# New York State Climate Action Council

**December 20, 2021**

**Meeting 18**

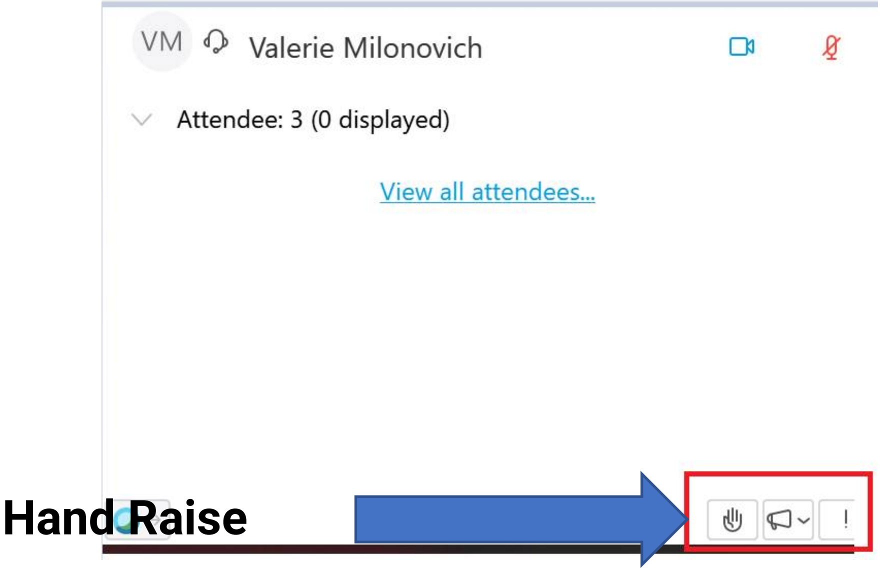
NEW YORK STATE OF OPPORTUNITY. | Climate Action Council

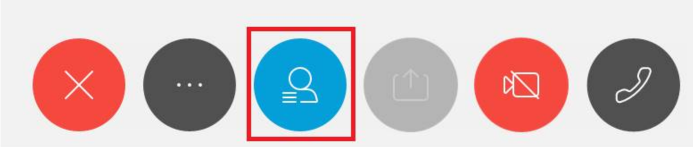
# Meeting Procedures

## Before beginning, a few reminders to ensure a smooth discussion:

- CAC Members should be on mute if not speaking.
  - If using phone for audio, please tap the phone mute button.
  - If using computer for audio, please click the mute button on the computer screen (1st visual).
- Video is encouraged for CAC members, in particular when speaking.
- In the event of a question or comment, please use the hand raise function (2nd visual). You can find the hand raise button by clicking the participant panel button (3rd visual). The co-chairs will call on members individually, at which time please unmute.
- If technical problems arise, please contact NYS.CAC@cadmusgroup.com.

**You'll see when your microphone is muted**



# Agenda

> Welcome and Roll Call
> Consideration of November 30 and December 6, 2021 Minutes
> Presentation and Discussion: Jobs Study and Integration Analysis Updates
> Presentation and Discussion: Disadvantaged Communities Update
> Discussion and Vote: Development of Draft Scoping Plan
> 2022 Next Steps

# Consideration of November 30 and December 6, 2021 Minutes

# New York State
# Climate Action Council

## Jobs Study & Integration Analysis Updates

December 20, 2021

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# More Information

> For more information visit:

- [https://climate.ny.gov/Climate-Resources](https://climate.ny.gov/Climate-Resources)
- [https://climate.ny.gov/Climate-Action-Council/Meetings-and-Materials](https://climate.ny.gov/Climate-Action-Council/Meetings-and-Materials)

## Resources

### Advisory Panel/Working Group Recommendations

- Compiled Advisory Panel/Working Group Recommendations [PDF]

### Technical Analysis

#### Integration Analysis

To inform and support the Climate Action Council's Scoping Plan, an integration analysis was developed to estimate the economy-wide benefits, costs, and GHG emissions reductions associated with pathways that achieve the Climate Act GHG emission limits and carbon neutrality goal. This integration analysis incorporates and builds from Advisory Panel and Working Group recommendations, as well as inputs and insights from complementary analyses, to model and assess multiple mitigation scenarios. Key results, drivers, and assumptions are available below.

- Integration Analysis - Benefits and Costs Presentation [PDF]
- Integration Analysis - Initial Results Presentation [PDF]

NY CCSC New York Climate Change Science Clearinghouse

https://www.nyclimatescience.org/

NEW YORK STATE CLIMATE IMPACTS ASSESSMENT

https://nysclimateimpacts.org/

# Contents

## Jobs Study Update



## Integration Analysis Updates



Note: Integration Analysis Technical Supplement (appendix to Scoping Plan) will document analysis and contain additional detail, including:

- Scenario development and representation of Advisory Panel recommendations
- Additional information on sensitivity analysis

# Jobs Study Update

Jobs Study

# Overview & Initial Employment Outputs

Methodology Overview

# Initial Employment Outputs (IEO)

**For 2019, 2025, 2030, 2035, 2040, 2045, & 2050**

1. Investment Stream by sub-sector
2. Overall annual employment by sub-sector
3. For electricity, the energy that will be generated within each sub-sector

Key Findings:

- Range of jobs added by 2030: 211,000 (LCF Scenario) – 220,000 (AT scenario), with bulk in building shell/HVAC and strong growth in solar and wind
- Both scenarios show losses of about 22,000 jobs by 2030. In both cases, about half of the losses are in gas station employment.

Methodology Overview

# Secondary Employment Outlook (SEO)

**For 2019 & 2030**

1. Employment by Industry
2. Employment by occupational category
3. Employment by geographic region within NYS (5 Regions within NYS)
4. Employment by sustaining wage tier

# IEO to SEO & Wage Analysis

**I/O Model Industry Employment Outputs**

→

**NAICS Industry Employment** (IMPLAN-NAICS crosswalk)

→

**SOC Occupational Employment (**BLS OEWS staffing patterns)

→

Estimate sustainable wages in New York for 2030

[All wage data presented in 2019 dollars]

→

**Employment Categorized proportionally into:**

**Tier 1 – Above sustaining wage**

**Tier 2 - At sustaining wage**

**Tier 3 - Below sustaining wage**

## Jobs Study

# Model Sensitivities

Jobs Study

# Model Sensitivities

1. Develop an analysis that examines if ***in-state manufacturing*** increased in the Buildings Sector and how would it impact employment and the economy.

2. Describe the key assumptions that were done for ***gas station closings***, and how changes to those assumptions would impact the model outcomes.

Jobs Study

# Model Sensitivities: In-State Manufacturing

# Buildings Sector

## In-State Manufacturing for the Buildings Sector (2019)

| | Employment | In-State% |
|---|---|---|
| • Commercial HVAC | 220 | (7%) |
| • Commercial Shell | 1,360 | (29%) |
| • Commercial Other | 360 | (4%) |
| • Residential HVAC | 230 | (8%) |
| • Residential Shell | 1,190 | (29%) |
| • Residential Other | 340 | (9%) |
| **Buildings (Manufacturing)** | **3,700** | **(14%)** |

Jobs Study

# Model Sensitivities: In-State Manufacturing

# Buildings Sector

**Example Products & Devices for each Buildings Sub-Sector (Commercial & Residential)**

- **HVAC**: Air Conditioners, Heat Pumps, Furnaces & Boilers
- **Shell**: Paints, Coatings, Windows & Doors
- **Other**: Stoves, Lighting, Water Heating, Washers/Dryers (Residential) & Refrigerators

Jobs Study

# Model Sensitivities: In-State Manufacturing

# Buildings Sector

## In-State Manufacturing for the Buildings Sector (2030) under S2:LCF

| | 50% | 100% |
|---|---|---|
| • Commercial HVAC | 2,670 | 5,340 |
| • Commercial Shell | 2,760 | 5,530 |
| • Commercial Other | 3,680 | 7,360 |
| • Residential HVAC | 3,320 | 6,630 |
| • Residential Shell | 4,910 | 9,810 |
| • Residential Other | 1,620 | 3,250 |
| **Buildings (Manu) Total** | **18,960** | **37,920** |
| **Added over 2030 Base** | **10,880 (>2x's)** | **29,840 (<5x's)** |

# Model Sensitivities: In-State Manufacturing

# Buildings Sector

## In-State Manufacturing for the Buildings Sector (2030) under S3:AT

| | 50% | 100% |
|---|---|---|
| • Commercial HVAC | 2,950 | 5,910 |
| • Commercial Shell | 2,770 | 5,530 |
| • Commercial Other | 3,690 | 7,370 |
| • Residential HVAC | 3,780 | 7,560 |
| • Residential Shell | 1,910 | 3,810 |
| • Residential Other | 1,630 | 3,250 |
| **Buildings (Manu) Total** | **16,760** | **33,430** |
| **Added over 2030 Base** | **8,810 (>2x's)** | **25,480 (>4x's)** |

# Jobs Study Secondary Employment Outlook (SEO)

Jobs Study

# Secondary Employment Outlook (SEO)

1. IEO's are an estimate of how **the quantity of jobs** will change over time from 2019 to 2050 under the two investment scenarios for the four primary sectors (Buildings, Electricity, Fuels & Transportation). IEO's include induced employment.

2. SEO's are an assessment of how **the type, the location, and the quality of jobs** that will change from 2019 to 2030 under the two investment scenarios for the four primary sectors (Buildings, Electricity, Fuels & Transportation). SEO's do not include induced employment.

Jobs Study

# Key Employment Findings: SEO

**Industry Findings**

- All of the major industry categories, see a net increase of employment in the four sectors combined from 2019 to 2030, with the largest increases in Construction and Manufacturing.

- Just over three-quarters of total industry added jobs (2019 to 2030), in the growth sub-sectors, will be found in the construction industry.

- Over 80 percent of total industry jobs lost, in the displaced sub-sectors, will be found in the Other Supply Chain industries, which include Utilities, Transportation & Warehousing, Wholesale, and Retail industries.

**Occupational Findings**

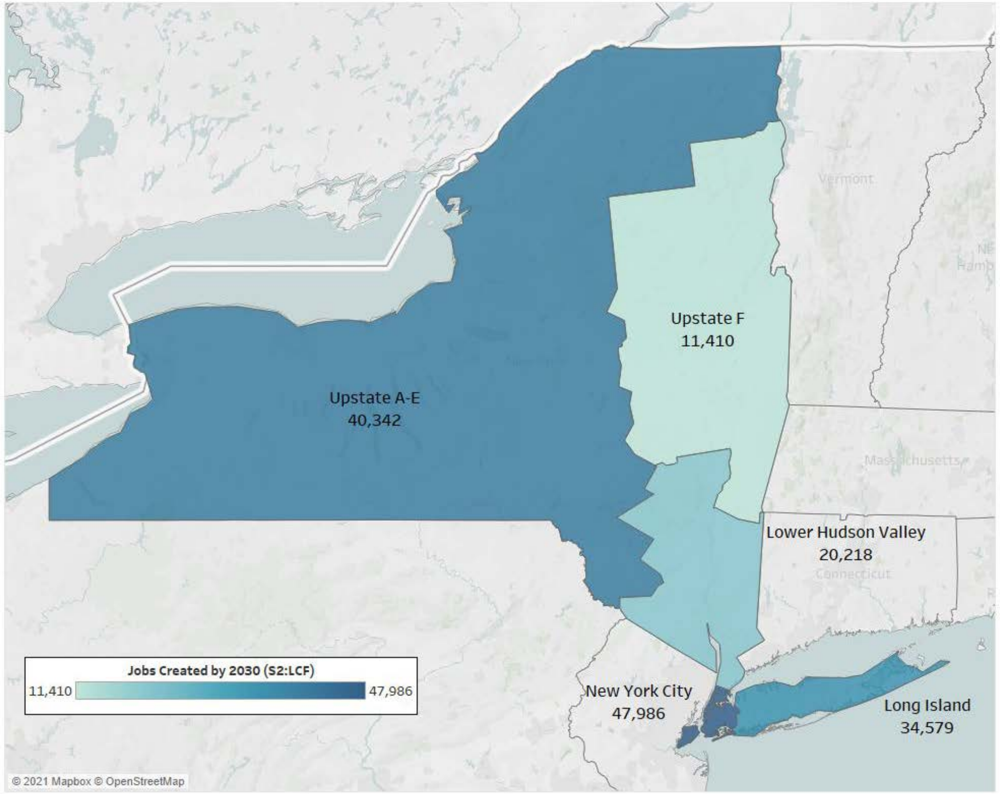
- Just under two-thirds of added jobs from 2019 to 2030, in the growth sub-sectors, will be found in Installation & Repair positions.

Jobs Study

# Key Employment Findings: SEO

## Wage Findings

- 70 percent of jobs added in the growth sub-sectors, from 2019 to 2030, will be in the middle ($28 to $37 an hour) or higher (>$37 an hour) wage paying category.
- 60 percent of jobs lost in the displaced sub-sectors, from 2019 to 2030, will be from the lower (<$28 an hour) wage paying category




## Geographic Findings

- Net job growth can be found across the state, with each of the five regions, experiencing over 10,000 added jobs from 2019 to 2030.

# SEO Highlights: Electricity

## Industry Profile

- Approximately 40% increase in total sector employment by 2030
- The sector is projected to experience almost a doubling of Construction industry employment by 2030

## Occupational Profile

- Growth sub-sectors see employment increases across all occupational categories with the most substantial increases (nearly two-thirds) projected for Installation & Repair professions
- Displaced sub-sectors see employment decreases across all occupational categories with the most substantial decreases (approximately a quarter) projected for Production & Manufacturing as well as Administrative positions

## Wage Profile

- Approximately half of all employment in this sector is found in the highest wage category (>$37 an hour). From 2019 to 2030 the most growth will be found in the middle wage category ($28 to $37 an hour)

# SEO Highlights: Fuels

## Industry Profile

- There is a 3% increase in employment in the LCF Scenario, and a 10% decrease in the AT Scenario by 2030. This is the only sector with considerable employment differences between scenarios
- The sector is projected to increase employment in the Construction industry, but decrease in all other industries

## Occupational Profile

- Growth sub-sectors see employment growth in all occupational categories, with larger increases in the LCF Scenario
- Decreases in employment in displacement sub-sectors mostly offset growth in other sub-sectors, largely due to jobs lost in Administrative occupations

## Wage Profile

- There is a 6% increase in workers in the higher wage category (>$37) in the LCF Scenario by 2030
- About two-thirds of jobs lost under the AT Scenario are in the lower wage category (<$28)

# SEO Highlights: Buildings

## Industry Profile

- Over 80 percent total increase in employment by 2030
- Four out of five jobs added are in the Construction industry

## Occupational Profile

- Employment increases across all occupational categories including Production & Manufacturing, Administrative, Sales, Management & Professional
- The most significant increase (over 80%) is projected for Installation & Repair occupations

## Wage Profile

- About one-third of workers are projected to be in the highest wage category (>$37) by 2030
- The $28 to $37 wage category sees the largest increase in workforce, more than doubling by 2030

# SEO Highlights: Transportation

## Industry Profile

- Relatively flat total employment from 2019 to 2030
- Declines in Other Supply Chain industries are largely offset by major growth in Construction

## Occupational Profile

- Growth sub-sectors see employment increases across all occupational categories with the most substantial increases (over one-half) projected for Installation & Repair occupations
- Displaced sub-sectors see employment decreases across all occupational categories with the most substantial decreases (nearly one-third) projected for Administrative and Other (Gas station) positions

## Wage Profile

- Approximately 63% of all employment in this sector is in the lower wage category (<$28 an hour) in 2019. From 2019 to 2030 the Transportation sector experiences a decline in the lower wage category and increases in the middle and higher wage categories.

## Jobs Study

# Workforce Analyses

## Jobs Study

# Wage Analysis Highlights

- Wage categories were based on data from the 2019 living wage calculation for New York State (Living Wage Calculator, MIT)
- Middle wage positions ($28 - $37) see the largest increase in jobs, from 2019 to 2030, with the largest decline in lower wage positions (<$28).
- The electricity sector has the highest proportion of higher wage positions (>$37), with approximately half of employment falling in this category.
- The transportation sector has the highest proportion of lower wage positions (<$28), with approximately 60 percent of employment falling in this category.

| | All Four Sectors (Combined) | | | Change from 2019 to 2030 | |
|---|---|---|---|---|---|
| | 2019 | AT 2030 | LCF 2030 | AT 2030 | LCF 2030 |
| **<$28** | 41% | 37% | 37% | -4% | -4% |
| **$28 - $37** | 23% | 28% | 29% | 6% | 6% |
| **>$37** | 36% | 34% | 34% | -2% | -2% |

# Integration Analysis Updates

# Acknowledgements

## Integration Analysis Technical Advisory Group

**Vatsal Bhatt**, Department of Materials Science and Chemical Engineering, Stony Brook University, and U.S Green Building Council;

**Gang He**, Department of Technology and Society, Stony Brook University;

**Benjamin Houlton**, College of Agriculture and Life Sciences, Department of Ecology and Evolutionary Biology and Department of Global Development, Cornell University;

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**Jessica Lau**, Grid Planning and Analysis Group, National Renewable Energy Laboratory;

**Timothy Lipman**, Institute of Transportation Studies, University of California Berkeley;

**Melissa C. Lott**, Columbia University SIPA Center on Global Energy Policy;

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**Richard Perez,** Atmospheric Sciences Research Center, University of Albany;

**Mark Ruth**, Industrial Systems and Fuels group, National Renewable Energy Laboratory;

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**Eric Williams,** Golisano Institute for Sustainability, Rochester Institute of Technology;

**Eric Wilson**, Buildings and Thermal Sciences Center, National Renewable Energy Laboratory

# Benefits-Cost Analysis

# Benefit-Cost Analysis Updates

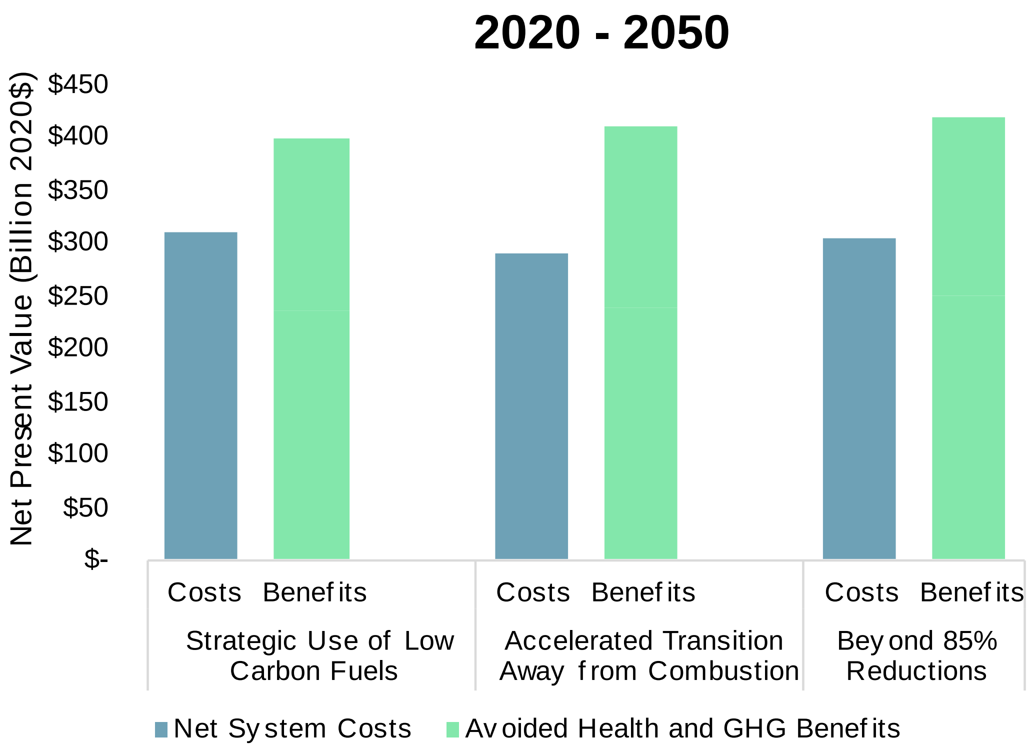
> Benefits and costs for all mitigation scenarios
- Scenario 2: Strategic Use of Low-Carbon Fuels
- Scenario 3: Accelerated Transition Away from Combustion
- **Scenario 4: Beyond 85% Reduction**

> Additional updates to benefit-cost analysis include:
- Final review and update of cost inputs
  (e.g., further incorporation of results from supporting studies and TAG feedback)
- Social cost of GHG
  (e.g., includes updated HFC emission values)

# Key Benefit-Cost Findings [NPV 2020-2050]

## Cost of Inaction Exceeds the Cost of Action by more than $90 billion

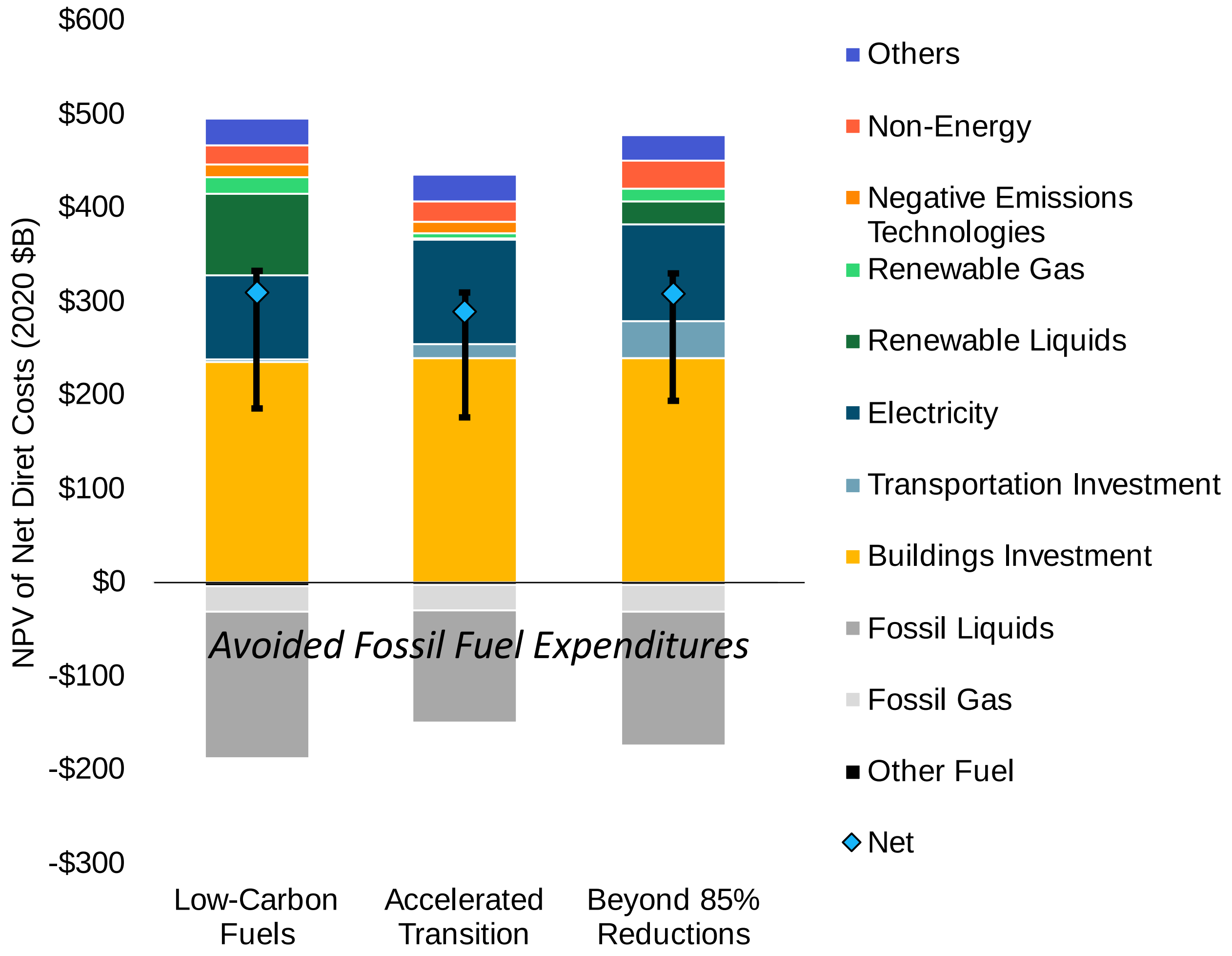
There are significant required investments to achieve Climate Act GHG Emissions Limits, accompanied by even greater external benefits and the opportunity to create hundreds of thousands of jobs




- **Net *benefits* range from $90-$120 billion**
- Costs are a small share of **New York's economy:** 0.6-0.7% of GSP in 2030 and 1.4% in 2050
- As a share of current overall **system expenditures,** costs are moderate: 9-11% in 2030 and 25-26% in 2050

