacity**
- Grid modernization roadmap developed

New Jersey has adopted several new targets and policies since the 2019 EMP

+ Key policies influencing the 2024 EMP Results:

- **Electricity**
  - **EO307** (Sep 2022) increases the **offshore wind** goal by nearly 50% to **11,000 MW** by 2040
  - **EO315** (Feb 2023) accelerates the target of 100% clean electricity by 2050 **to 2035**
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  - **NESCAUM MOU** (Feb 2024) pledged - along with 8 other states - to have **heat pumps make up 90% of residential heating, air conditioning, and water heating sales by 2040**

2024 Stakeholder Feedback on Climate Policy & Planning

Organized by frequency of mention

+ Affordability and Cost

- Stakeholders desire to see information on upfront costs of equipment in addition to expected impacts of climate change mitigation on utility bills
- Stakeholders sought special consideration for the needs of renters - particularly those in LMI brackets - to address energy affordability concerns and improve access to clean energy

+ Environmental Justice and Equity

- Stakeholders expressed concerns for overburdened communities, such as low-income or communities of color, that have historically been disproportionately impacted by industrial pollution, extreme weather, and other impacts of fossil fuel generation
- Stakeholders called for expanded policies and programs targeting overburdened communities to improve access to energy efficiency programs, clean energy, and job opportunities. Stakeholders emphasized that the challenges related to old housing stock disproportionately affect LMI and overburden communities.

+ Infrastructure and Reliability

- Stakeholders emphasized grid modernization and costs, prioritizing energy efficiency, peak demand management, streamlined interconnection, updated rates, energy storage, and continued, strategic natural gas use, as well as accelerated clean energy generation and storage capacity for grid reliability and affordability.

2024 Stakeholder Feedback on Climate Policy & Planning

Organized by frequency of mention

+ Climate Change and Environmental Risk

- Stakeholders stressed the importance of acting swiftly to mitigate the impacts of climate change and noted how adopting clean energy and transitioning away from fossil fuels could help to offset the impacts of climate change;
- There were calls for accelerated timelines and more aggressive targets for clean energy, phasing out of existing fossil fuel infrastructure, and more holistic cost analysis to inform statewide planning

+ Workforce Readiness

- Stakeholders shared significant concern for the rate and scope of workforce development necessary to meet the State's goals, particularly in relation to LMI and overburdened communities, including feedback on workforce gaps, curriculum development, and workforce pipeline partnerships

+ Transparency in Modeling and Reporting

- Stakeholders placed emphasis on the importance of clearly documenting modeling assumptions and analysis used in the EMP's scenario modeling; Stakeholders desire for the State to provide regular updates to the public, detailing progress being made on the goals set out in the EMP

+ Energy Efficiency Program Offerings and Structure

- Stakeholders gave feedback on the importance of expanding and improving energy efficiency programs as a core component of New Jersey's decarbonization strategy, including recommendations for a streamlined "one stop shop" of all funding, rebate, energy efficiency, and clean energy program opportunities

2024 Integrated Energy Plan

Methodology

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Climate PATHWAYS Scenarios

The study included a current policy scenario, which does not meet the state's climate goals, and three "mitigation" scenarios, which do meet the 80% by 2050 reduction goal.

Current Policy

Includes finalized state and federal policies as of 2024, but excludes voluntary targets without enforcement mechanism:

- 50% renewable portfolio standard and 5 GW of offshore wind by 2030
- Heat pump adoption increases slowly but steadily, gas use in buildings declines ~25% by 2050
- Advanced Clean Cars and Advanced Clean Trucks programs drive significant ZEV adoption
- EPA regulations reduce refrigerant emissions

Why this scenario

This scenario explores how far existing state and federal policies could get New Jersey towards achieving its emissions targets.

High Electrification

Represents the most ambitious electrification of end-uses in buildings, industry, and transportation, with lower reliance on hybrid heating and no decarbonized fuels use:

- 100% clean electricity standard by 2035
- Rapid heat pump adoption, gas use in buildings declines over 80% by 2050.
- ~94% of NJ passenger vehicles are EVs by 2050
- Natural gas for low temperature industrial heat is electrified, around ~50% of industrial gas in 2050.

Why this scenario

This scenario examines the impact of rapid electrification on demand-side emissions and the build out of electricity resources needed to meet load while still maintaining reliability.

Demand Management

Includes ambitious electrification, but with increased efficiency measures to reduce bulk grid demands:

- 100% clean electricity standard by 2035
- Over 60% of existing homes and commercial buildings have envelope upgrades by 2050
- 5 GW of customer-sited solar added by 2050
- Managed EV charging to reduce peak load
- VMT reductions from urban design and public transit

Why this scenario

This scenario explores how energy efficiency and conservation can reduce the costs of decarbonization through peak load management.

Hybrid Electrification Scenario

Includes more hybrid heat pump systems where gas backup provides heat during the coldest hours, and plug-in hybrid vehicles are higher share of EVs sold:

- 100% clean electricity standard by 2035
- 40% of homes have a heat pump with a backup gas system by 2050.
- ~94% of passenger vehicles are EVs, but 20% are plug-in hybrids
- Advanced renewable fuels blended with fossil gas and petroleum mitigate a portion of non-electrified fuel use

Why this scenario

This scenario illustrates a future where heat pumps and EVs are rapidly adopted, but strategic fuel use lowers peak electric load.

Greatest impact on electric grid

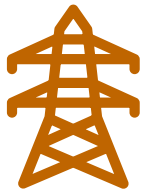
Reduced impact on grid via peak demand reduction

The Integrated Energy Plan consisted of four key areas of research

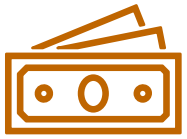
- Current Policy
- High Electrification
- Demand Management
- Hybrid Electrification

Economywide Pathways to Decarbonization: *How can we reduce emissions from the devices and vehicles we use?*

Electric Sector Growth and Decarbonization: *What will a decarbonized, reliable electric sector look like by 2050?*



Societal Impacts of Decarbonization: *What are the benefits and costs of reducing carbon emissions?*



Customer Energy Affordability: *What will residential energy and equipment costs be by 2035?*

2024 Integrated Energy Plan

Results

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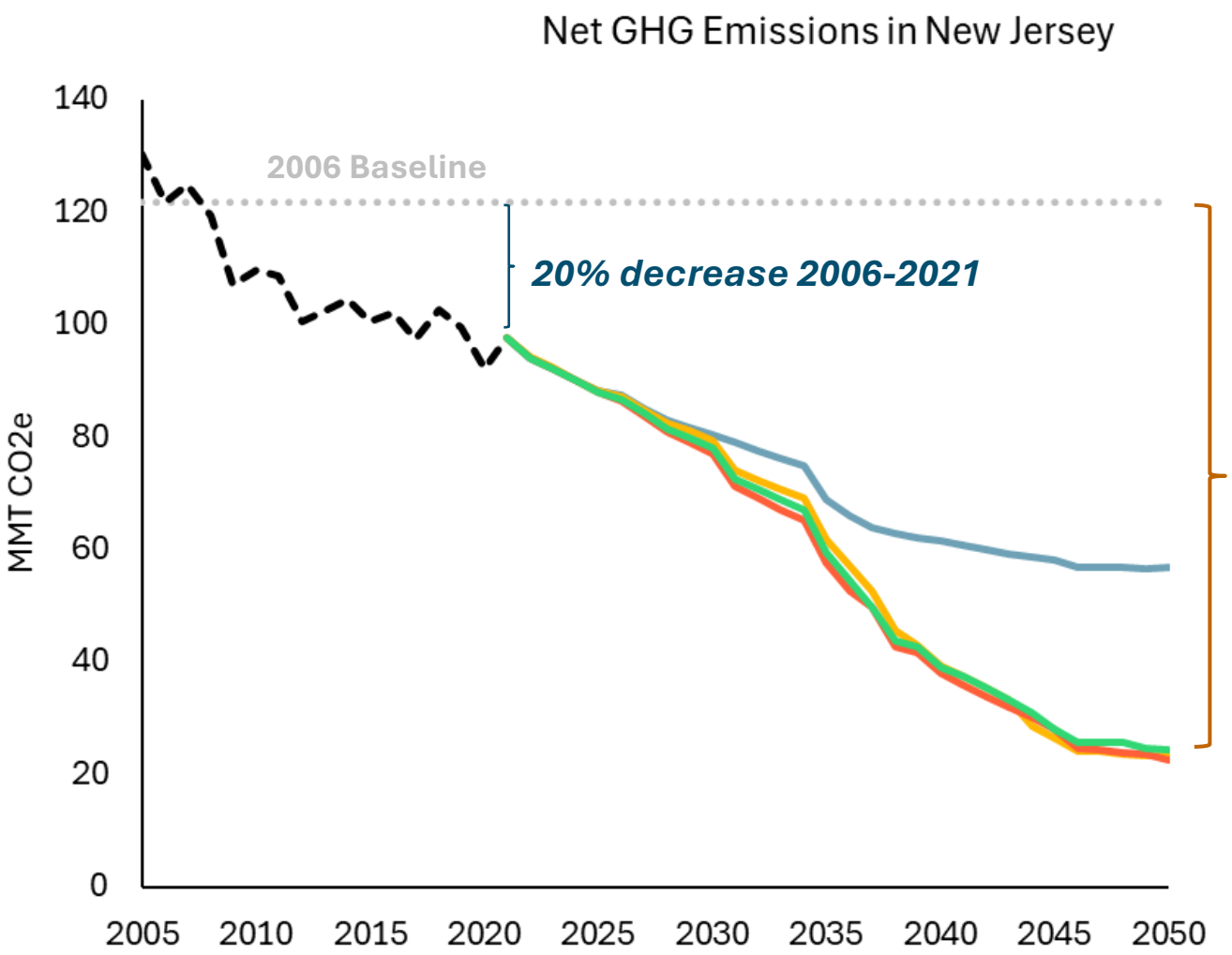
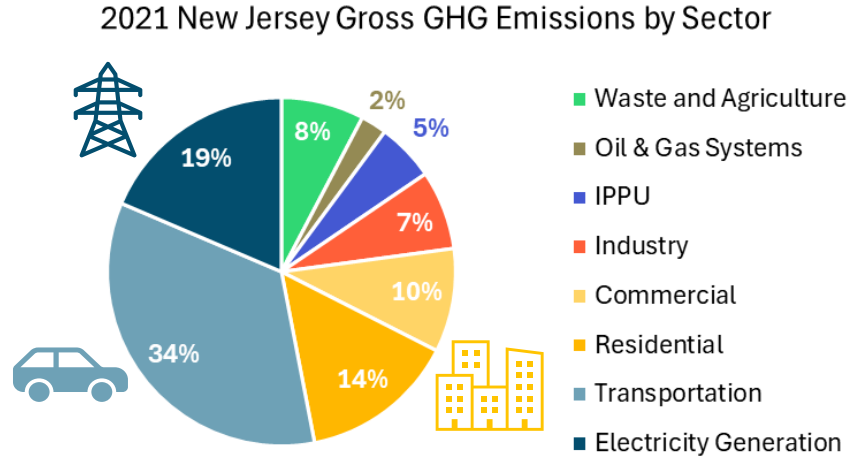
Integrated Energy Plan Key Findings

1. **It is feasible for NJ to meet its goals, but there will be challenges**
   - A rapid and sustained pace of low carbon technology deployment will be necessary to meet climate goals
   - New Jersey can pursue “no regret” climate actions in the near-term, such as building and transportation electrification, utility-scale solar and battery storage deployment
2. **If NJ meets its goals, there will be societal benefits**
   - Health benefits and avoided impacts of climate change result in significant cumulative net societal benefits 2025-2050
   - In the High Electrification scenario, 53,900 net new jobs are supported by climate and clean energy activities by 2035
3. **Energy affordability and equity must be addressed**
   - Policies must ensure low-income communities benefit from the clean energy transition while managing cost impacts
4. **Under all mitigation scenarios, electricity demand is projected to increase considerably over the next decade, requiring new capacity additions to maintain system reliability**
   - Data centers, building electrification, and transportation electrification will drive increases in electric demand
   - There will be a role for emerging clean firm technologies such as new nuclear, long duration storage, and decarbonized fuels to maintain system reliability post-2035; New Jersey has the opportunity to emerge as a leader in this space

New Jersey's emissions have been declining since 2005, primarily driven by a cleaner electric sector and increasing fuel efficiency standards

