



# Salem Greenhouse Gas Projections

March 3, 2021

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# Overview

- **Baseline Forecasts** - From what starting point are we measuring your outcomes?
- **Target Scenario Projections (Planning)**- Where might you be after meeting certain GHG reduction outcomes?
- **Salem City Council Goal**
  - 50% net GHG reduction from 2016 by 2035 (50/2035)
  - 100% net GHG reduction from 2016 by 2050 (100/2050)



# Baseline Forecasts



# Baseline Forecast Details

## → What these graphs **are**:

- A range of baselines of where Salem **might** be **if** Salem did **not** take proactive steps to reduce GHG emissions through its climate action plan
- A baseline
- Context setting

## → What these graphs **are not**:

- An estimate of where Salem **will** be
- Models that include reductions undertaken by Salem
- Models that include higher level goals (State, Federal) that lack specific State/Federal action to achieve those goals

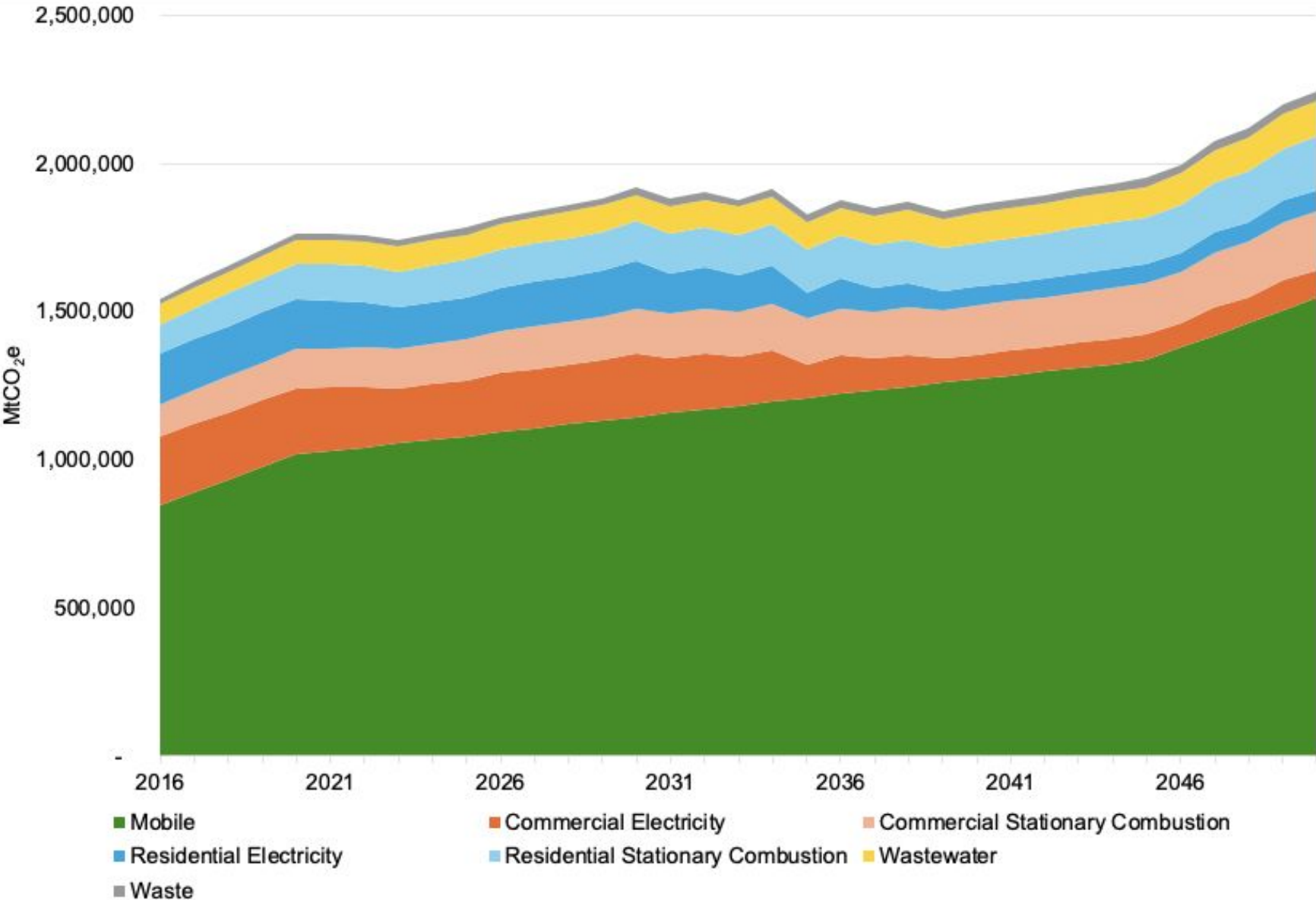


# Baseline Forecast Details

- Three forecasts, each built on slightly different assumptions
  - “Pessimistic”
  - “Mid-Range”
  - “Optimistic”
- Intent is to provide a range of where Salem might be in the future without taking more action than Salem is taking today