# Scenario Cost Assessment

## *Net Present Value of net direct costs relative to Reference (2020 – 2050)*

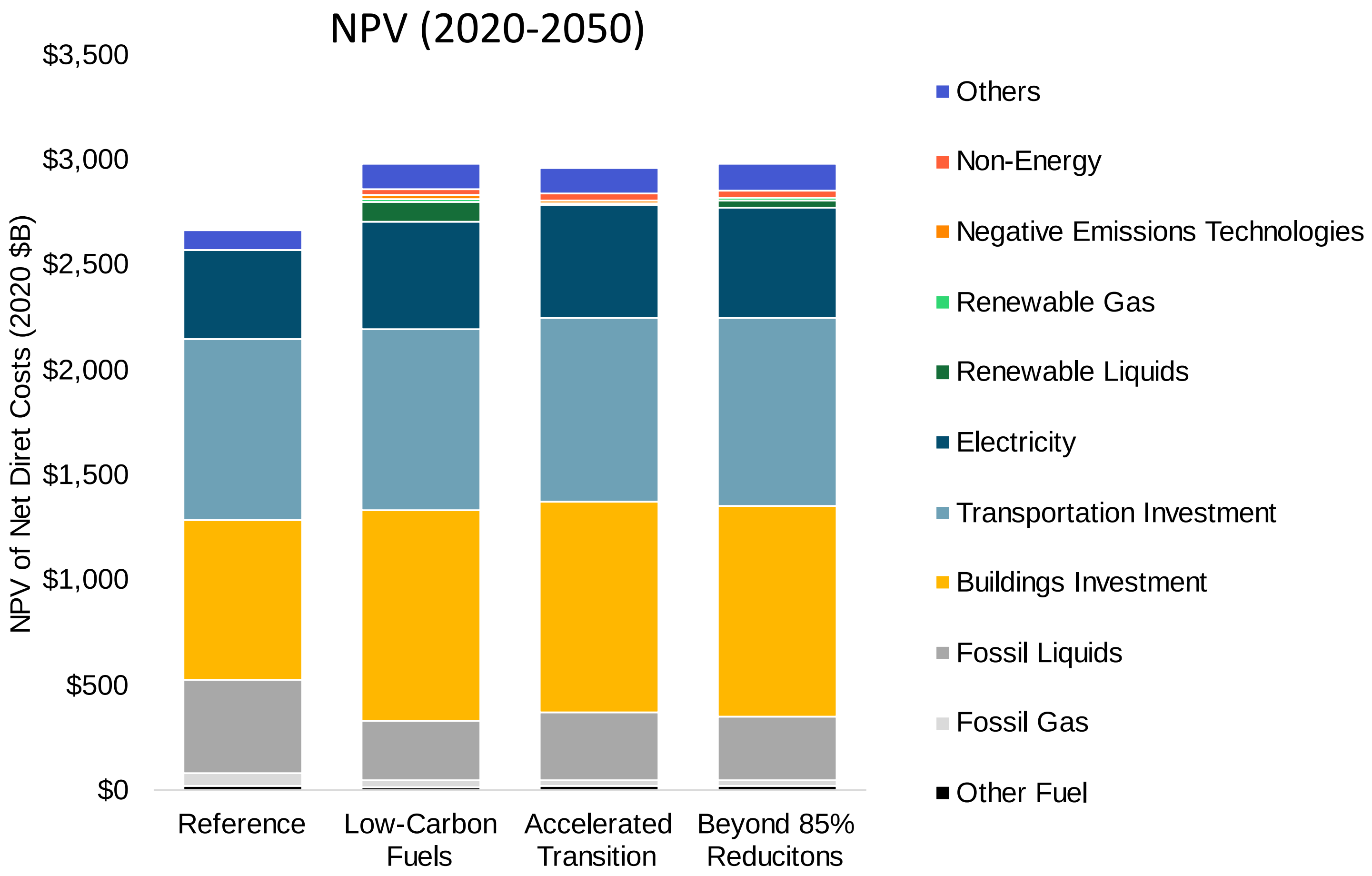



Key findings:

- Net direct costs in all scenarios are in the **same range** given uncertainty, and are primarily driven by **investments in buildings and the electricity system**
- All scenarios show **avoided fossil fuel expenditures** due to efficiency and fuel-switching relative to the Reference Case (shown in the chart as negative costs)
- Scenario 2: Strategic Use of Low-Carbon Fuels includes significant investment in renewable diesel, renewable jet kerosene, and renewable natural gas
- Scenario 3: Accelerated Transition Away From Combustion meets emissions limits with greater levels of electrification, which results in greater investments in building electrification, zero-emission vehicles, and the electricity system
- Scenario 4: Beyond 85% Reductions meets emissions limits with further investments in transportation (intrastate rail, electric and hydrogen aviation, smart growth and VMT reductions), and innovation in non-energy agriculture and waste and avoids the need for negative emissions technologies

# System Expenditure

## *Net Present Value of direct costs (2020 – 2050)*



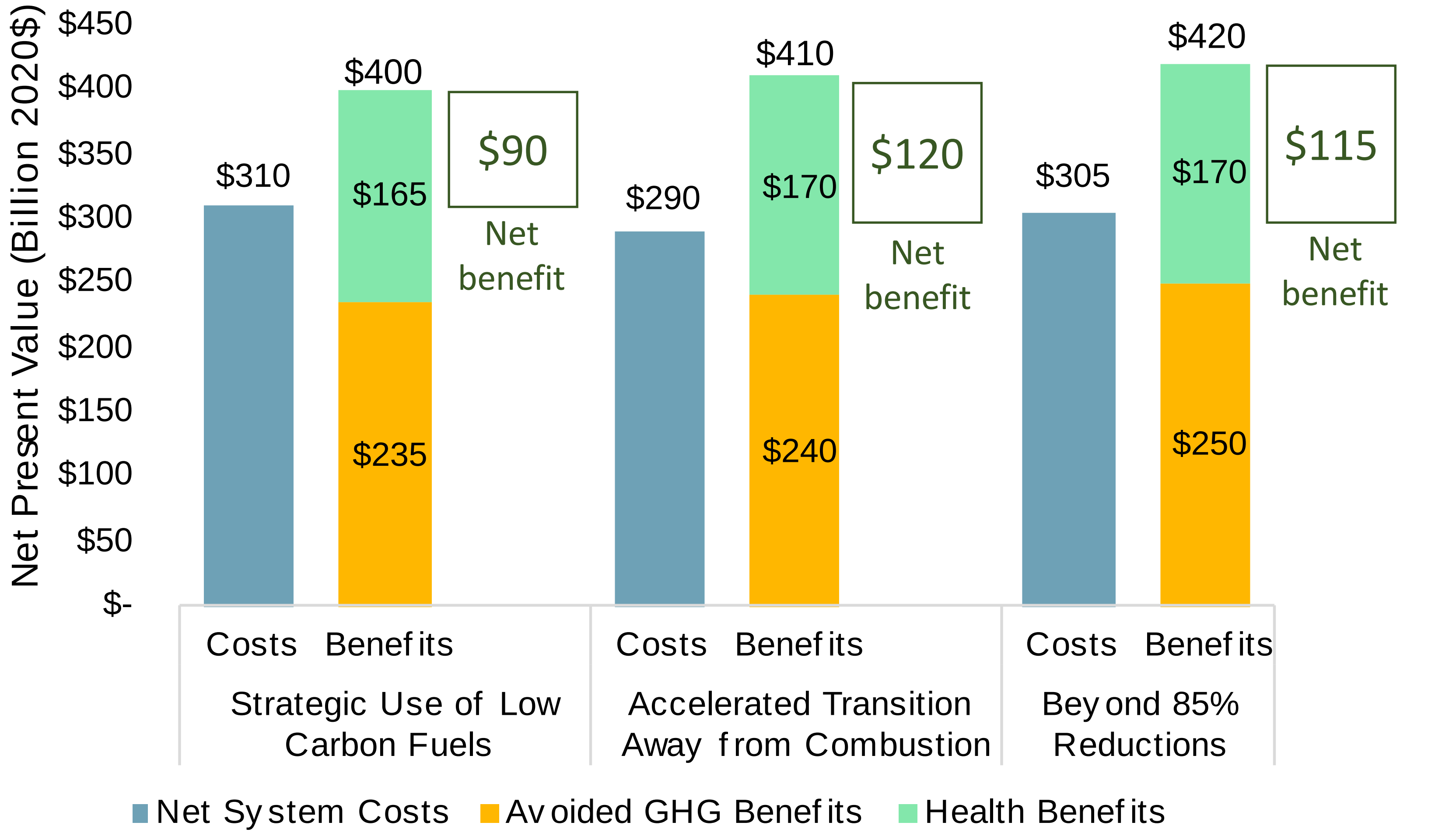

> The NPV of Reference Case system expenditure: $2.7 trillion

> When calculated on an NPV basis, the net direct costs are moderate: 11-12% higher than the Reference case

Note: System expenditure metric does not reflect direct costs in some sectors that are represented with incremental costs only. These include investments in industry, agriculture, waste, forestry, and non-road transportation

# Benefit-Cost Assessment

*Net Present Value of benefits and costs relative to Reference, including net direct costs, GHG benefits, and health benefits (2020 – 2050)*



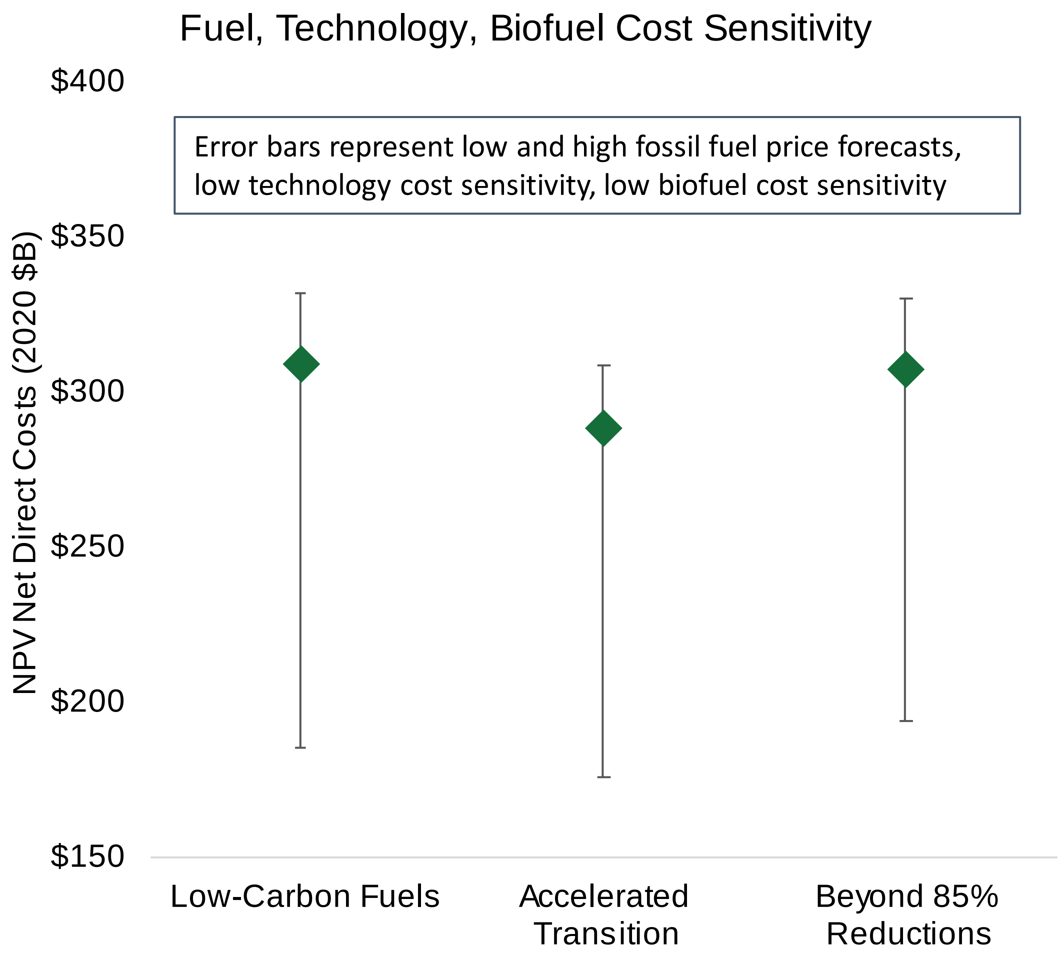

Mitigation cases show **positive net benefits ($90-$120 billion)** when considering the value of avoided greenhouse gas emissions and health co-benefits, in addition to cost savings from reduced fuel use

# Overview of Uncertainty Analysis

> Analysis explored uncertainty in key areas
- Technology costs: Developed high innovation/low technology cost sensitivity assumptions for key demand-side and supply-side technologies
- Fuel costs: Incorporated a range of fossil fuel costs from EIA's Annual Energy Outlook and developed central and low-cost biofuel cost projections

> From this examination of a wide range of assumptions
- Net direct **costs** in all scenarios are in the **same range**
- **All scenarios** realize a **net societal benefit**

> Net direct costs (central estimate from $290 - $310 billion) are in the same range given uncertainty bounds
- Reference Case system expenditure: $2.7 trillion
- Net direct cost central estimate range from 11-12% over Reference Case system expenditures



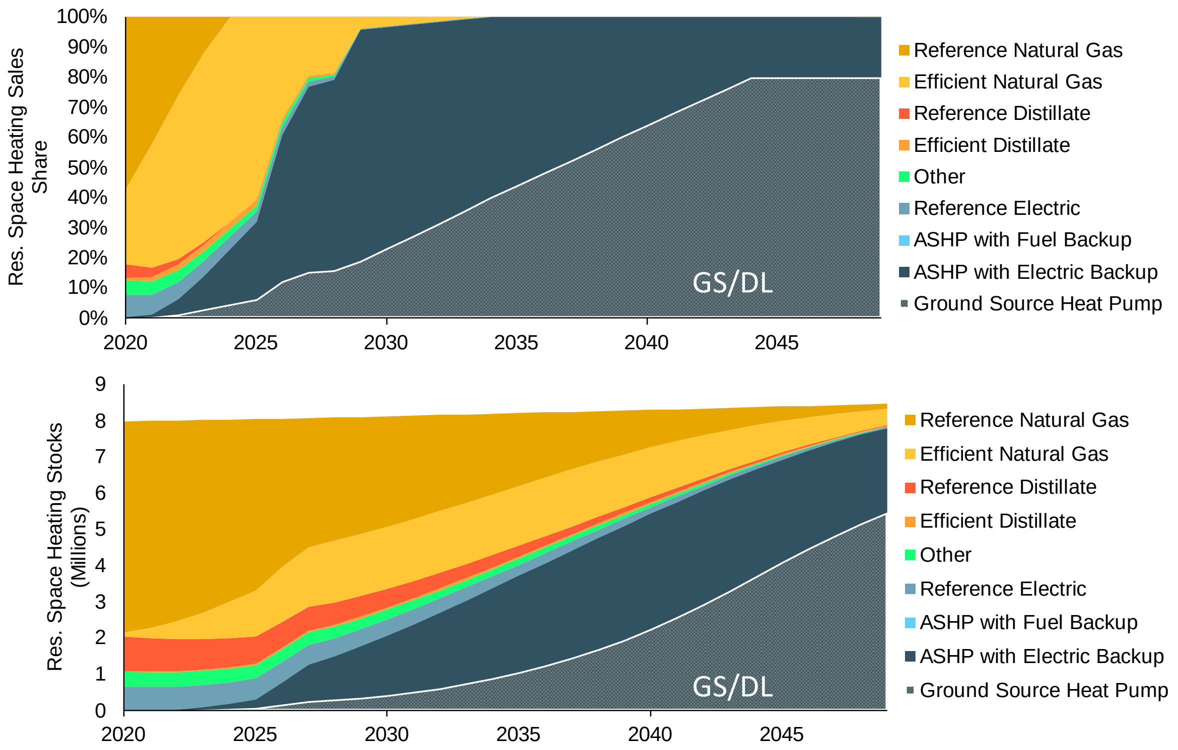
# Ground Source/District Loop Heat Pump Sensitivity Analysis

# Higher Ground Source/District Loop Heat Pump Sensitivity

> Ground source and district loop heat pump systems can provide overall system benefits due to increased annual and peak performance efficiency

> Although there is remaining uncertainty on the full potential/site suitability for ground source and district heating systems, this sensitivity explores a future where, after an initial period for expansion of the industry, ground source and district loop heat pump systems predominate, ultimately ramping up to 80% of new sales.

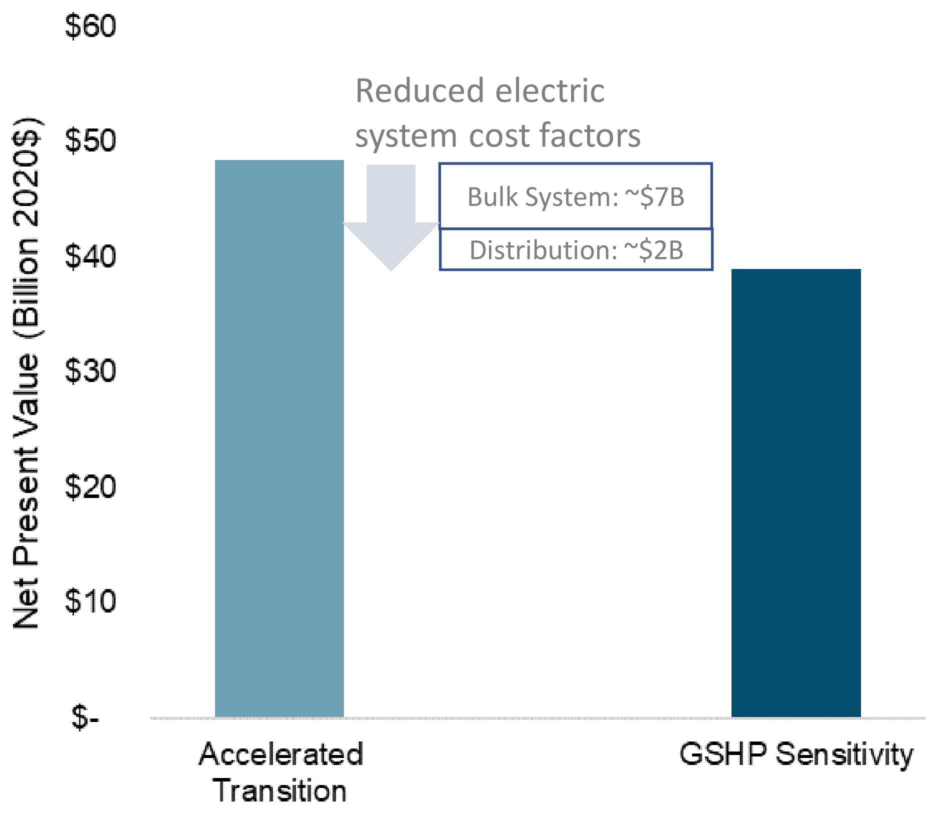
> Sensitivity is based on Accelerated Transition Away from Combustion scenario, but with an increased share of ground source/district heat pump adoption over time
- 40% of HP sales are GS/DLHP systems by 2035, 60% by 2040, 80% by 2045
  - Up from a ramp up to approximately 20% across scenarios 2-4
- Majority of heating systems are ground source/district systems by 2050



# Impacts of Higher Ground Source/District Loop Heat Pump Penetration on Electricity System Cost

- Higher adoption of GS/DLHPs can reduce system load and peak needs, yielding a $9B reduction composed of a $7B reduction in bulk grid costs and a $2B reduction in distribution system costs
- These figures do not yet account for heat pump costs

NPV Relative to the Reference Scenario controlled for Electrification Loads ($B)



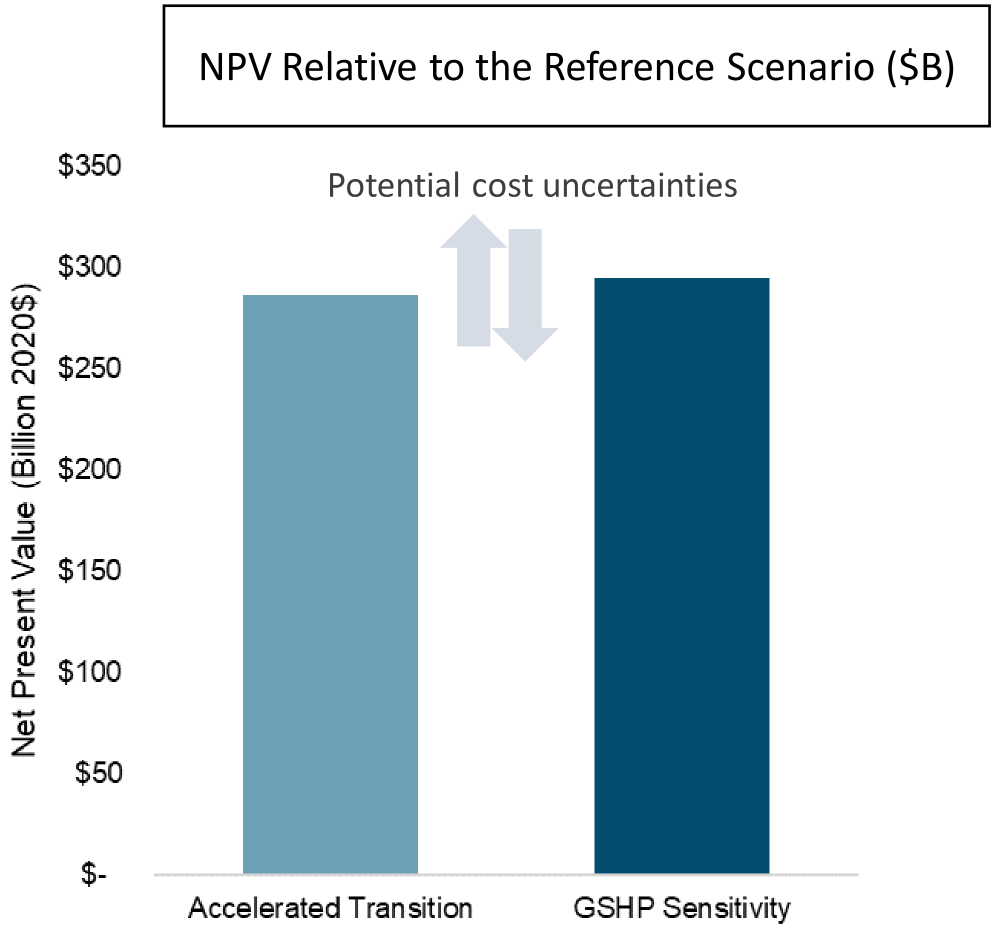
# Impacts of Higher Ground Source/District Loop Heat Pump Penetration on Overall System Cost

> Higher adoption of GS/DLHPs result in reduced electric sector costs (-$9B), but increased demand-side technology costs (+$19B), for an overall increase in net NPV of about $10B

> Significant uncertainty in:

- Cost of heat pump technologies over time
- Potential per-unit cost savings from district heating
- Potential evolution of heat pump peak performance
- Cost of electricity grid infrastructure

> Further investigation is warranted to explore these dimensions in greater detail and assess potential for realizing benefits



# Appendix

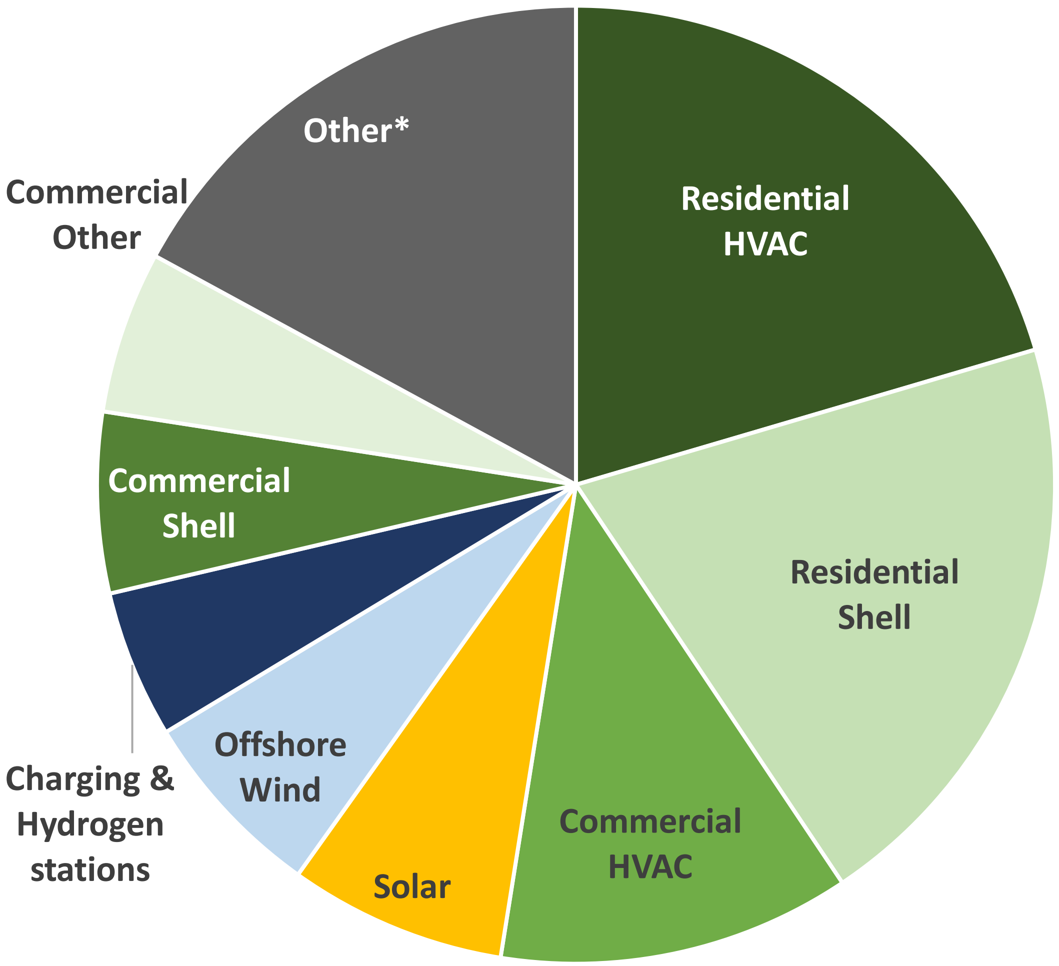
## Additional background on Jobs Study, Health Study Results, Benefits & Costs, Uncertainty, Analysis, Sensitivities, and Key Scenario 4 Vehicle Miles Travelled (VMT) Drivers