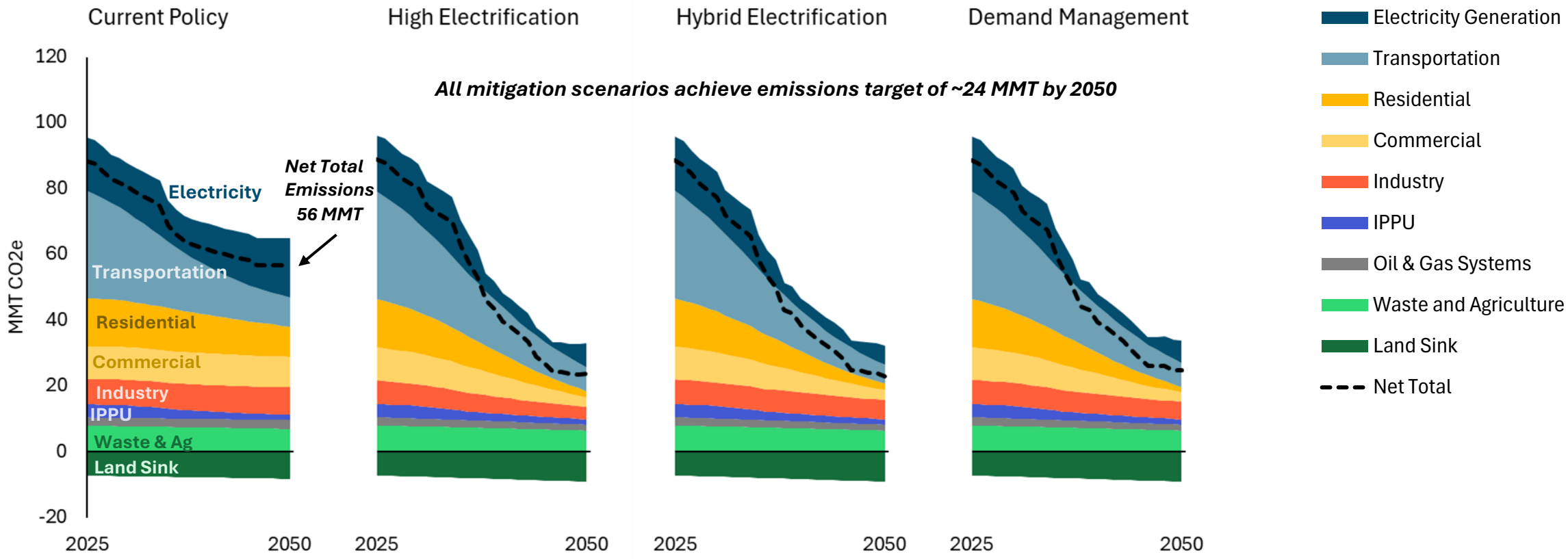




Steep emissions reductions are needed over the next 25 years to hit target

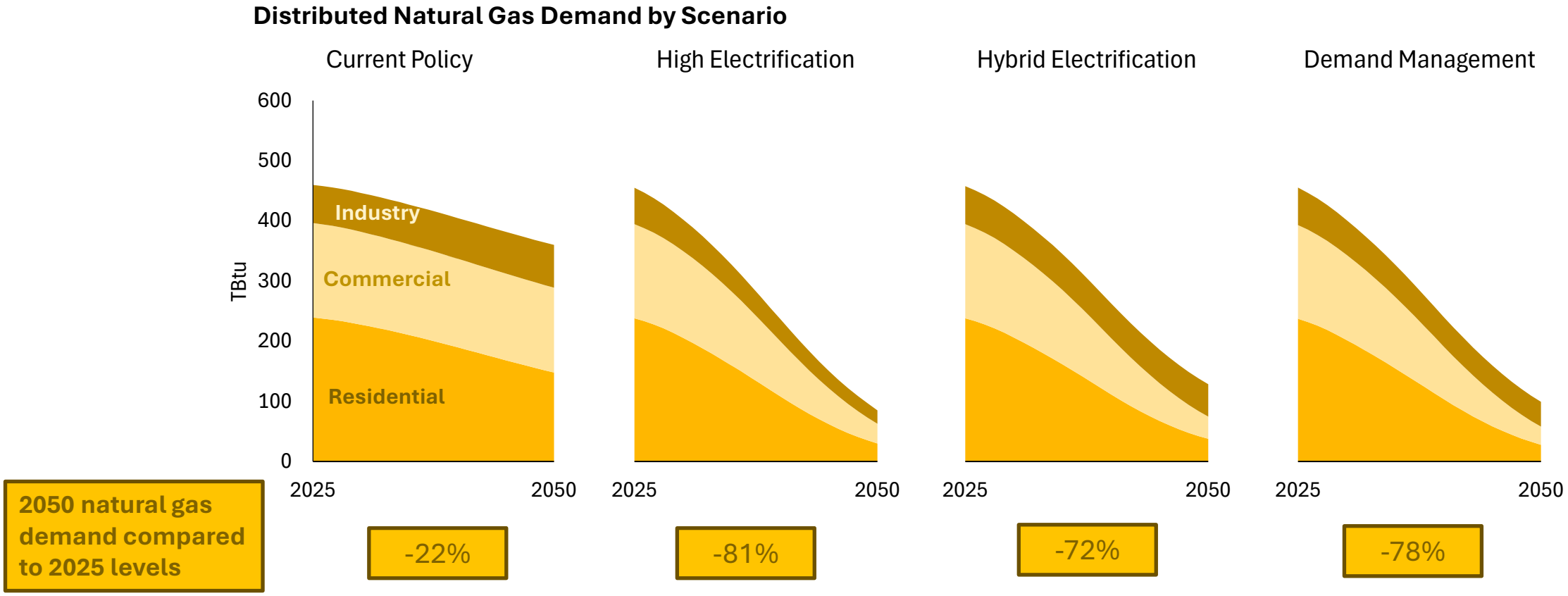
+ Electricity, transportation, and buildings sectors have the largest emissions reductions
+ Industry and non-energy/non-combustion sector also decline, but at slower rate

Greenhouse Gas Emissions by Scenario and Sector



Distributed natural gas demand* declines significantly in all mitigation scenarios

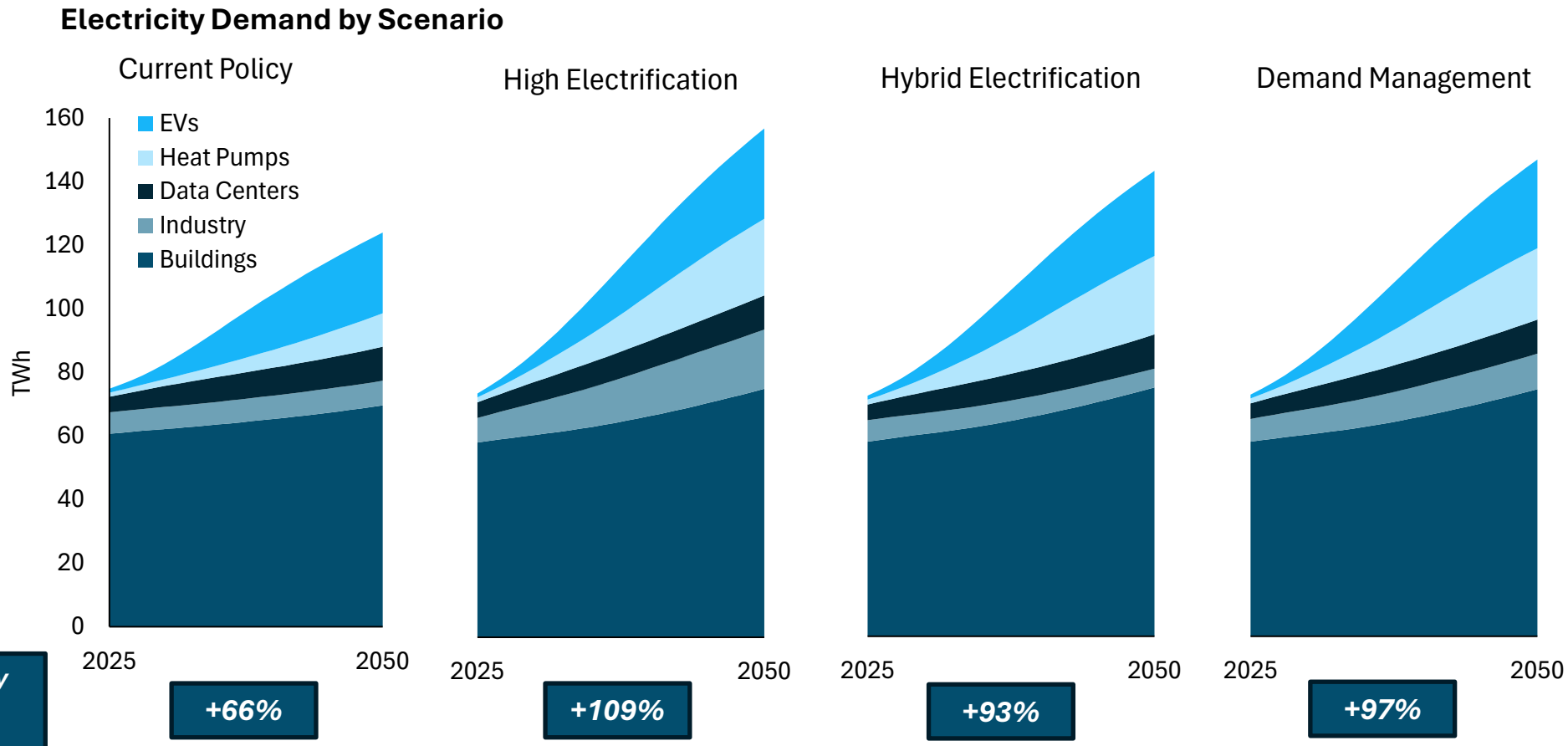
- Gas demand for buildings and industry declines by over 70% by 2050 in all GHG mitigation scenarios, but continues to play an important role through 2050 by providing peak heating needs in many buildings
- RNG is only needed to meet the economy-wide target in the Hybrid Electrification (5% blend by 2050)



Distributed gas includes gas consumed for end-uses in buildings and industry and excludes gas consumed for electricity generation

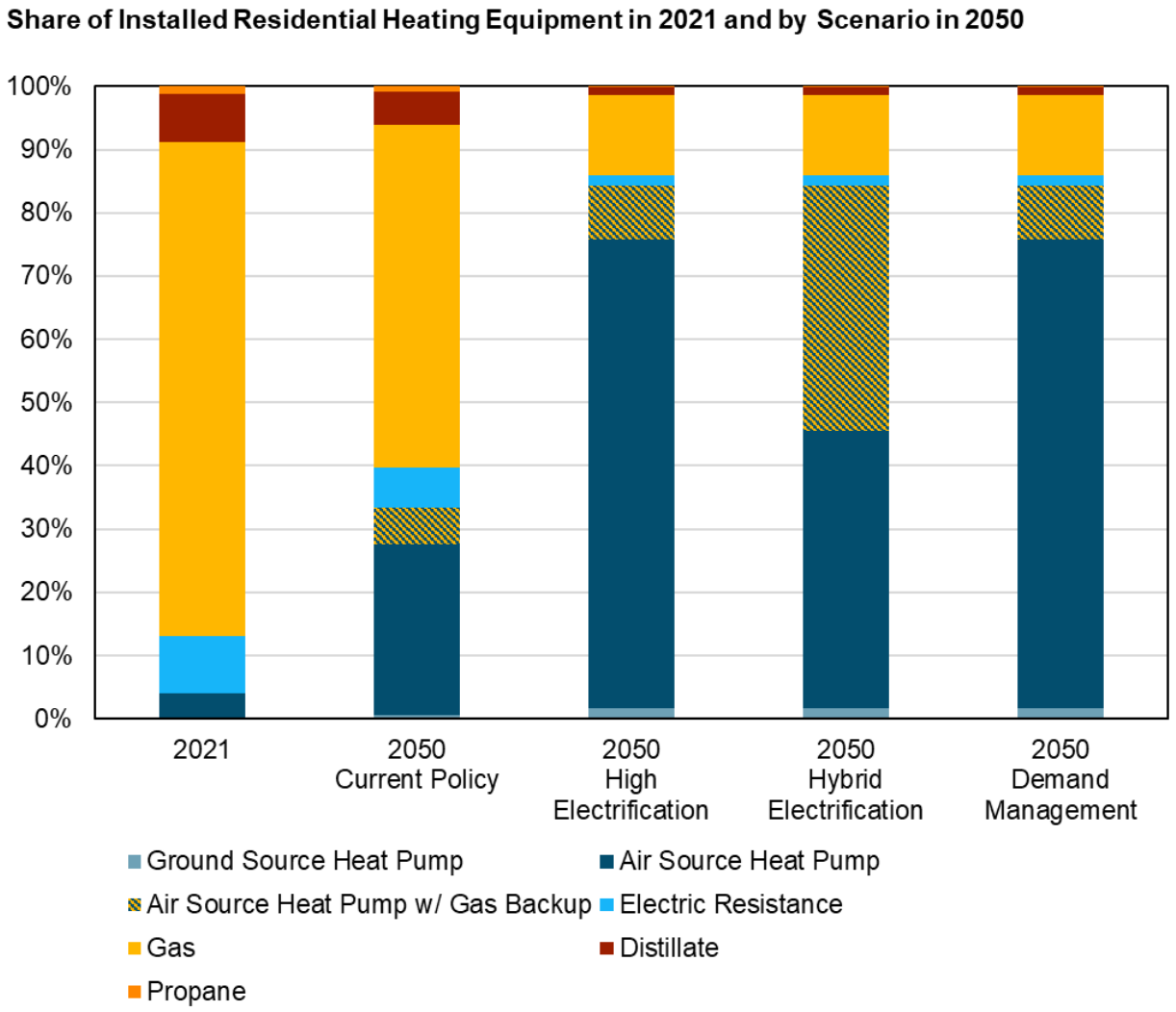
Electricity use increases over time as fossil fuel use decreases

- Annual electricity demand is expected to increase in all scenarios; Peak demand also increases (slide 45)
- New electricity demands will largely be met by decarbonized sources like solar and offshore wind



2050 annual electricity demand compared to 2025 levels

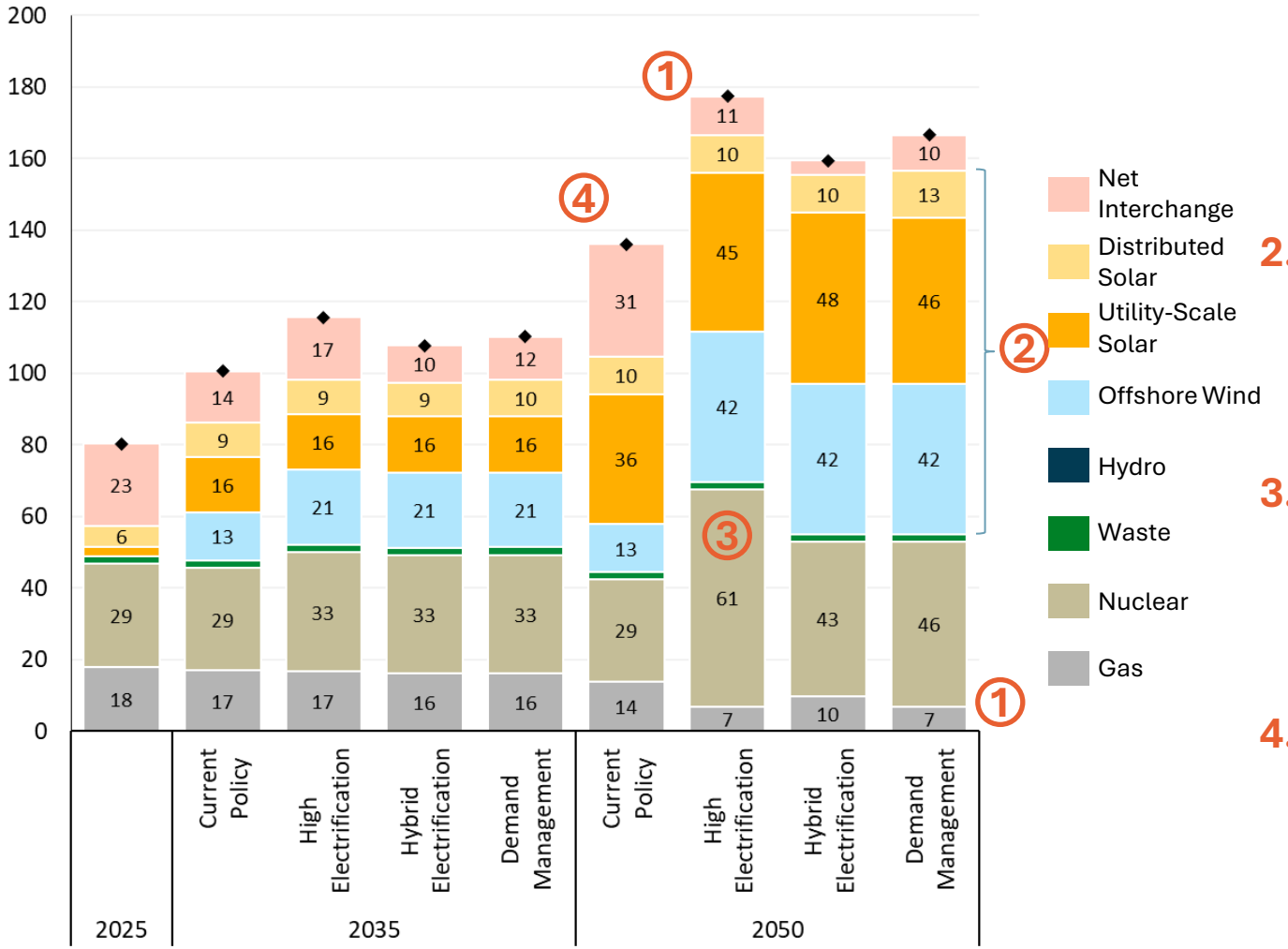
Meeting climate goals requires a significant level and pace of transformation



+ **In the mitigation scenarios, residential heat pump adoption meets the targets set by the NESCAUM Memorandum of Understanding signed by NJ:**
  - NESCAUM MOU targets heat pump sales shares of 65% by 2030 and 90% by 2040
  - These sales shares translate to heat pumps accounting for ~85% of the installed equipment by 2050
+ **While heat pump penetration is similar between hybrid and high electrification, hybrid has a lesser impact on electric peak demand**
+ **To achieve the levels of installed equipment shown here, the pace of adoption must ramp up considerably (slides 47-48)**

Renewables, storage, and nuclear help reduce New Jersey's reliance on imports and gas generation, leading to lower emissions

