



2018 Pennsylvania Climate Action Plan Updates (Appendix Slides)

June 26, 2018



Prepared for the
Climate Change
Advisory Committee
Meeting

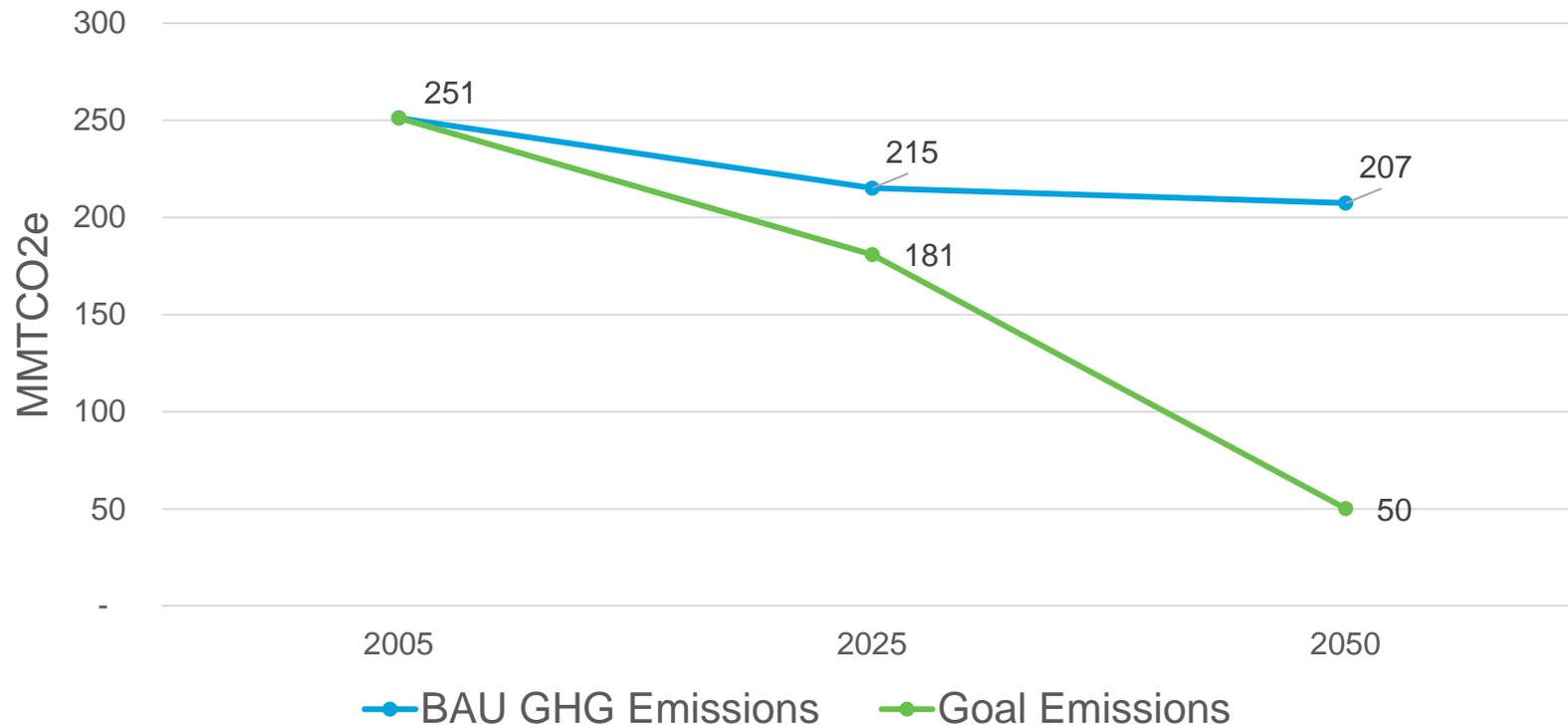
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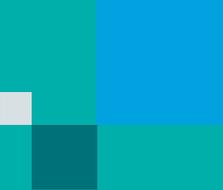
Disclaimer

- Draft results for each mitigation action and strategy presented in these slides are a work in progress. The draft results are based on the set of assumptions presented to the CCAC on June 26, 2018.
- The modeling team is intending that the DEP and the CCAC will comment on and give feedback to the modeling team on assumptions and the related draft results.
- Draft results presented in these slides focus on key metrics for which we are seeking CCAC feedback.
- The draft results presented in these slides may be tweaked or adjusted based on feedback from DEP and the CCAC, and then will be used as inputs into the REMI model for a macroeconomic analysis.

BAU and Goal Emissions



- Goals used for modeling purposes consist of a 28% reduction below 2005 levels by 2025, and an 80% reduction below 2005 levels by 2050.



Draft Mitigation Action Modeling and Strategy Results



Strategy: Promote a diverse portfolio of clean, utility-scale electricity generation (grid decarbonization)

Actions:

- **Increase Alternative Energy Portfolio Standards (AEPS) Tier 1 targets, and further increase in-state generation and use of renewables**
 - Goal-related GHG Reductions (below BAU): 5.4 MMTCO₂e (2025); 12.5 MMTCO₂e (2050)
 - Utility-scale renewable generation (above BAU): 11,121 GWh (2025); 29,598 GWh (2050)
 - Net Present Value (NPV)*: **-\$5,981 million**
 - Cost-per-ton of GHG Emission Reductions: \$20 per MTCO₂e
 - Results are driven by utility-scale solar and wind – 25% Tier 1 requirement by 2030, 30% by 2050
 - 6% Tier 1 solar carve-out from 2030 onwards