# Jobs Study

Jobs Study

# Key Employment Findings: S2: LCF Scenario

# Sub-Sectoral Breakdown of 211,000 jobs Added by 2030



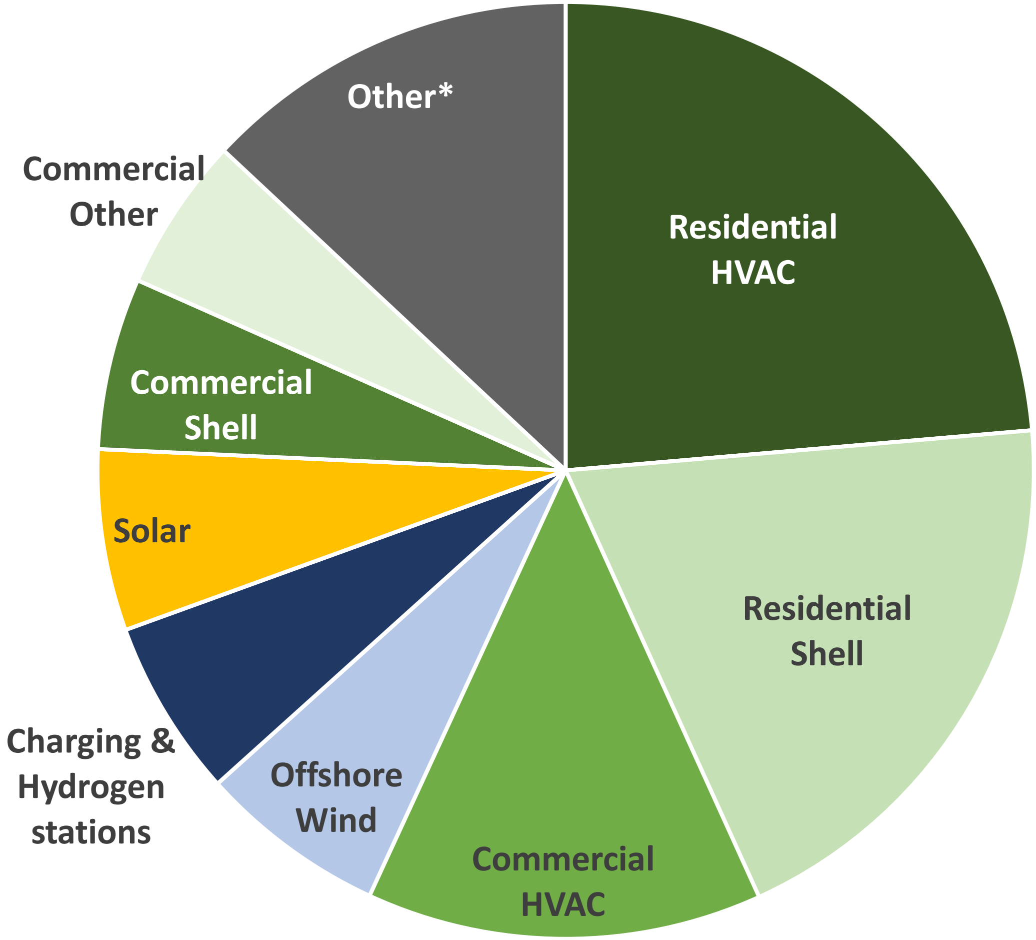

- **Over half of the new jobs, in the growth sub-sectors, from 2019 to 2030, will be found in the Buildings sub-sectors (shaded green)**
- **The next largest growth sub-sectors are Solar and Offshore Wind electricity generation, and Electric Vehicle Charging and Hydrogen Fueling Stations**

* Includes Distribution (Electricity), Transmission, Storage, Hydropower, Hydrogen, Biomass, Bioenergy, Residential Other, Hydrogen Fuels, Onshore Wind, & Vehicle Manufacturing

**Jobs Study**

# Key Employment Findings: S3: AT Scenario

## Sub-Sectoral Breakdown of 220,000 jobs Added by 2030




- **With higher levels of investment in 2030, the Buildings sector shows even more growth in the third scenario (S3:AT), compared to the second (S2:LCF)**
- **Offshore Wind is one of the fastest growing sub-sectors, increasing from less than 1,000 jobs to almost 15,000 by 2030**

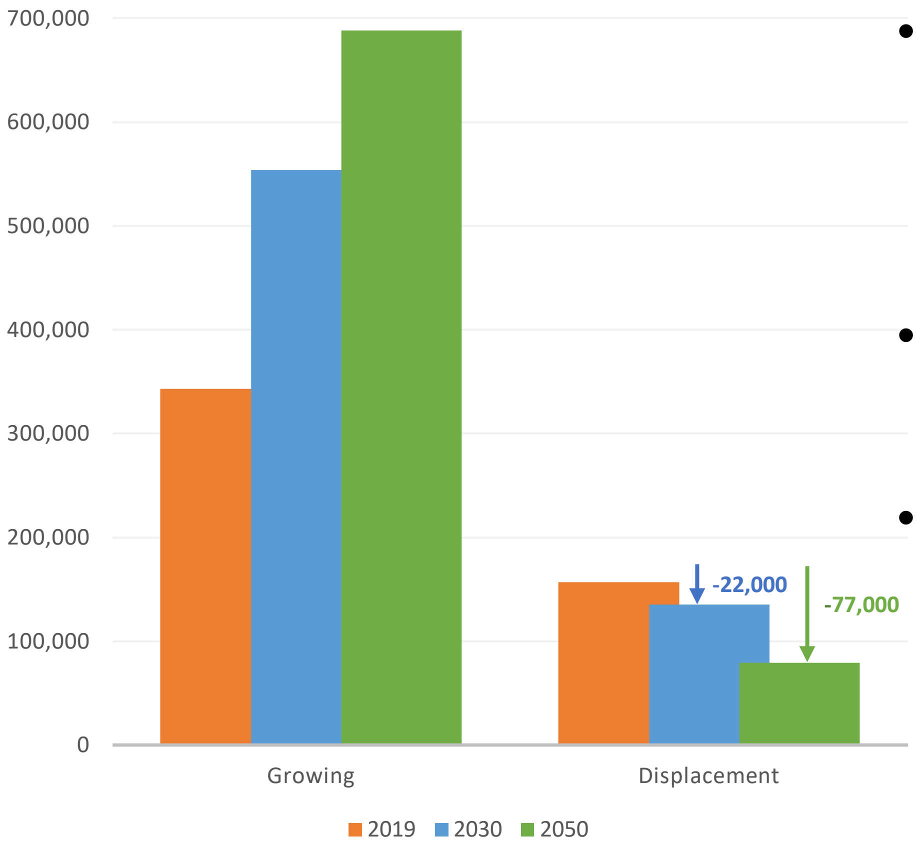
* Includes Distribution (Electricity),Transmission, Storage, Residential Other, Bioenergy, Onshore Wind, Hydrogen Fuels, Hydropower, Hydrogen, Biomass, Wholesale Trade, and Vehicle Manufacturing

Jobs Study

# Key Employment Findings: Overall

# Displaced Sub-Sectors

## For every job displaced, 10 jobs are added by 2030 under the Scoping Plan scenarios

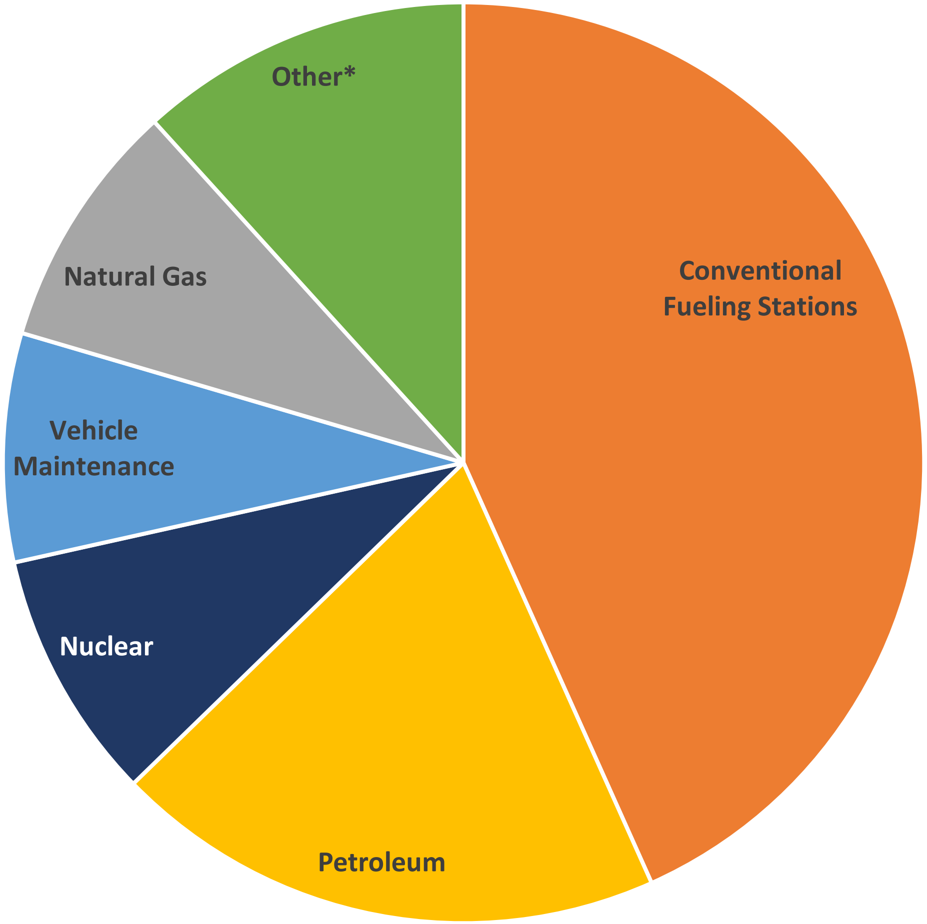



- Employment in the displaced sub-sectors **decreases by at least 22,000 jobs by 2030**, a 14 percent decrease in the workforce from 2019 to 2030.
- Employment **declines in these sub-sectors by at least 77,000 jobs through 2050**.
- In the displaced sub-sectors, from 2019 to 2030, one worker may be lost for every seven current workers, which **could be offset by retiring workers coupled with job transitions**

Jobs Study

# Key Employment Findings: S2: LCF Scenario

## Sub-Sectoral Breakdown of 22,000 jobs Displaced by 2030



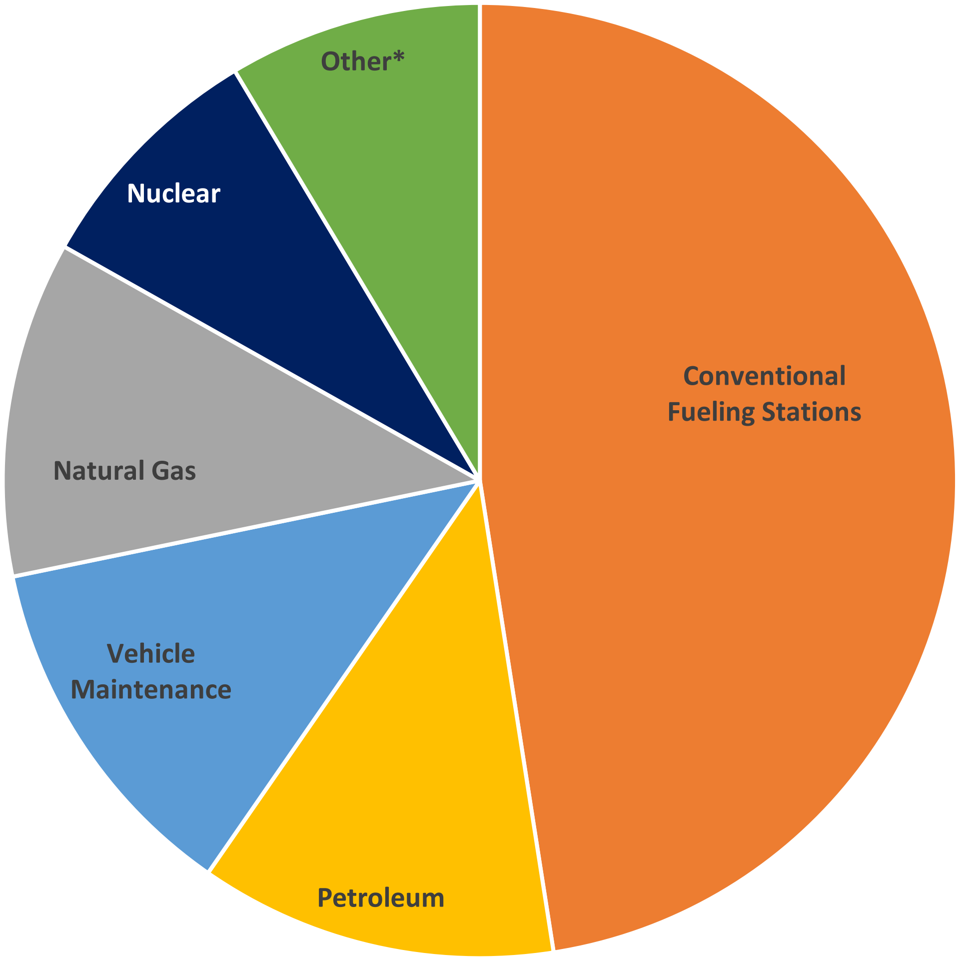

- **Conventional Fueling Stations represent over one-third of the displaced employment**
- **About one-quarter of displaced employment is in conventional fuel industries (Petroleum & Natural Gas)**

* Includes Natural Gas Generation, Natural Gas Distribution, and Other Fossil Generation

## Jobs Study

# Key Employment Findings: S3: AT Scenario

# Sub-Sectoral Breakdown of 22,000 jobs Displaced by 2030




- **Displaced employment from Conventional Fueling Stations represents almost half of all displaced jobs in the third scenario (S3:AT)**

* Includes Natural Gas Generation, Natural Gas Distribution, and Other Fossil Generation

Jobs Study

# Model Sensitivities: Fueling Stations

- **Primary case**
  - Model gas station employment using projected fossil fuel consumption relative to 2019
  - Gas stations with convenience stores earn 61.1% of revenues from gasoline station sales; thus 61.1% of employment is scaled by fossil fuel demand, and 38.9% of employment is unaffected
  - All employment at gas stations without convenience stores is affected
- **Sensitivity Analysis 1**
  - Assume that gas stations with convenience stores adapt to the changing market environment and experience no job impacts
  - Gas stations without convenience stores experience declines in employment as in the primary case
- **Sensitivity Analysis 2**
  - Assume some gas stations with convenience stores install charging units, enabling some stations to avoid job displacement associated with declining fossil fuel consumption
  - Assume 50% of estimated Light Duty DCFC charging units are installed at these stations, at a rate of 4 charging units per gas station
  - Convert station closures to employment declines at average number of employees per establishment in Census data
  - Gas stations without convenience stores experience same declines in employment as in the primary case

Jobs Study

# Model Sensitivities: Fueling Stations

| Scenario | Baseline Jobs 2019 | Displaced Jobs 2030 | |
|---|---|---|---|
| | | S2: LCF | S3: AT |
| Primary case | 49,163 | 9,371 | 10,952 |
| Sensitivity 1<br>*(% difference vs. base case)* | | 2,210<br>*(-76%)* | 2,583<br>*(-76%)* |
| Sensitivity 2<br>*(% difference vs. base case)* | | 4,625<br>*(-51%)* | 4,056<br>*(-63%)* |

*Total jobs equal to sum of direct, indirect, and induced jobs across all industries (e.g., manufacturing, professional services, etc.)*

Effect on total job displacement across all subsectors:

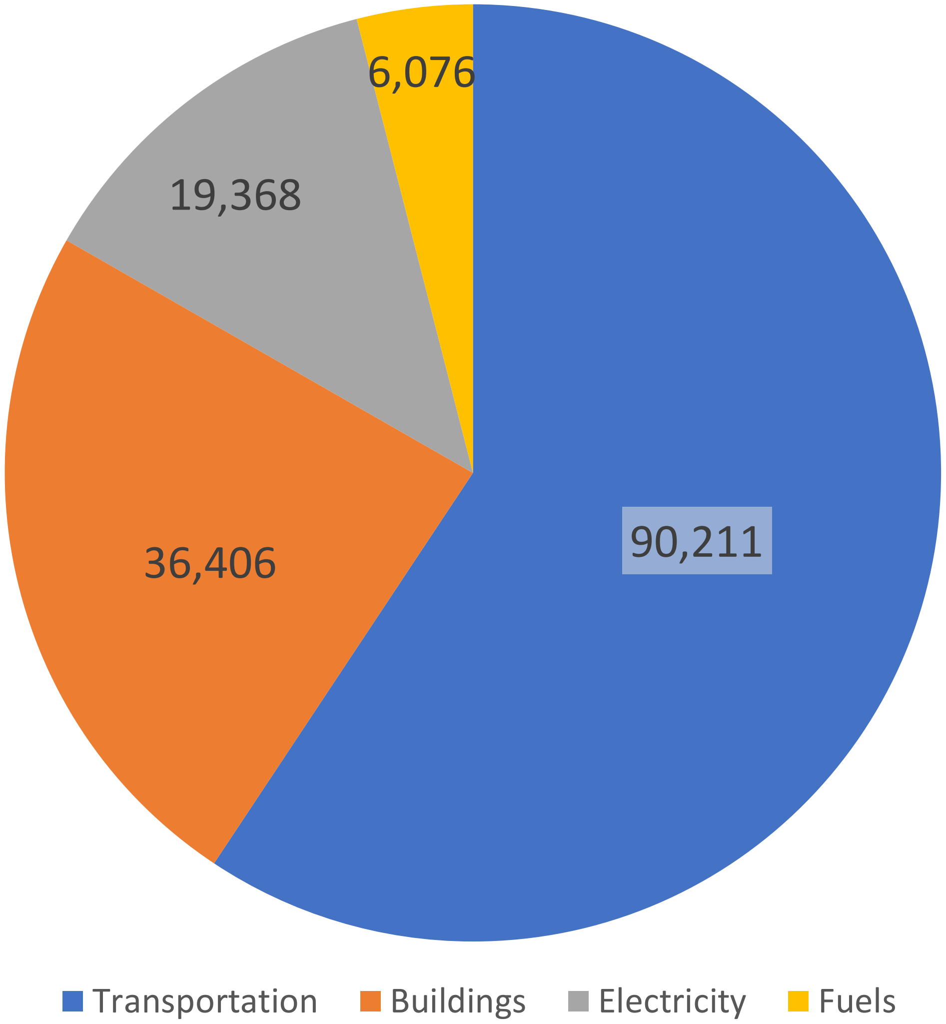
- Sensitivity analysis 1: Total displaced jobs decreases from **21,600** to **14,500** (33%) in the LCF Scenario, and from **21,800** to **13,500** (38%) in the AT Scenario.
- Sensitivity analysis 2: Total displaced jobs decreases from **21,600** to **16,900** (22%) in the LCF Scenario, and from **21,800** to **15,000** (32%) in the AT Scenario.

Jobs Study

# Wage Analysis

# 2019 Baseline

The 41% of workers (2019) in the four sectors with an hourly wage under $28, can be largely found (~60%) in the Transportation sector.



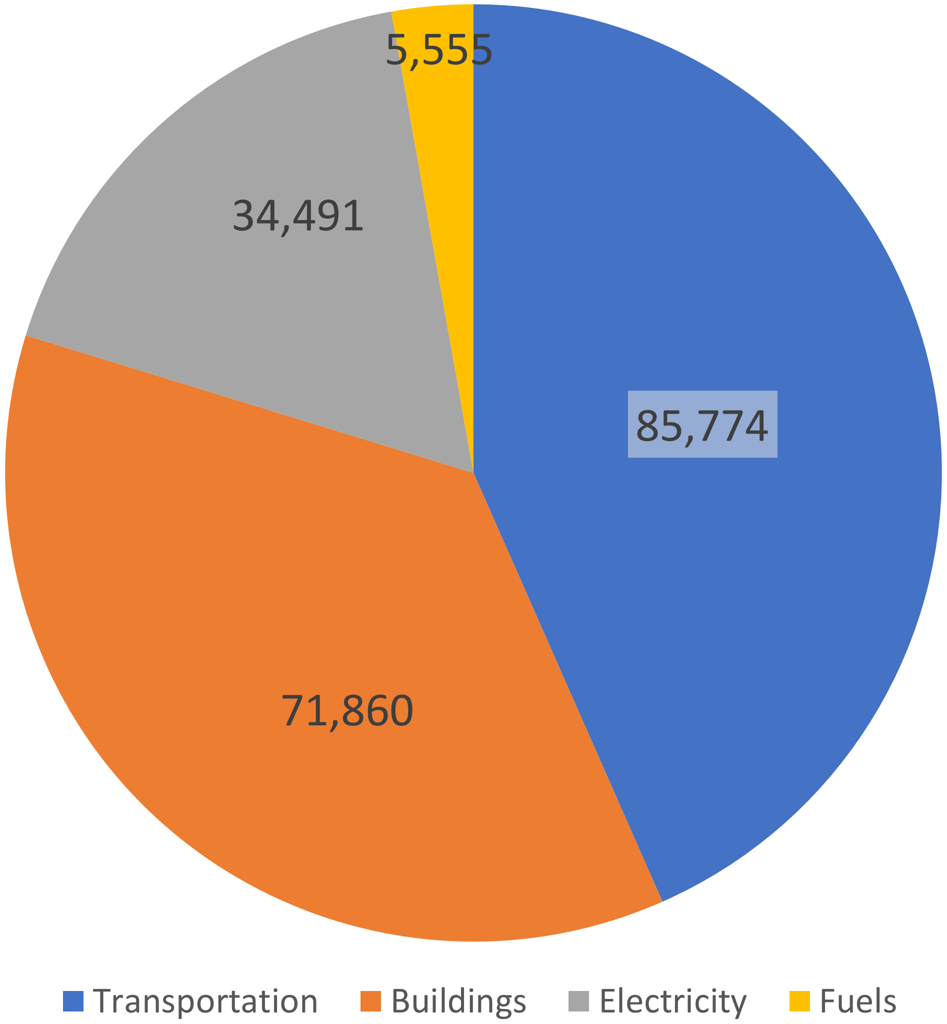

- **Typical occupations in this wage category include Transportation and Material Moving, Production, and Installation, Maintenance & Repair Occupations.**

**Jobs Study**

# Wage Analysis

# 2030 S2:LCF

The 37% of workers (2030) in the four sectors with an hourly wage under $28, are predominantly found in the Transportation or Building sector.