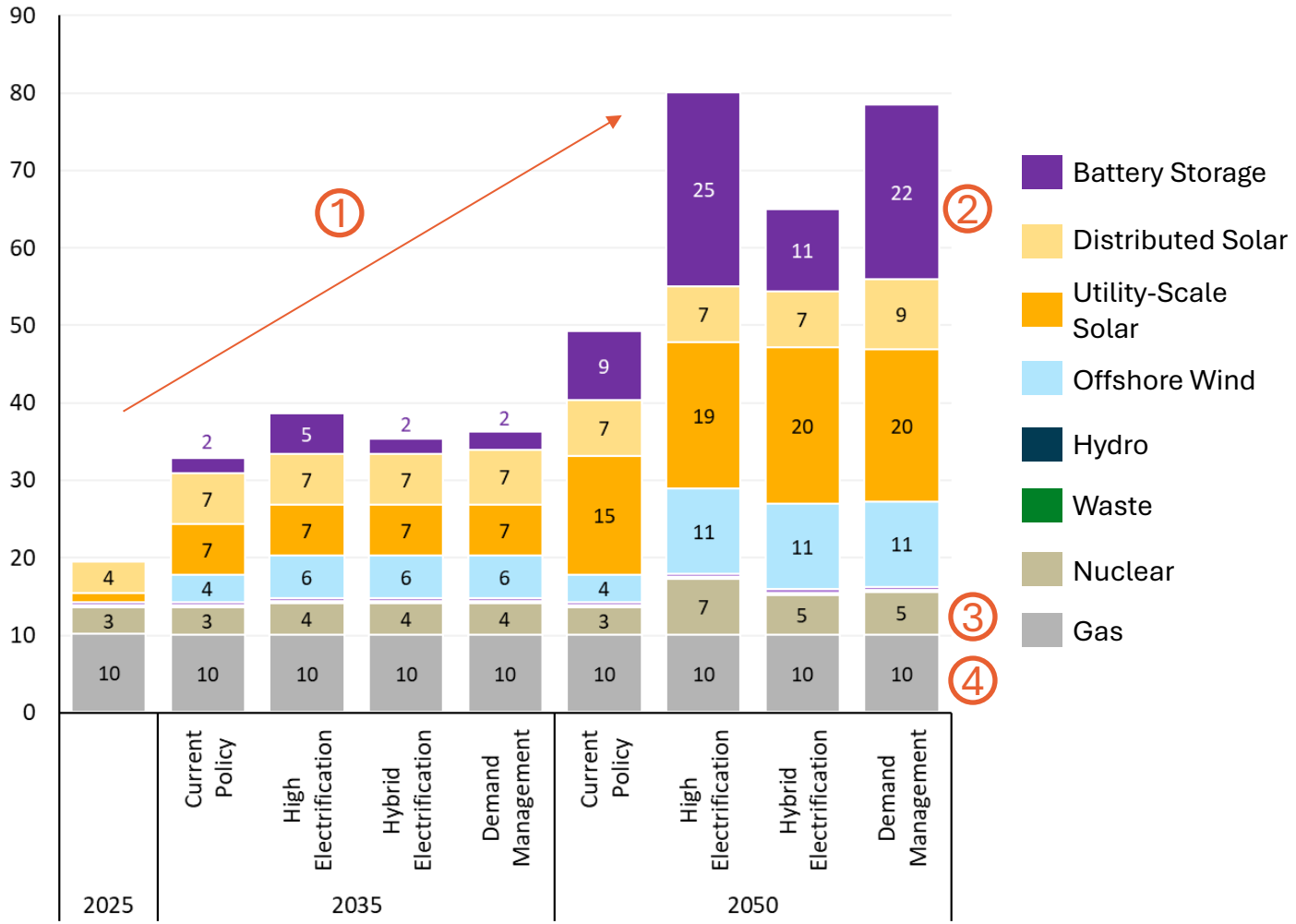
Annual Generation and Load (TWh)



1. In the Mitigation scenarios, New Jersey meets 100% of its annual retail sales with clean electricity, with reduced annual reliance on gas and imports relative to today
2. New Jersey relies on a diverse mix of renewable energy resources; solar generation is complemented well by offshore wind
3. Nuclear deployment grows in all Mitigation scenarios to help meet 100% CES, and provides year-round clean energy including when renewable production is low
4. Clean energy growth reduces New Jersey's reliance on imported energy in Mitigation scenarios; in Current Policy, significant reliance on imports remains by 2050

NJ's resource portfolio grows by 150-300% by 2050; most growth comes from in-state renewables and storage

Total Installed Capacity (GW)



1. Across all scenarios, total installed capacity grows substantially as electric demand grows and RPS/CES policies are achieved
2. Battery storage installations are critical resources for meeting capacity needs, resulting in a significant increase in deployment
   - Of the Mitigation scenarios, storage additions are lowest in the Hybrid Electrification scenario due to management of peak load growth
3. In addition to storage, new nuclear provides a source of new clean firm capacity; other emerging technologies may also play this role
4. Existing gas capacity is maintained for reliability during high load, low renewable periods; annual utilization of fleet declines over time

Societal Impacts of Decarbonization

Results

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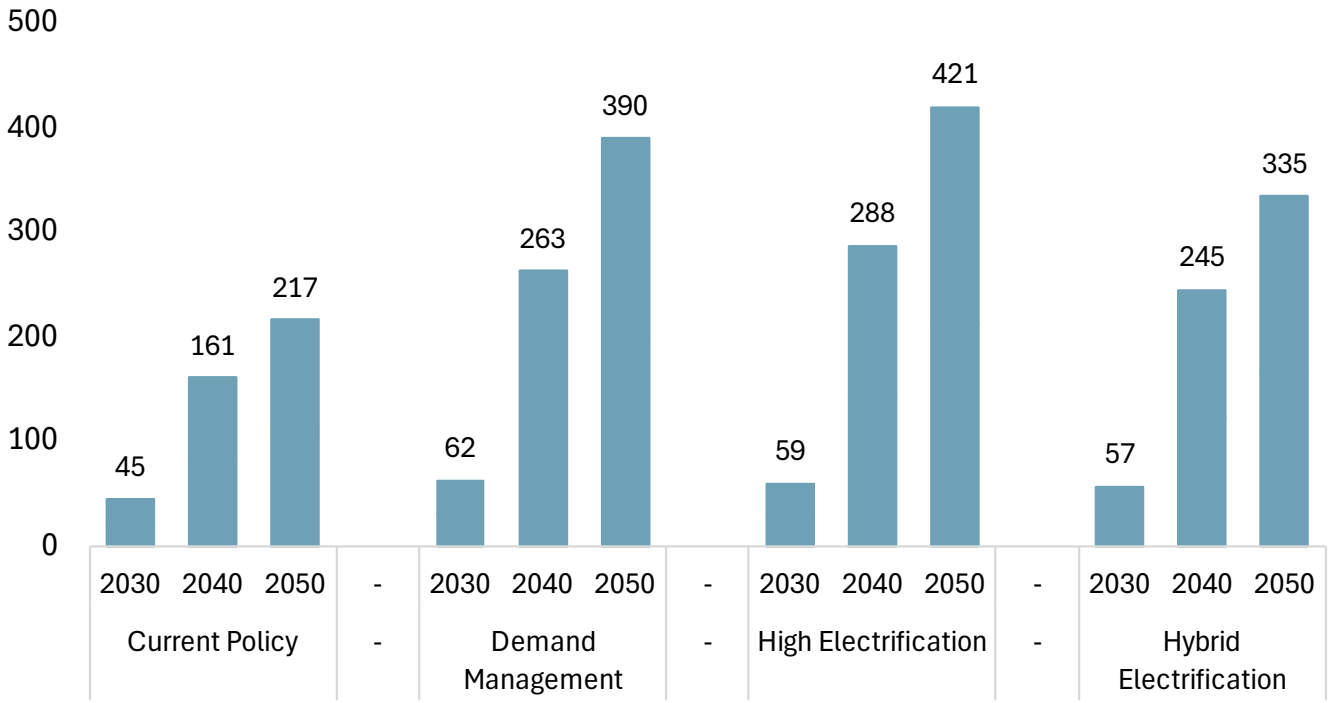
Air quality benefits in the High Electrification scenario result in ~$6B of annual savings by 2050 due to avoided premature mortality

Annual Avoided Adult Premature Mortalities*



* Air quality ($PM_{2.5}$) related health benefits were estimated using projected reductions of fossil fuel combustion and EPA's Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA, v4.1).

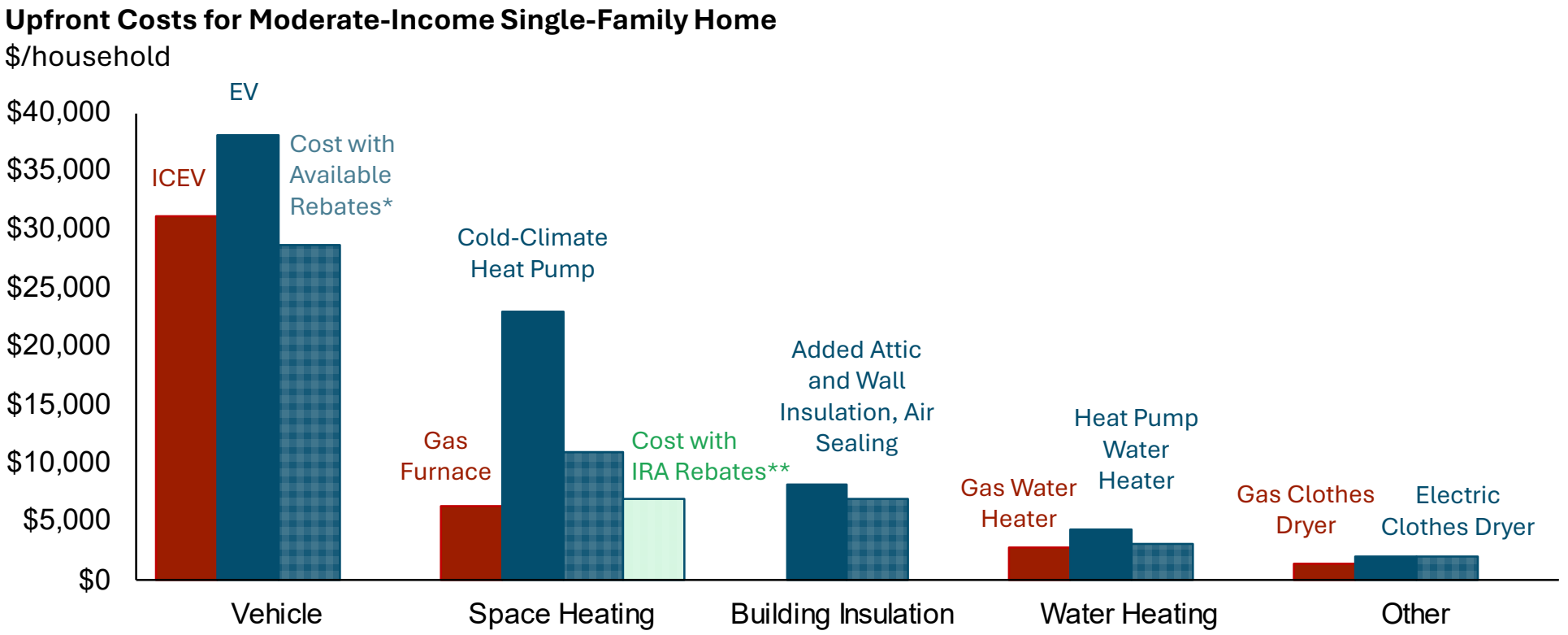
- **The High Electrification scenario avoids over 400 premature mortalities per year by 2050 due to reductions in $PM_{2.5}$ exposure from avoided fossil fuel combustion, compared to a business-as-usual scenario**
- **While significant benefits occur within NJ, benefits also occur in nearby states (particularly NY and PA) due to the ability of air pollution to cross state borders**

The clean energy transition will create thousands of net new jobs, primarily in the electricity and buildings industries

- **In 2023, New Jersey employed 63,200 workers across its clean energy workforce.***
- **In the High Electrification scenario, 53,900 net new jobs are supported by climate and clean energy activities by 2035. This includes 77,900 gross new jobs, and 24,000 jobs displaced.**
  - The Electricity and Buildings sectors are estimated to create the most net new jobs by 2035, with 37,000 new jobs in Electricity and 35,200 new jobs in Buildings.
  - In addition to electricity and buildings, the nuclear, commercial HVAC, and charging stations sub-sectors see significant growth.
  - The Fuels and Transportation sectors see job displacement due to reductions in fuel demand.

*This figures includes direct and indirect employment only

Rebates play a critical role in making clean technology adoption accessible



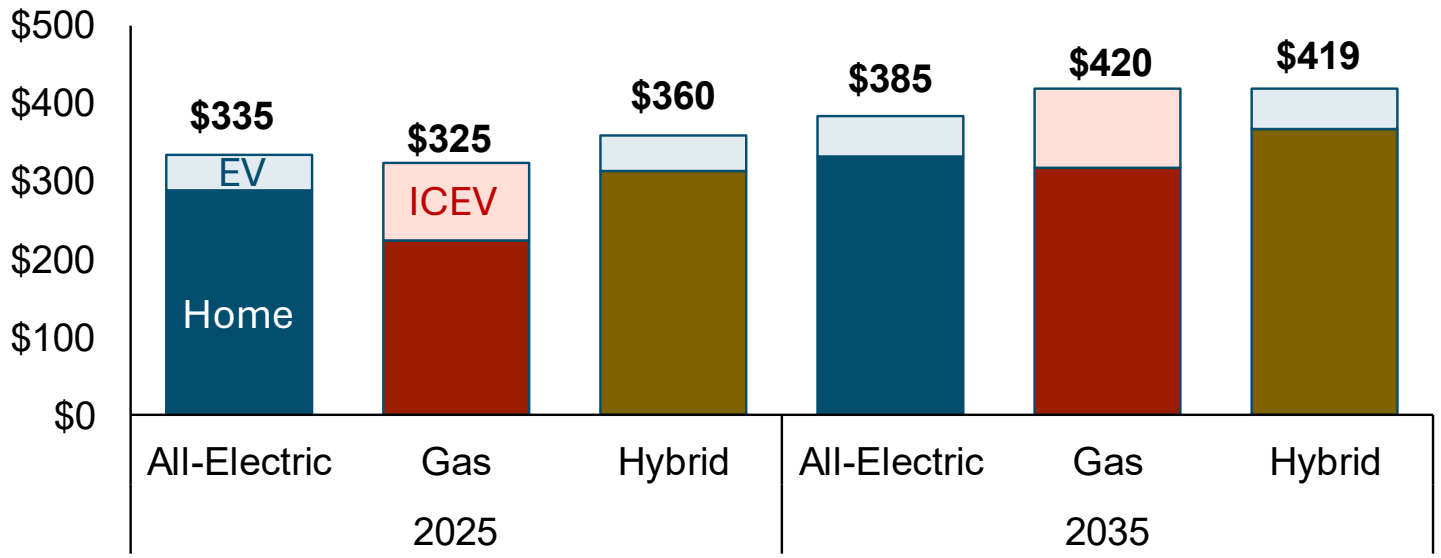
Rebates help reduce cost premium of clean technologies such as EVs and heat pumps

- Heat pump cost gap remains significant
- Incentives approved for building electrification in Triennium II programs and access to federal rebates would help further reduce heat pump cost gap

*including available state and utility rebates and 25C IRA tax credit for eligible technologies
**including $4,000 IRA HOMES rebate

By 2035, average energy bills of all electric households and gas-using households are nearly equal, excluding vehicle costs

Average Monthly Energy Bills, including vehicle fuel
$/year (2024 dollars)