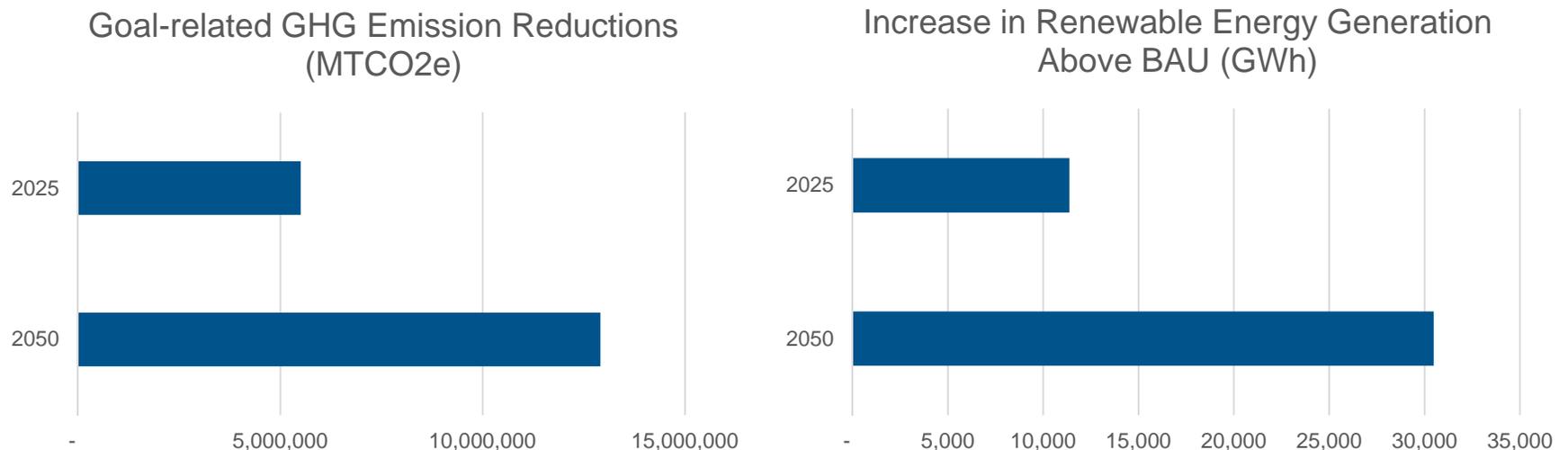
* Net Present Value represents the value of costs and savings of the action discounted over time from 2018 to 2050. In the case of utility-scale increases in solar and wind, costs include capital and O&M costs, while savings include fuel and O&M savings from displaced coal and gas generation.



Strategy: Promote a diverse portfolio of clean, utility-scale electricity generation (grid decarbonization)

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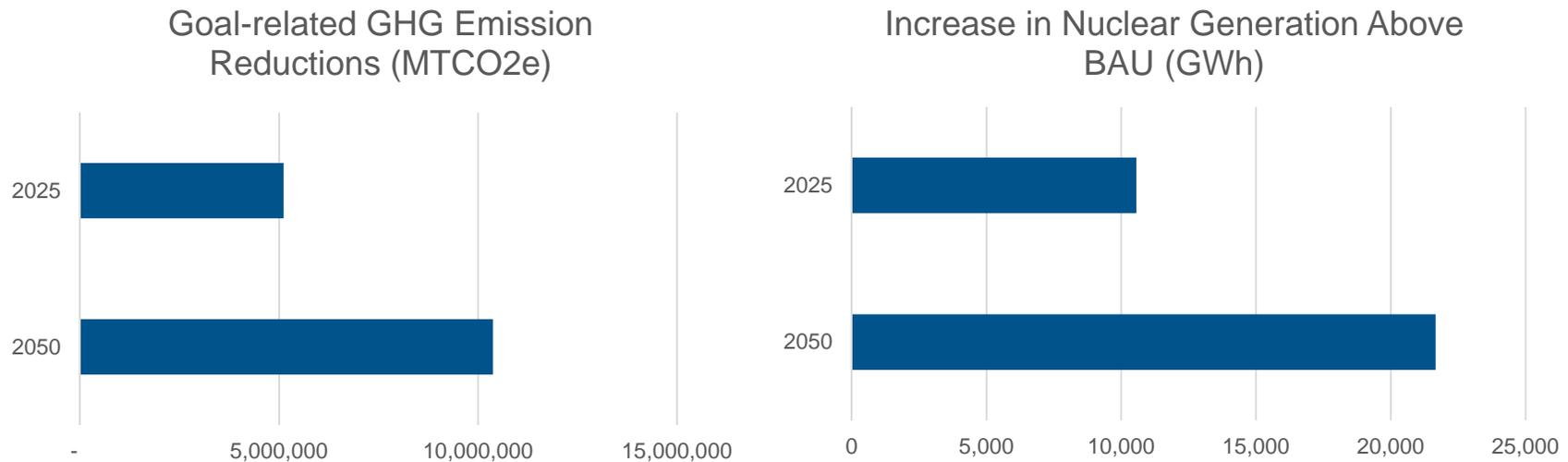
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Strategy: Promote a diverse portfolio of clean, utility-scale electricity generation (grid decarbonization)

Actions:

- **Maintain the existing nuclear fleet**



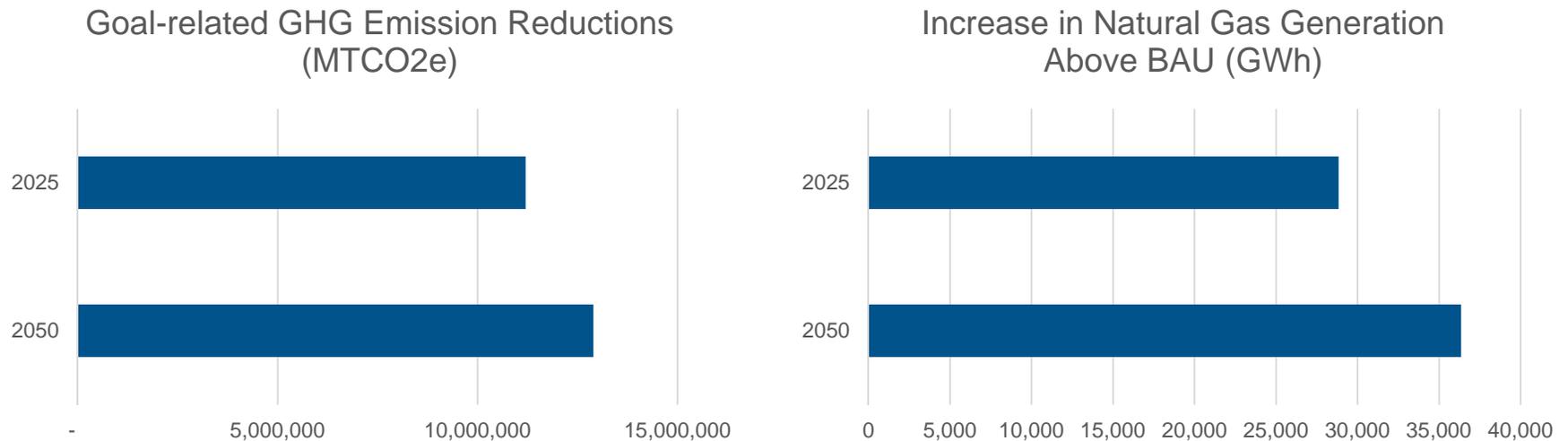
- NPV: **-\$1,697 million**
- Cost-per-ton of GHG Emission Reductions: **\$9 / MTCO2e**