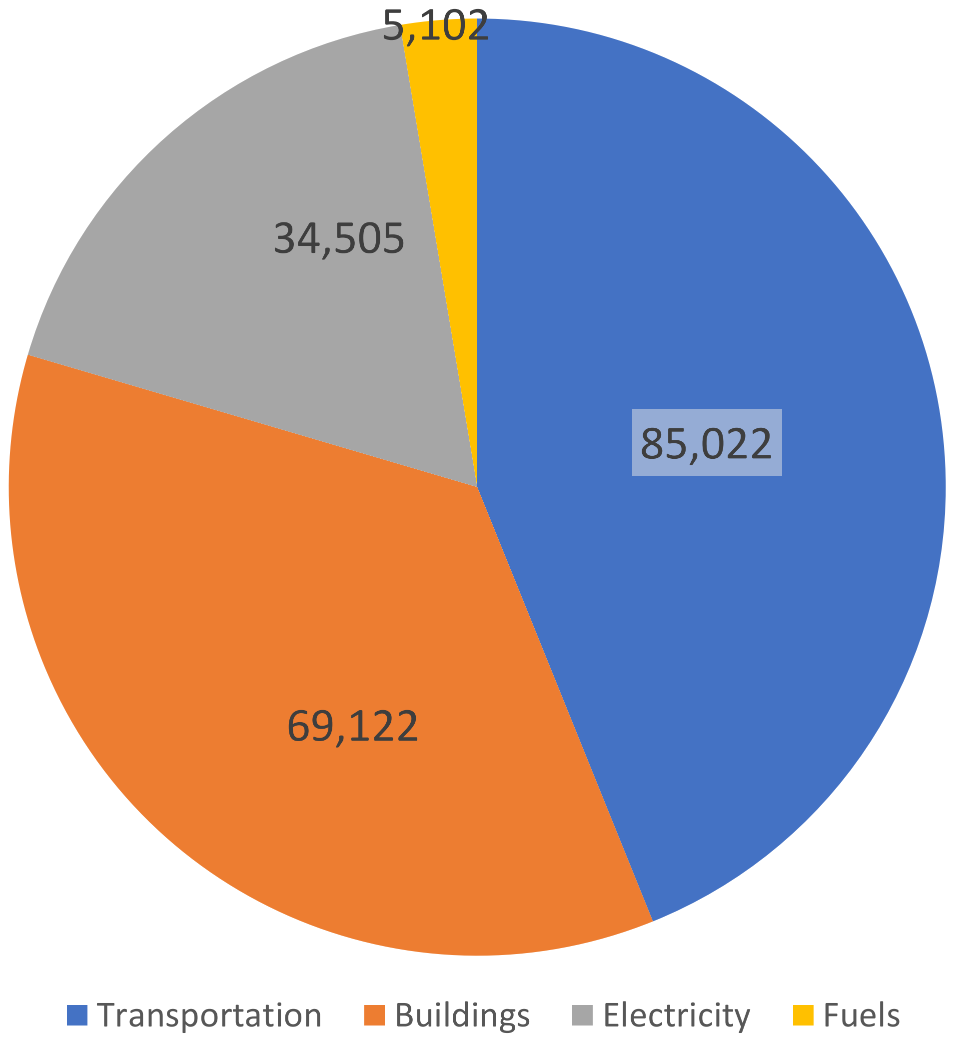


Jobs Study

# Wage Analysis

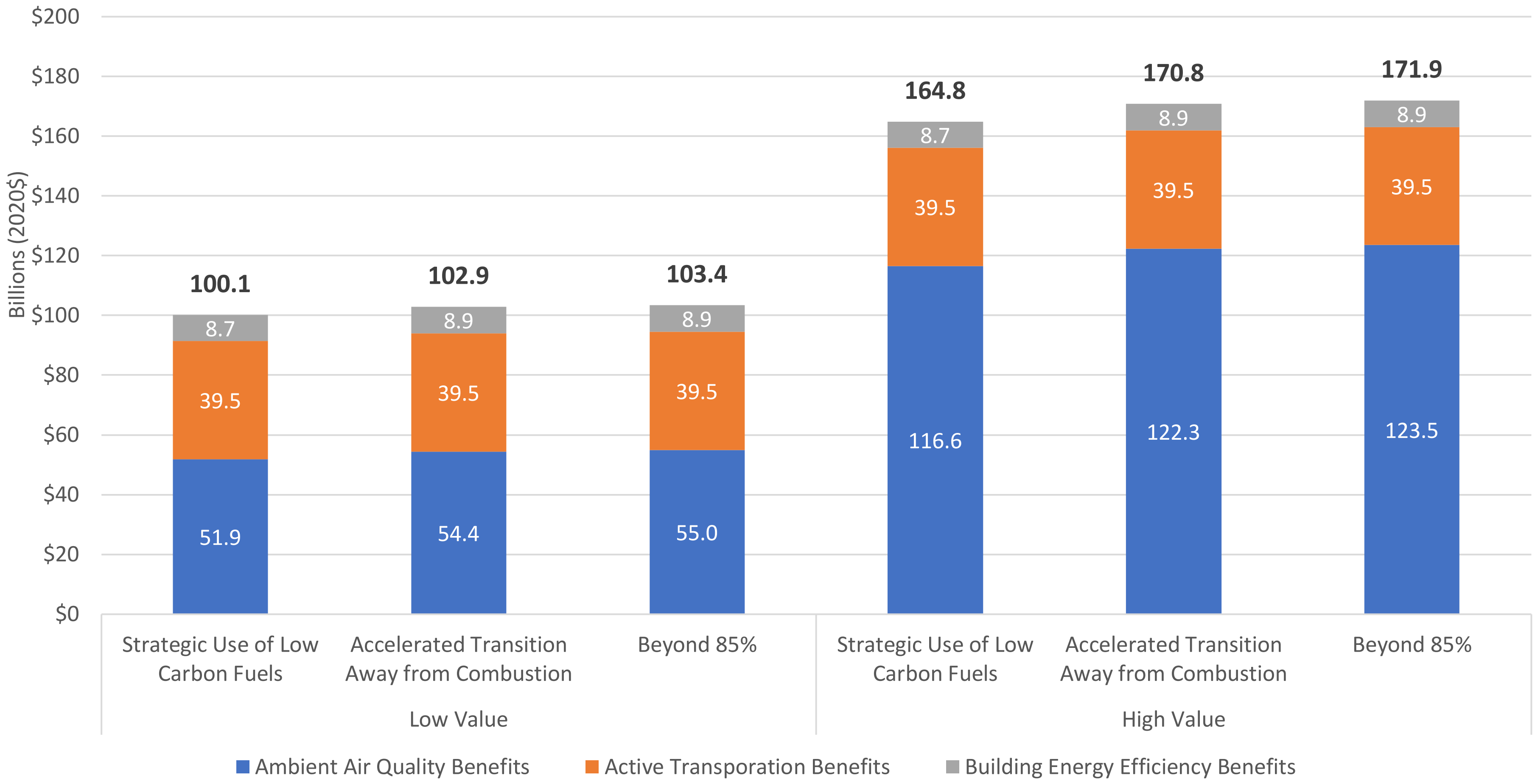
# 2030 S3:AT

Nearly 194,000 workers will earn under $28 an hour in 2030 under this scenario, and the composition of this group of workers is similar to the LCF scenario.



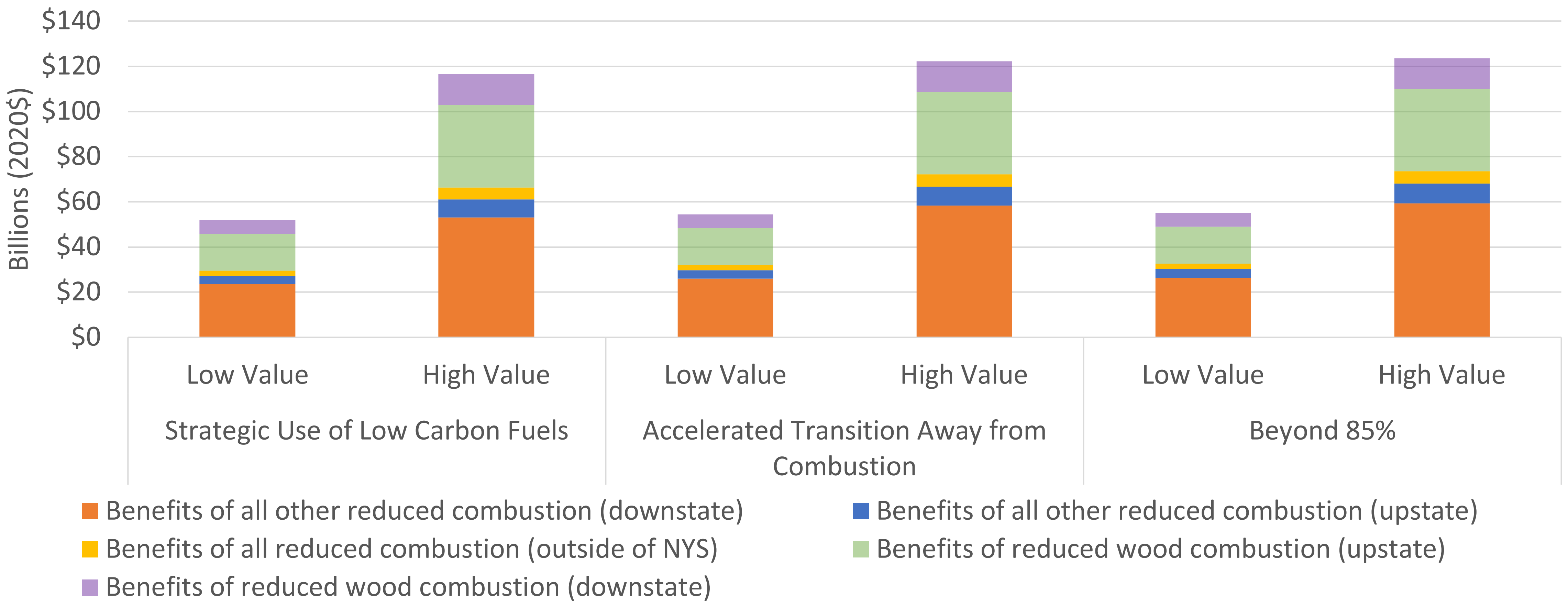
# Health Study Results Update

# Total Health Benefits
## (net present value 2020-2050)

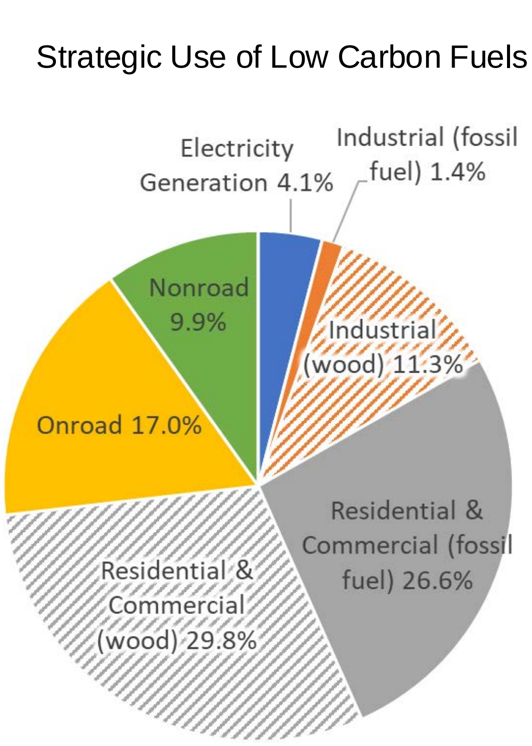


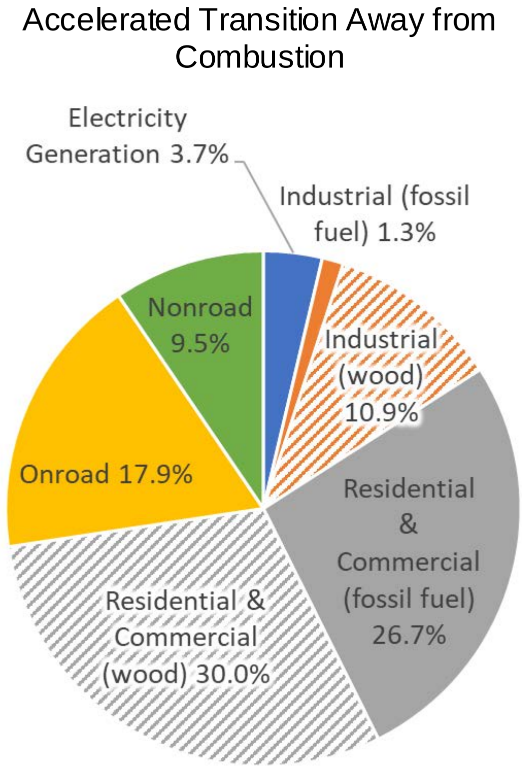
# Ambient Air Quality Health Benefits

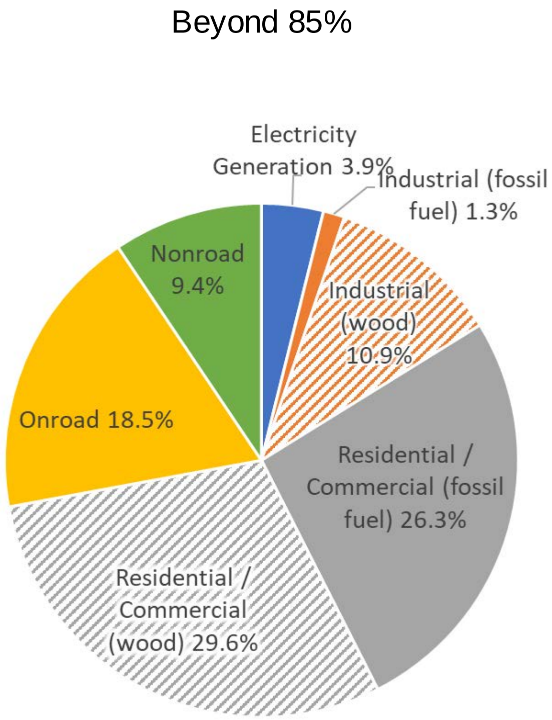
## (net present value 2020-2050)



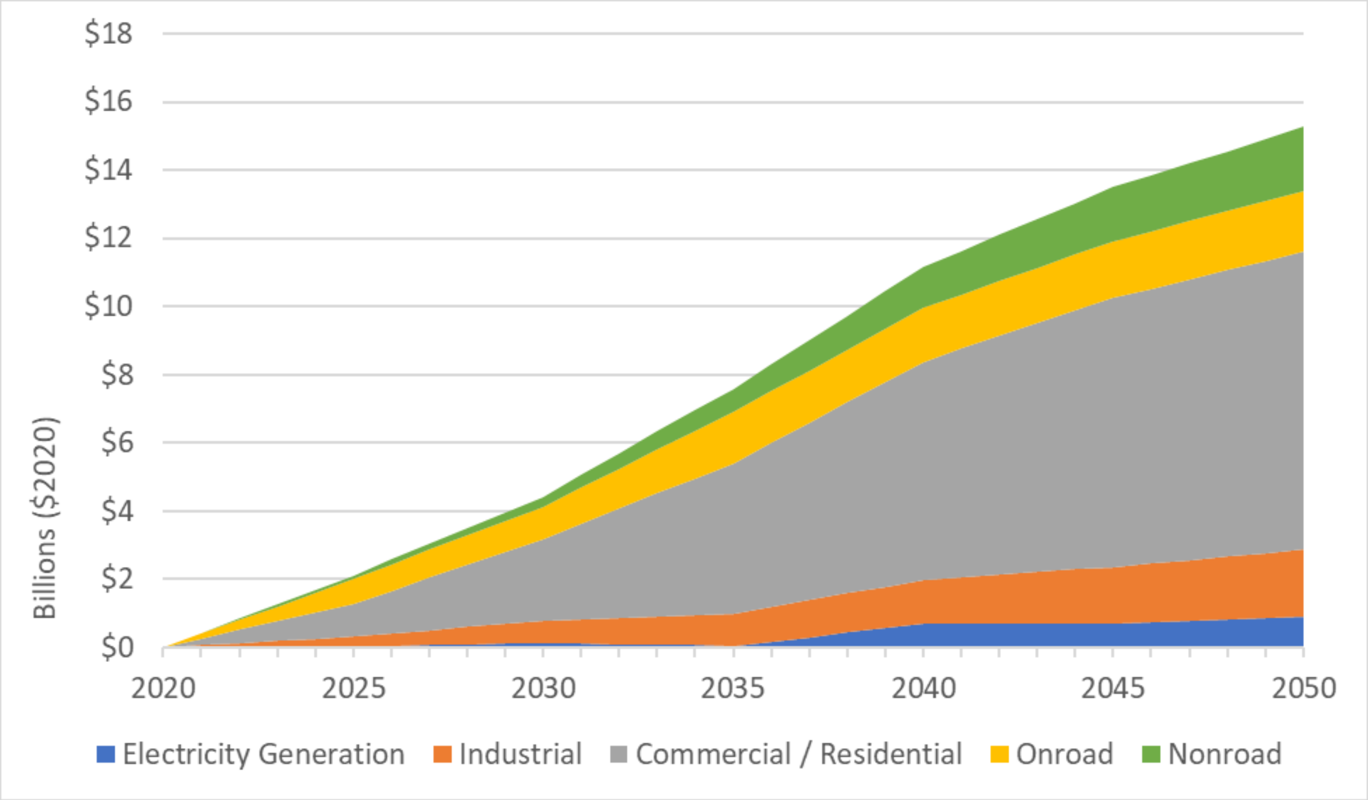
# Health Benefits by Sector
## (2020-2050 Net Present Value)



# Annual Health Benefits by Sector
## (Low Carbon Fuels Scenario)



# Benefits and Costs

# Cost Metric Definitions

> Annual Net Direct Costs
  - Net Direct Costs are levelized costs in a given scenario incremental to the Reference Case for a single year
  - Includes direct capital investment, operating expenses, and fuel expenditures

> Net Present Value (NPV) of Net Direct Costs
  - NPV of levelized costs in a given scenario incremental to the Reference Case from 2020-2050
  - Includes direct capital investment, operating expenses, and fuel expenditures
  - Real discount rate of 3.6%

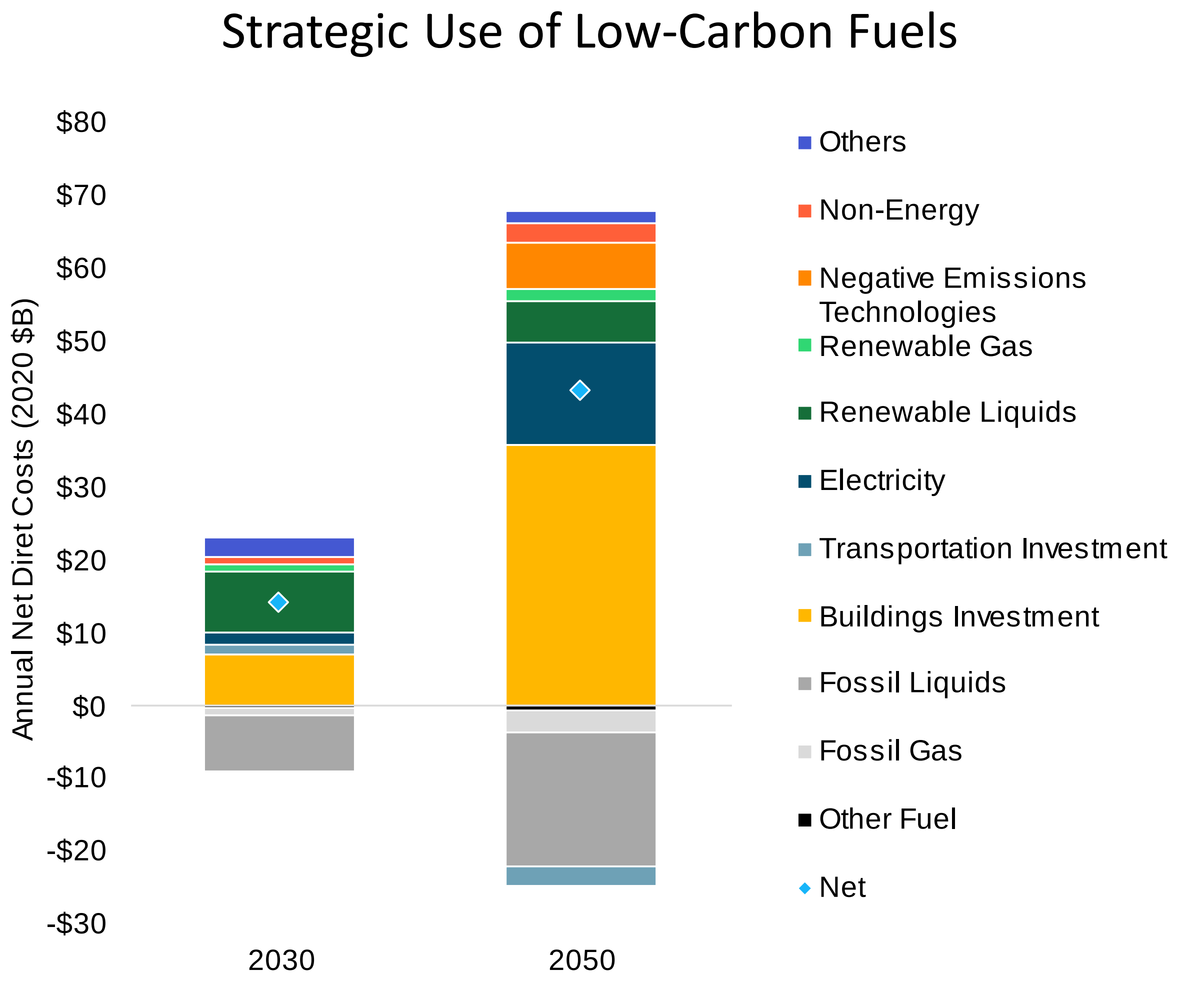
> System Expenditure
  - An estimate of absolute direct costs (not relative to Reference Case) for energy-related expenditures
  - As well as incremental costs for industry, agriculture, waste, forestry, and non-road transportation

# Cost Categorization

| Cost Category | Description |
|---|---|
| Electricity System | Includes incremental capital and operating costs for electricity generation, transmission (including embedded system costs), distribution systems, and in-state hydrogen production costs. |
| Transportation Investment | Includes incremental capital and operating expenses in transportation (e.g. BEVs and EV chargers) |
| Building Investment | Includes incremental capital and operating expenses in buildings (e.g. HPs and building upgrades) |
| Non-Energy | Includes incremental mitigation costs for all non-energy categories, including agriculture, waste, and forestry |
| Renewable Gas | Includes incremental fuel costs for renewable natural gas and imported green hydrogen |
| Renewable Liquids | Includes incremental fuel costs for renewable diesel and renewable jet kerosene |
| Negative Emission Technologies (NETs) | Includes incremental costs for direct air capture of CO2 as a proxy for NETs |
| Other | Includes other incremental direct costs including industry sector costs, oil & gas system costs, HFC alternatives, and hydrogen storage |
| Fossil Gas | Includes incremental costs spent on fossil natural gas (shown as a negative for cases when Gas expenditures are avoided compared with the Reference Case) |
| Fossil Liquids | Includes incremental costs spent on liquid petroleum products (shown as a negative for cases when liquids expenditures are avoided compared with the Reference Case) |
| Other Fuel | Includes incremental costs spent on all other fossil fuels |

# Scenario 2 Costs

## *Annual net direct costs relative to Reference*




> Net direct costs:

- In the early years on the order of $15 billion per year, equivalent to .7% of GSP in 2030
- In the later years on the order of $45 billion per year, equivalent to 1.4% of GSP in 2050

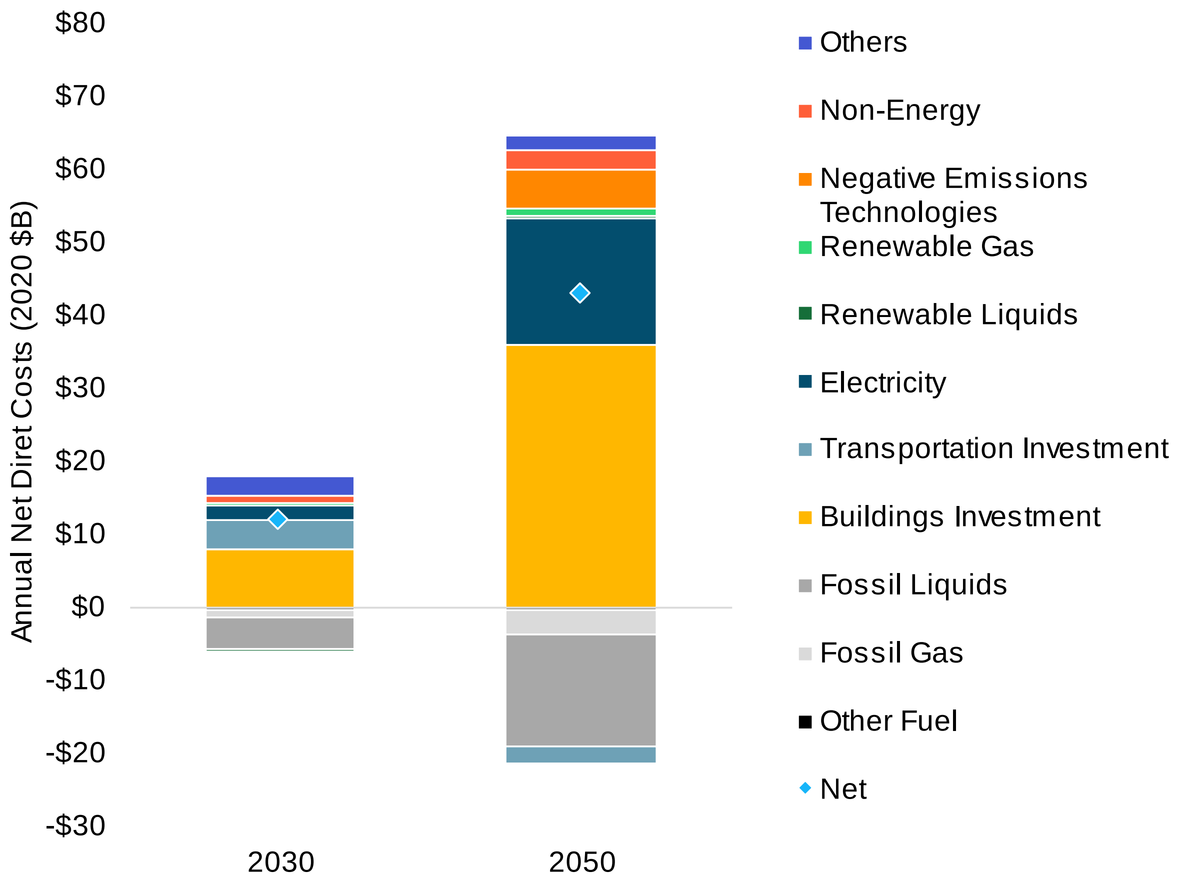
> Key findings:

- Incremental costs in all scenarios are primarily driven by investments in buildings and the electricity system
  - Transportation investment sees net benefits due to cost declines from zero emissions vehicles
- All scenarios have avoided fossil fuel expenditures due to efficiency and fuel-switching relative to the Reference Case (shown in the chart as negative costs)
- Significant investment in renewable diesel, renewable jet kerosene, and renewable natural gas starting in the mid-2020s
- Investment in Negative Emissions Technologies (NETs) is needed to achieve net zero by 2050