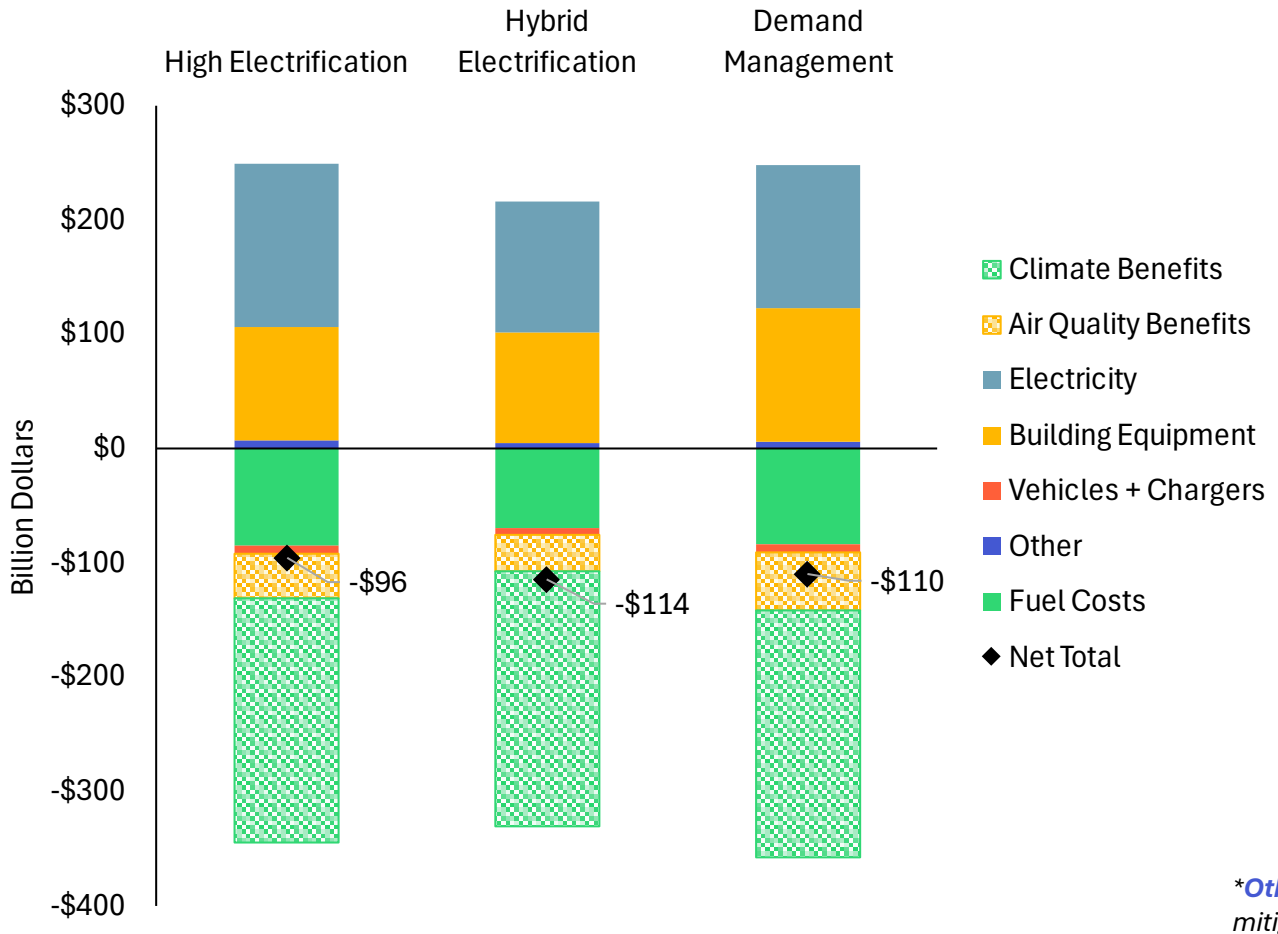


High Electrification scenario shown, but findings are similar across all scenarios, including ***Current Policy***

+ Average bills for electric heating and transportation are currently comparable with fossil alternatives
+ Customer departure from gas system could lead to increased gas bills post 2035
+ Building shell and insulation further improve bill savings for customers
+ Electric rate design can offer opportunities for increased bill savings from load flexibility and management, limiting cost growth for all ratepayers

Reaching New Jersey's GHG target results in significant cumulative benefits 2025-2050

NPV of Incremental Direct Costs + Societal Benefits Compared to "Business As Usual" 2025-2050



+ The societal benefits of decarbonization include:

- **Local air quality benefits** from a reduction in criteria air pollutants from fuel combustion (measured using EPA COBRA)
- **Global climate benefits** from a reduction in GHG emissions (measured using societal cost of GHG emissions from EPA)

+ There may be an opportunity to reduce net costs of decarbonization through targeted electrification and strategic demand management

**Other* includes costs for industrial energy efficiency and fuel-switching measures and mitigation costs for non-energy/non-combustion emissions*

Conclusions and Recommendations

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   - Data centers, building electrification, and transportation electrification will drive increases in electric demand
   - There will be a role for emerging clean firm technologies such as new nuclear, long duration storage, and/or generators fueled by hydrogen or renewable natural gas to contribute to maintaining system reliability post-2035; New Jersey has the opportunity to emerge as a leader in this space

The next steps for the State are clear through 2035

- **The State must stay laser focused on its "no regrets" policies regarding renewable energy generation, battery storage, transportation & building electrification, and energy efficiency. Through these policies, NJ will achieve its mid-century clean energy and climate goals.**
  - The Partnership to Plug-In and Clean Buildings Roadmap will support these efforts.
  - The New Jersey Comprehensive Climate Action Plan, due December 2025, will include specific strategies for achieving sectoral goals.
- **The State must continue to prioritize energy affordability through rate design, as well as continue programming to reduce the upfront cost of equipment upgrades.**
  - This is partially addressed in the Affordability, Equity & Rates Study and the Clean Buildings Roadmap.
- **Growing electricity usage and greater reliance on renewable electricity will require that NJ build clean firm capacity in the coming decades to maintain reliability.**
  - The immediate next step is a Clean Firm Capacity Roadmap that the BPU will begin after the EMP to explore emerging technologies and their ability to contribute to system reliability needs, including long-duration storage, new advanced nuclear and small modular reactors, and hydrogen.
- **NJ must determine new strategies to guide the evolution of the natural gas distribution system towards clean energy attainment, consistent with EO317.**

Appendix: Progress and Policy

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Evolution of federal context since the 2019 EMP

- **Since the 2019 EMP, Congress has taken the most significant action on clean energy and climate change in the nation's history, which offers significant additional support to New Jersey's core actions**
- **Some of the funding is at-risk under the new administration, but other funding is subject to binding agreements or already received by NJ**
- **Two key policies enacted in the last administration were:**
  - **Infrastructure Investment and Jobs Act of 2021 (IIJA)**, also known as Bipartisan Infrastructure Law (BIL), authorizes $1.2 trillion for various infrastructure projects, include broadband, water and electric grid funding
  - **Inflation Reduction Act of 2022 (IRA)** is a major investment in the American economy, energy security, and climate
    - **Greenhouse Gas Reduction Fund (GGRF) Solar for All Program** provides $156M in federal funding that will help NJ deploy more than 175 MW of solar energy to benefit 22,000 overburdened households within the first 5 years of funding
    - **HOMES** and **HEEHR** programs provide over $183M in federal funding to support building electrification, with a primary focus on the needs of LMI customers
    - **Climate Pollution Reduction Grant Program (CPRG)** provides $3M in federal funding to perform comprehensive, statewide climate action planning

The EMP will serve as the basis for New Jersey's Comprehensive Climate Action Plan, to be submitted to the EPA in December 2025

Appendix: Stakeholder Feedback

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Ongoing New Jersey Initiatives Relating to Stakeholder Feedback

Stakeholder Feedback Theme	Key New Jersey Actions
Affordability and Cost	Ongoing Effort
	Equitable Rates Study (BPU) Examines alternative rate designs that would distribute cost burden equitably during the decarbonization process.
Environmental Justice and Equity	Implemented
	Environmental Justice Law (DEP) Directs DEP to consider the cumulative environmental and public health impacts on overburdened communities when reviewing applications for certain facilities.
Infrastructure and Reliability	Implemented
	FERC Order 1920 (BPU) Requires the nation's transmission providers to conduct long-term planning for future regional transmission facility needs and plan for their funding. **Grid Modernization Study (BPU)** The findings and recommendations of this study, finalized in November 2022, are informing the State's plan to modernize the grid.
Climate Change and Environmental Risk	Implemented and Ongoing Efforts
	Priority Climate Action Plan and Comprehensive Climate Action Plan (DEP with significant cross-agency coordination) NJ has published its Priority Climate Action Plan and is developing its Comprehensive Climate Action Plan based on the State's 80X50 report.
Workforce Readiness	Ongoing Efforts
	NJ Green Economy and Workforce Analysis (BPU) Examines the entire NJ workforce with respect to decarbonization, including existing workforce, training programs, wraparound services, and net jobs impacts
Transparency in Modeling and Reporting	Ongoing Efforts
	2024 EMP (BPU) The 2024 EMP explicitly details its stakeholder engagement approach and outlines all modeling and assumptions in its narrative and technical appendices. **Governor's Office of Climate Action and the Green Economy** Provides strategic leadership, vision, and coordination across NJ agencies in addressing climate change and the transition to green jobs and the green economy.
Energy Efficiency Program Offerings and Structure	Implemented and Ongoing Effort
	NJ Comfort Partners Program's Whole House Pilot (BPU) Connects residents who need assistance with community-based organizations to address health and safety concerns in their homes to make them ready to take advantage of energy efficiency upgrades.

Appendix: Background and Methodology

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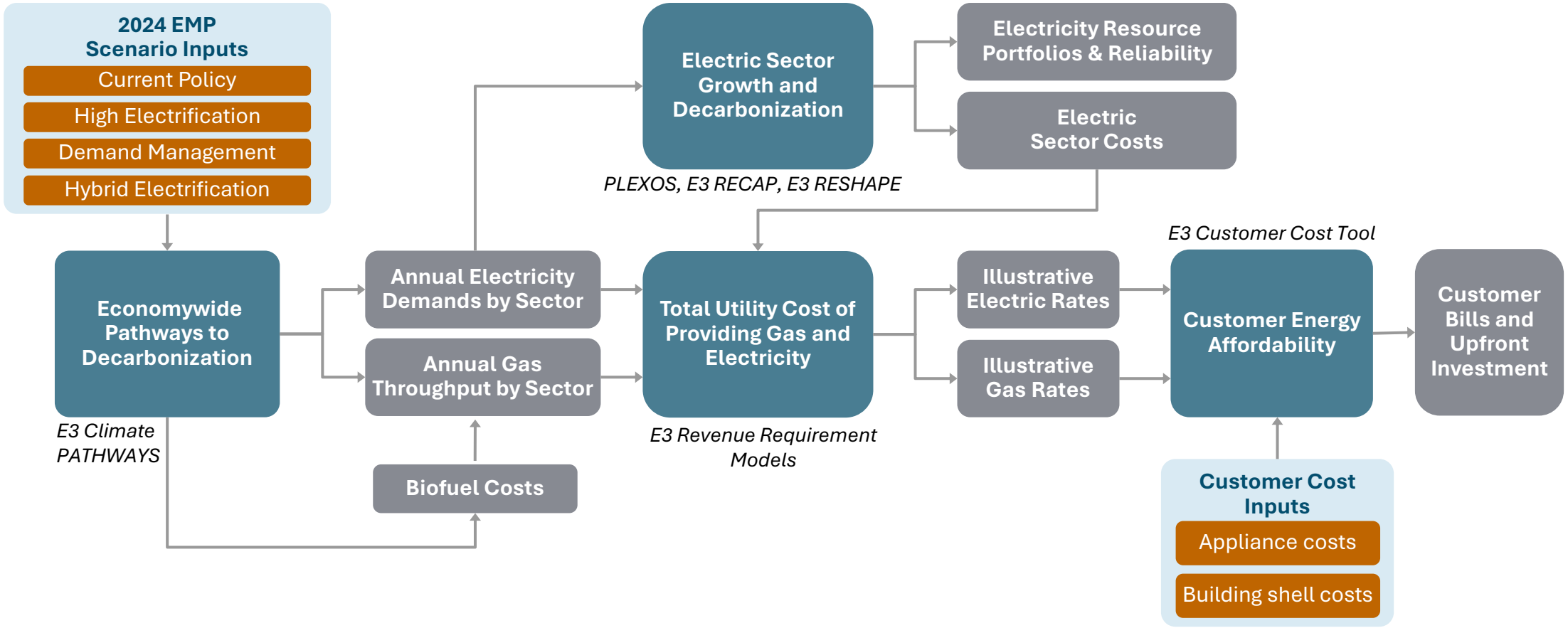
Key Abbreviations

Abbreviation	Meaning
ASHP	Air source heat pump
GSHP	Ground source heat pump
Hybrid ASHP	Air source heat pump with a natural gas system that is used during the coldest hours of the year
EV	Electric vehicle
ICEV	Internal combustion engine vehicle
MMT	Million metric tons, a common reporting metric for CO2 emissions
IPPU	Industrial processes and product use
OSW	Offshore wind
RPS	Renewable Portfolio Standard
CES	Clean Electricity Standard

2024 EMP: Key Measures by Scenario

Category	Current Policy	High Electrification	Hybrid Electrification	Demand Management
Economy-wide target	None	80% reduction in GHGs by 2050 relative to 2006 levels		
Electricity RPS/CES	50% RPS by 2030	50% RPS by 2030, 100% CES by 2035		
OSW carve-out	~5 GW by 2030	11 GW by 2040		
Building Electrification	~50% HP sales by 2050 20% hybrid w/ gas backup	100% HP sales by 2050 **10% hybrids w/ gas backup**	100% HP sales by 2050 **50% hybrids w/ gas backup**	100% HP sales by 2050 **10% hybrids w/ gas backup**
Building Appliance Efficiency	Federal appliance standards	Federal appliance standards, all new appliances are high efficiency by 2035		
Building Shell Efficiency	Existing new construction codes	Existing new construction codes, **~25% buildings retrofitted by 2050**	Existing new construction codes, **~25% buildings retrofitted by 2050**	Existing new construction codes, **~60% buildings retrofitted by 2050**
Transportation	100% LDV EV sales by 2035 (80% BEV, 20% PHEV) 40-75% MHDV ZEV sales by 2035	100% LDV EV sales by 2035 **(transition to 100% BEV)** 100% MDHV ZEV sales by 2050 **(87% BEV, 13% FCV)**	100% LDV EV sales by 2035 **(80% BEV, 20%PHEV)** 100% MDHV ZEV sales by 2050 **(79% BEV, 21% FCV)**	100% LDV EV sales by 2035 **(transition to 100% BEV)** 100% MDHV ZEV sales by 2050 **(87% BEV, 13% FCV** **VMT reductions based on 80x50 report**
Industry	None	26% manufacturing EE improvement, **~60% gas and petroleum electrification**	26% manufacturing EE improvement, **no electrification**	26% manufacturing EE improvement, **~25% gas and petroleum electrification**
Demand Management	3% managed charging by 2050; no flexible loads in buildings	25% managed charging by 2050; no flexible loads in buildings	12% managed charging by 2050; no flexible loads in buildings	50% of LDVs and MHDVs charge off-peak by 2050, Flexible loads shift to off-peak in buildings
Net Land Sink	-8 MMT by 2050	-9 MMT by 2050		
Advanced Biofuels	None	**No advanced biofuels**	**7 TBtu of RNG, 37 TBtu of renewable liquid fuels from wastes & residues**	**No advanced biofuels**
Hydrogen	Existing uses	Existing uses + fuel cell HDVs		