Strategy: Promote a diverse portfolio of clean, utility-scale electricity generation (grid decarbonization)

Actions:

- Limit carbon emissions through a power sector cap & trade program



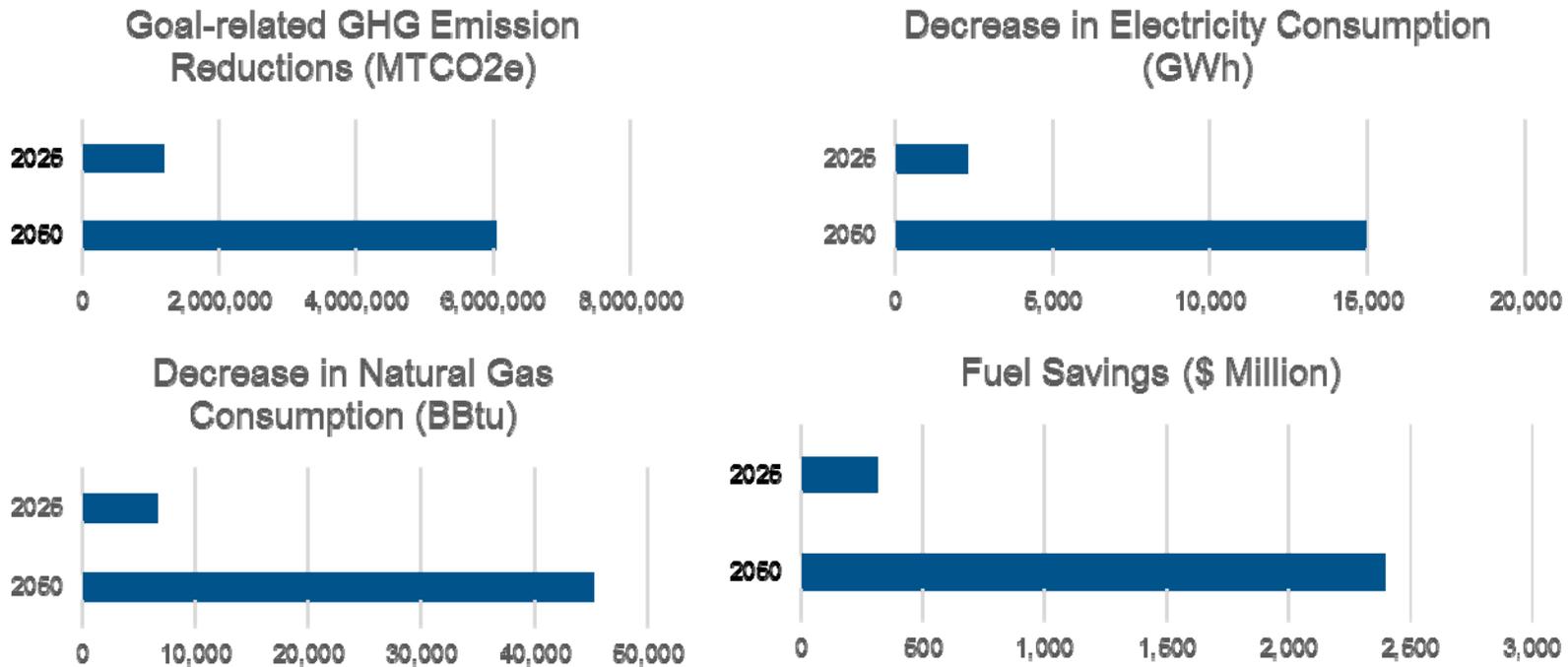
- 30% reduction in power sector GHG Emissions from 2020 to 2030
- NPV: **-\$2,009 million**
- Carbon Price: \$1 / MTCO2e (2025); \$1 / MTCO2e (2050)



Strategy: Increase end use energy efficiency

Actions:

- Update residential and commercial building codes



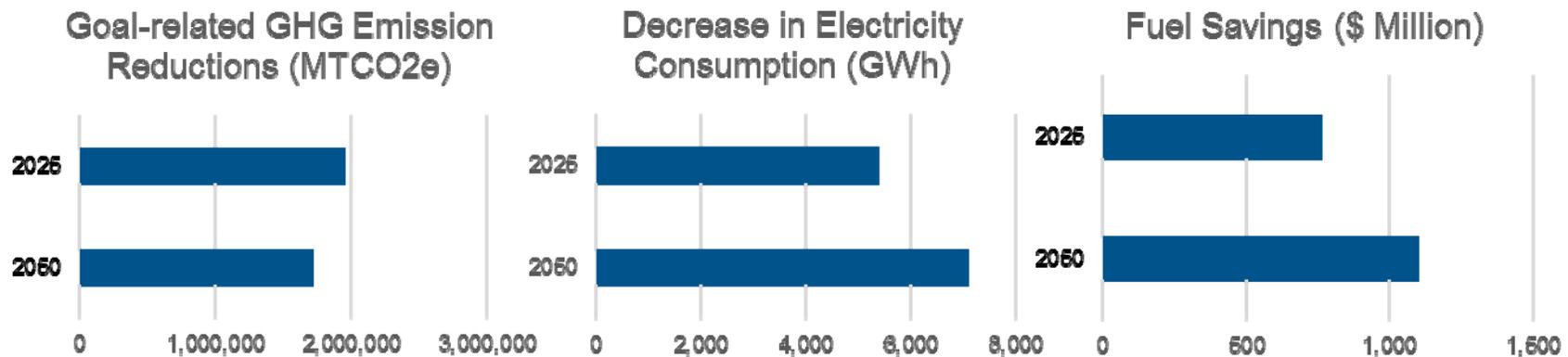
- NPV: \$5,013 Million (Residential); \$8,657 Million (Commercial)
- Cost-per-ton of GHG Emission Reductions: **-\$150/MTCO_{2e}** (Residential); **-\$1,972/MTCO_{2e}** (Commercial)