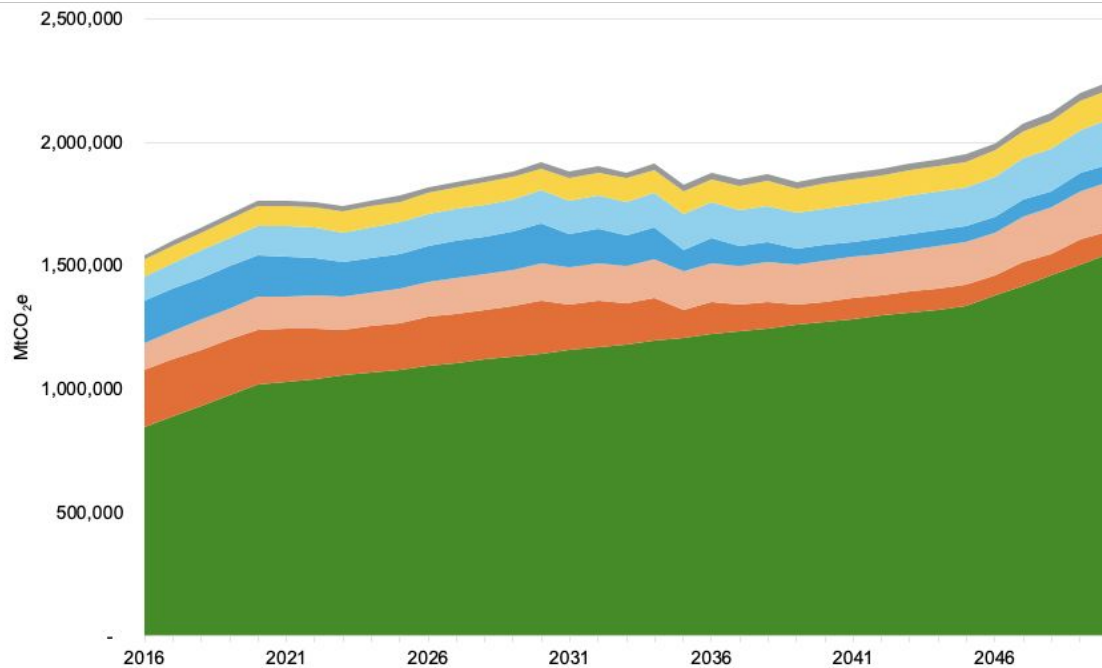


# Pessimistic Baseline Forecast



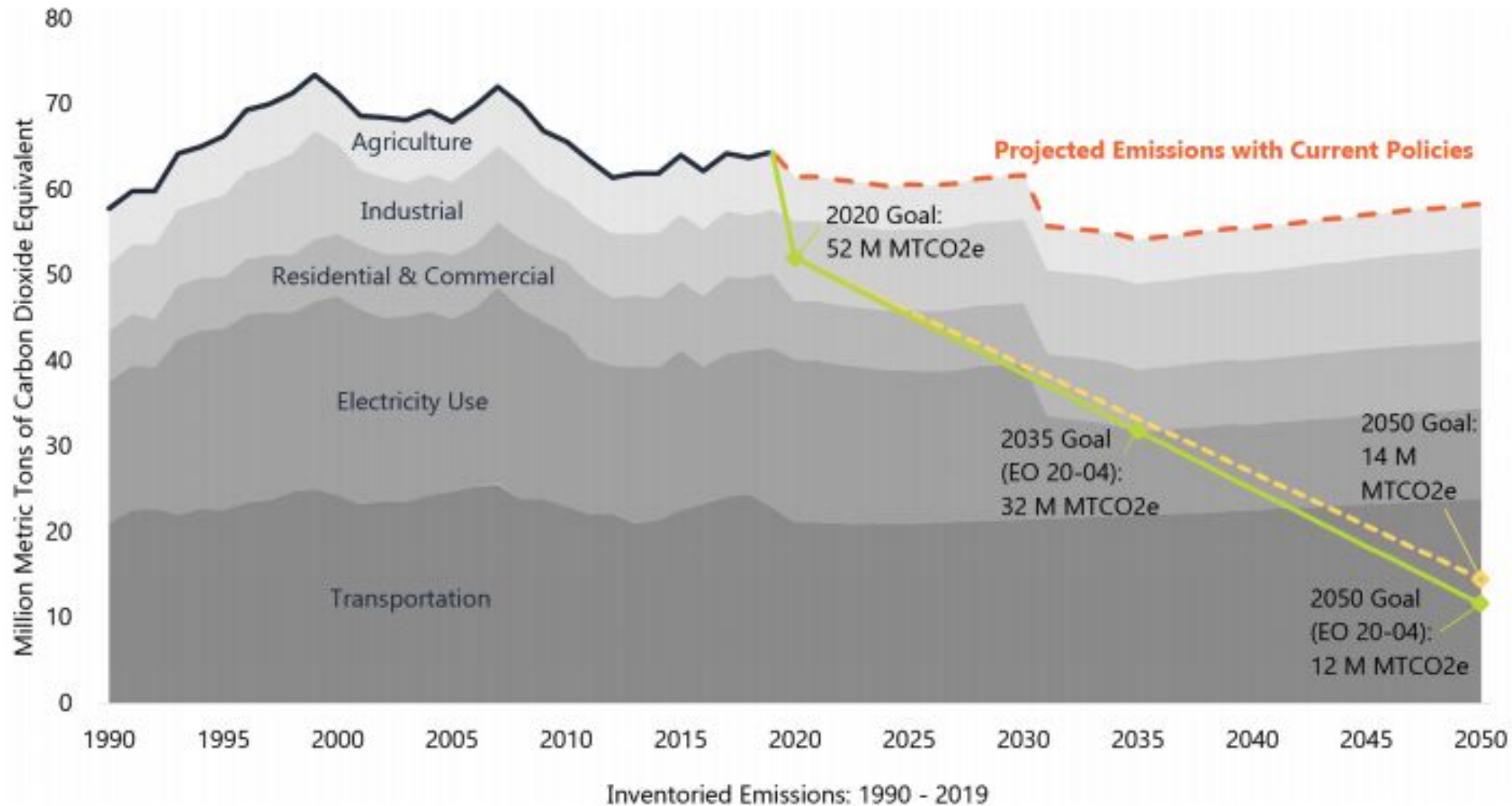
31% net GHG increase from 2016 by 2050

# Pessimistic Baseline Forecast



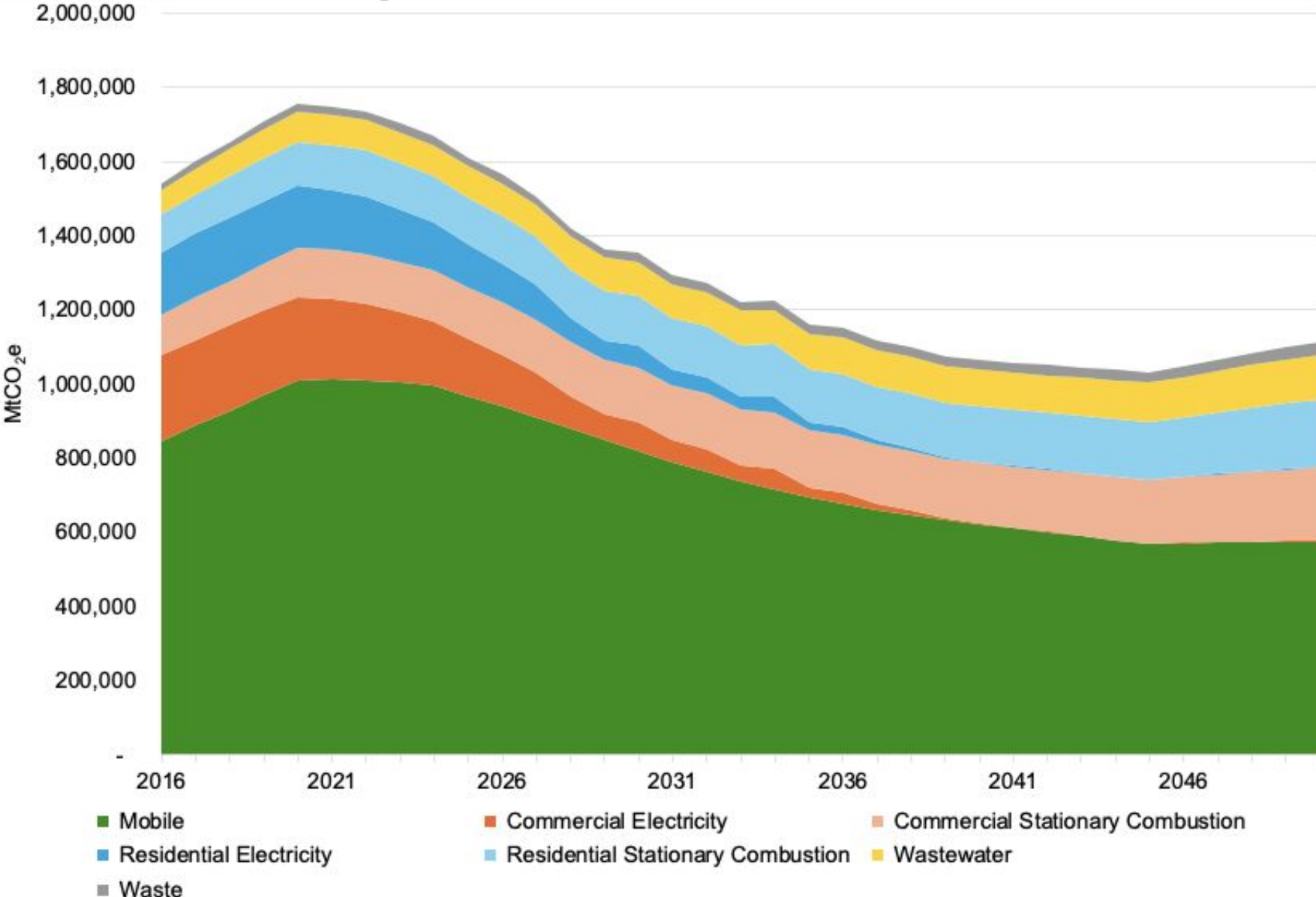
- Portland State University population growth rate
- Mobile
  - No mile-per-gallon improvement on on-road vehicles
  - Electric vehicle adoption remains at current levels
  - No technological improvement in heavy vehicles
- Electricity
  - Salem Electric maintains fuel mix
  - Portland General Electric achieves 2019 reference goal but not 2040 net-zero
- Natural gas
  - Grows with population