Overview of Modeling Workflow



Appendix: Climate PATHWAYS Supporting Findings

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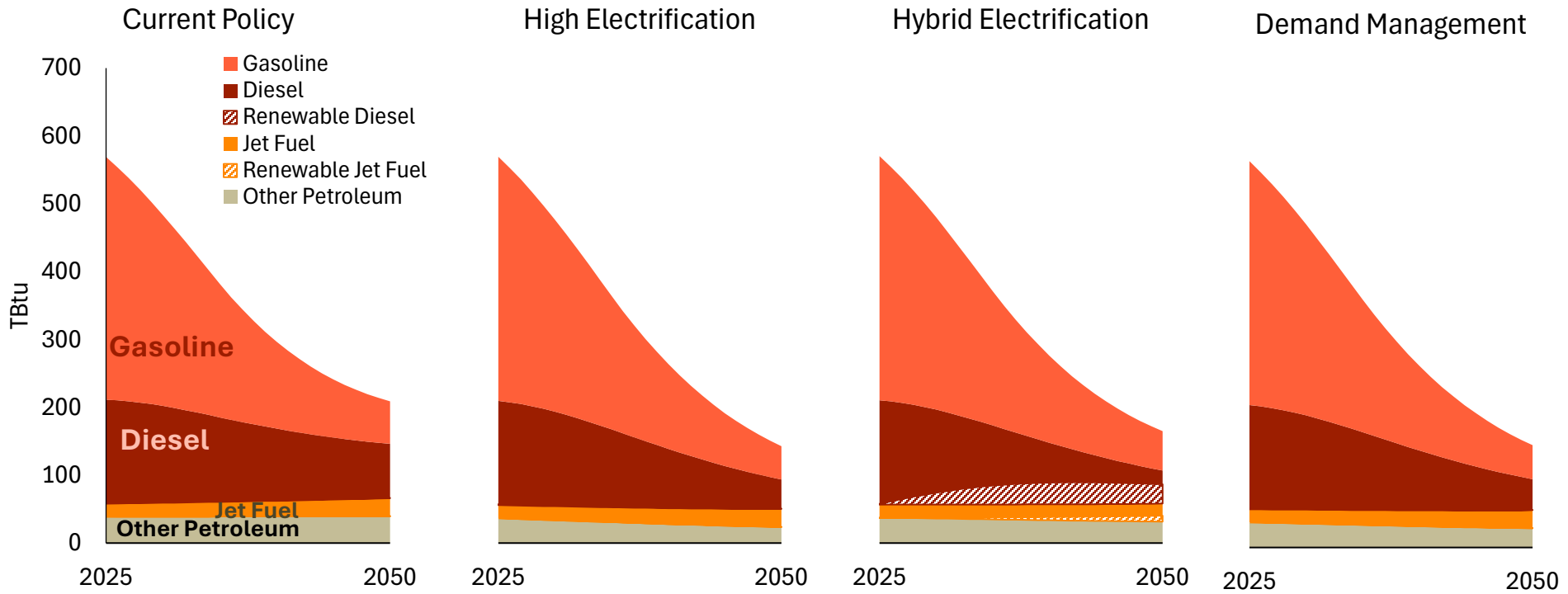
Annual Petroleum Demand by Scenario



2050 petroleum demand compared to 2025 levels

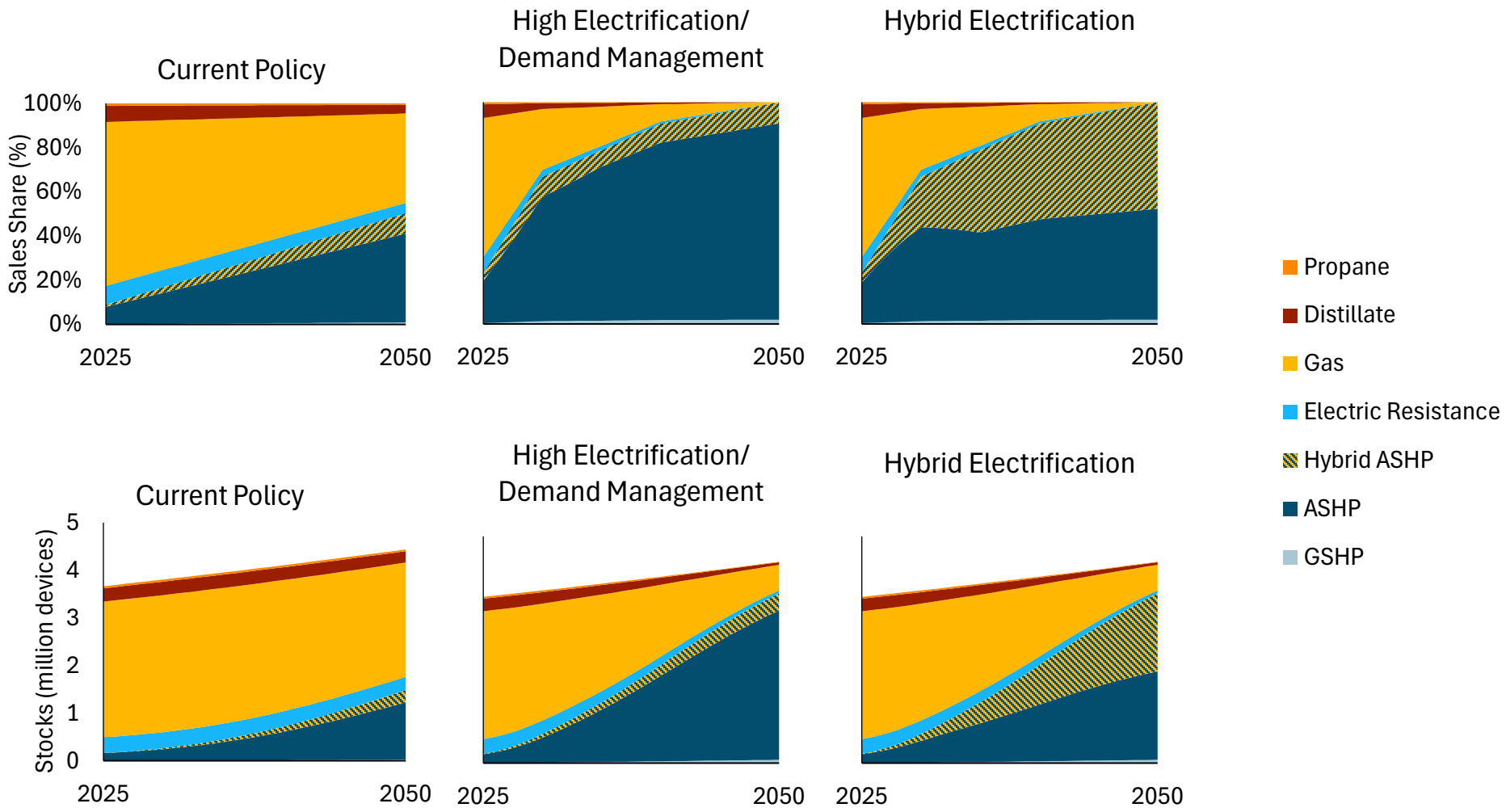
-63%

-75%

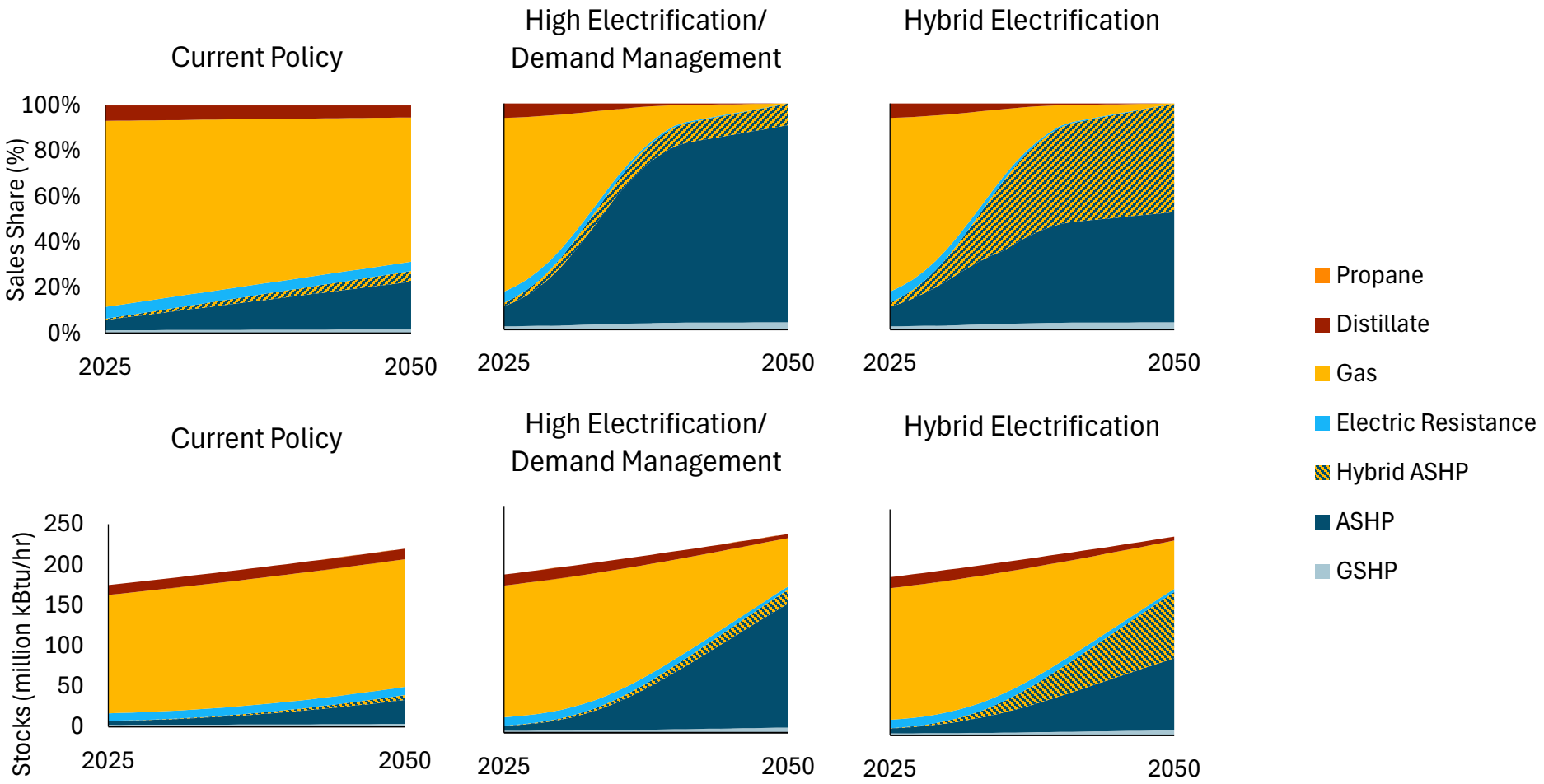
-71%

-74%

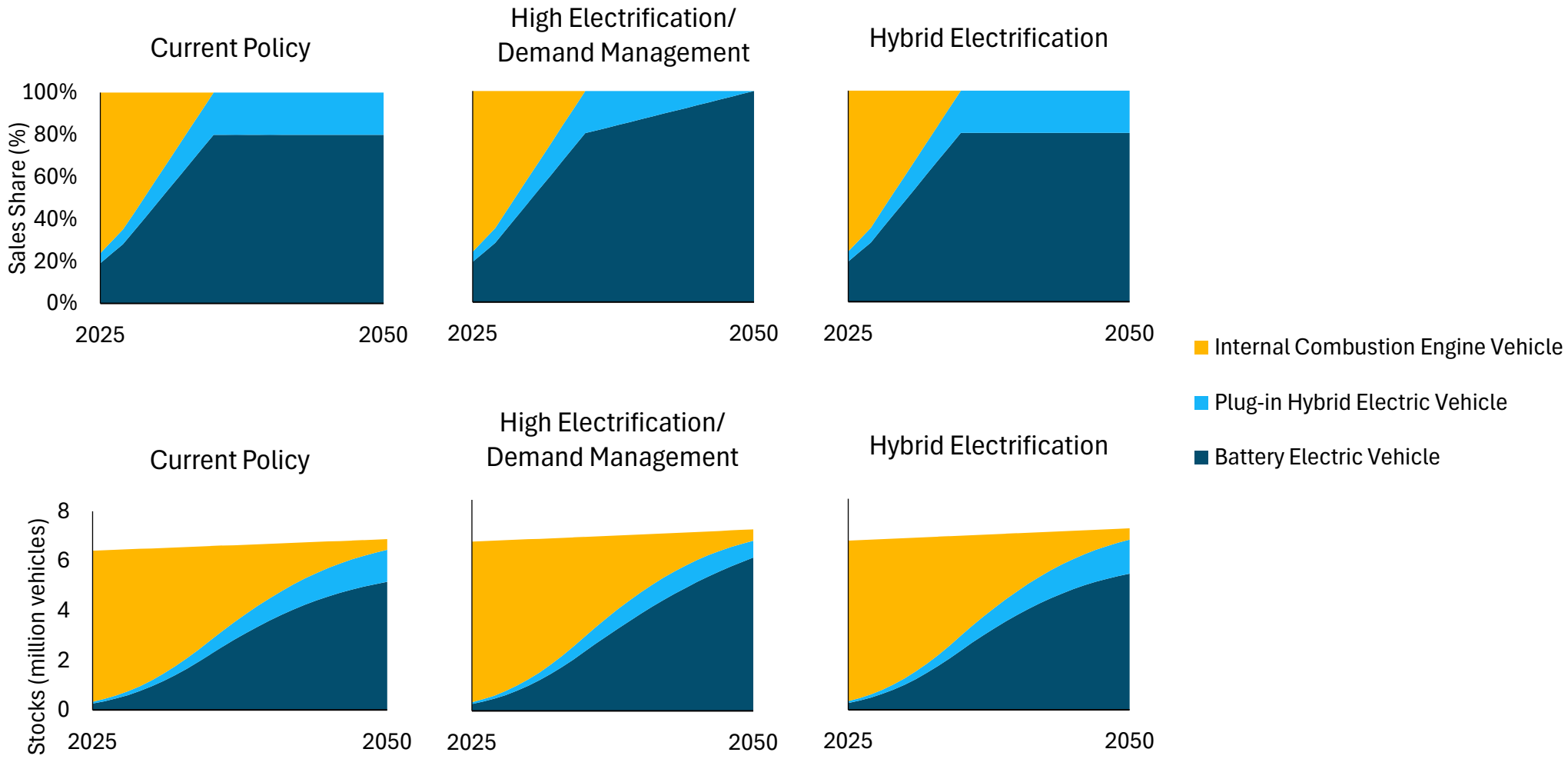
Residential Space Heating Stocks and Sales