# Scenario 3 Costs

## *Annual net direct costs relative to Reference*

Accelerated Transition Away from Combustion

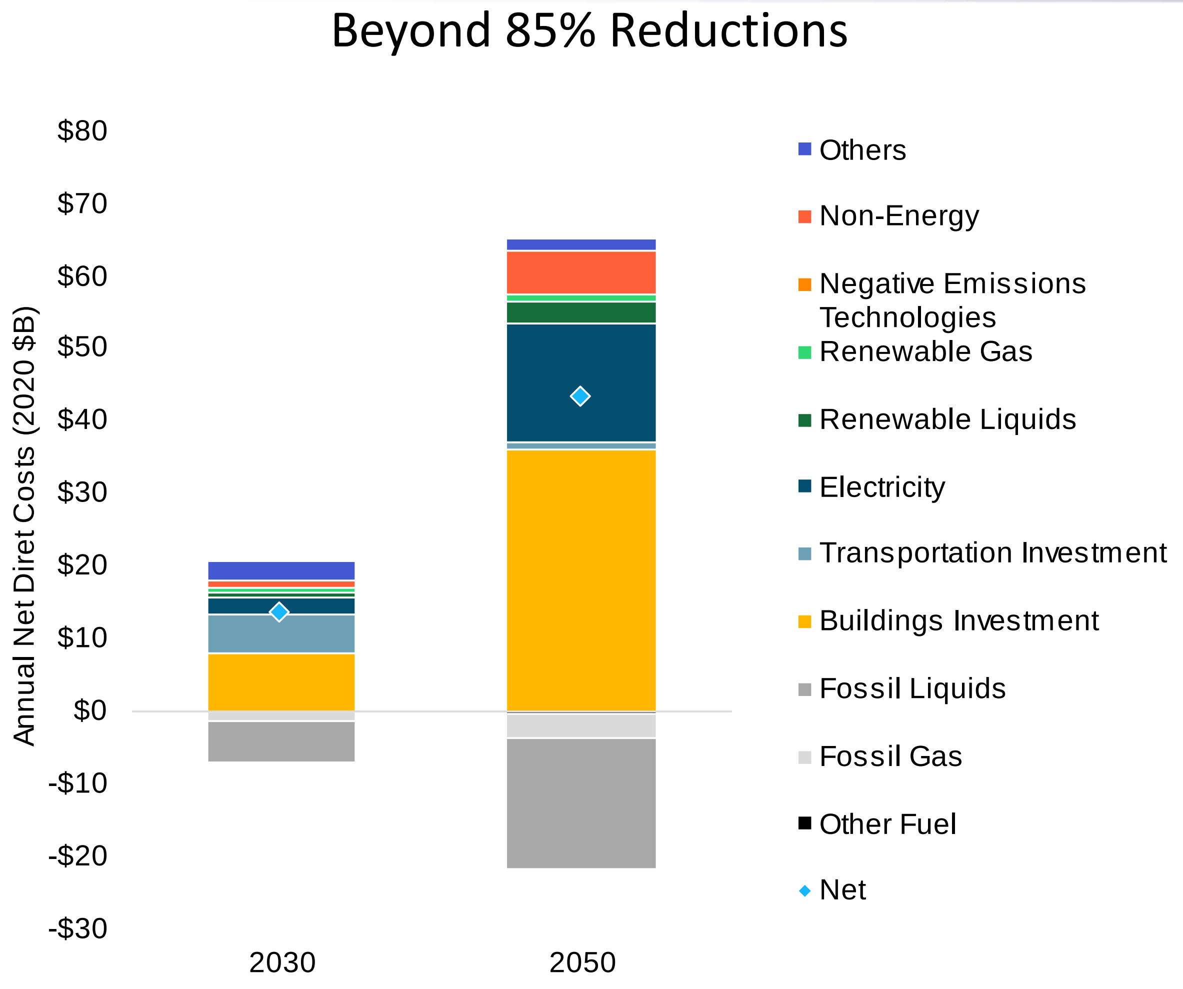



> Net direct costs:
- In the early years on the order of $15 billion per year, equivalent to .7% of GSP in 2030
- In the later years on the order of $45 billion per year, equivalent to 1.4% of GSP in 2050

> Key findings:
- Incremental costs in all scenarios are dominated by investments in buildings and the electricity system
  - Transportation investment sees net benefits due to cost declines from zero emissions vehicles
- All scenarios have avoided fossil fuel expenditures due to efficiency and fuel-switching relative to the Reference Case (shown in the chart as negative costs)
- Scenario 3 includes greater levels of electrification compared to Scenario 2, which results in greater investments in building retrofits, zero-emission vehicles, and the electricity system
- Investment in Negative Emissions Technologies (NETs) is needed to achieve net zero by 2050

# Scenario 4 Costs

## *Annual net direct costs relative to Reference*




> Net direct costs:

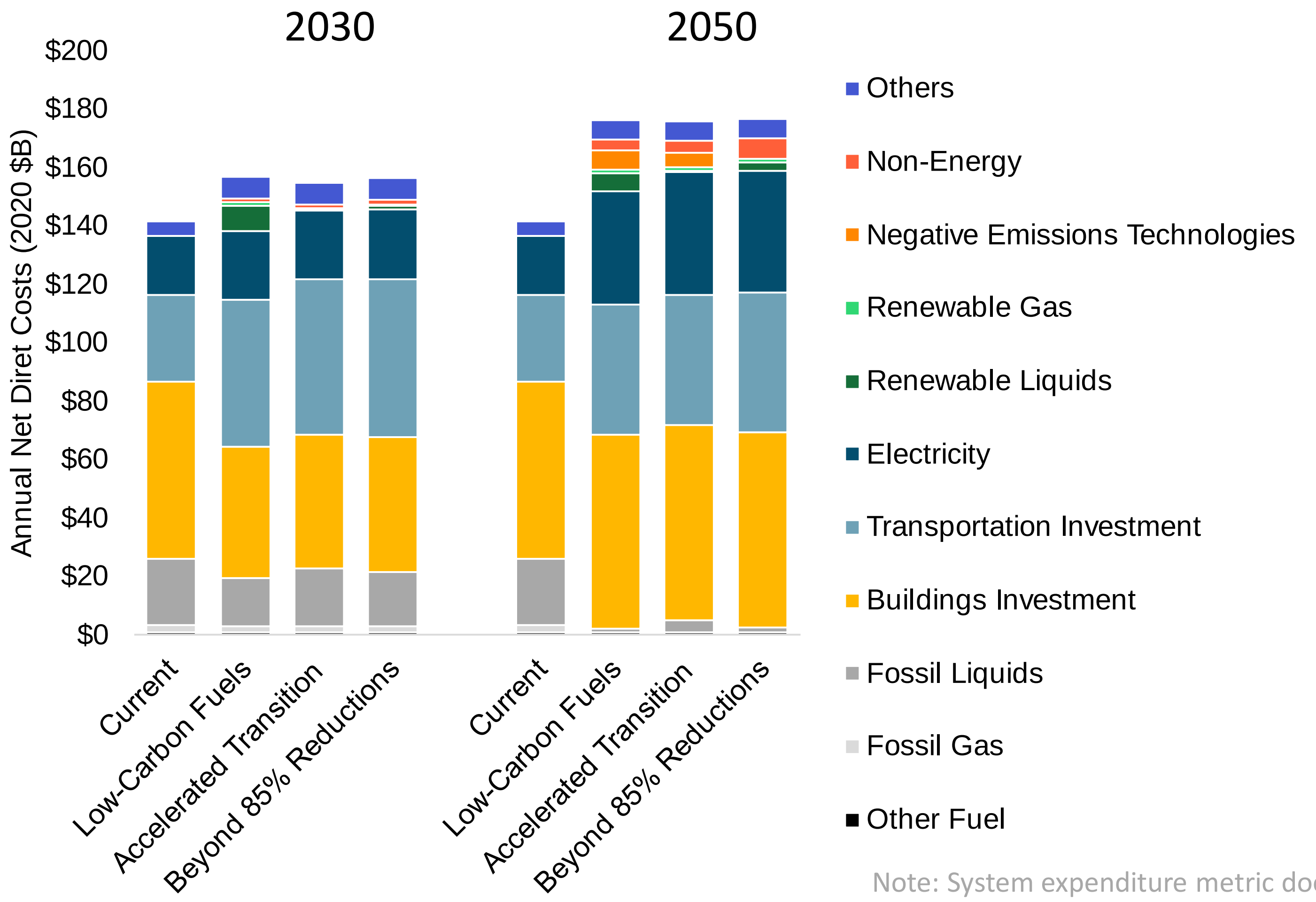
- In the early years on the order of $15 billion per year, equivalent to .7% of GSP in 2030
- In the later years on the order of $45 billion per year, equivalent to 1.4% of GSP in 2050

> Key findings:

- Incremental costs in all scenarios are dominated by investments in buildings and the electricity system
- All scenarios have avoided fossil fuel expenditures due to efficiency and fuel-switching relative to the Reference Case (shown in the chart as negative costs)
- Scenario 4 includes greater levels of investment and innovation in transportation, agriculture and waste
  - This greater level of ambition eliminates the need for Negative Emissions Technologies (NETs)

# System Expenditure

*Annual direct costs*




> Change in direct costs over time is moderate relative to total system expenditure in 2030 and 2050:

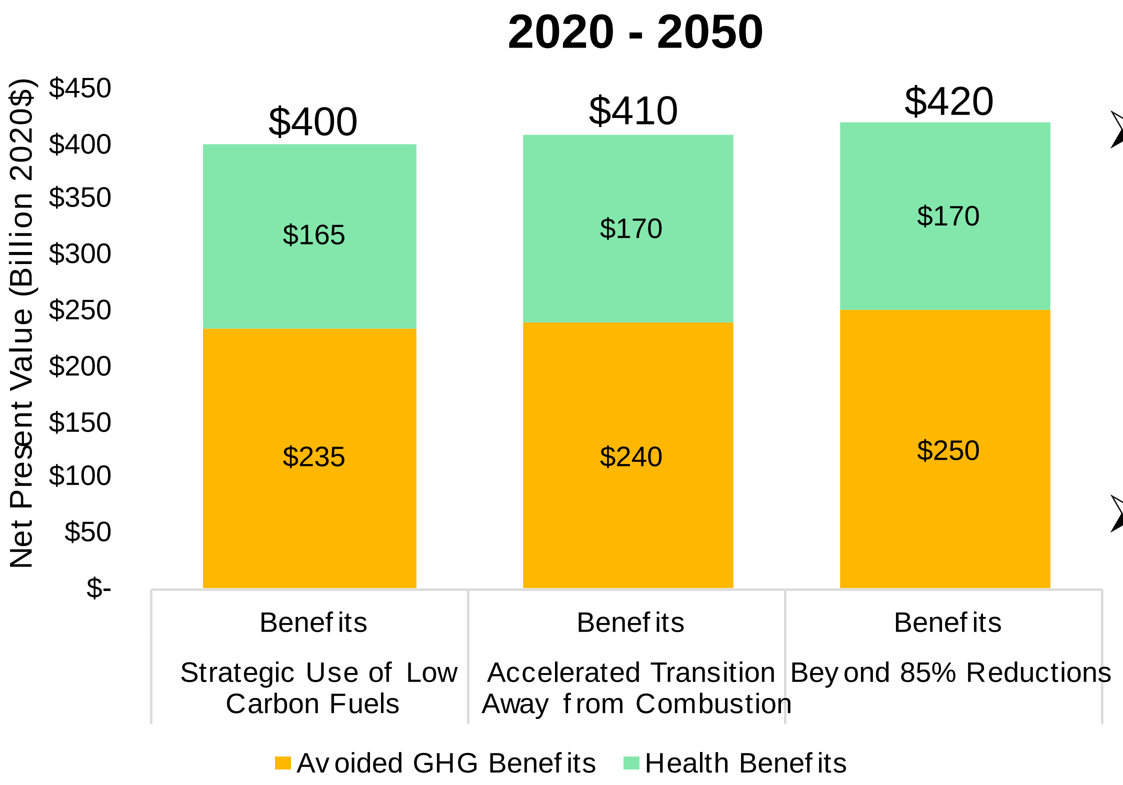
- 2030: 9-11% of system expenditure
- 2050: 25-26% of system expenditure

Note: System expenditure metric does not reflect direct costs in some sectors that are represented with incremental costs only. These include investments in industry, agriculture, waste, forestry, and non-road transportation

# Key Benefit-Cost Findings cont'd [NPV 2020-2050]

## Cost of Inaction Exceeds the Cost of Action by more than $90 billion

There are significant required investments to achieve Climate Act GHG Emissions Limits, accompanied by even greater external benefits and the opportunity to create hundreds of thousands of jobs



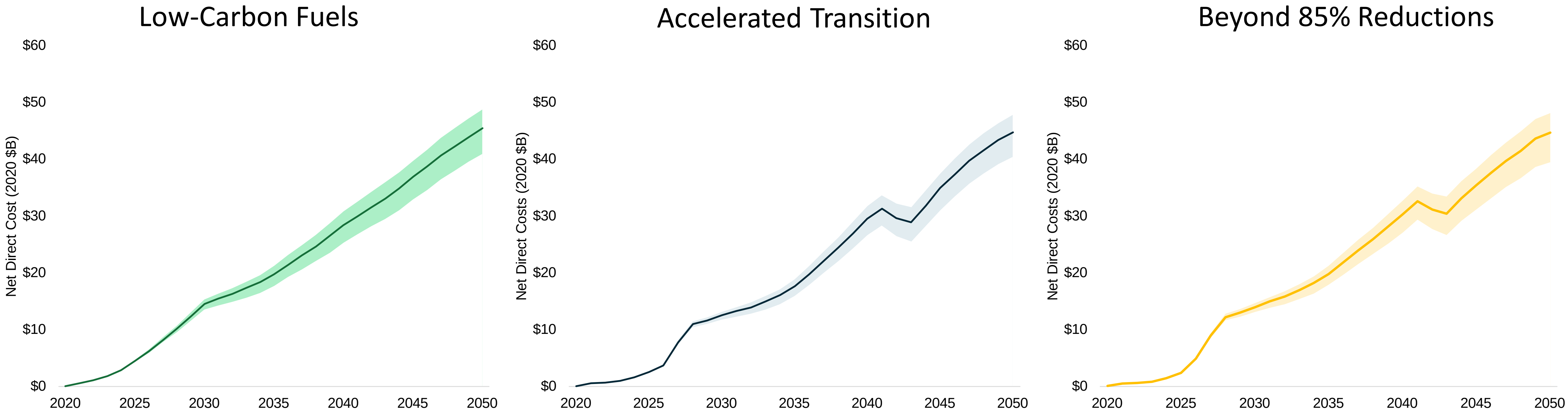

- Improvements in **air quality, increased active transportation, and energy efficiency interventions in low- and moderate-income homes** generates health benefits ranging from $165 - 170 billion
- Reduced GHG emissions **avoids economic impacts of damages caused by climate change** equaling approximately $235 - 250 billion

# Uncertainty Analysis

# Fuel Price Sensitivity

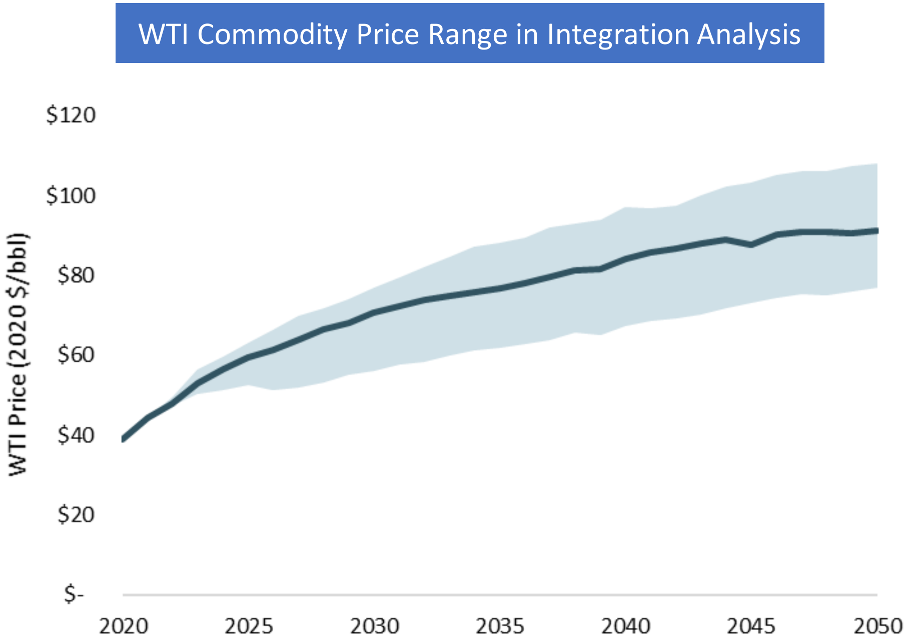
## *Annual net direct costs relative to Reference*

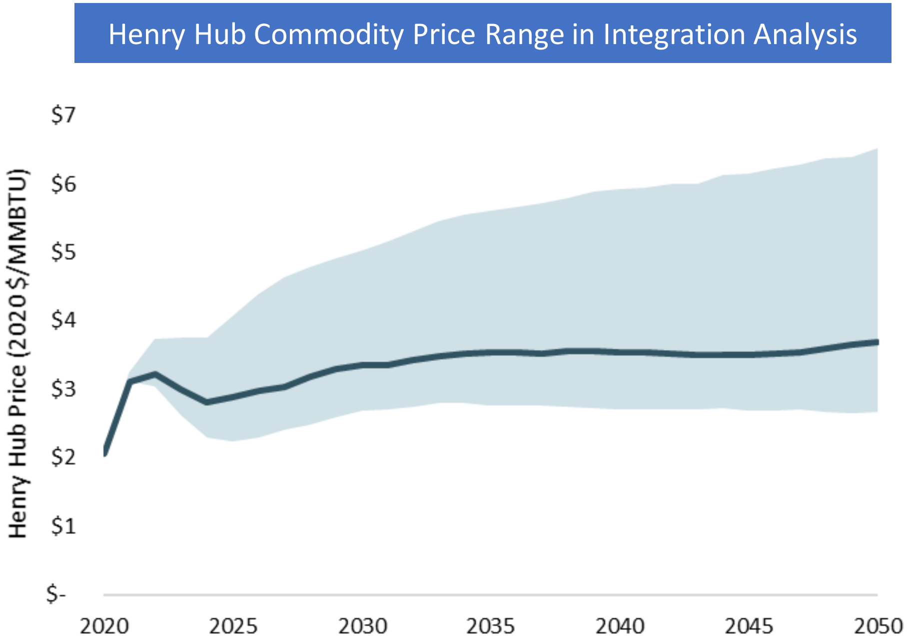
- Scenario costs are very sensitive to the price of fossil fuels. This graphic includes commodity fossil fuel price sensitivities
- Range includes fuel prices from two AEO cases: “Low Oil and Gas Supply” and “High Oil and Gas Supply” to represent range of high/low fossil fuel price forecast overall, consistent with low/high fuel availability



# Fuel Prices

- Range of commodity fossil fuel prices sourced from EIA Annual Energy Outlook 2021
- Prices for renewable fuels and zero carbon fuels (such as hydrogen) based on analysis of feedstocks and feedstock to fuel pathways. Hydrogen production via electrolysis is included in the electricity modeling framework

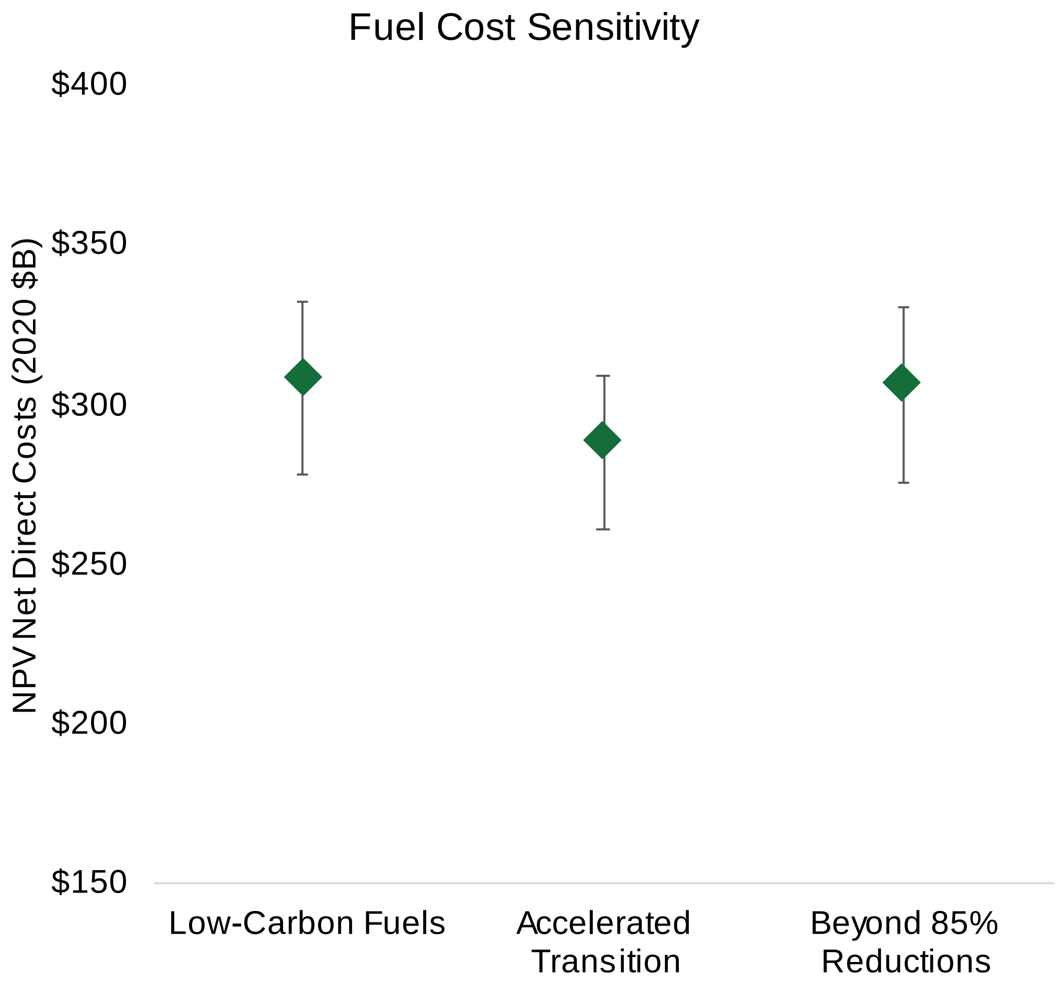


# Scenario Costs

*Net Present Value of costs relative to Reference, including net direct costs [2020-2050]*

> Error bars represent low and high fossil fuel price projections
- Technology costs held at core case levels



# Technology Cost Sensitivity

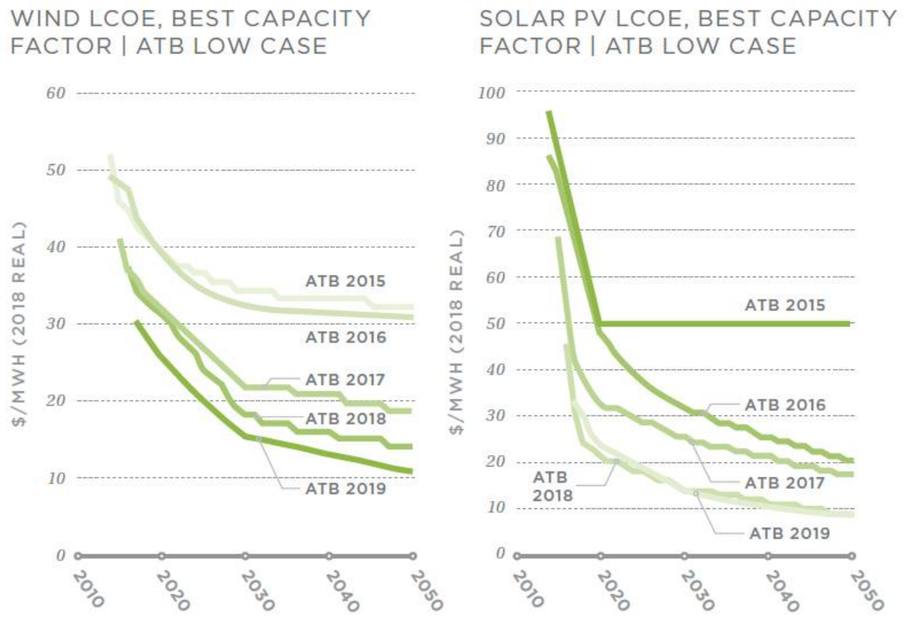
> **High innovation world view** sensitivity analysis on cost decline for key **demand side technologies**

- Air source, ground source heat pumps, building shell & retrofits
- Lower-cost hydrogen electrolysis and direct air capture
- Battery electric vehicles (across all vehicle categories)

> For **electric generating units**, cost declines for wind, solar, and storage based on NREL's Annual Technology Baseline (ATB)

- Central case used ATB "Mid Case"
- Low-cost sensitivity used ATB "Low Case"

> For highly uncertain technologies examine potential learnings over time



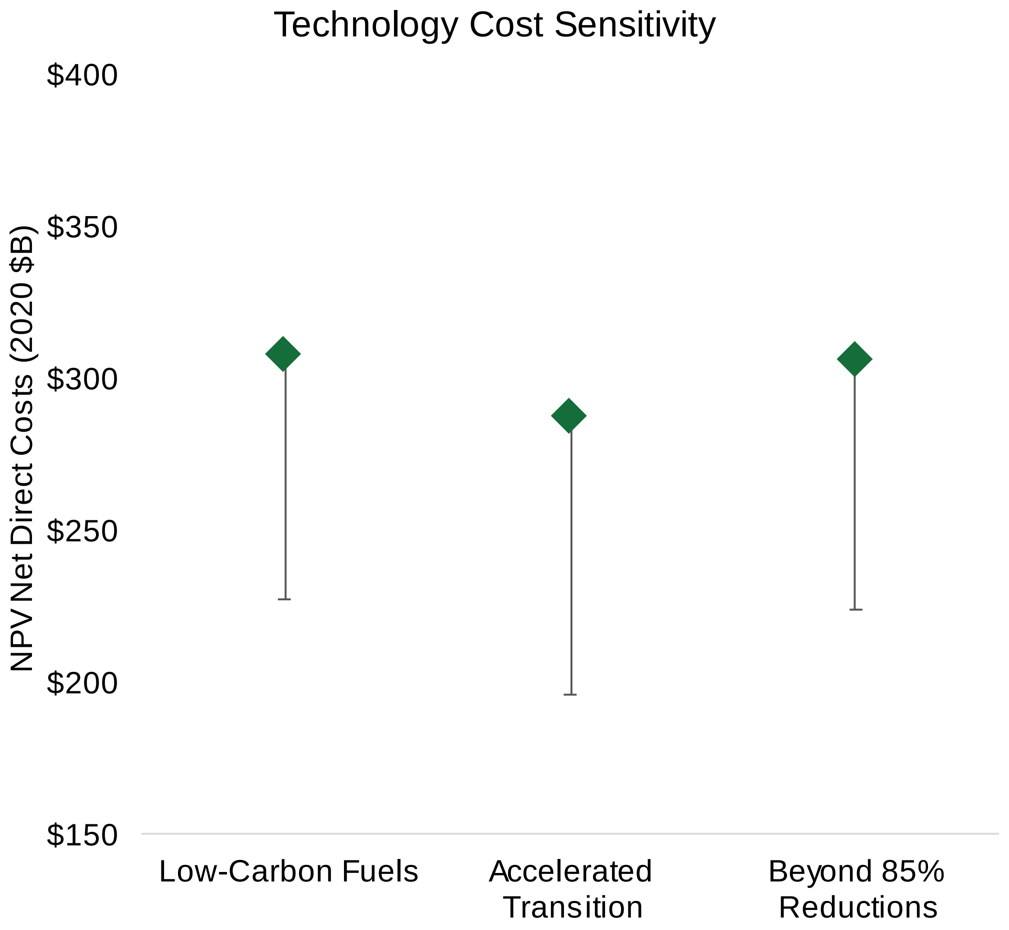

https://www.2035report.com/

Note: Specific, detailed input assumptions for Integration Analysis found at https://climate.ny.gov/Climate-Resources. Values above shown for illustrative purposes.