# Oregon's Emissions



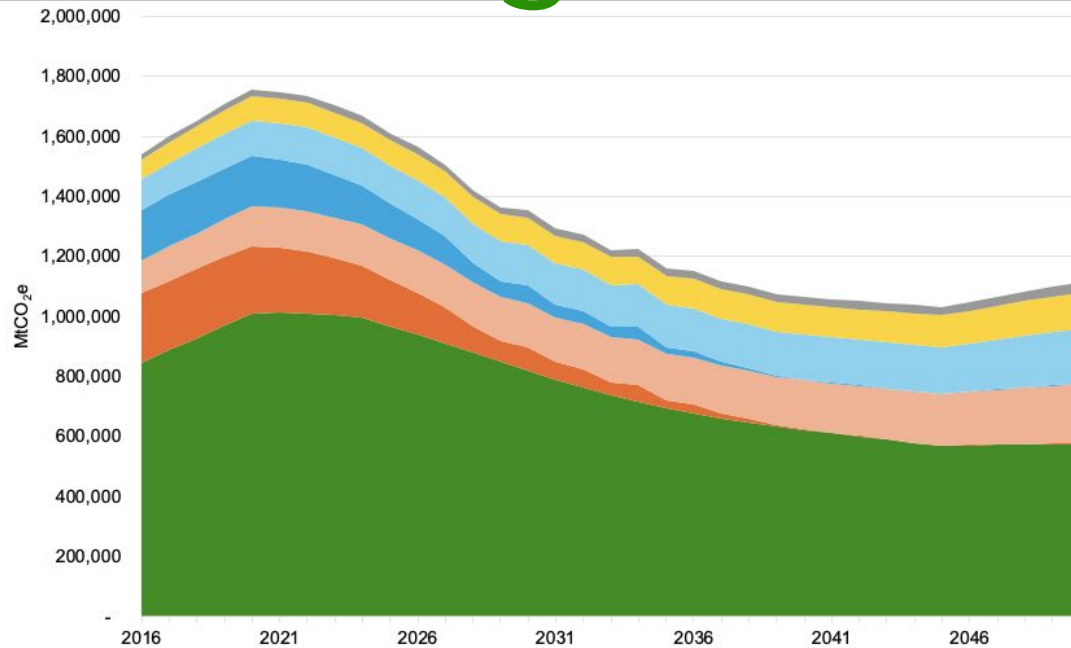


# Mid-Range Baseline Forecast



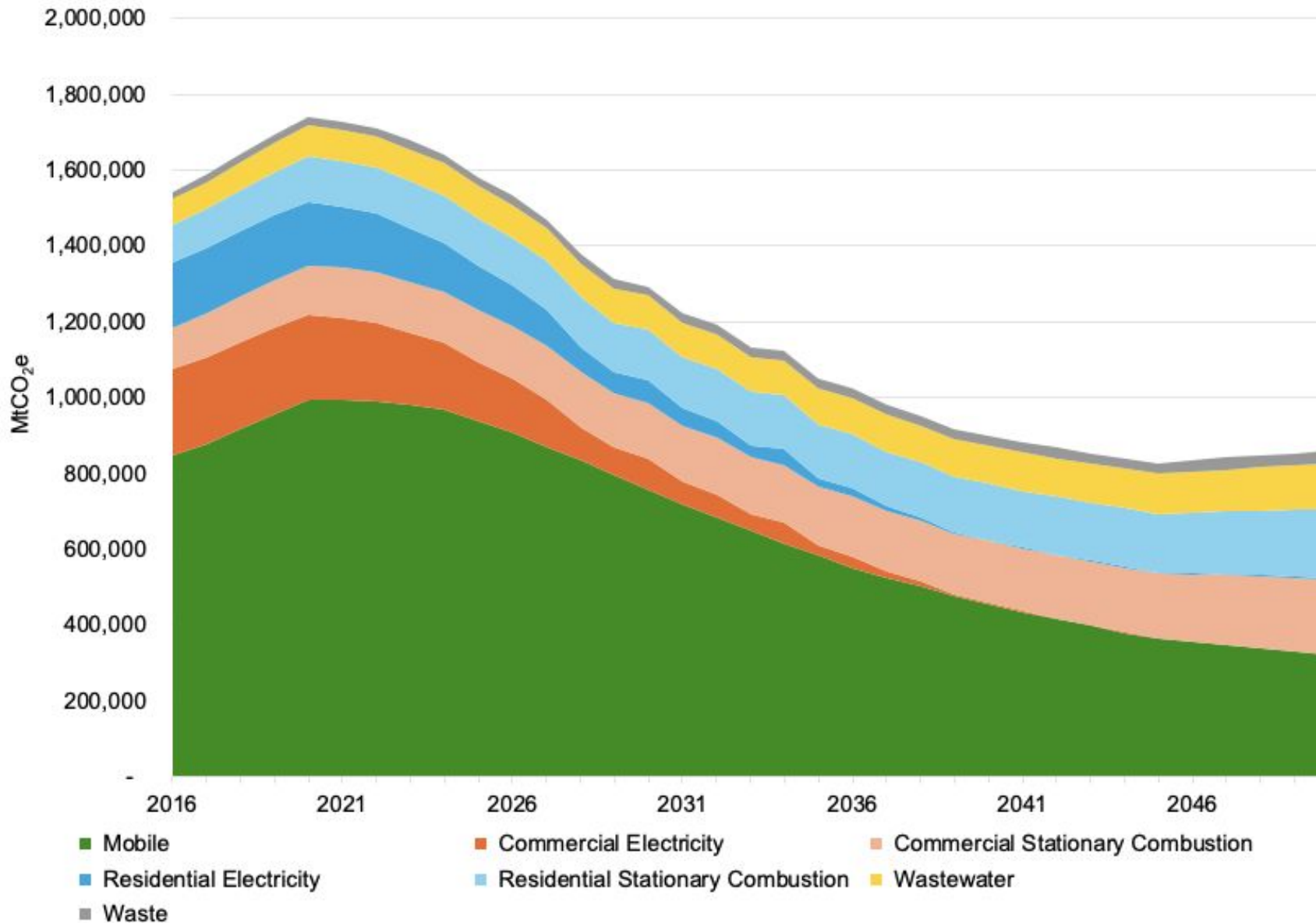
38% net GHG reduction from 2016 by 2050

# Mid-Range Baseline Forecast



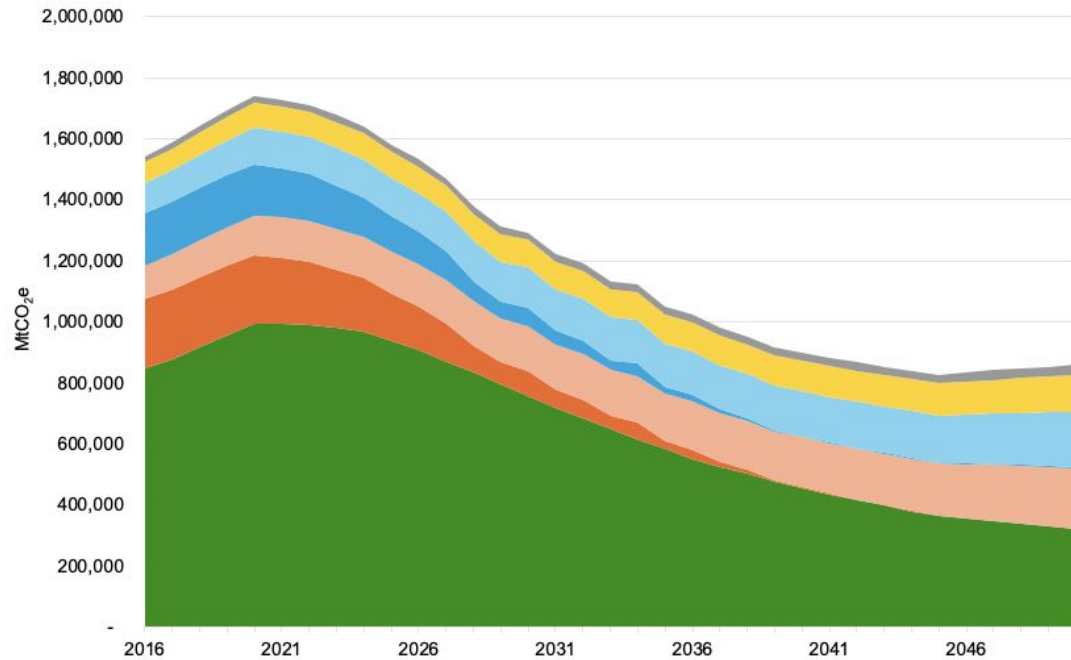
- Portland State University population growth rates
- Mobile
  - Annualized mile-per-gallon improvement on on-road vehicles
  - Low electric vehicle adoption
  - Annualized mile-per-gallon improvement in heavy vehicles
- Electricity
  - Salem Electric maintains fuel mix
  - Portland General Electric achieves 2040 net-zero
- Natural gas
  - Grows with population