Strategy: Increase end use energy efficiency

Actions:

- Expand Act 129 to include more eligible measures, increase targets, increase or eliminate cost caps



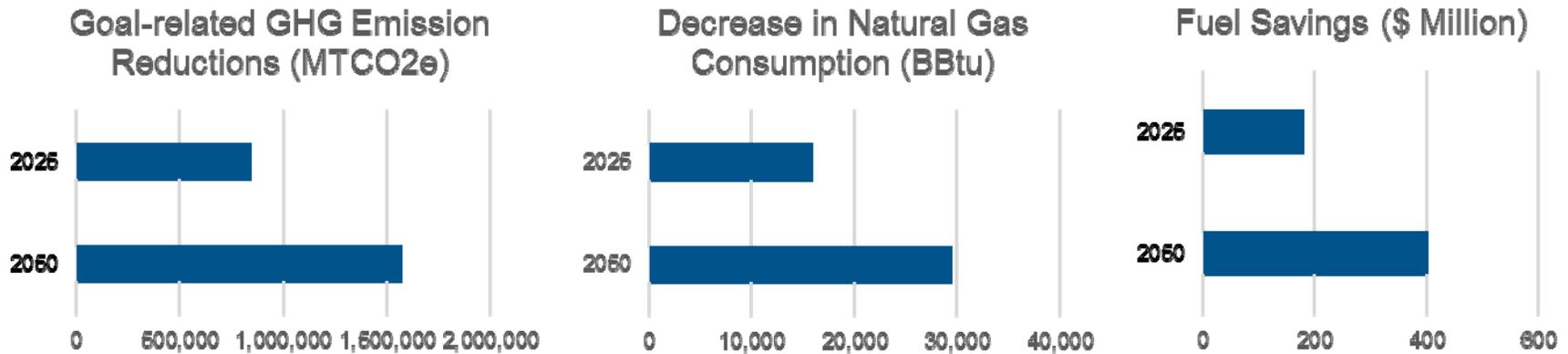
- NPV: \$8,962 Million (Residential); **-\$423 Million (Commercial)**
- Cost-per-ton of GHG Emission Reductions: **-\$243/MTCO₂e (Residential)**; \$20/MTCO₂e (Commercial)



Strategy: Increase end use energy efficiency

Actions:

- Create similar program to Act 129 for natural gas



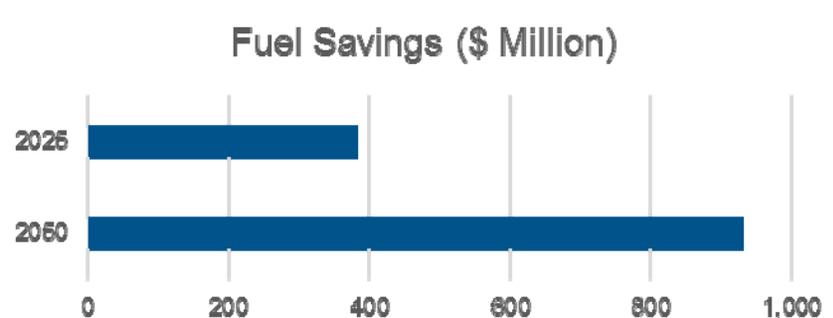
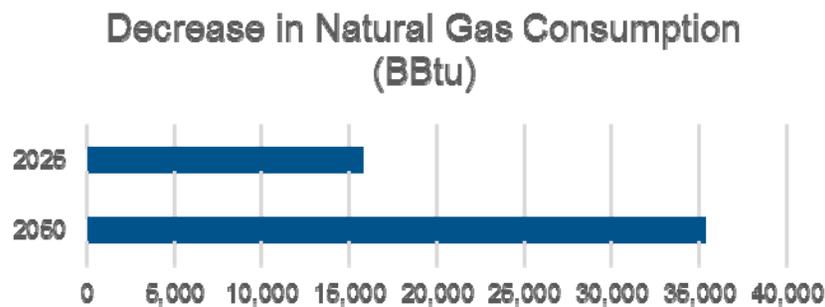
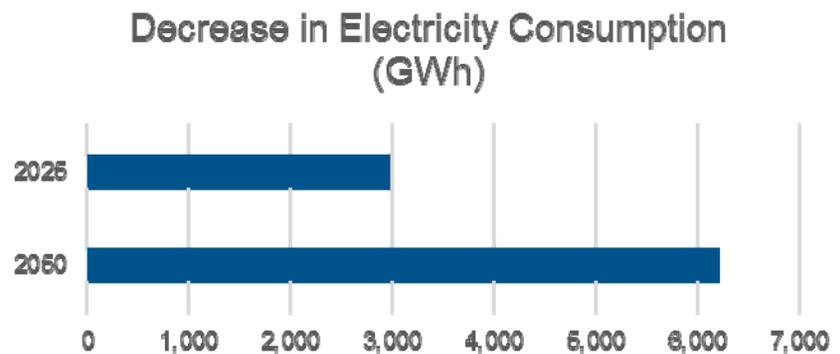
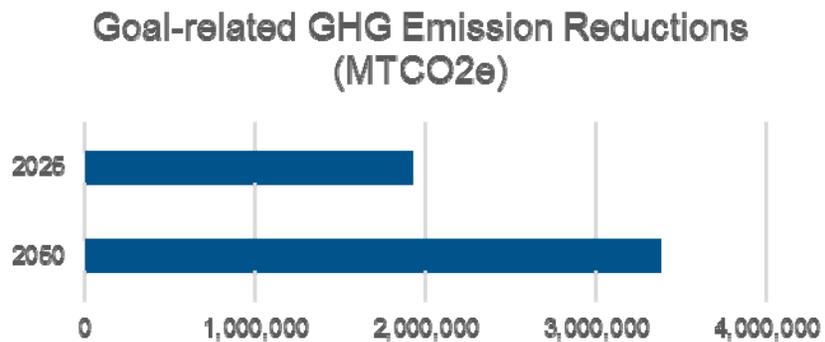
- NPV: \$2,825 Million (Residential); \$1,152 Million (Commercial)
- Cost-per-ton of GHG Emission Reductions: **-\$98/MTCO₂e** (Residential); **-\$92/MTCO₂e** (Commercial)