# Scenario Costs

*Net Present Value of costs relative to Reference, including net direct costs [2020-2050]*

- Error bars represent high innovation device technology cost decline (heat pumps, electrolysis, wind and solar, electric vehicles, NETs)

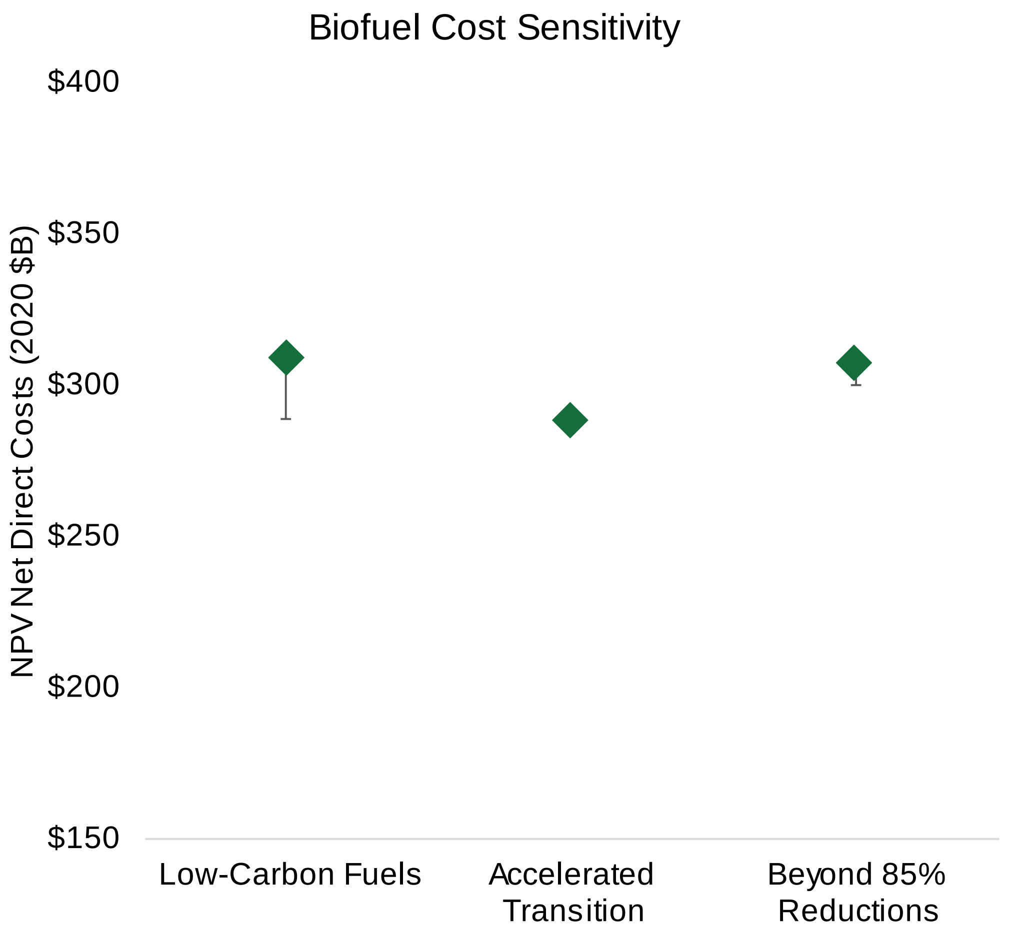


# Scenario Costs

*Net Present Value of costs relative to Reference, including net direct costs [2020-2050]*

> Error bars represent high innovation biofuel cost decline

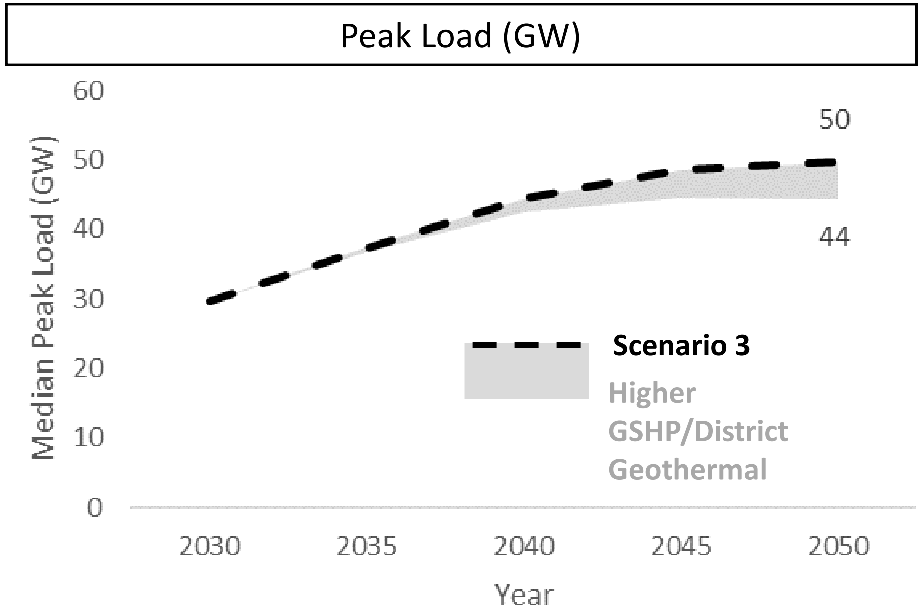
- Renewable fuel costs range from central estimate assuming biofuels market with marginal clearing prices to low-cost case assuming biofuels sold at cost

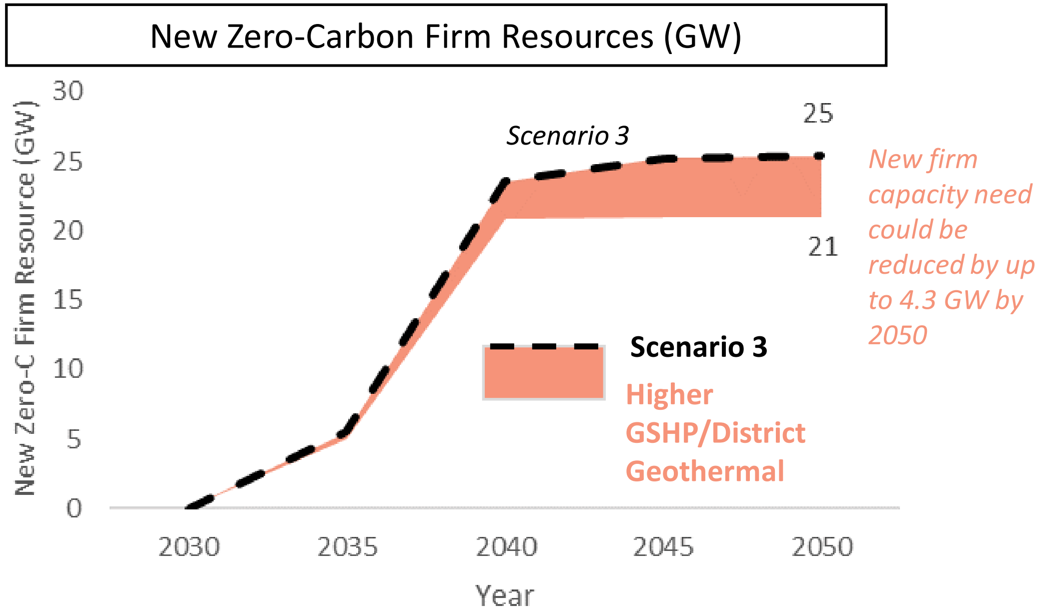


# Ground Source/District Loop Heat Pump Sensitivity

# Impacts of Higher Ground Source/District Loop Heat Pump Penetration on Electricity Resource Needs Relative to Scenario 3

- With higher penetration of GS/DHPs, annual load is reduced by 2-3%
  - Changes to solar, wind and storage capacity are relatively small overall
- System peak is 5.4 GW lower in 2050
  - 4.3 GW less firm capacity is needed in 2050 as a result
  - Small changes to other resources make up rest of difference in peak and firm capacity reduction

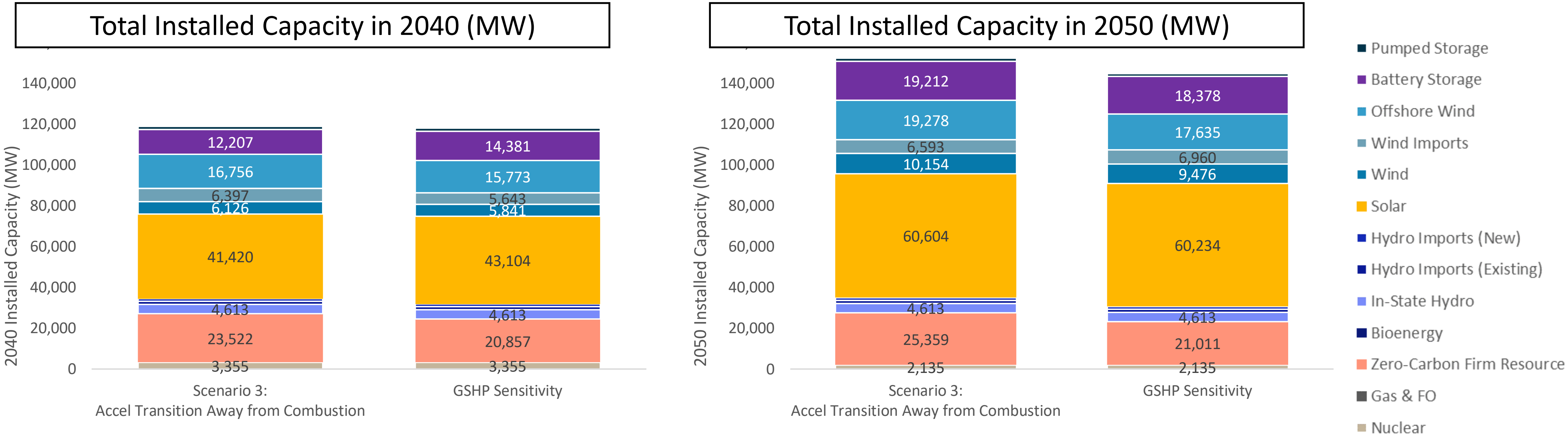


# Impacts of Higher Ground Source/District Loop Heat Pump Penetration on Electricity Resource Needs

> With higher penetration of GS/DLHPs, annual load is reduced by 2-3%
  - Changes to solar, wind and storage capacity are relatively small overall

> System peak reduces by 2 GW in 2040 and 5.4 GW in 2050
  - 2.6 GW and 4.3 GW less firm capacity is needed in 2040 and 2050 as a result
  - Changes to storage build trajectory makes-up most of the difference in peak and firm capacity reduction



# GS/DLHP Have Better Annual and Peak Performance Than ASHP, GSHP

| | Annual COP (Electric Load) | Peak COP (Electric Load) | Residential Unit Capital Cost ($/household) | Commercial Unit Capital Cost ($/sq-ft) |
|---|---|---|---|---|
| ASHP with Electric Resistance backup | 2.41 | 1.6 | $17k to $27k, depending on type of household | $14/sq-ft |
| ASHP with Fuel Backup | 2.65 | n/a (runs on fuel primarily during peak) | | |
| GSHP | 3.44 | 3.44 | $30k to $40k, depending on type of household | $17/sq-ft |
| **Ground Source / District Loop Heat Pump Sensitivity** | **3.44 through 2022, rising to 4.5 by 2035** | **3.44 through 2022, rising to 4.5 by 2035** | Same as GSHP | Same as GSHP |

Sources: Heat pump annual and peak performance and cost assumptions are developed based on EIA's National Energy Modeling System, and NEEP Cold Climate Heat Pump Specifications and Product List, in conjunction with analysis of underlying NYSERDA building electrification and efficiency modeling (BEEM) data inputs. Peak performance data is in line with heat pump specs, such as the Mitsubishi PUZ-HA36NHA5 (see ACEEE 2018 field tests in Minnesota: single family vs duplex). Ground source/district loop heat pump sensitivity includes growth/innovation in GS/DLHP performance over time, assuming same per-unit cost as GSHP technologies.

# Flexible Load Sensitivity

# Peak Load Management

## Overview of Strategies Incorporated in Integration Analysis Scenarios

> All scenarios examined in this analysis include significant investments in building shell as well as a diverse mix of heat pump technologies to mitigate "peak heat" impacts

> **All scenarios** examined in this analysis include strategies for **Managed Infrastructure** and **Managed Usage**

- All scenarios include significant investments in building shell as well as a diverse mix of heat pump technologies to mitigate "peak heat" impacts
- All scenarios assume a proportionate build-out of workplace charging infrastructure and moderate shifting of EV charging loads towards day-time and overnight charging

> **Sensitivity analysis** examines varying assumptions of **Dynamic Usage**

- Scenarios assume "medium" dynamic usage, while sensitivities test lower and higher adoption of grid-interactive load management practices
    - LDV loads range from 0-50% flexibility
    - Building loads range from 0 to 60% flexibility (varies by end use)
    - Electrolysis loads are 100% flexible across all cases

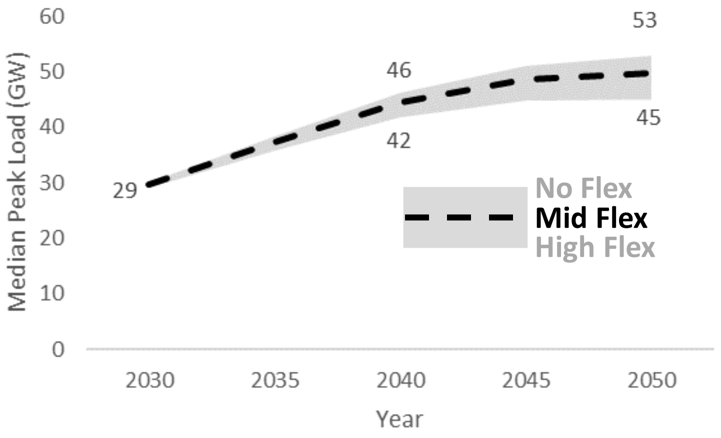
# Impacts of Load Flexibility on Resource Needs
## Scenario 3

> System peak could reduce by up to 4.5 GW in 2040 and 8 GW by 2050
  - Reduces firm resource and storage capacity needs to meet the peak

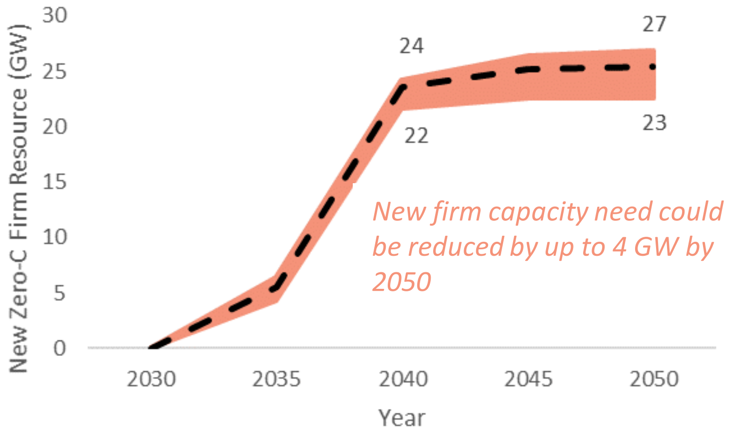
> Flexible loads enable intra-day shifting of renewable energy to further reduce storage need

> Since total energy *demand* does not change, changes to solar and wind builds are relatively small

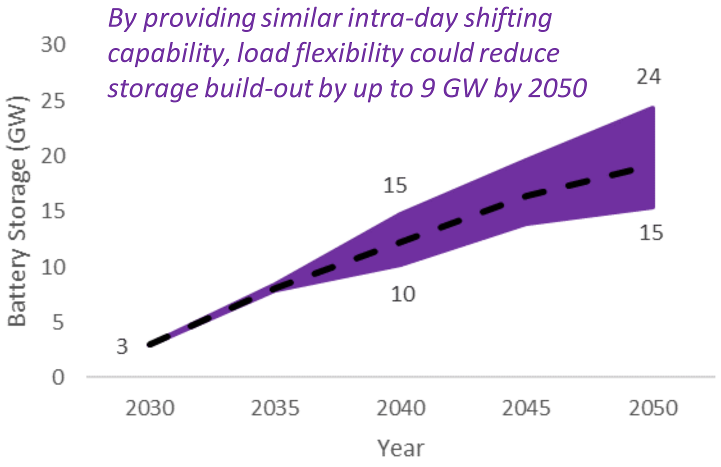
Peak Load (GW)




New Zero-Carbon Firm Resources (GW)

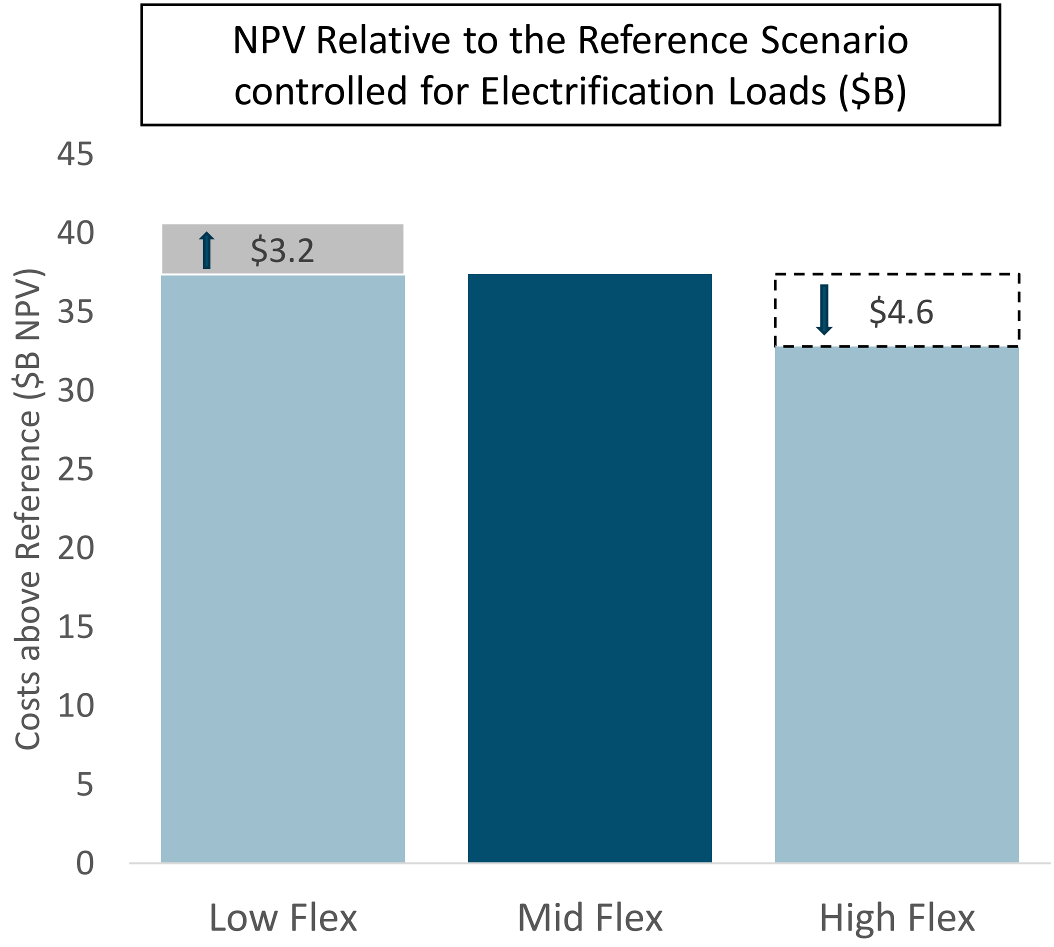



Battery Storage (GW)



# Impact of Load Flexibility on System Cost
## Scenario 3

- Demand-side flexibility can reduce system peaks and provide intraday balancing by shifting loads to times of high renewable output
- This in turn reduces the need for firm capacity and battery storage, leading to lower overall system costs
  - Analysis does not include any incremental costs to enable dynamic load flexibility; in practice both additional infrastructure (e.g. AMI if not already in place) and customer incentives may be needed



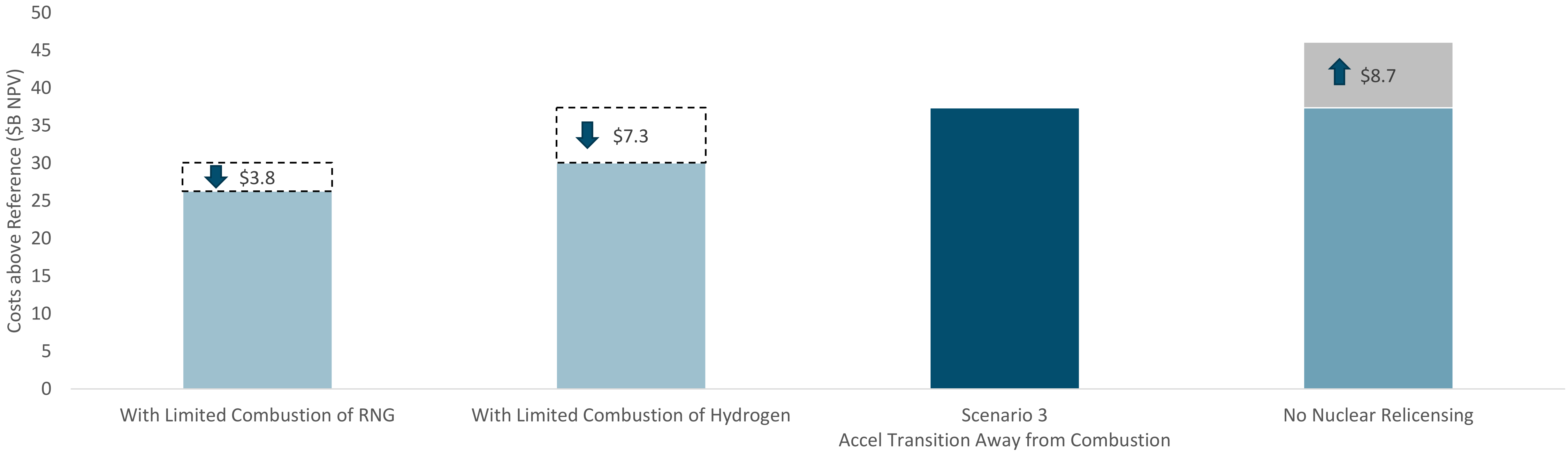
# Updates to Electricity Sector Sensitivities

# Electricity System Cost Impacts

## Scenario 3 Sensitivities

> Costs are measured against a Reference Case **controlling for electrification loads**

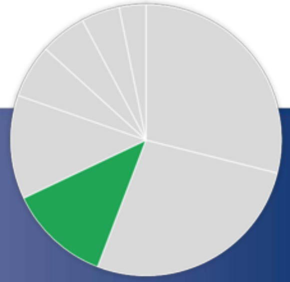
> Limiting available technologies places upward pressure on costs




*Note: In Scenario 3, existing fossil fuel resources are retired by 2040 and no new combustion-based (CCGT or CT) capacity is permitted. New firm capacity is provided by a combustion-free resource (e.g. hydrogen fuel cells).*

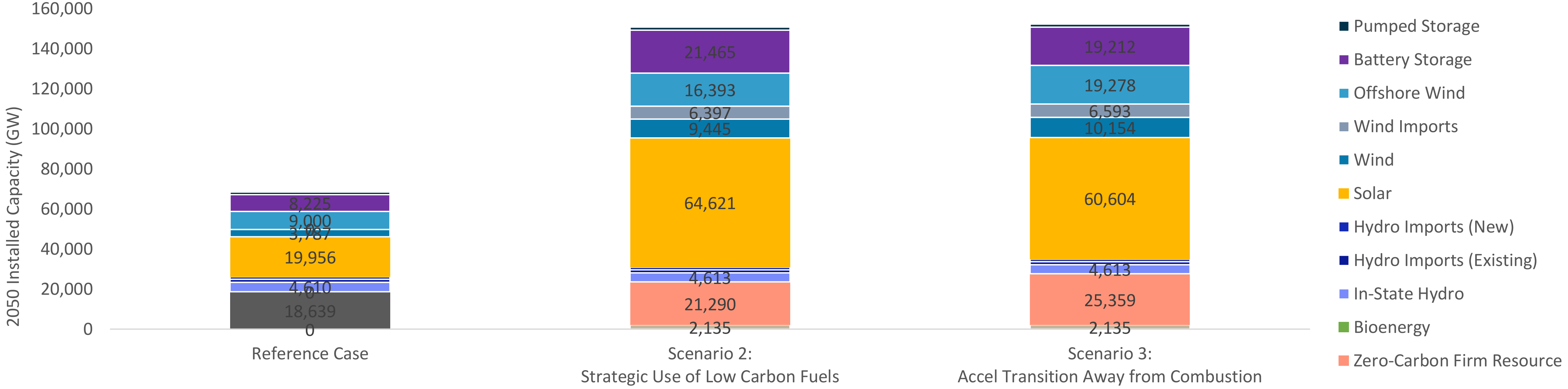
# Electricity Generation

## Comparison of 2050 Installed Capacity



> In these Scenarios, firm capacity is provided by hydrogen resources to meet multi-day reliability needs, ranging from 21-25 GW