# Optimistic Baseline Forecast



44% net GHG reduction from 2016 by 2050

# Optimistic Baseline Forecast

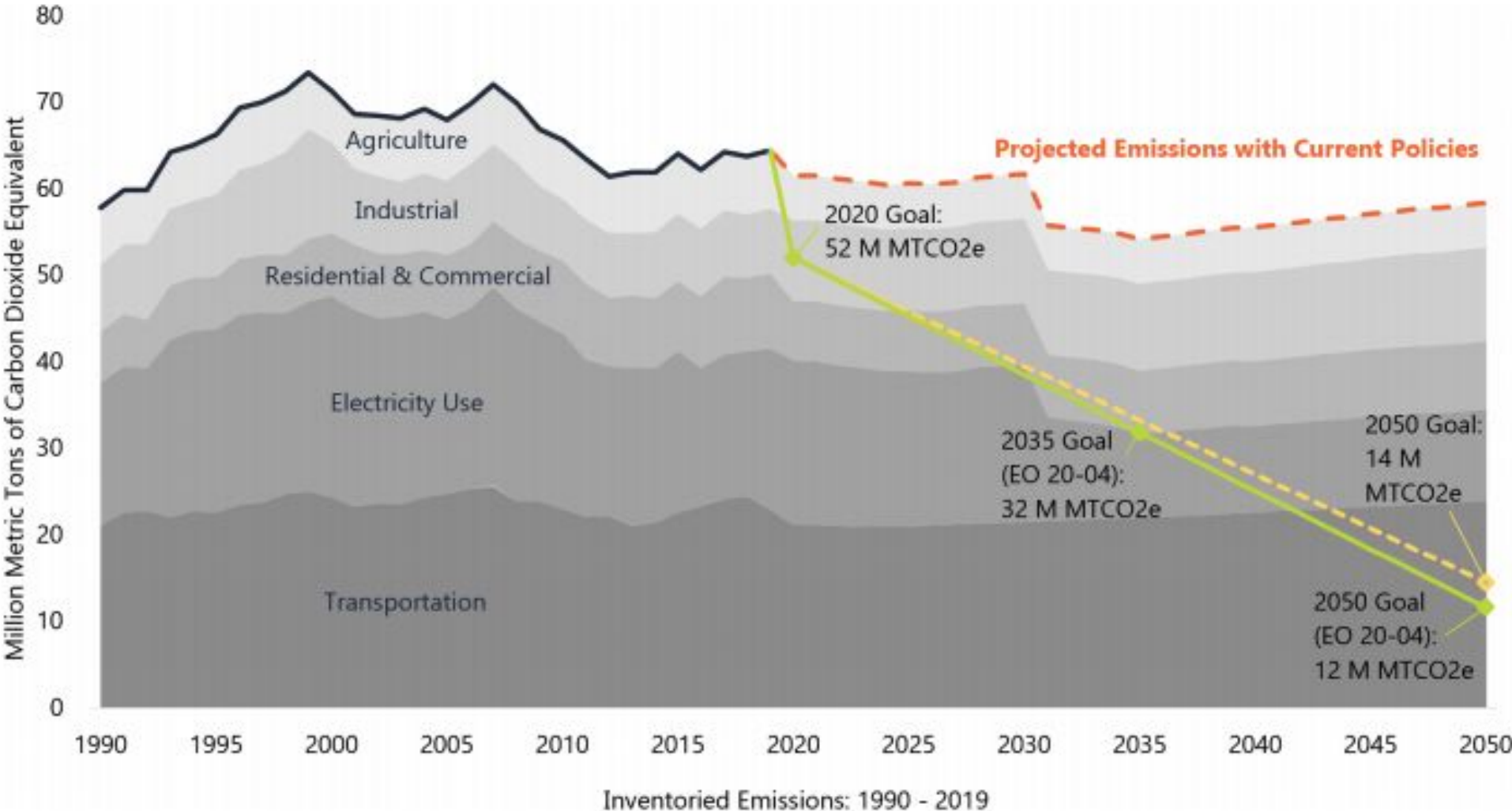


- Portland State University population growth rates
- Mobile
  - Annualized mile-per-gallon improvement on on-road vehicles
  - High electric vehicle adoption
  - Annualized mile-per-gallon improvement in heavy vehicles
- Electricity
  - Salem Electric maintains fuel mix
  - Portland General Electric achieves 2040 net-zero
- Natural gas
  - 20% energy efficiency improvements

# Forecast Discussion

- **Pessimistic Baseline Forecast** (31% increase) - Likely pushing the boundaries of what is possible
- **Optimistic Baseline Forecast** (44% decrease)- Doesn't include technological innovations and breakthroughs