Strategy: Increase end use energy efficiency

Actions:

- Expand energy assessments and provide more trainings for the industrial sector



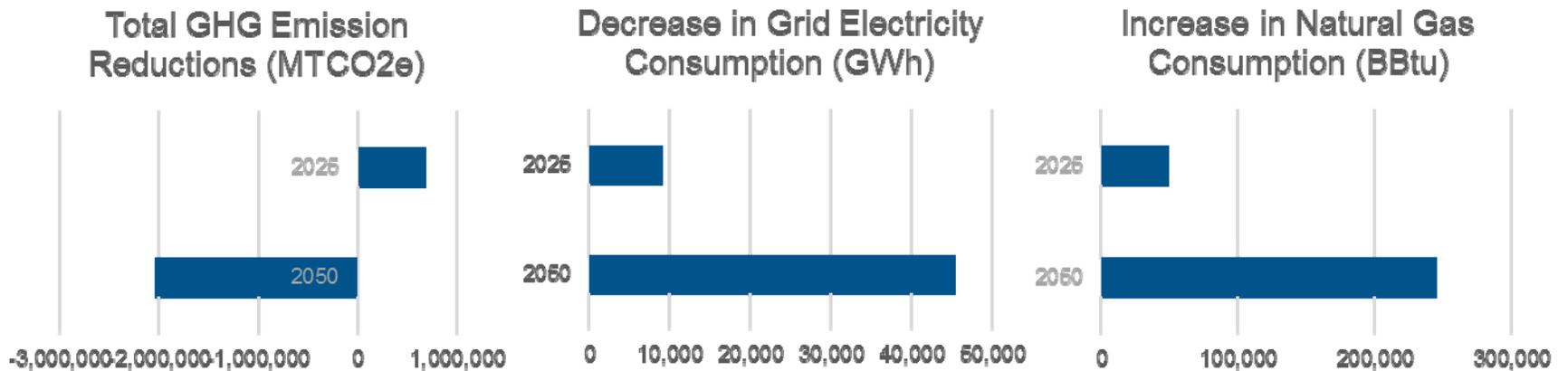
- NPV: **-\$945 Million**
- Cost-per-ton of GHG Emission Reductions: \$11/MTCO₂e



Strategy: Promote clean, distributed generation resources

Actions:

- Incentivize and encourage CHP for large campuses, hospitals, infrastructure, mass transit, and industry



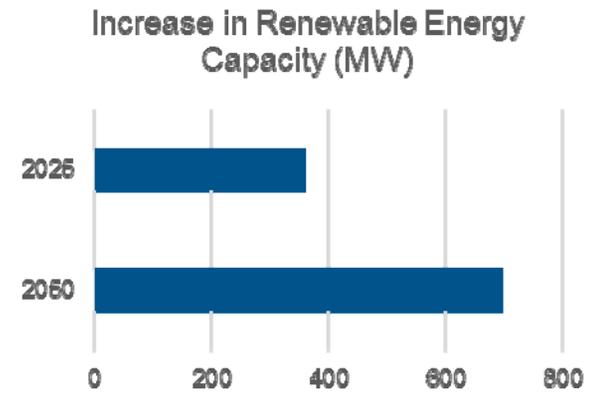
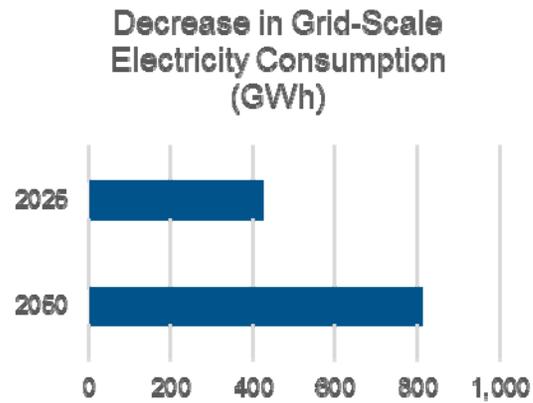
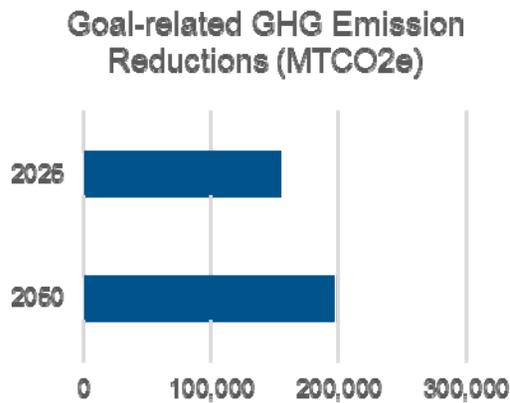
- NPV: \$3,787 Million



Strategy: Promote clean, distributed generation resources

Actions:

- Invest in and promote building-scale solar



- NPV: \$560 million
- Cost-per-ton of GHG Emission Reductions: **-\$99/MTCO₂e**



Strategy: Reduce upstream impacts of energy production

Actions:

- **Promote policies and practices to reduce methane emissions across natural gas systems**
 - *In progress, working with DEP to develop assumptions and results*

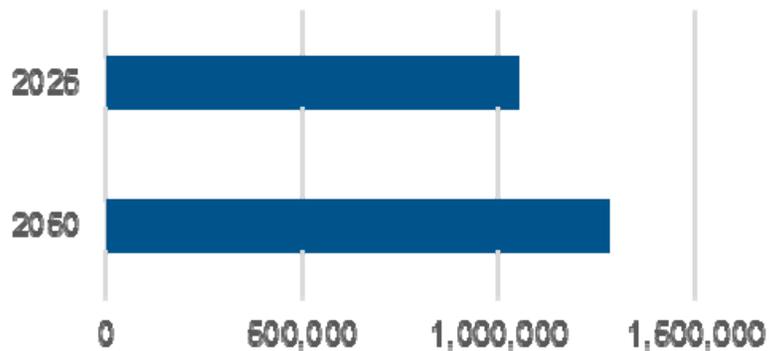


Strategy: Promote the production and use of alternative fuels

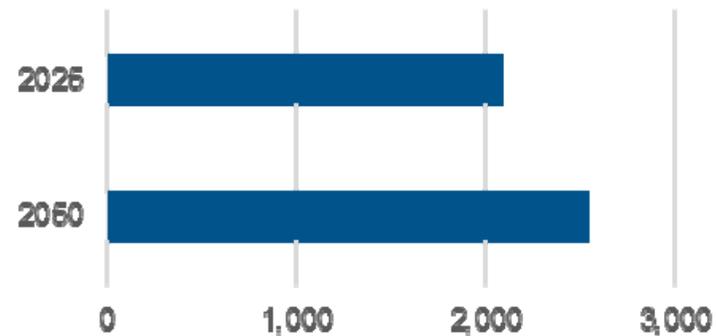
Actions:

- Increase Capture of coal mine methane

Goal-related GHG Emission Reductions (MTCO₂e)



Coal Mine Methane Production (BBtu)



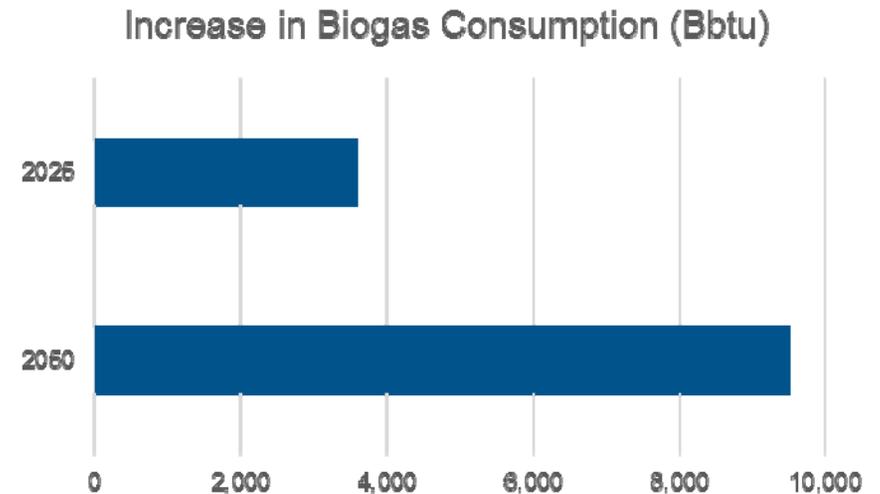
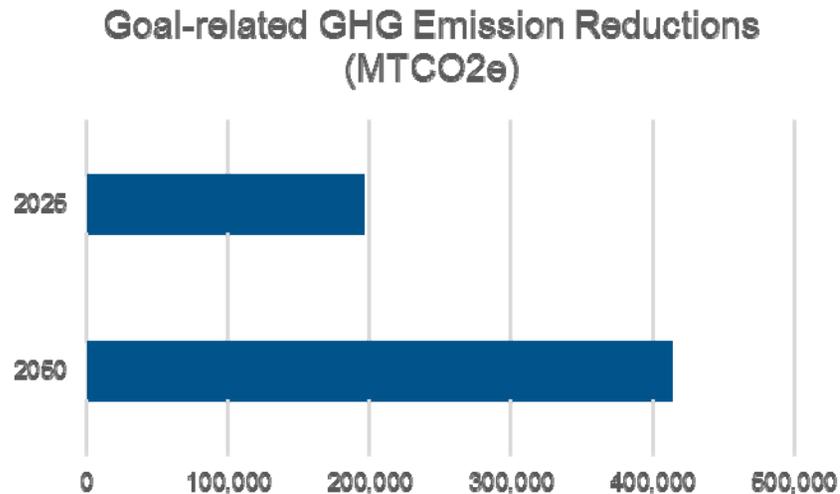
- NPV: \$78 Million
- Cost-per-ton of GHG Emission Reductions: **-\$2** /MTCO₂e



Strategy: Promote the production and use of alternative fuels

Actions:

- Ag waste, landfill gas, wastewater gas



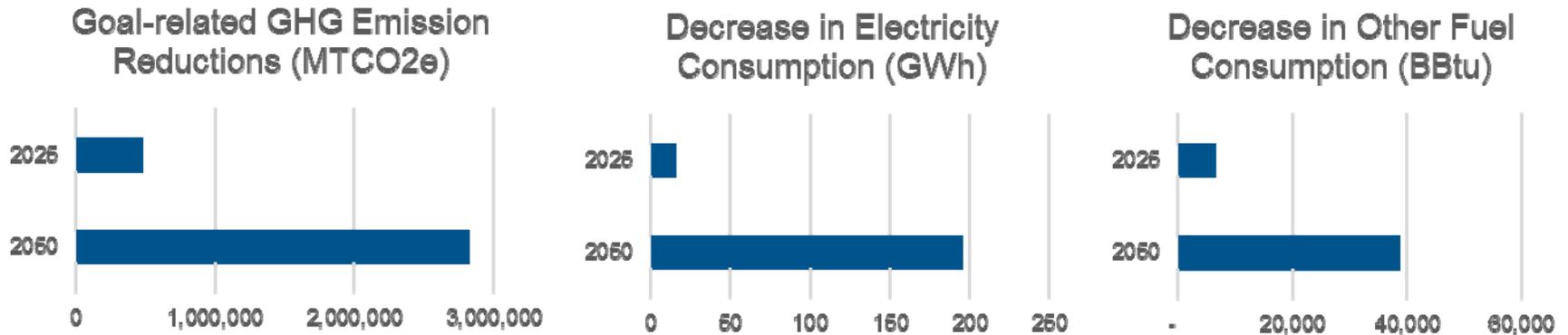
- NPV: \$931 Million
- Cost-per-ton of GHG Emission Reductions: **-\$90/MTCO₂e**



Strategy: Promote sustainable transportation planning and practices

Actions:

- Reduce VMT for SOVs



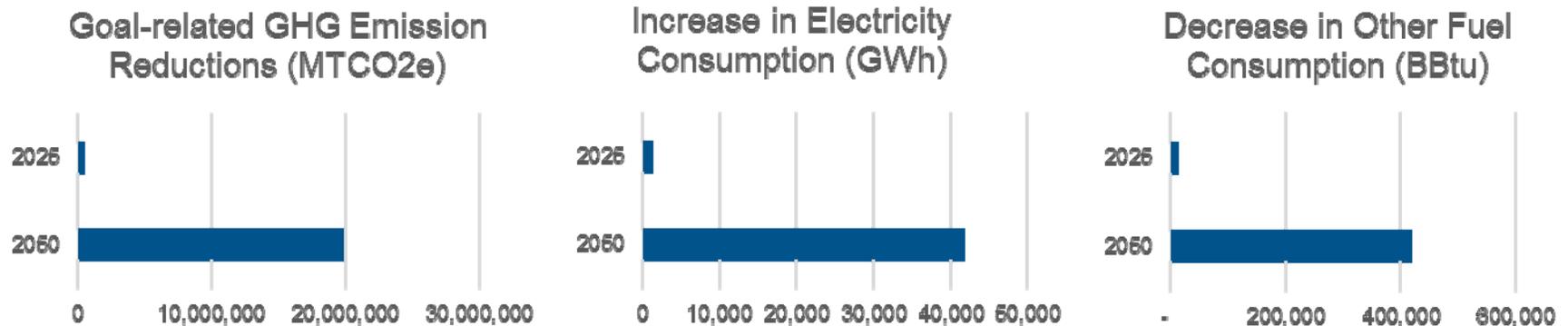
- NPV: \$14,259 Million
- Cost-per-ton of GHG Emission Reductions: **-\$340/MTCO₂e**



Strategy: Promote sustainable transportation planning and practices

Actions:

- Provide a strategic plan and incentives for increasing EV use for light-duty vehicles



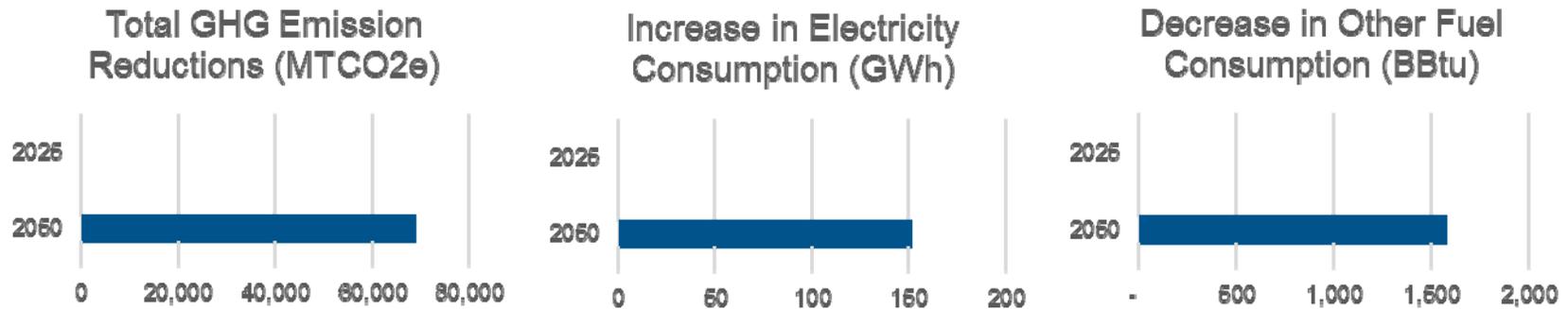
- NPV: **-\$29,189 Million** (positive \$17,500 Million with Bloomberg EV cost projections)
- Cost-per-ton of GHG Emission Reductions: \$124/MTCO_{2e}
- 31% EV penetration by 2033, 88% by 2050.



Strategy: Promote sustainable transportation planning and practices

Actions:

- Promote clean public transportation (Support electrification of municipal bus fleets)