> Significant expansion of foundational resources (wind, solar, and storage) is needed across scenarios
  - Offshore wind: 16-19 GW
  - Land based wind: 16-17 GW
  - Solar: 61-65 GW
  - Storage: 19-21 GW

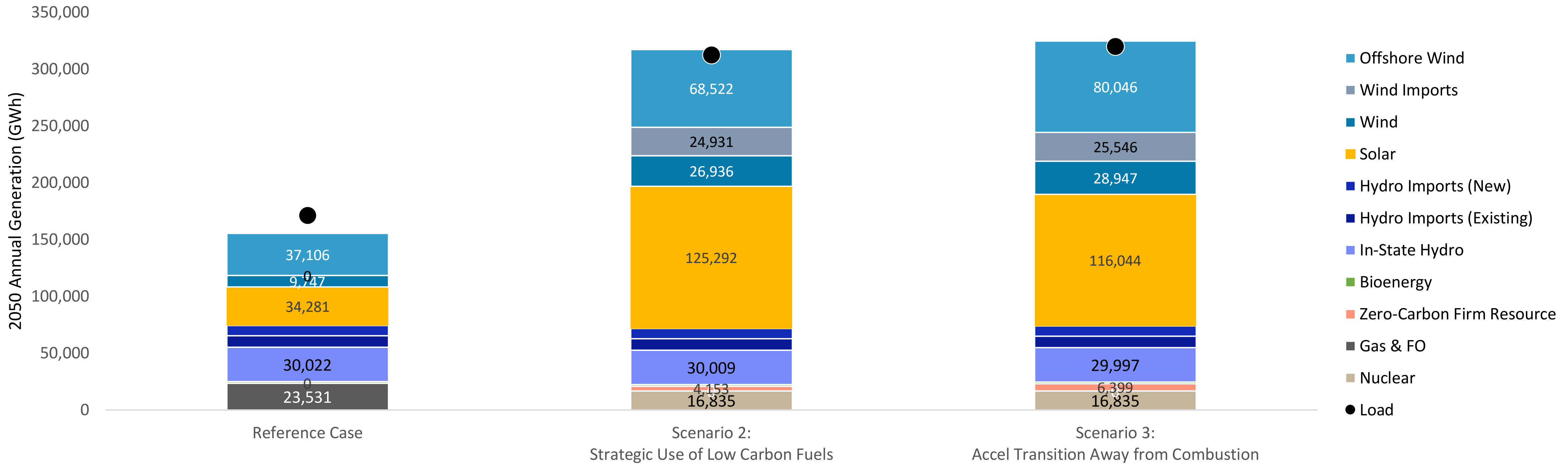



*Note: In Scenario 3, existing fossil fuel resources are retired by 2040 and no new combustion-based (CCGT or CT) capacity is permitted. New firm capacity is provided by a combustion-free resource (e.g. hydrogen fuel cells).*

# Electricity Generation

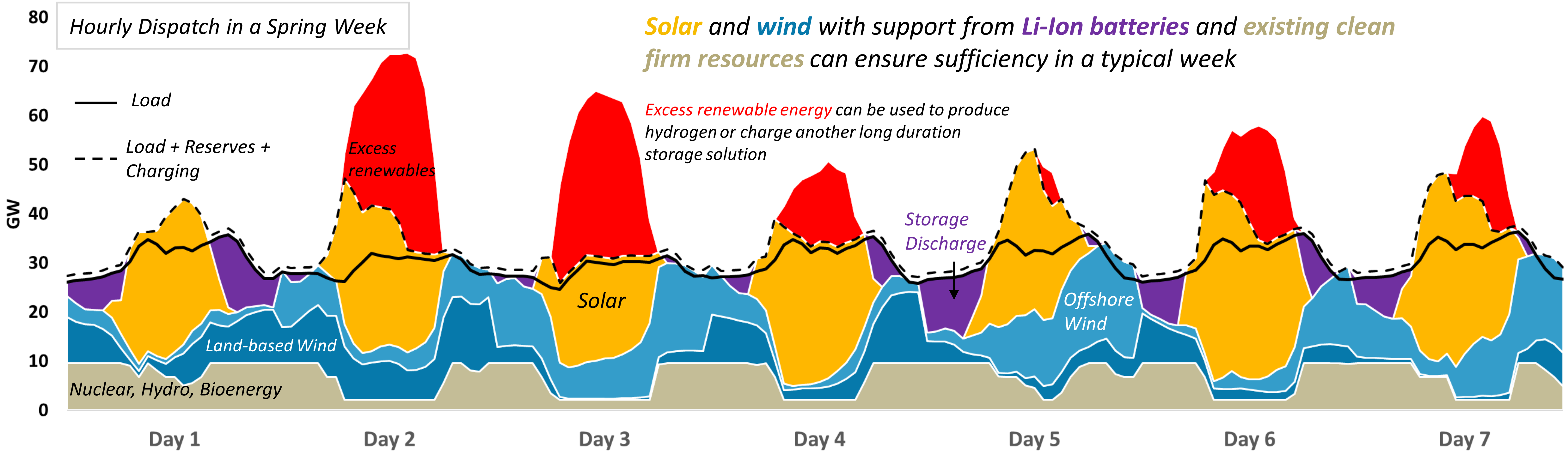
## Comparison of 2050 Annual Generation

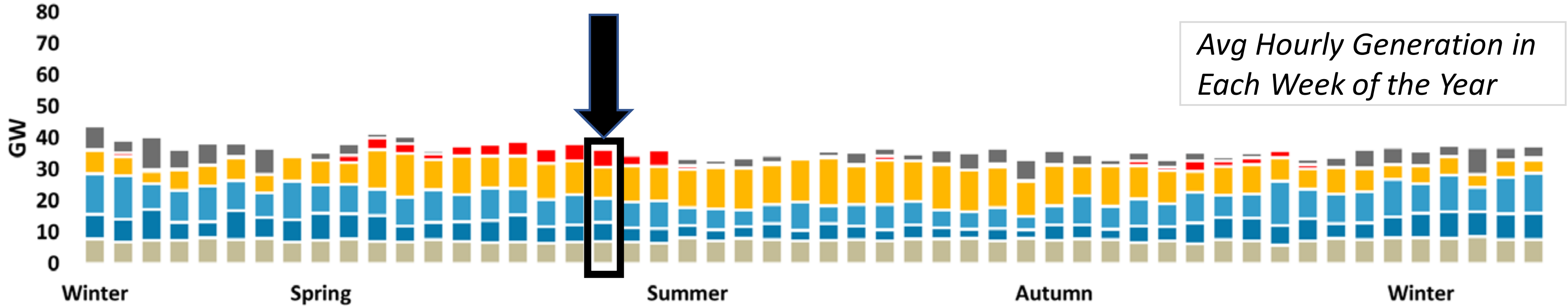
> Share of annual generation across mitigation scenarios:
- Solar: 36-40%
- Wind: 39-42%
- Zero-carbon firm resource: 1-2%



# Typical Spring Week in 2050

## Scenario 3

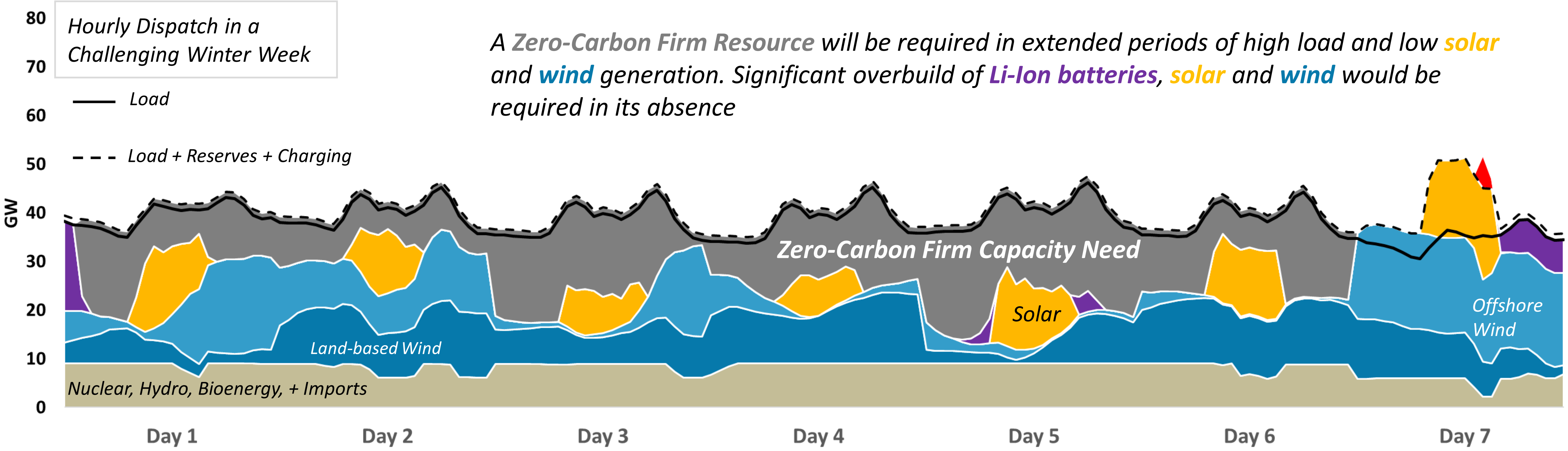


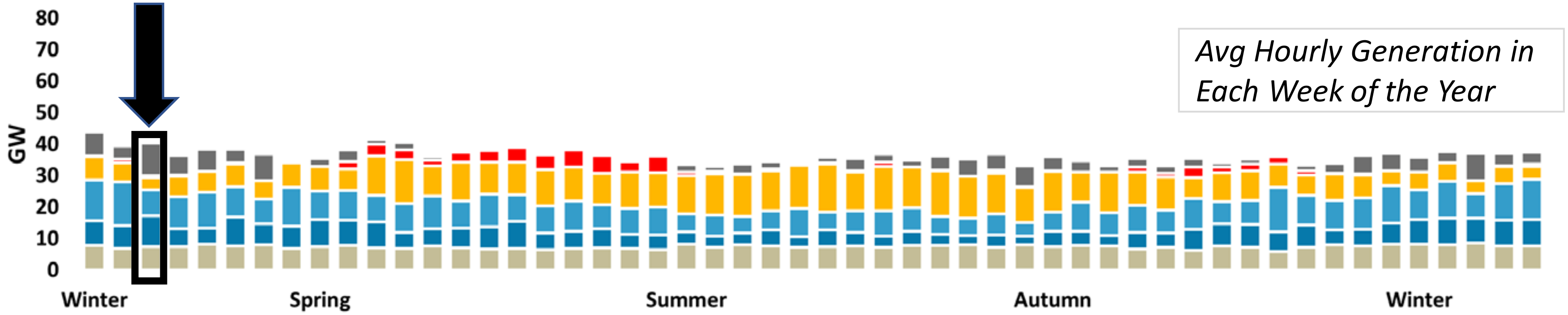



# Multi-Day Reliability Needs in 2050

## Scenario 3

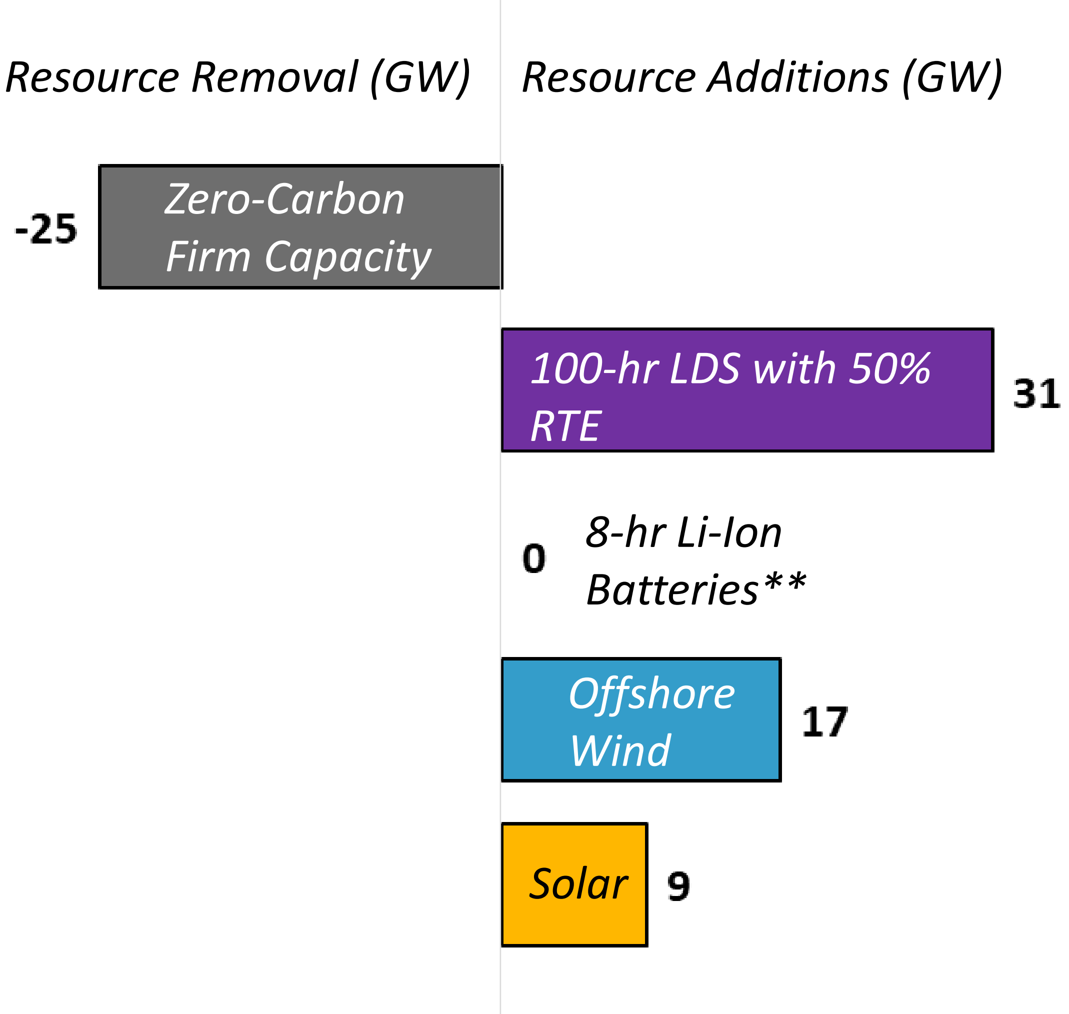
*A **Zero-Carbon Firm Resource** will be required in extended periods of high load and low **solar** and **wind** generation. Significant overbuild of **Li-Ion batteries**, **solar** and **wind** would be required in its absence*



# Replacing Zero-Carbon Firm Capacity with Long Duration Storage and Additional Renewables

## Scenario 3




- > Starting point: Scenario 3 loads and resources (without in-state electrolysis)
- > 25 GW of zero-carbon firm capacity removed from system
- > Analyzed cost-effective strategies to maintain statewide reliability with a mix of additional storage and renewables
- > Options for replacement included*:
  - 100-hr long duration storage (LDS) with 50% round-trip efficiency (RTE)
  - 8-hr Li-Ion battery storage
  - New solar and offshore wind
- > 31 GW of **LDS** + 26 GW of additional **renewables** required to replace 25 GW of **firm capacity**

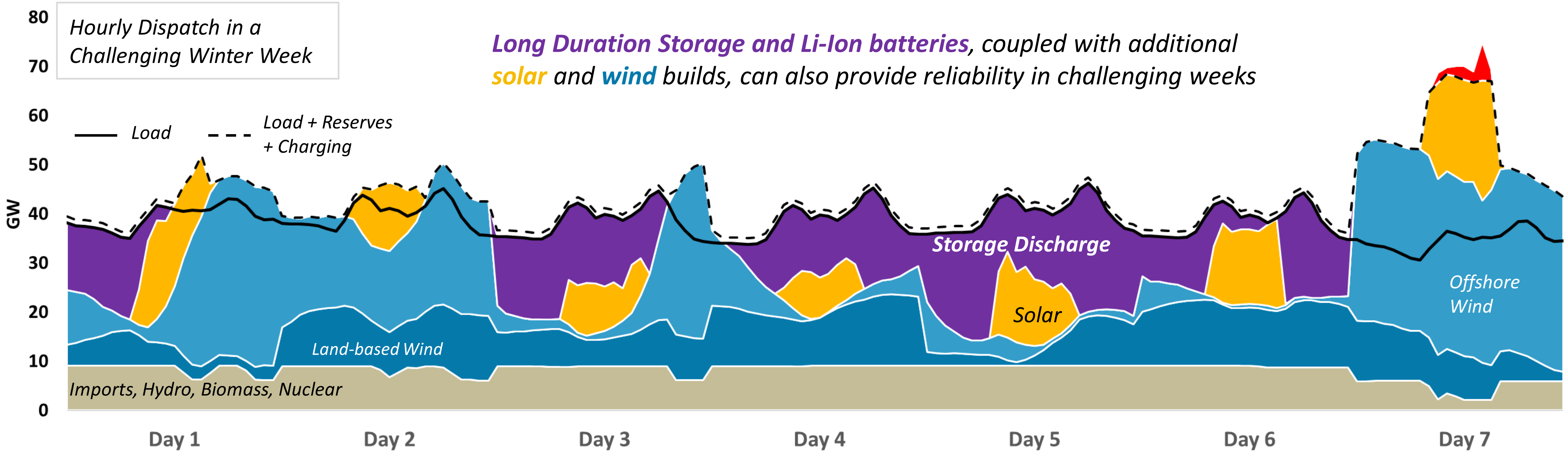
- *Additional onshore wind beyond the amount already built in the Scenario 3 portfolio was not considered here due to potential resource constraints.*

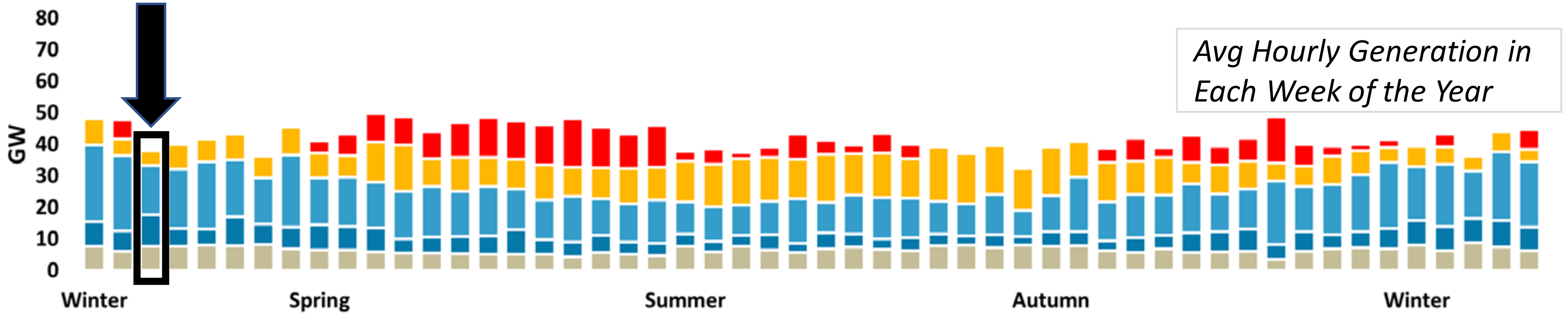
** *The starting portfolio already contains 7 GW of 8-hr Li-Ion batteries; reliability value of incremental 8-hr storage is limited due to long loss of load periods.*

# Meeting Multi-Day Reliability Needs in 2050 with LDS

## Scenario 3

*Long Duration Storage and Li-Ion batteries*, *coupled with additional* ***solar*** *and* ***wind*** *builds, can also provide reliability in challenging weeks*



# Vehicle Miles Travelled (VMT)

# VMT Analysis Approach

> Modeled VMT reduction measures fall into three broad categories: enhanced transit & mobility, telework & transportation demand management (TDM), and smart growth & biking/walking modeshifting. In all scenarios, we assume a targeted effort to expand programs and policies in the 2020s and 2030s, with continuous investment to maintain levels of reductions beyond 2035 through mid-century.

> **Enhanced Transit & Mobility**

- Low VMT: Expansion in bus transit service statewide, enhanced transit service taken from Carbon Neutral NYC report.
- Very Low VMT: Incremental reductions from enhanced in-state rail aligning with 125 MPH alternative detailed in Empire Corridor Tier 1 Draft EIS

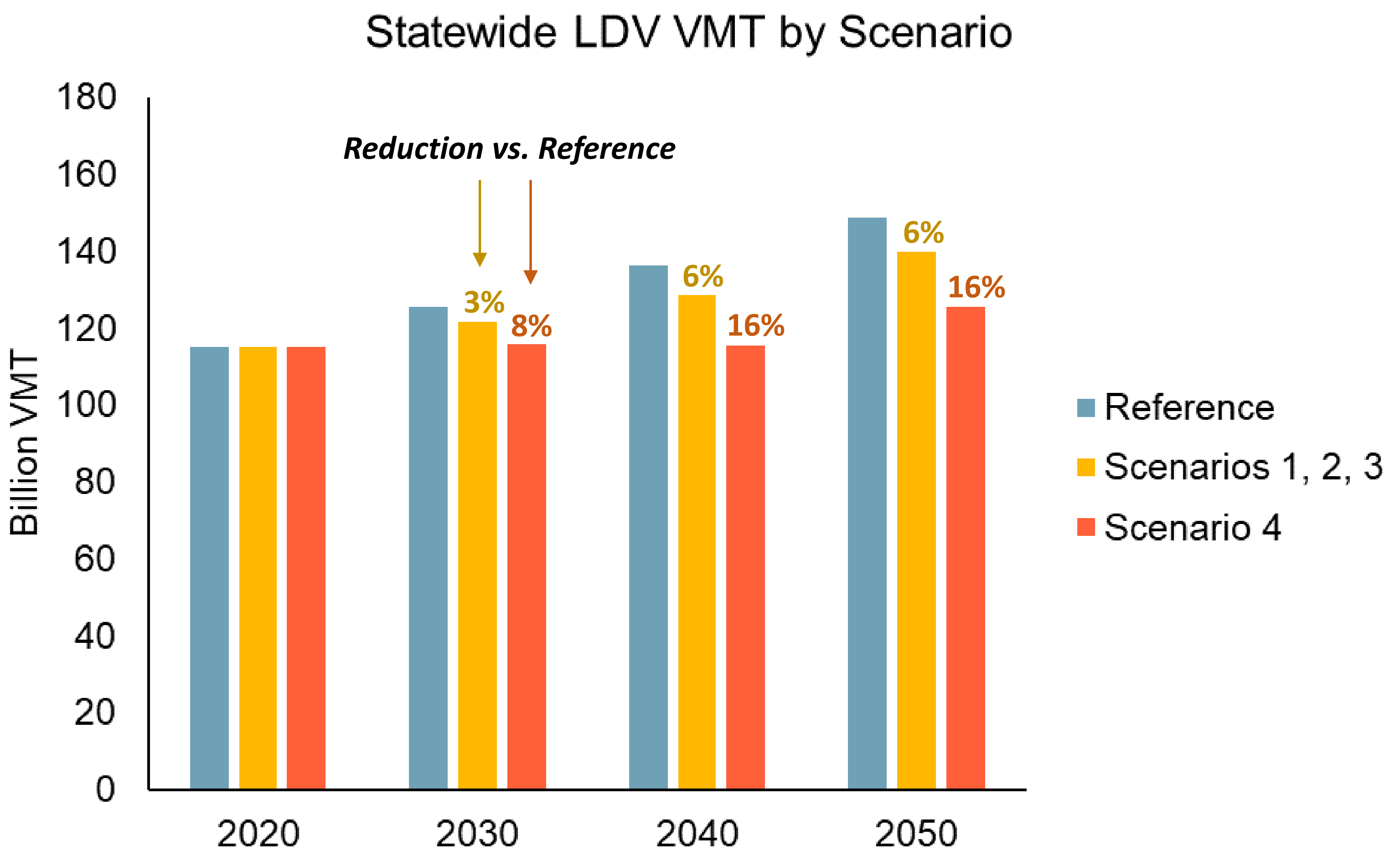
> **Telework & TDM**

- Low VMT: Additional promotion and informational TDM programs and modest increase in teleworking reduces a small amount of VMT, while in NYC additional programs like congestion pricing and other measures modeled in Carbon Neutral NYC further reduce VMT, although we do not include full Carbon Neutral NYC impacts in this case
- Very Low VMT: Further ambition statewide reduce LDV VMT and full adoption of congestion pricing and other policies in Carbon Neutral NYC reduce NYC VMT. Similarly to the Low VMT case, maximum reductions are achieved in the mid-2030s and maintained through 2050

> **Smart Growth & Biking/Walking Modeshifting**

- Low VMT: Focus on transportation-oriented development for new construction leads to reduced LDV VMT, with VMT impacts estimated using methodology from Growing Cooler report
- Very Low VMT: Assume incremental ambition in smart growth development in co-locating residential and commercial development, and incremental ambition in biking/walking infrastructure investments, all which lead to greater reductions.