# Forecast Discussion




# Target Scenario Projections



# Target Scenario Projections

## Scenarios Modeled

- Double EV rate from current projection
  - Quadruple bus ridership
  - Reduce external commuter VMT by 40% per capita
  - Reduce internal VMT by 10% per capita
  - Decouple natural gas emissions from growth, reduce carbon intensity
  - Improve average building efficiency (5% “now”, 10% by 2050)
  - Maximize onsite renewables (offset 90% of electricity on new construction)
  - Adopt a fossil-fuel-free public fleet
  - Minimize emissions from waste disposal
  - Maximize carbon sequestration
- 



# Target Scenario Projections

## Scenarios Modeled

- Double EV rate from current projection

Year	EV Adoption Rate*	Target
2016	1%	1%
2020	3%	3%
2025	8%	16%
2030	24%	48%
2035	43%	86%
2040	54%	100%
2045	65%	100%
2050	76%	100%

EV's purchased as a percentage of that year's total purchases

# Target Scenario Projections

## Scenarios Modeled

### → Quadruple bus ridership

Mode Split	2017	2043
Vehicle	85%	85%
Bus	1%	1%
Parknride	0%	0%
Walk	9%	10%
Bike	1%	1%
School Bus	3%	3%

RTSP mode split



# Target Scenario Projections

## Scenarios Modeled

- Reduce external commuter VMT by 40% per capita

4,200 miles per capita → 2,500 miles per capita

- Reduce internal VMT by 10% per capita

2,800 miles per capita → 2,500 miles per capita

Combined impact = approximately 30% reduction in per capita VMT



# Target Scenario Projections

## Scenarios Modeled

- Decouple natural gas emissions from growth, reduce carbon intensity
  - 85/15 Natural gas/Hydrogen generated from clean sources
  - No additional growth in activity data (new use) past 2025
  - Efficiency improvements, up to 47% depending on forecast