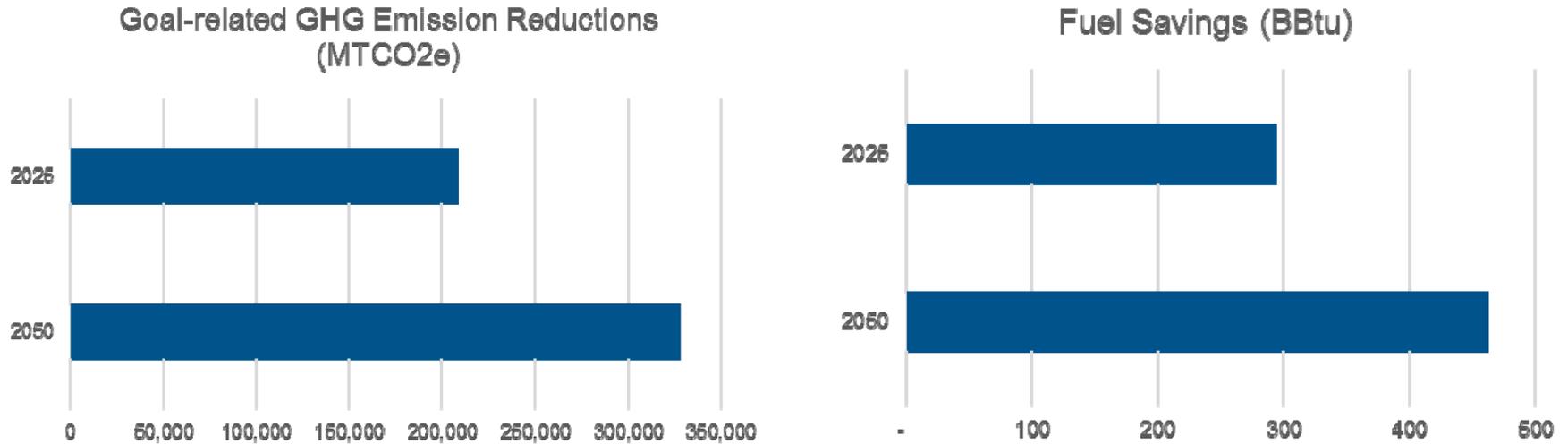
- NPV: **-\$533 Million**
- Cost-per-ton of GHG Emission Reductions: \$1,022/MTCO₂e



Strategy: Promote agricultural best practices

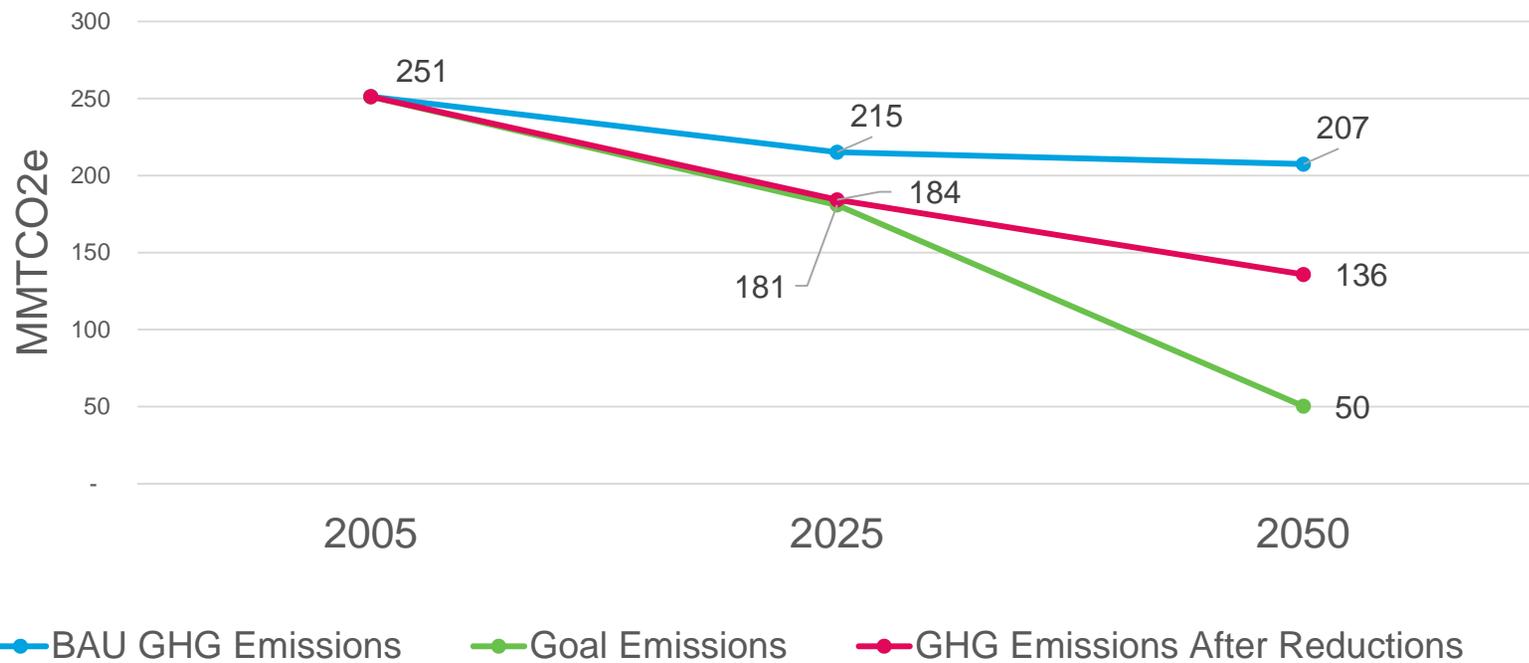
Actions:

- Implement and provide training for no-till farming practices, especially those that sequester carbon in soils and plants



- NPV: **-\$23 Million**
- Cost-per-ton of GHG Emission Reductions: \$3/MTCO₂e

CAP Emission Reductions



- Goals used for modeling purposes consist of a 28% reduction below 2005 levels by 2025, and an 80% reduction below 2005 levels by 2050.



Interim GHG Modeling Results

■ **Goals Used for Modeling**

- 28% below 2005 levels by 2025
- 80% below 2005 levels by 2050

■ **Draft results show short-term goal is achievable; long term goal will require more ambitious actions to achieve**

- 27% below 2005 levels by 2025
(Upstream Oil/Gas action is pending; reductions expected to increase)
- 46% below 2005 levels by 2050

■ **Short term: Grid decarbonization strategy drives the greatest reductions by 2025**

- Grid decarbonization (22 MMTCO₂e in 2025)
- Energy Efficiency (5.9 MMTCO₂e in 2025)

■ **Long term: Transportation strategy provides significant reductions**

- Grid decarbonization (36 MMTCO₂e in 2050)
- Transportation (23 MMTCO₂e in 2050)

■ **Grid decarbonization significantly increases the GHG reductions from electrification of the transport sector**

Thank You

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