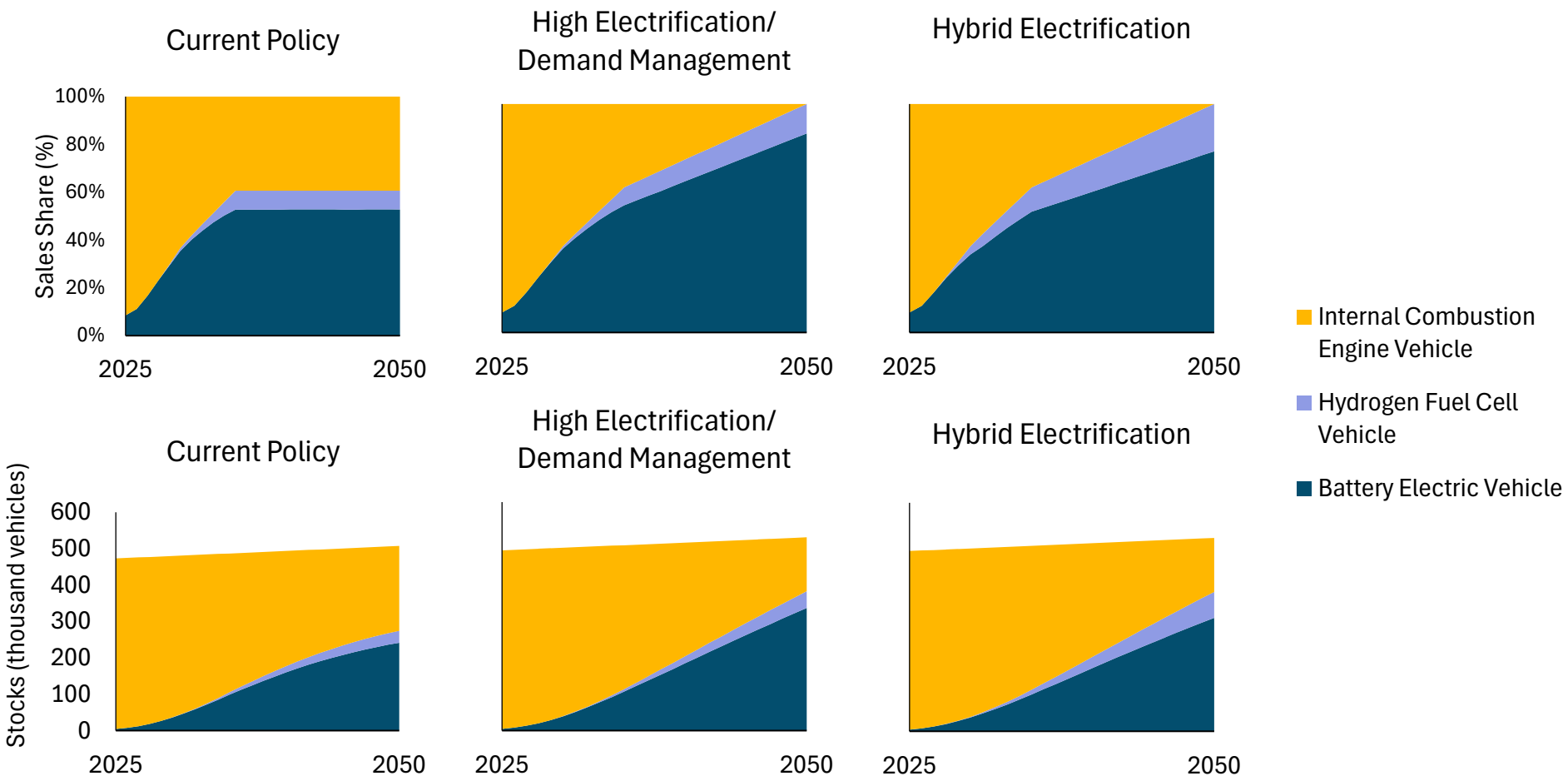
Commercial Space Heating Stocks and Sales



Light Duty Vehicles Sales Shares and Stocks



Medium & Heavy-Duty Vehicles Sales Shares and Stocks



Appendix: Peak Load Supporting Findings

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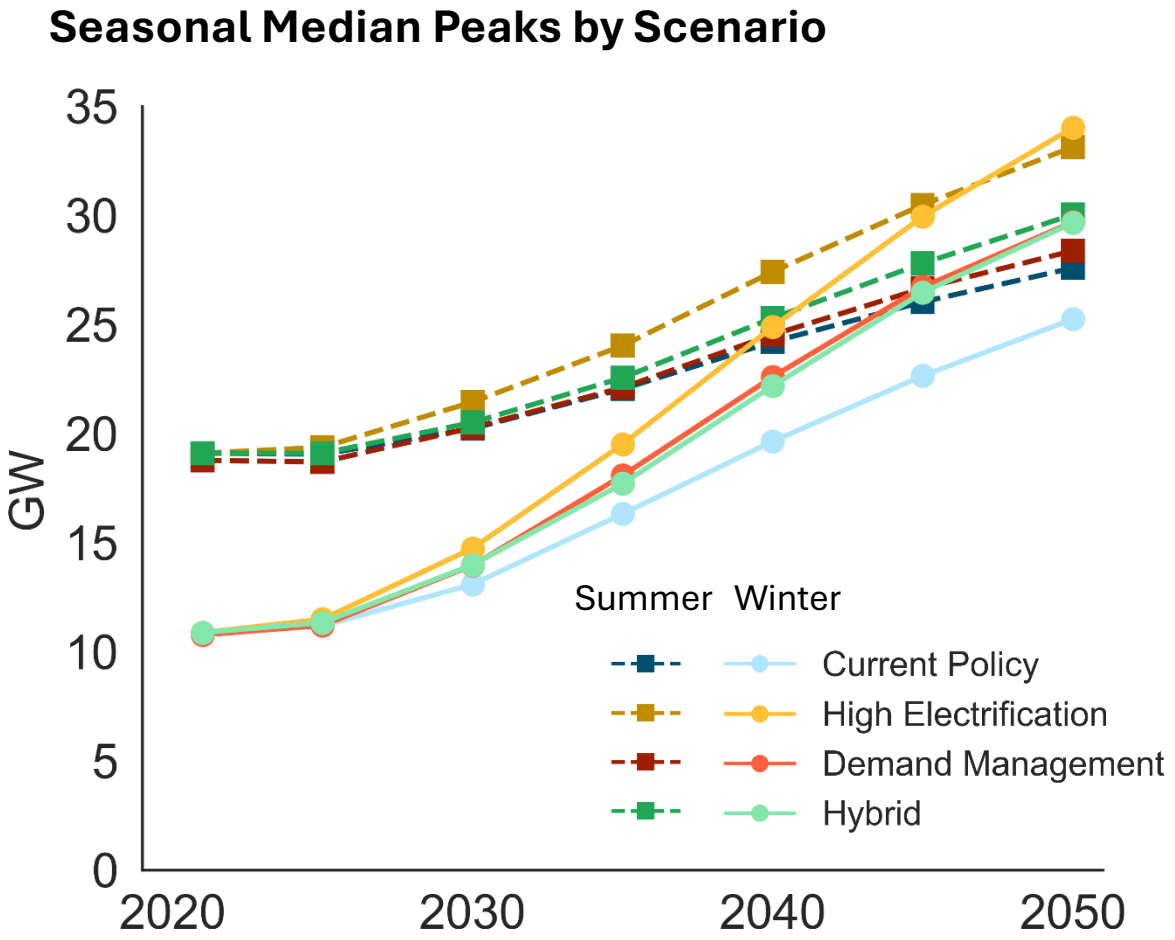
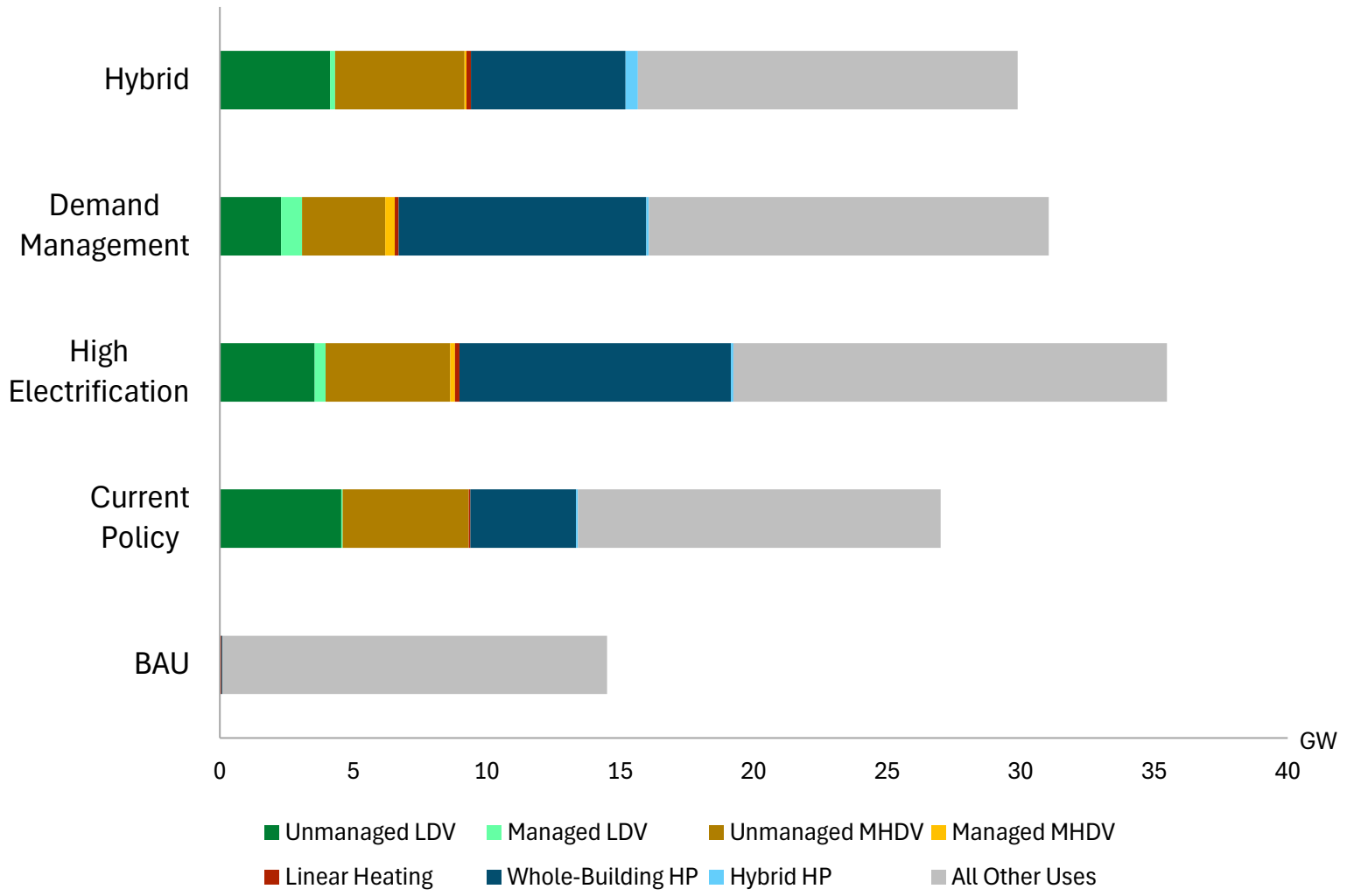
High Electrification, Demand Management and Hybrid scenarios suggest a dual peaking system by 2050

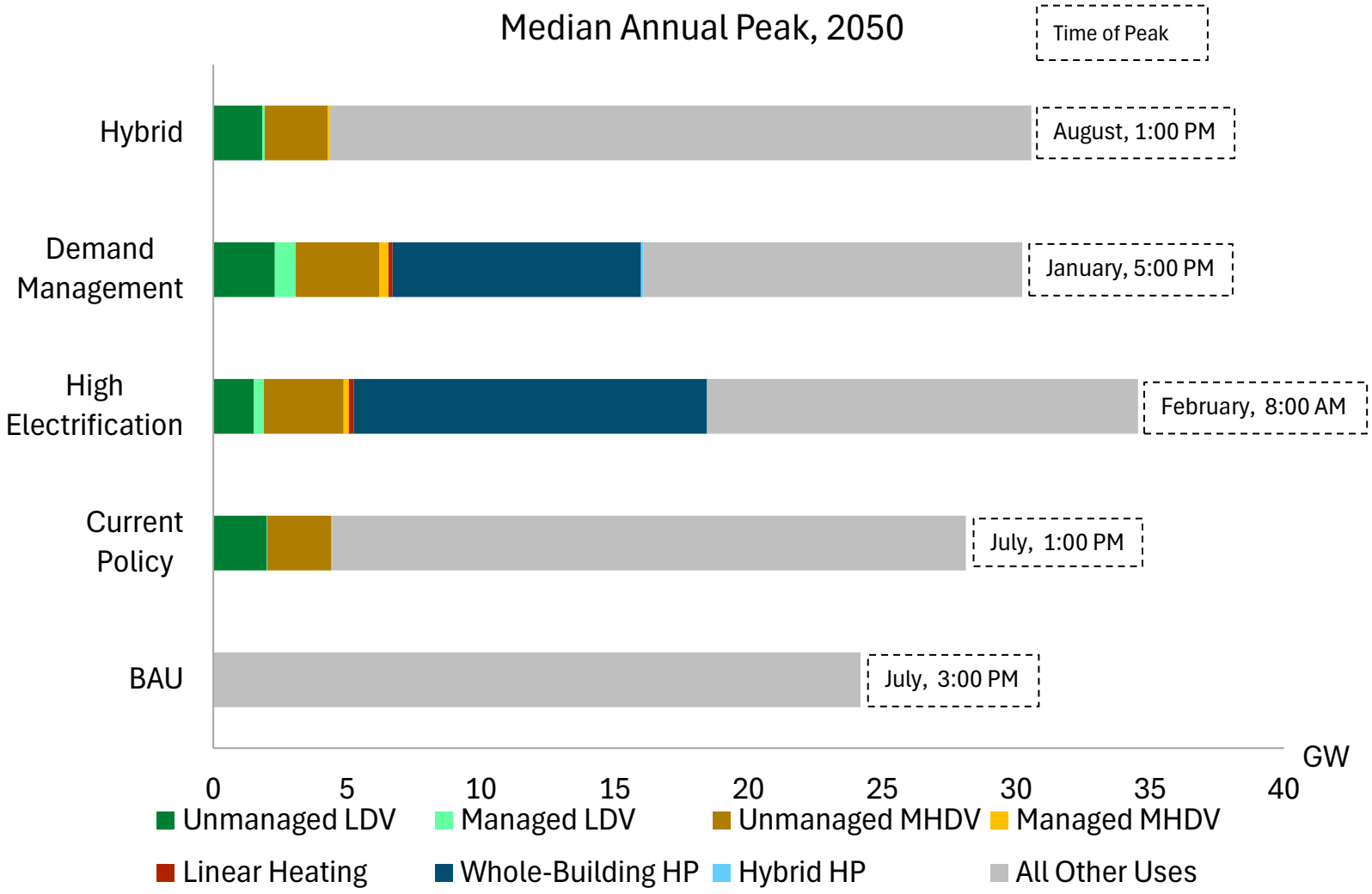
- High Electrification, Demand Management, and Hybrid Electrification are dual peaking, arising from overlap in summer and winter peaking, with winter peaks further driven by increasing electric heating loads.
- The current policy scenario continues to be summer peaking.
- The summer peaks for all scenarios except high electrification are similar in magnitude.