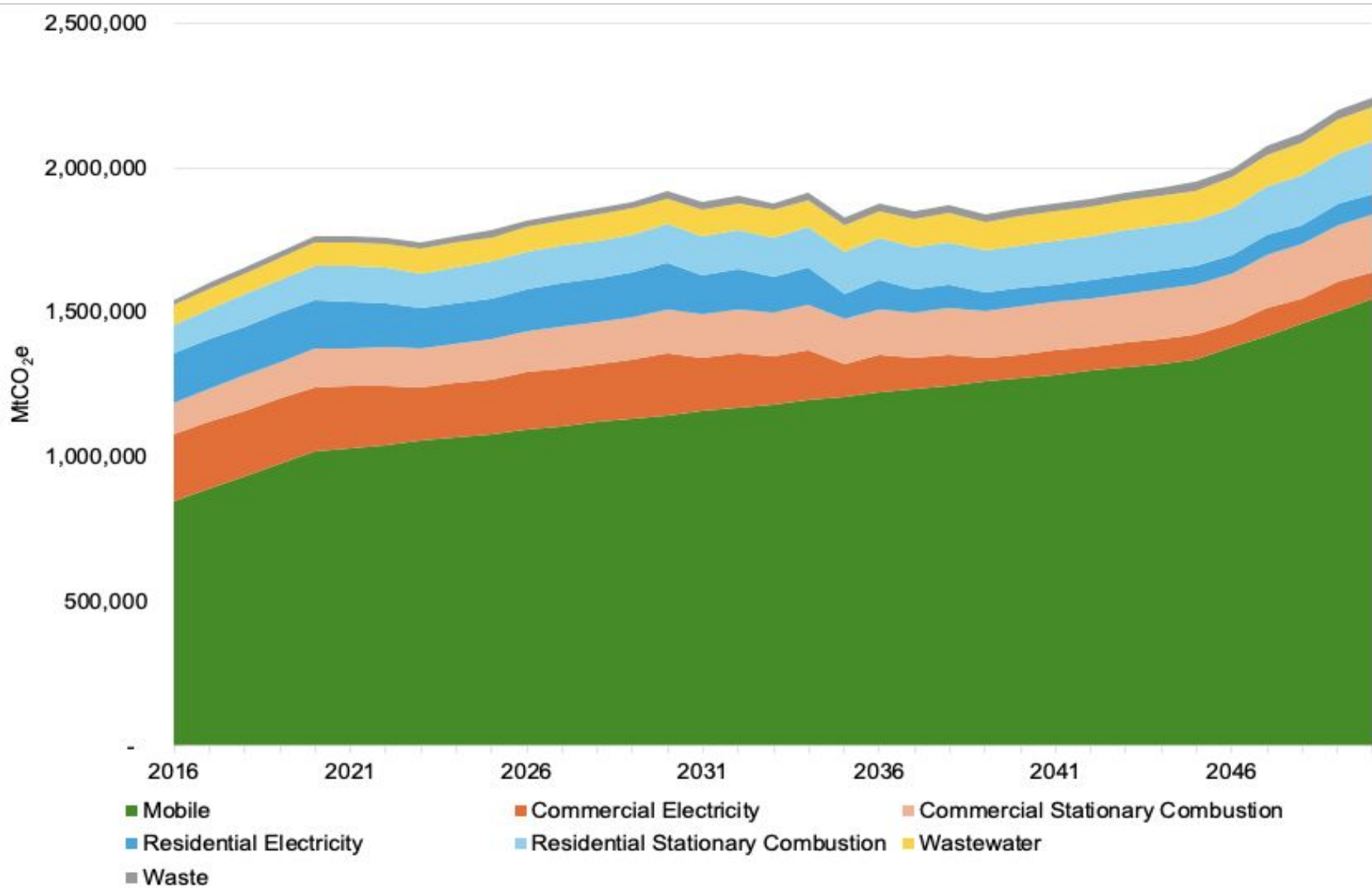
# Target Scenario Projections

## Scenarios Modeled

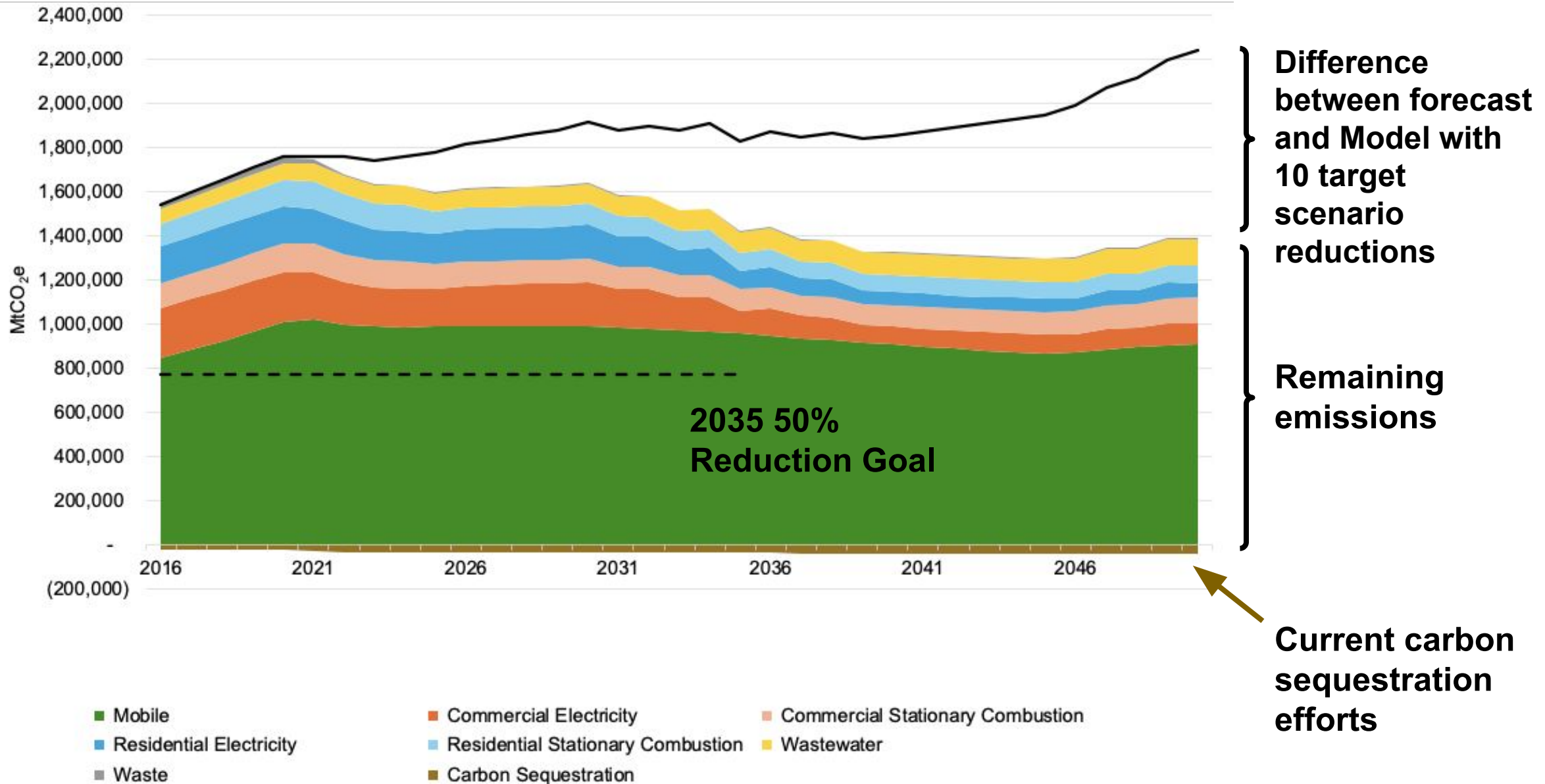
- Improve average building efficiency (5% “now”, 10% by 2050)
  - 5% average improvement by 2025
  - 10% average improvement by 2035
- Maximize onsite renewables (offset 90% of electricity on new construction)
- Adopt a fossil-fuel-free public fleet
- Minimize emissions from waste disposal
  - Shifting from Covanta to landfill
- Maximize carbon sequestration
  - At least maintaining tree canopy
  - Increasing carbon sequestration of managed land (e.g. parks)
  - Municipal composting