# VMT Projections




**VMT assumptions based on Clean Transportation Roadmap modeling framework, which was calibrated to latest available starting year VMT data (2017)**

- VMT reductions are high-level estimates meant to represent ambitious action in reducing VMT relative to a Reference scenario.
- We model two levels of ambitions: Low VMT (Scenarios 1-3) and Very Low VMT (Scenario 4)
- VMT reductions below Reference forecast reach their maximum value by 2040 and are maintained through 2050
- Scenarios 1, 2, and 3 reach a maximum LDV VMT reduction of 6% below Reference, while Scenario 4 achieves a 16% reduction

# VMT Reduction Measures

> By 2050, VMT reductions are achieved through the following measures in Scenarios 1-3:

| | **State Total** (million VMT) | **Reduction vs. Reference** (%) | **Sources** |
|---|---|---|---|
| **2050 Reference VMT** | **140,400** | | |
| *VMT Reductions:* | | | |
| Enhanced Transit and Mobility | 3,700 | 3% | Carbon Neutral NYC, E3 Internal Analysis |
| Telework and TDM | 2,300 | 2% | Carbon Neutral NYC, UCR COVID Impacts Study, FHWA Integrating TDM into the Transportation Planning Process |
| Smart Growth and Biking/Walking Modeshifting | 2,900 | 2% | Carbon Neutral NYC, Growing Cooler: The Evidence on Urban Development and Climate Change |
| **Total Reductions** | **8,800** | **6%** | |

# VMT Reduction Measures

## Scenarios 1, 2, 3: *Low VMT Case*

- Enhanced Transit and Mobility
  - Expansion of bus transit service statewide and all transit services in New York City reduces statewide LDV VMT by 2.6%
- Telework and Travel Demand Management (TDM)
  - Additional TDM programs reduce statewide LDV VMT by 1.2%
    - Congestion pricing and other TDM policies reduce LDV VMT by 3.2% in New York City
  - An increase in telework across the state reduces LDV VMT by 0.4%
- Smart Growth and Biking/Walking Modeshifting
  - Focus on transportation-oriented development where public transit and other low or zero-transportation modes like biking and walking are highly accessible. This reduces LDV VMT by 2% across the state.

# VMT Reduction Measures

> By 2050, VMT reductions are achieved through the following measures in Scenario 4:

| | **State Total** (million VMT) | **Reduction vs. Reference** (%) | **Sources** |
|---|---|---|---|
| **2050 Reference VMT** | **140,400** | | |
| *VMT Reductions:* | | | |
| Enhanced Transit and Mobility | 3,700 | 3% | Carbon Neutral NYC, Empire Corridor Draft 1 EIS, E3 Internal Analysis |
| Telework and TDM | 7,200 | 5% | Carbon Neutral NYC, UCR COVID Impacts Study, FHWA Integrating TDM into the Transportation Planning Process |
| Smart Growth and Biking/Walking Modeshifting | 10,800 | 8% | Carbon Neutral NYC, Growing Cooler: The Evidence on Urban Development and Climate Change |
| **Total Reductions** | **21,700** | **16%** | |

# VMT Reduction Measures

## Scenario 4: *Very Low VMT Case*

> Enhanced Transit and Mobility
- Expansion of bus transit service statewide and all transit services in New York City reduces statewide LDV VMT by 2.6%

> Telework and TDM
- Further ambition in TDM programs reduce statewide LDV VMT by 2.8%
  - Congestion pricing and other TDM policies reduce LDV VMT by over 10% in New York City
- A further increase in telework across the state reduces LDV VMT by 2.3%

> Smart Growth and Biking/Walking Modeshifting
- Additional ambition in transportation-oriented development where public transit and other low or zero-transportation modes like biking and walking are highly accessible, along with a greater focus on mixed-use development and aligning home and job locations. This reduces LDV VMT by 7.7% across the state.

> Empire Corridor Rail Investments
- Investments in rail service within New York State increase ridership and reduce statewide LDV VMT by 0.2%

# Telework VMT Impacts

> The VMT impacts of widespread telework expansion were estimated using methodology from a 2020 report on COVID and transportation emissions in California from UC Riverside:

% of workers who can perform primary job from home (Source: American Time Use Survey 2017) × % of household VMT for work commuting (Source: National Household Travel Survey 2017) × % of workers who commute via personal vehicle (Source: American Community Survey 2018, NYC Mobility Survey 2019) = Max potential % of LDV VMT that can be displaced via telework

> Using this methodology, the we calculated a max LDV VMT reduction of 4.6%

> However, due to the potential VMT rebound affects of expanded telework that are not accounted for in the UC Riverside study methodology, we de-rated the final outputs for both the Low VMT and Very Low VMT cases:

- Low VMT: 0.4% reduction
- Very Low VMT: 2.3% reduction

# Smart Growth & Biking/Walking VMT Impacts

> Smart growth and biking/walking modeshifting VMT impacts were estimated based on a best-fit model of VMT impacts from the Growing Cooler report:
  - Best-fit model based on meta-analysis of 62 regional planning scenarios and takes population growth, increase in average density, and selection of key characteristics (centralized development, mixed-use development, coordination with existing transit) as input variables

> Smart growth investment costs were estimated based on measure costs from Moving Cooler report. Because the Moving Cooler report analyzed measures at a national scale, we converted these total costs to a $/mile VMT reduced unit cost and applied them to the VMT reduced in the CLCPA PATHWAYS:
  - Combined smart growth land use, pedestrian, and biking infrastructure costs average $0.019 / VMT reduced in Moving Cooler scenarios, with the most expensive tranche at $.039 / VMT reduced

# Empire Corridor High Speed Rail Scenarios

*Included in Scenario 4*

| Category | Alternative 90A | Alternative 90B | Alternative 110 | Alternative 125 |
|---|---|---|---|---|
| LDV VMT Displaced (Million VMT) | 106 | 119 | 127 | 200 |
| 2035 Reference LDV VMT (Million VMT) | 130,848 | 130,848 | 130,848 | 130,848 |
| LDV VMT Reduction (%) | 0.08% | 0.09% | 0.10% | 0.15% |
| Total Costs ($B) | $1.81 | $6.09 | $6.83 | $16.06 |
| Annualized Costs ($B/yr) | $0.14 | $0.45 | $0.51 | $1.20 |

Source: https://railroads.dot.gov/sites/fra.dot.gov/files/fra_net/3549/Empire%20Corridor%20Tier%201%20Draft%20EIS%20Volume%201.pdf

> Four scenarios from the Empire Corridor Tier 1 Draft Environmental Impact Statement were considered for inclusion in the PATHWAYS scenarios

- No high-speed rail scenarios were included in Scenarios 1, 2, and 3, but Alternative 125 was ultimately included in Scenario 4

# Disadvantaged Communities Update

# Climate Justice Working Group DRAFT Disadvantaged Communities Criteria – December 13th Vote Review

December 20, 2021

# Agenda

1. Indicators within Definition
2. Regional Distribution of Disadvantaged Communities
3. Individual Household Criteria
4. Where the vote Landed
5. Public Input Process

# 1 Indicators: Framework

The Geographic DAC scoring approach uses data from national and state sources to create 45 indicators in the following categories. For each indicator, the percentile-rank of each census tract is used in scoring.

**Environmental Burdens and Climate Change Risks**

- Potential Pollution Exposures
- Land use assoc. with historical discrimination or disinvestment
- Potential Climate Change Risks

20 Indicators in this component

**Population Characteristics and Health Vulnerabilities**

- Income, Education, Employment
- Race, Ethnicity, Language
- Health Impacts & Burdens
- Housing, Energy, Communica-tions

25 Indicators in this component

19 Tribal and Indigenous lands (census tracts) are automatically included in the Disadvantaged Community definition where 5% or more a designated tract are reservation territory or nation-owned.

# 1 Environmental Burdens and Climate Change Risks: Draft Indicators (20)

## Potential Pollution Exposures

- Vehicle traffic density
- Diesel truck and bus traffic
- Particulate Matter (PM2.5)
- Benzene concentration
- Wastewater discharge

## Land use and facilities associated with historical discrimination or disinvestment

- Remediation Sites (e.g., NPL Superfund or State Superfund/Class II sites)
- Regulated Management Plan (chemical) sites
- Major oil storage facilities (incl. airports)
- Power generation facilities
- Active landfills
- Municipal waste combustors
- Scrap metal processors
- Industrial/manufacturing/mining land use (zoning)
- Housing vacancy rate

## Potential Climate Change Risks

- Extreme heat projections (>90° days in 2050)
- Flooding in coastal and tidally influenced areas (projected)
- Flooding in inland areas (projected)
- Low vegetative cover
- Agricultural land
- Driving time to hospitals or urgent/critical care

# 1 Population Characteristics and Health Vulnerabilities: Draft Indicators (25)

### Income, Education & Employment

- Pct <80% Area Median Income
- Pct <100% of Federal Poverty Line
- Pct without Bachelor's Degree
- Unemployment rate
- Pct Single-parent households

Within this factor, both income metrics have 2x weight

### Race, Ethnicity & Language

- Pct Latino/a or Hispanic
- Pct Black or African American
- Pct Asian
- Pct Native American or Indigenous
- Limited English Proficiency
- Historical redlining score

Within this factor, Pct Latino/a and Pct Black have 2x weight

### Health Impacts & Sensitivities

- Asthma ED visits
- COPD ED visits
- Heart attack (MI) hospitalization
- Premature Deaths
- Low Birthweight
- Pct without Health Insurance
- Pct with Disabilities
- Pct Adults age 65+

### Housing, Energy, Communications

- Pct Renter-Occupied Homes
- Housing cost burden (rental costs)
- Energy Poverty / Cost Burden
- Manufactured homes
- Homes built before 1960
- Pct without Internet (home or cellular)

# 2 Designation: Regional Results

## Within *each* region, what percentage of census tracts would be geographic DACs?

| Region | % Designated DAC |
|---|---|
| New York City | 45% |
| Long Island | 12% |
| Mid-Hudson | 45% |
| Western NY | 32% |
| Finger Lakes | 35% |
| Capital Region | 22% |
| Central NY | 36% |
| Southern Tier | 18% |
| Mohawk Valley | 19% |
| North Country | 15% |
| **Total** | **35%** |

About 45% of NYC are designated a Geographic DAC.

In rural regions, a smaller share of tracts are designated.

On average (and overall), 35% of tracts are designated

Proportionally more urban census tracts are designated than rural areas

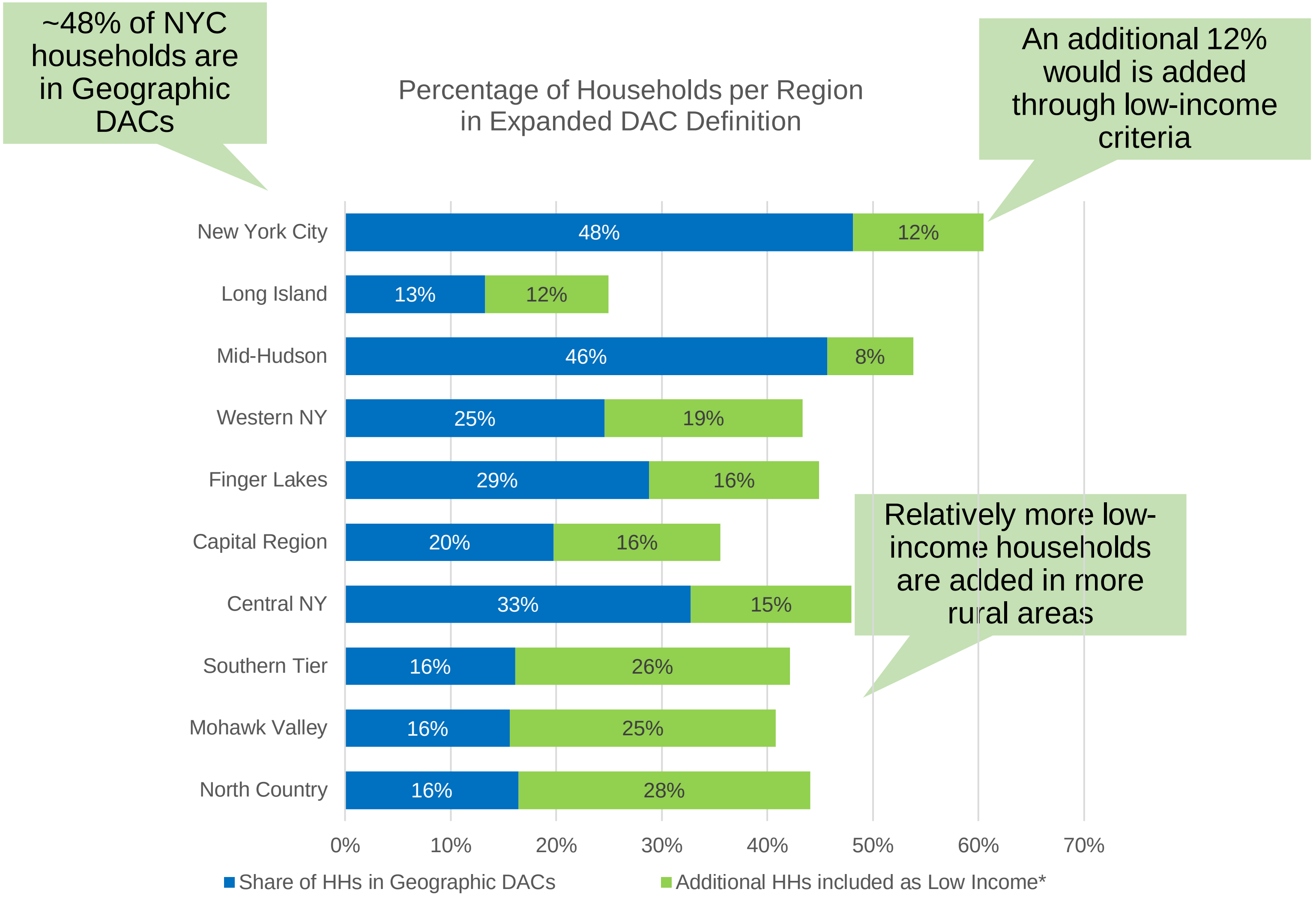
| | Count of All Tracts | Count of DACs | Pct of Area Type that is DAC |
|---|---|---|---|
| Rural | 857 | 130 | 15% |
| Suburban | 1479 | 381 | 26% |
| Urban | 2570 | 1210 | 47% |
| **All Tracts** | **4,918** | **1,721** | **35%** |

We hypothesize there are two reasons: (1) many of these indicators don't always "point in the same direction" – i.e., less cumulative burdens, and (b) Income, race and ethnicity are a significant component of scoring, and more urban/suburban areas have more BIPOC households

# 3 Low-Income Definition: Implications by Regions

Using 200% of Federal Poverty Line as a proxy for a 60% SMI definition, the individual income criteria has added relatively (proportionally) more households in rural regions.
New York City would still have (proportionally) the most households included.

Overall, inclusion of the 60% SMI criteria has added approximately 14% of HH's outside of DACs. Under the geographic definition and individual criteria, approximately 49% of HHs are included in the draft scenario.




*Estimated using 200% FPL as a proxy for 60% SMI; actual counts may be slightly higher

# 4 Where we landed

## Geographic DAC Definition

1. Include 45 indicators of (a) environmental exposures, burdens and climate change risks, and (b) sociodemographic and characteristics and health outcomes in the Disadvantaged Communities Definition. The documentation will list other indicators the CJWG considered and/or wanted to include and data limitations.

2. Score census tracts on relative basis using (a) percentile ranks of all indicators, (b) hierarchical scoring approach (indicators within factors; factors within component), and (c) multiplying Environmental/Climate component by Population/Health component to get overall score

3. Include 35% of New York State census tracts as Geographic DACs, considering each tracts' relative rank (a) statewide or (b) regionally (in NYC or Rest-of-State). Automatically include tracts where at least 5% of land is federally-recognized reservation or owned by an Indian Nation.

## Individual Criteria (applicable only for investment purposes, ECL 75-0117)

4. Include low-income households located anywhere in the State in the Disadvantaged Communities criteria for the purpose of investing or directing clean energy programs, projects or investments (i.e., only for purposes of ECL 75-0117).

5. Define low-income households as households reporting annual total income at or below 60% of State Median Income, or are otherwise categorically eligible for low-income programs.

## Annual Evaluation and Review

6. Per statute, CJWG will review DAC criteria and methods at least annually.

# 5 Public Input Process

- DEC will collaborate with NYSERDA to release basic CJWG information, including a summary, the December 13th PowerPoint presentation, the meeting recording, and the meeting notes on climate.ny.gov
- A high-level memo will be provided with the sources and indicators along with the draft list of DAC census tracts and context will be posted to climate.ny.gov.
- The tableau map will be released with a user interface, context, complete documentation, and discussion of limitations and areas for improvement
- DEC will host public educational session(s) to describe DAC criteria and public comment process (live and recorded)
- DEC will collect comments on the draft criteria and DACs for 120 days and hold a minimum of 6 public hearings

# CLCPA 40% of Benefits Goal

ECL § 75-0117

"State agencies, authorities and entities, in consultation with the environmental justice working group and the climate action council, shall, to the extent practicable, invest or direct available and relevant programmatic resources in a manner designed to **achieve a goal for disadvantaged communities to receive forty percent of overall benefits of spending** on clean energy and energy efficiency programs, projects or investments in the areas of housing, workforce development, pollution reduction, low income energy assistance, energy, transportation and economic development, provided however, that disadvantaged communities shall receive **no less than thirty-five percent** of the overall benefits of spending on clean energy and energy efficiency programs, projects or investments and provided further that this section shall not alter funds already contracted or committed as of the effective date of this section."

# Clean Energy & Energy Efficiency Investments

- New York State's clean energy and energy efficiency portfolio includes economy-wide investments in the areas of buildings, transportation, distributed energy resources, infrastructure, workforce development, market development, and outreach and education

- Clean energy and energy efficiency investments can drive:
  - improved health outcomes associated with reducing combustion of fossil fuels and reducing exposure of residents to thermal extremes
  - economic development and wealth creation through jobs, reduction of energy burden, and improvements to homes/assets
  - community self-determination through capacity building and technical assistance

# Clean Energy and Energy Efficiency Benefits Tracking

- Considerations for identifying, measuring, tracking, and reporting of benefits:
  - benefits that are tangible and meaningful to communities should be prioritized to reduce potential for greenwashing
  - complexity and cost of measurement, tracking, and reporting with desire to account for and to localize benefits
  - metrics should be used to manage to the benefits requirement, allowing for calibration of investment strategies
  - investments and resulting benefits, as well as capacity for tracking and reporting benefits will vary by agency

# Components of Benefits Framework

1. **Place-based Investment as Compliance Metric**- establish place-based investments as metric to measure state progress towards investment mandate/goal
   - ➢ Investments that are place-based will be included in the numerator/denominator

   (Place-based investments represent funding directed to projects located within communities or going to support community-related projects, where the funding and impact can be tied back to the locality)
   - ➢ Investments that are statewide or systems-based will not be included in equation

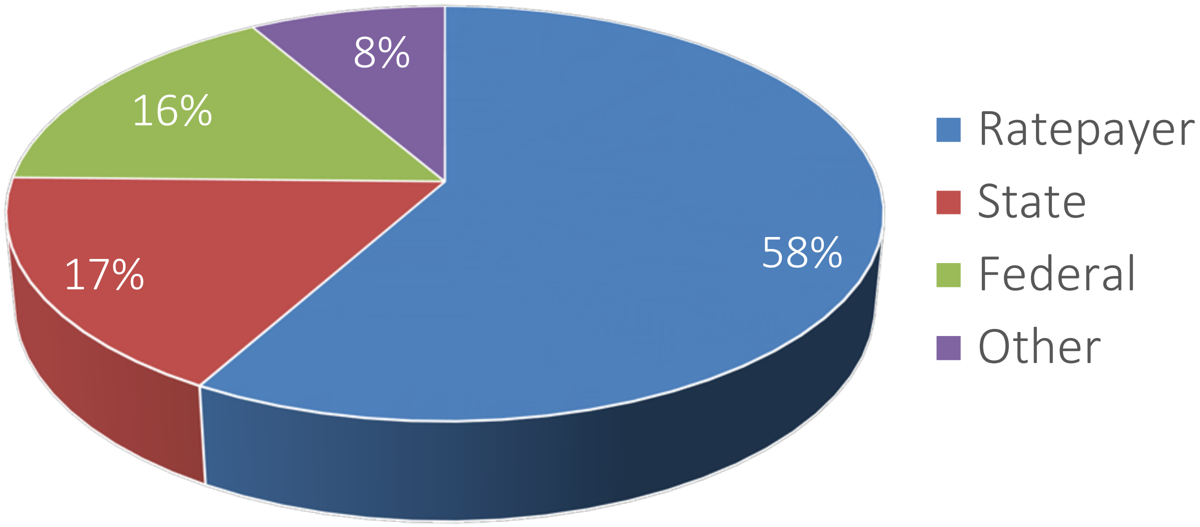
2. **Investment Guidance-** agencies will be expected to incorporate considerations for DAC impacts into program design and in procurements to drive investments/ benefits to and for DAC on a go-forward basis

3. **Reporting of Co-benefits**- Co-benefits and other impacts/outcomes associated with clean energy investments in DAC will be reported in addition to the 35%/40% investments metric (compliance metric)

# Estimated Annual Clean Energy/EE Investments- Prelim, as of 2021*

Est. Annual Place-Based Clean Energy/EE Investment = $3.2b
Annual Investment to Meet 35% Requirement= $1.15b
Annual Investment to Reach 40% Goal+ $1.3b

## Est. Annual Investment by Funding Source




*Preliminary Estimates, for Illustrative Purposes*

## Est. Annual Investment by Category (place-based)

| Investment Category | % of Annual $ |
|---|---|
| Clean Energy | 16.9% |
| Economic Dev. | 0.2% |
| Energy Efficiency | 34.9% |
| Housing | 0.3% |
| Energy Assistance | 24.6% |
| Pollution Reduction | 1.7% |
| Transportation | 20.5% |
| Workforce Dev. | 0.8% |

Notes:

- Estimated investments presented for illustrative purposes
- Based on initial inventory by agency staff in 2021
- Refinement of inventory underway

# Operationalizing Framework

1. Refinement of agency investments- *estimated February 2022*

2. Identification of co-benefits, attribution and localization rules, and considerations for qualitative outcomes- *estimated April 2022*

3. Tracking and reporting structure and process- *estimated September 2022**; Reporting commences Q4 2022***

4. Guidance to agencies, including regular engagement with agency staff

# Discussion and Vote: Development of Draft Scoping Plan

# Overview

> **Revised Draft**

- Incorporates CAC input, as discussed at November 30 and December 6 meetings

> **Process**

- Discussion of revised draft, by topic, including Members' requested edits
- Vote (simple majority approval) on release of the draft Scoping Plan for public comment, subject to any edits
  - Members may make a brief statement when casting their vote

# Discussion of Draft Scoping Plan

- Gas System Transition
- Economywide Strategies

# Vote on Release of Draft Scoping Plan

## Resolution #4

RESOLVED, that the Members of the New York State Climate Action Council hereby approve the release of the draft Scoping Plan, as presented at its December 20, 2021 meeting, together with any changes necessary to reflect considerations discussed at said meeting and any additional non-substantive, editorial or grammatical changes deemed necessary for clarity or accuracy, for purposes of soliciting public comment for a period of not less than 120 days, which will include at least six public comment hearings, and will so notify the public by posting on the Climate Action Council website. The draft Scoping Plan was developed in consultation with the climate justice working group and other stakeholders.

# 2022 Next Steps

# Next Steps

## December 30: Release of Draft Scoping Plan (if approved today)

> Initiates public comment period
  - To identify areas where additional **clarity** is needed in the scoping plan
  - To further understand **relevant needs and priorities** of members of the public and how they connect to existing (or additional) climate strategies
  - Highlight where New York **residents and businesses can participate** in achieving the State's climate goals

## Public and stakeholder input will occur in parallel to complementary continued analysis, speaker series input, and CAC discussion

> **Written comment**: Written comments and questions to be shared by members of the public with the CAC via written format

> **Public hearings**: In-person and virtual hearings to take input directly from the public

> **Stakeholder engagement:** Targeted stakeholder engagement

# Public Input | Written Comment Summary

**Written comment will be solicited and reviewed**

> Initial plan:
- Hold open comment period for minimum of 120 days, through April, 2022
- Conduct targeted promotion and outreach
- Receive comments through public comment form available at Climate.ny.gov
- Can also provide written comments via USPS or by email (info to be posted on Climate Act website)
- Comments to be posted publicly after the comment period closes

> Suggested CAC member involvement:
- Each CAC member encouraged to review written-comment directly; the State-team will also offer supplementary written comment summaries
- Written comment themes will inform CAC member discussions

# Public Input | Hearings Summary

**Hold several accessible public hearings across the state and virtually, ensure CAC member participation**

> Initial plan (subject to change and dependent on COVID-19 health and safety guidelines):
  - Hold 7 hearings, ~ 2-3 hours each
    - 6 in-person hearings geographically balanced across the State
    - 1 virtual hearing
  - Anticipated timing: March – April 2022
  - Format: ~30 min overview of draft Scoping Plan content; remaining time for public comment

> CAC member involvement:
  - Each CAC member encouraged to attend at least two meetings
  - Aiming for 4 or more Council members per session

# Public Input | Stakeholder Engagement Summary

**Stakeholder engagement will supplement broad public input**

> Meeting(s) with Climate Justice Working Group

> Targeted stakeholder engagement could include:
- Technical experts
- Disadvantaged Communities
- Implementation partners

> Anticipated timing: March – April+ 2022

> Plans to be further developed, and in part informed by themes from public input and CAC member discussions

# Scoping Plan Outreach

**In addition to info sessions, speaker series, and public hearings supporting the release of the draft scoping plan, outreach will include:**

> Traditional and social media

- Issue press release when draft scoping plan is made public, efforts to date and releases--draft definition of DACs, Just Transition Working Group Jobs Report, Barriers Report, and Greenhouse Gas Emissions Report.
- Revamp climate.ny.gov website to serve as home for the draft scoping plan and provide additional resources for the public to review and provide comment.
- Social media campaign to drive awareness of the website and messaging around key sectors.

> *Moving forward*

- Developing broader campaign to communicate with New Yorkers about CLCPA implementation.
- Working closely with key partners to identify opportunities to engage stakeholders and leverage existing networks of support