Median peak load for the same hour across all scenarios, 2050 Demand Scenario Peak Hour

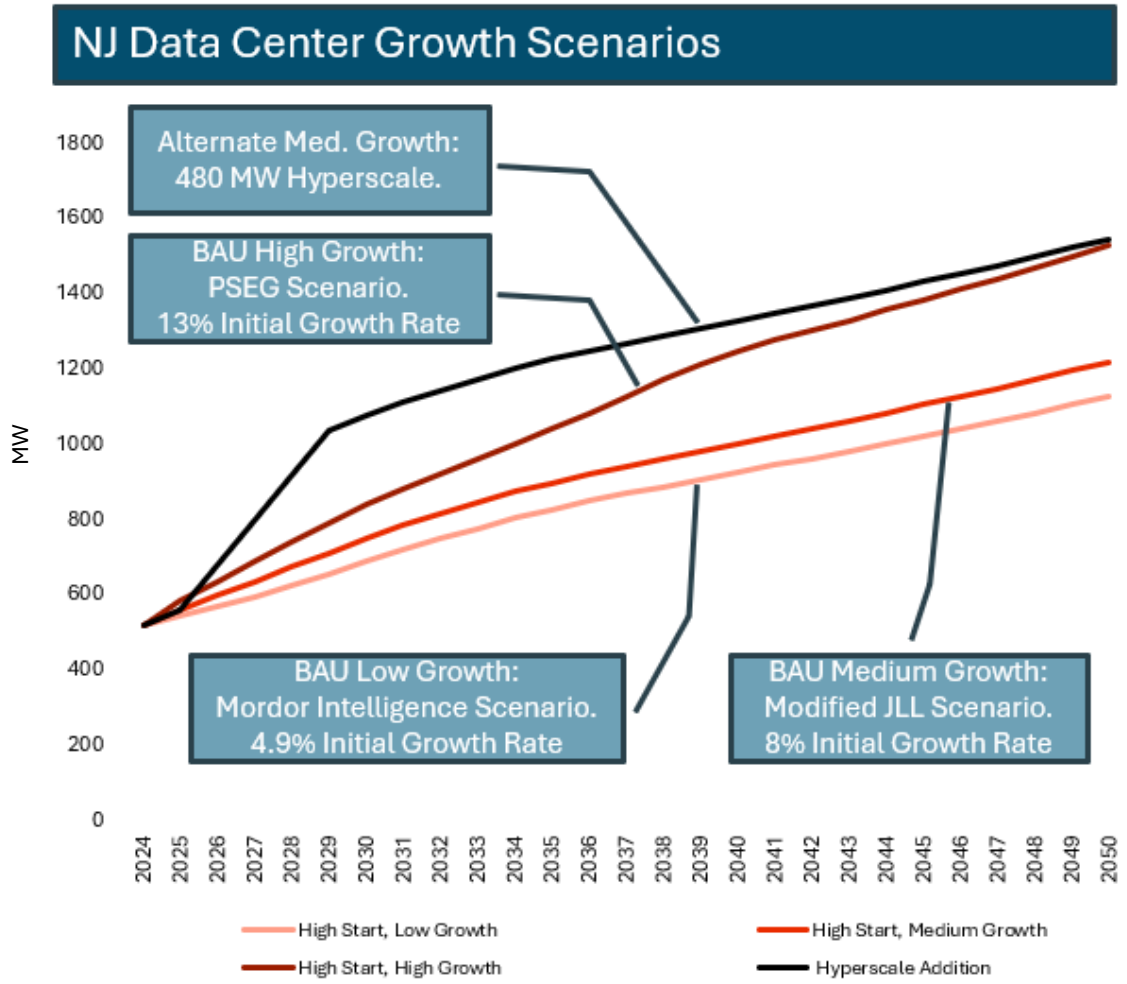


Median Peak Load by Scenario, 2050



New Jersey Data Center Load Forecast

- **Business as usual scenario: modest increases by 2050**[1, 2, 3, 4, 5]
  - Small-scale gradual additions to existing fleet[2]
  - Support NJ population and NYC business needs
  - Consistent with PSEG 2024 load forecast update[2]
- **Alternate scenario: large-scale new builds**
  - Potential to add a significant (100+ MW) point load in short period of time[7]
  - PSEG Q1 2024 earnings call outlined discussions of 50-100 MW facilities[8]
- **Historic NJ annual data center growth rate is about 5% since 2014 (consistent with the low growth case), but single years have been as high as 12% (consistent with high growth case)**[9]



Appendix: Electric Sector

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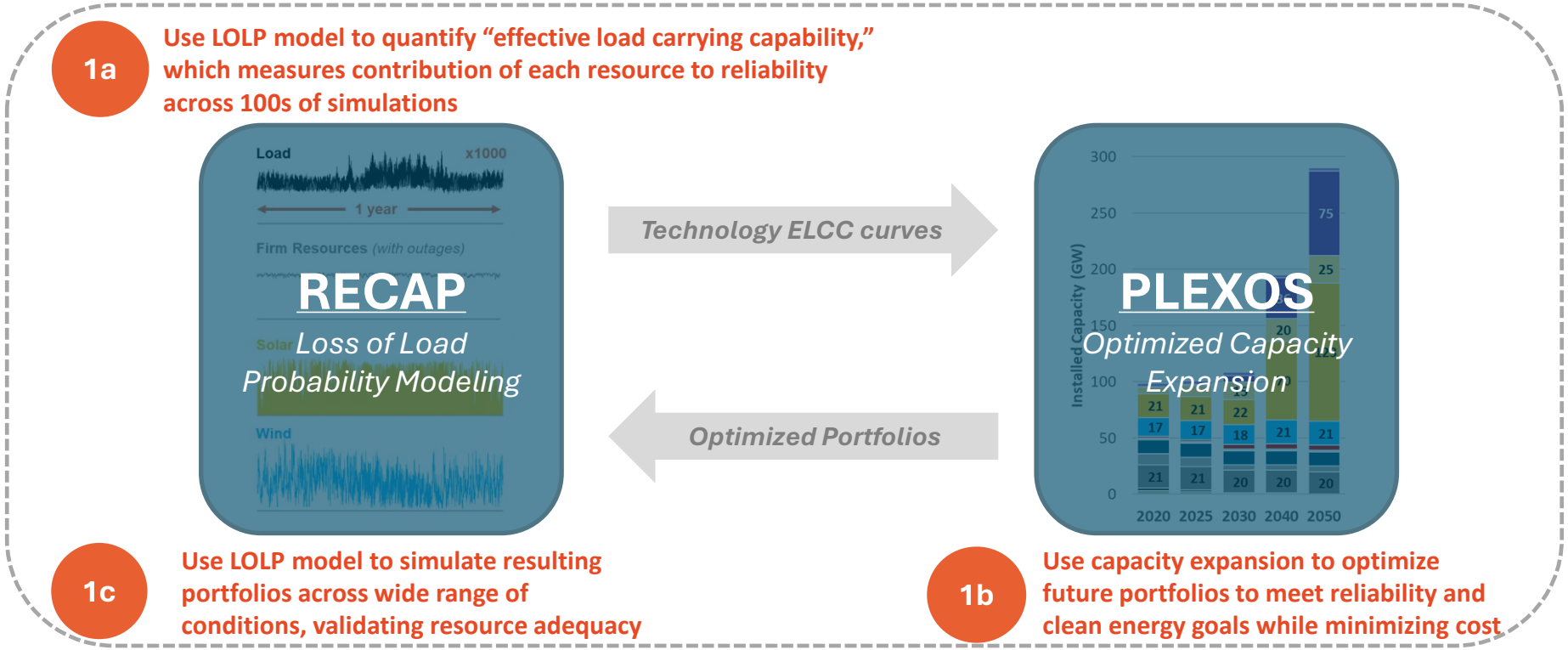
Electric Sector Modeling Framework

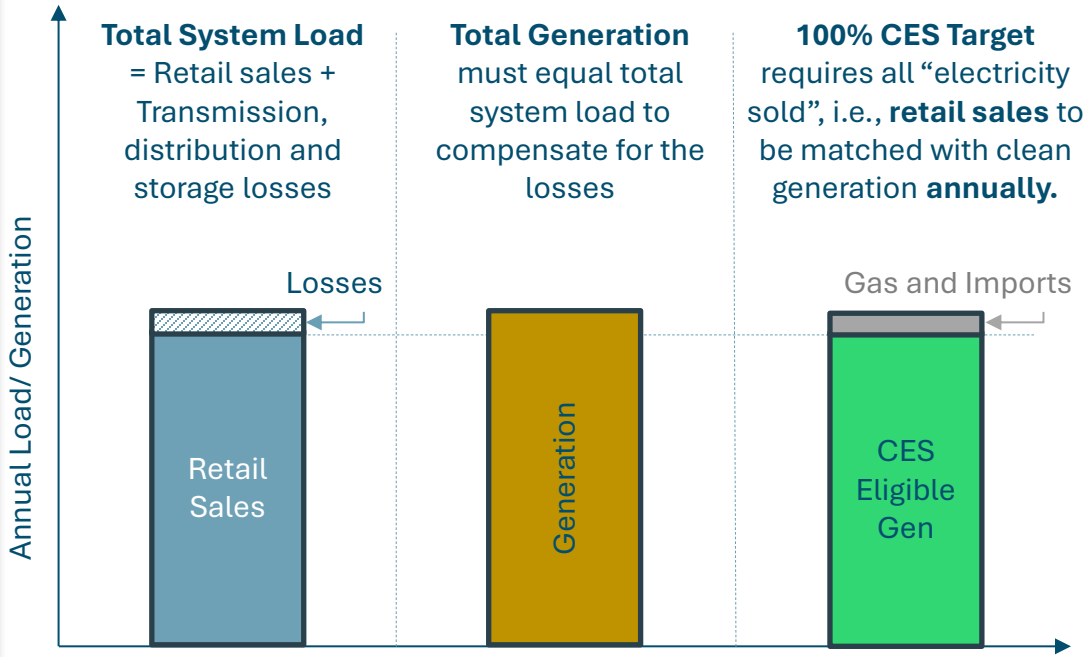
*To perform its electric sector modeling for the EMP, E3 leveraged a **capacity expansion model** in tandem with a **loss of load probability model**, to ensure the resulting portfolios are reliable over a broad range of weather conditions.*

E3 has leveraged this toolkit for many states and regions including Virginia, New York, New England, California, and the Pacific Northwest.

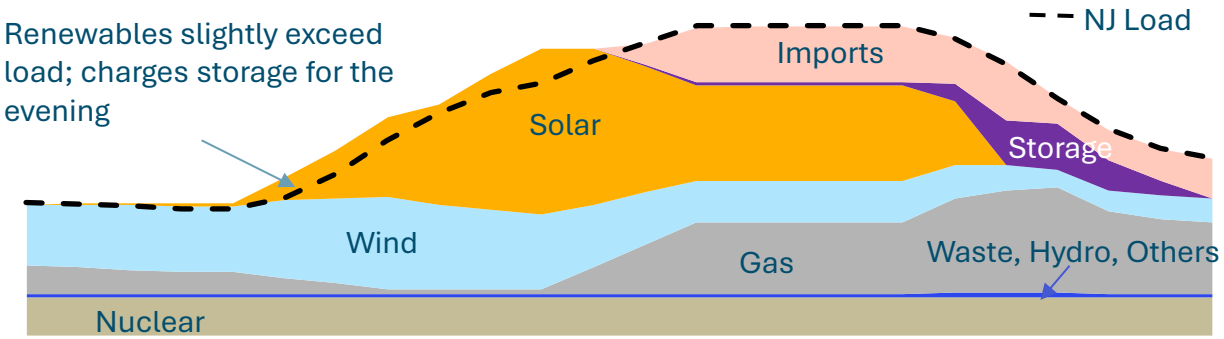


NJ can meet its 100% CES target while also utilizing gas and imports to help maintain reliability

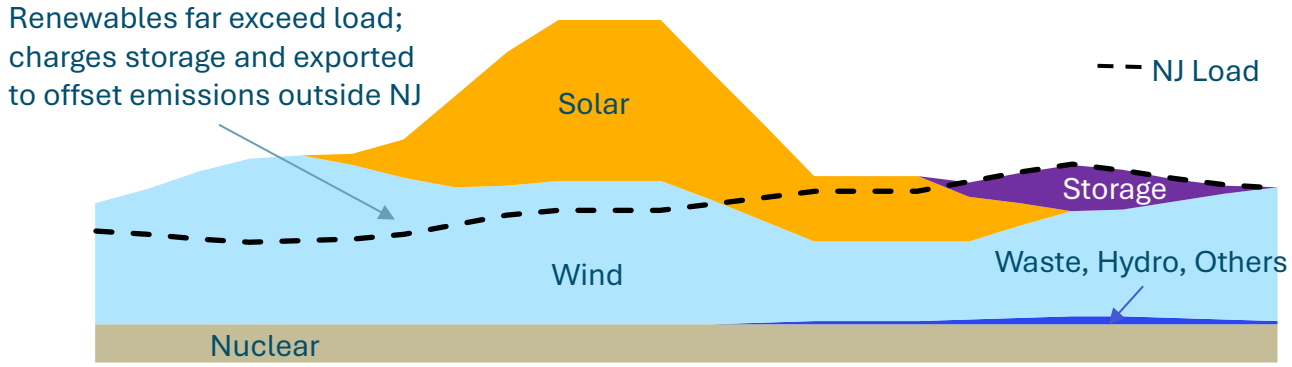
Illustrative Annual Load and Generation Balance with the 100% CES Target



Illustrative System Dispatch on a Day with High Load, Low Renewable Generation



Illustrative System Dispatch on a Day with Low Load, High Renewable Generation



New Jersey meets the 100% CES target on an annual basis, as gas and imports help cost-effectively maintain reliability on challenging days, while exporting clean energy to displace gas generation elsewhere in PJM during other times.

Appendix: Cost and Benefits of Decarbonization Supporting Findings

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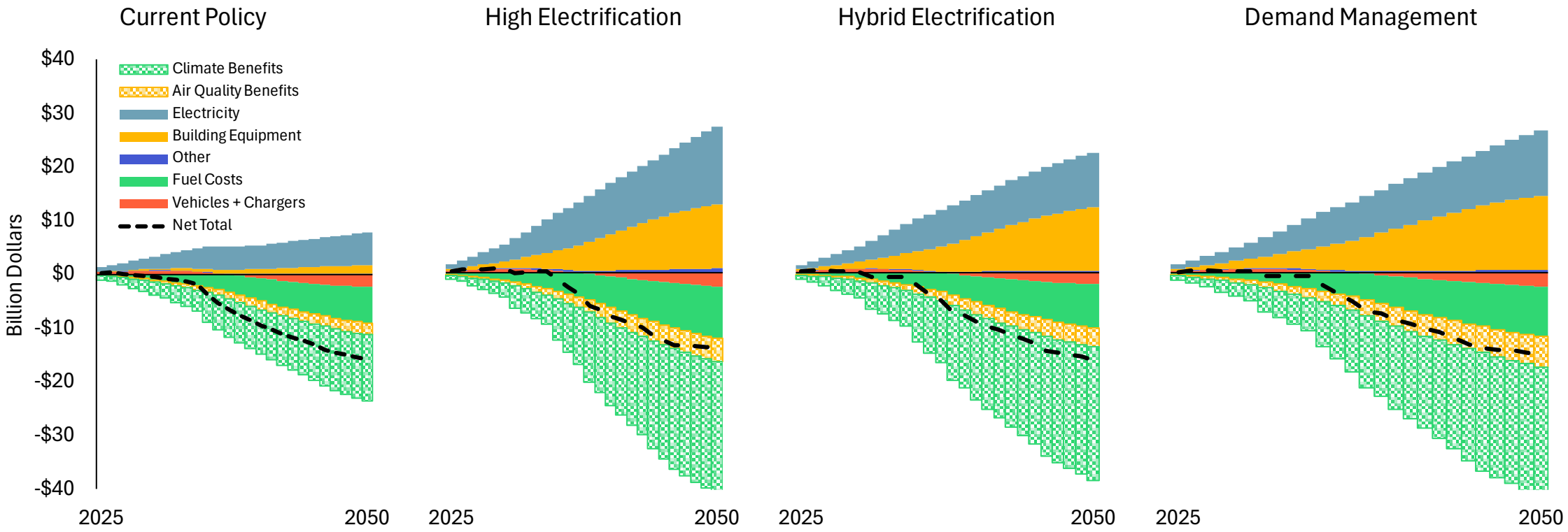
Annual Incremental Direct Costs + Societal Benefits



Appendix: Rates and Affordability Supporting Findings

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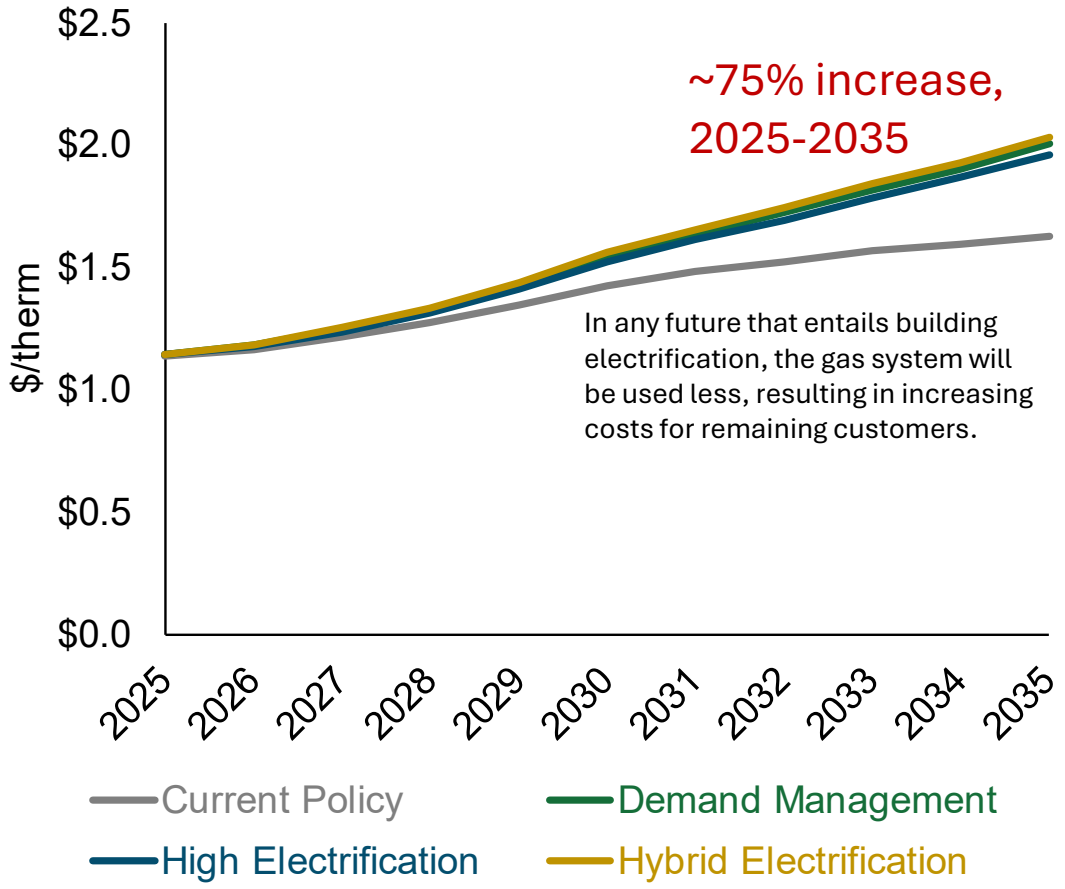
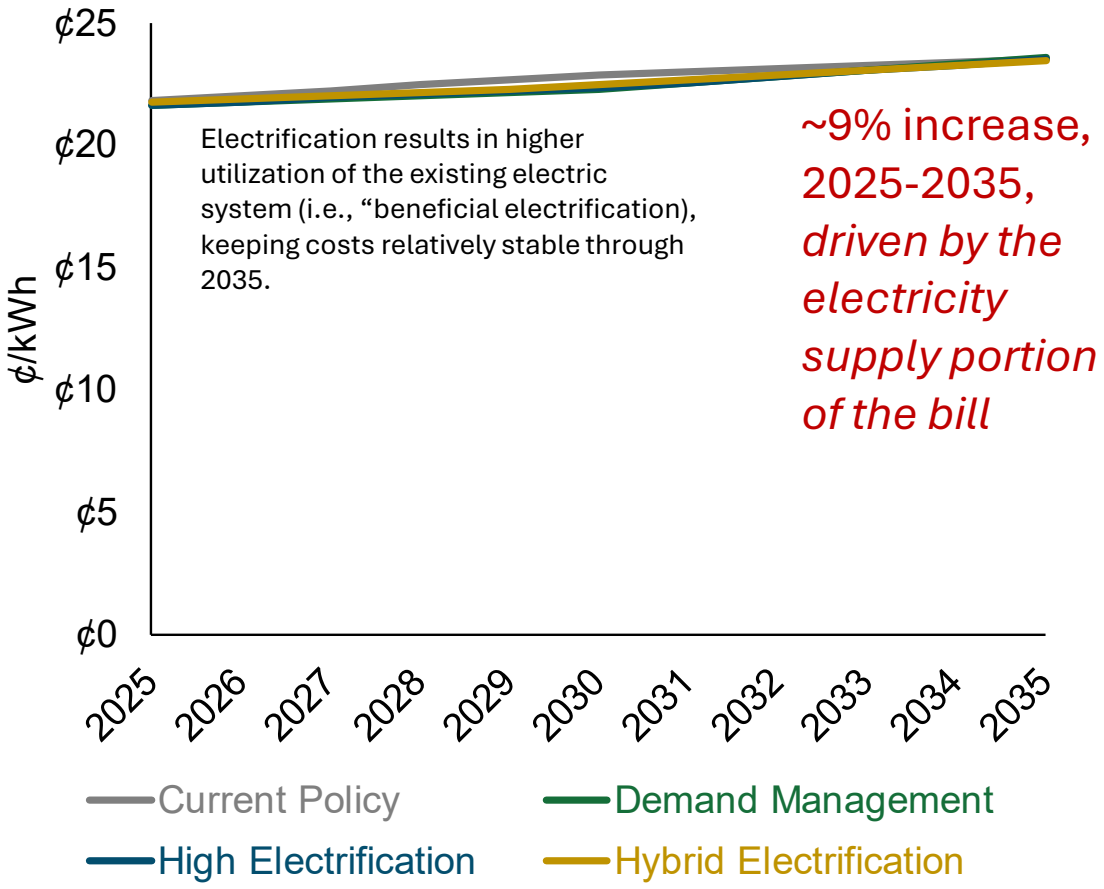
Residential Retail Electricity and Gas Rates Under Deep Decarbonization and Electrification

Retail Natural Gas Rate



Retail Electricity Rates

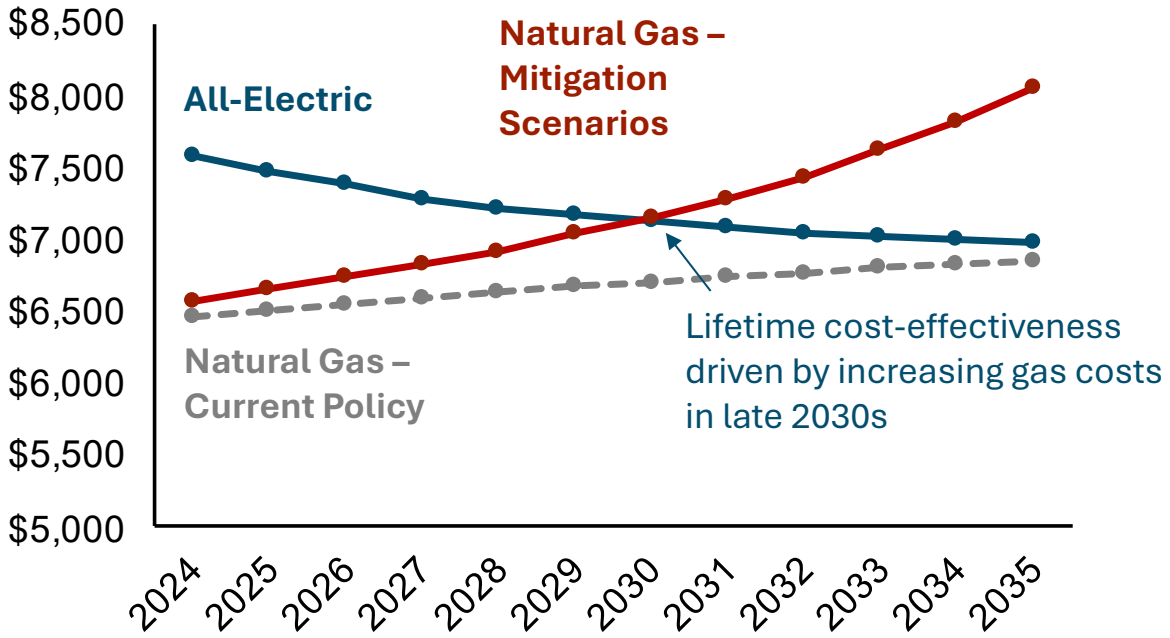


Total cost of ownership approaches parity in near term due to equipment rebates and future gas cost growth

Without Equipment Rebates

15-Year Cost of Ownership (incl. Equipment and Energy Costs) – Household and Vehicle

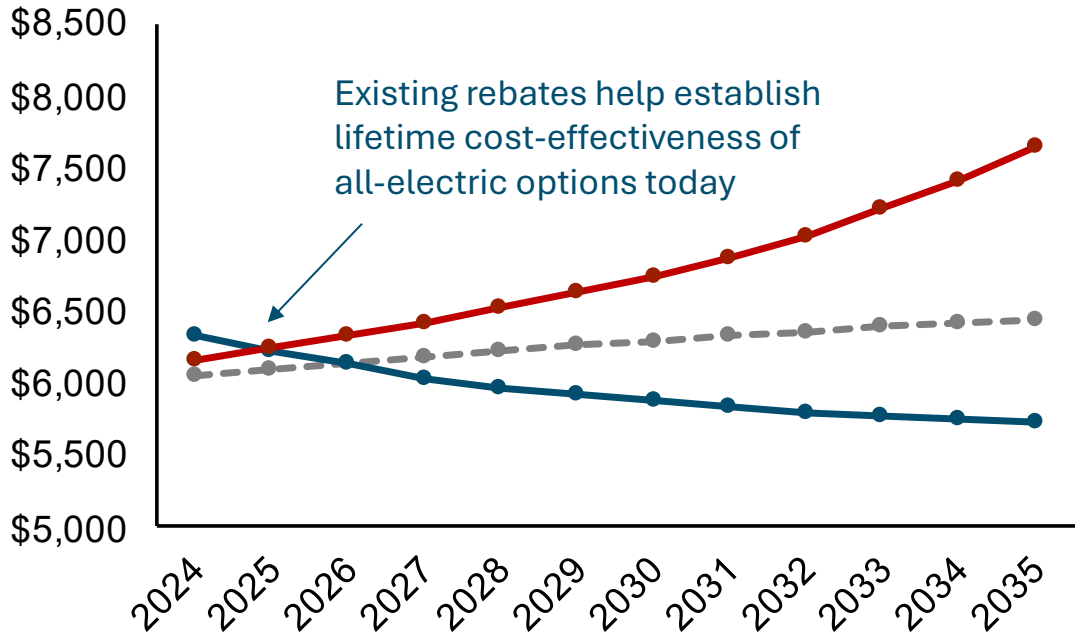
$NPV



With Equipment Rebates

15-Year Cost of Ownership (incl. Equipment and Energy Costs) – Household and Vehicle

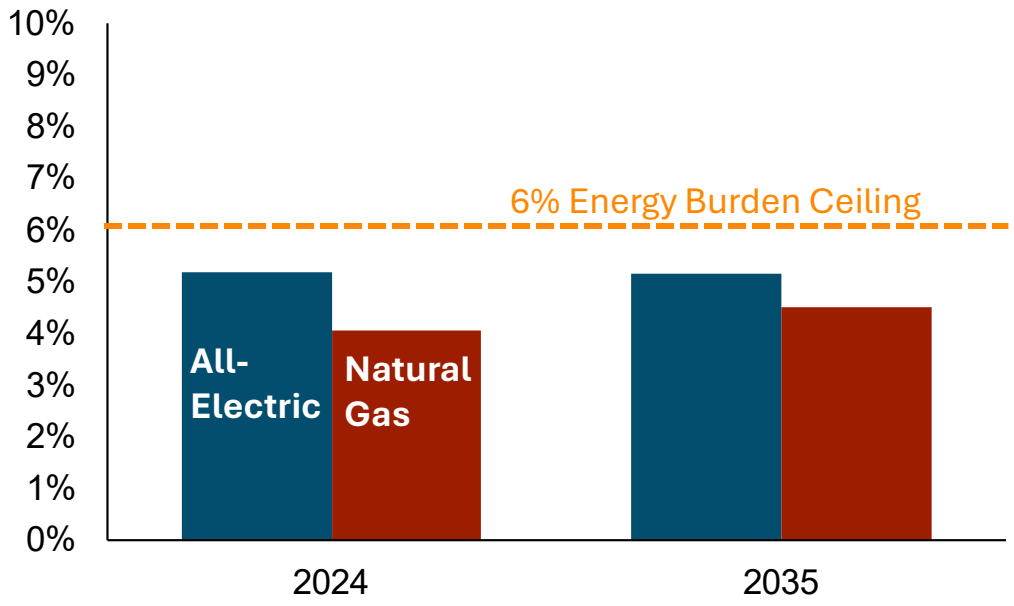
$NPV



Energy burden for low-income* households across scenarios

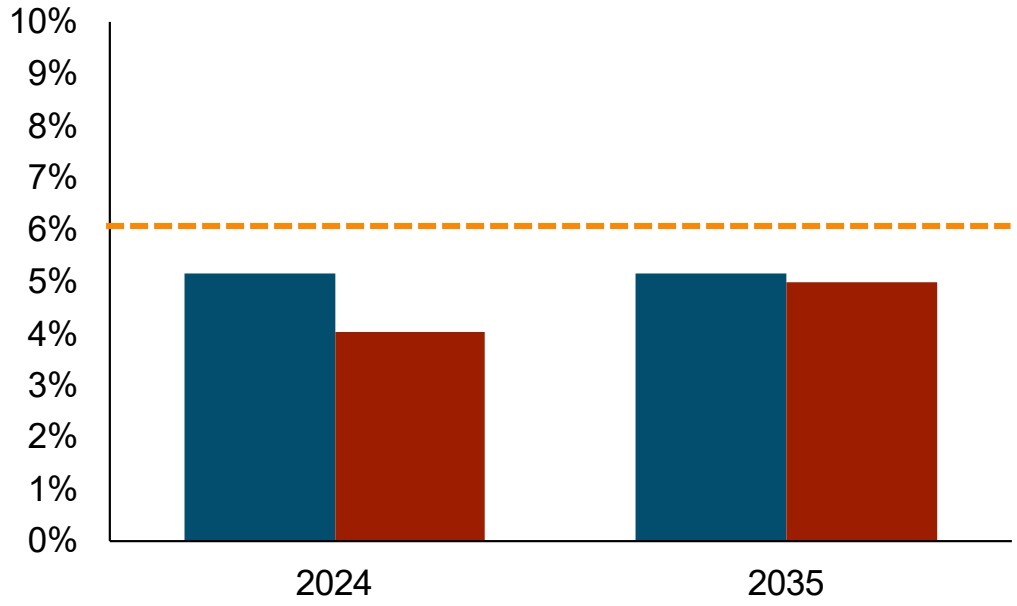
Current Policy Scenario

Energy Burden
% of Income



Mitigation Scenarios

Energy Burden
% of Income



*40% state median income multifamily home shown here, ~$37k for a four-person household