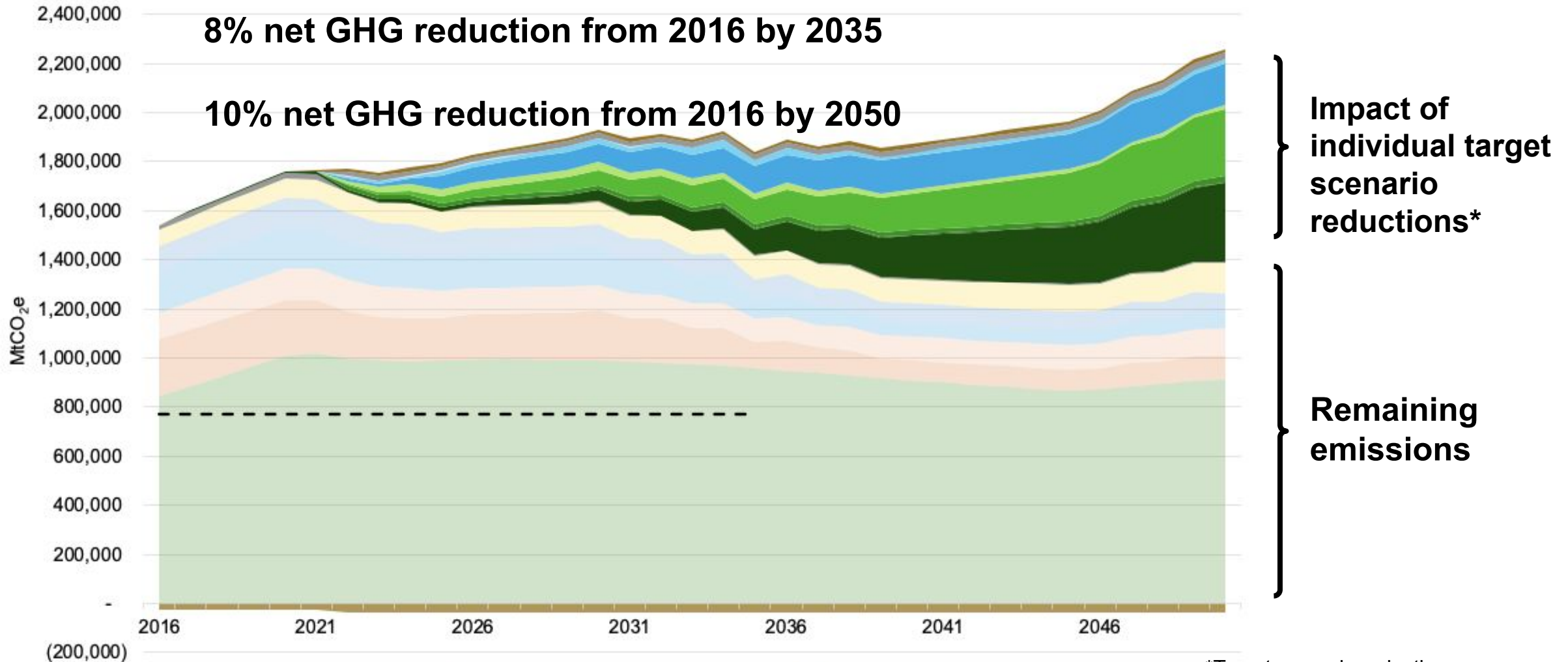
# Pessimistic Baseline Forecast



# Pessimistic + Salem Actions



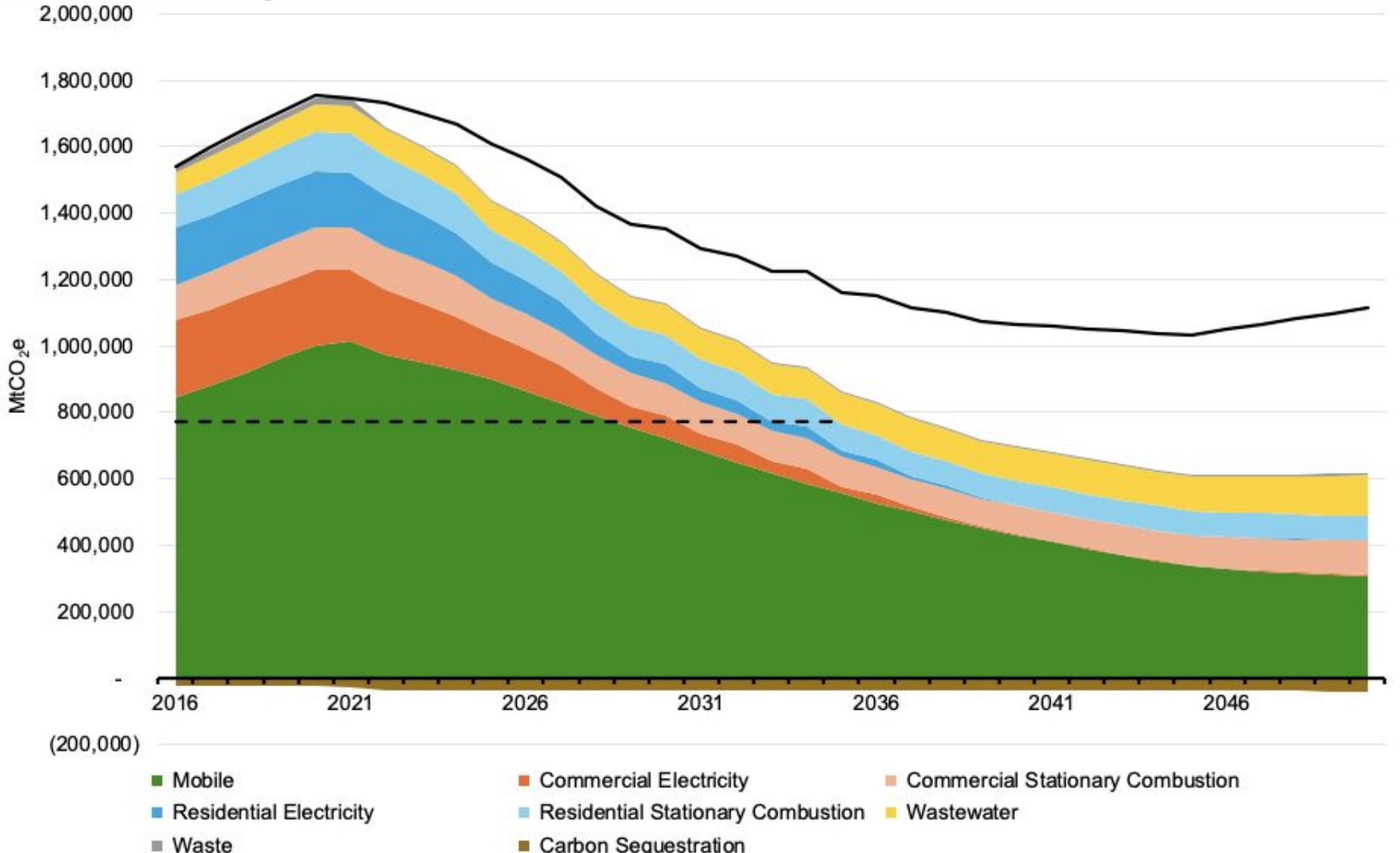
# Pessimistic + Salem Actions



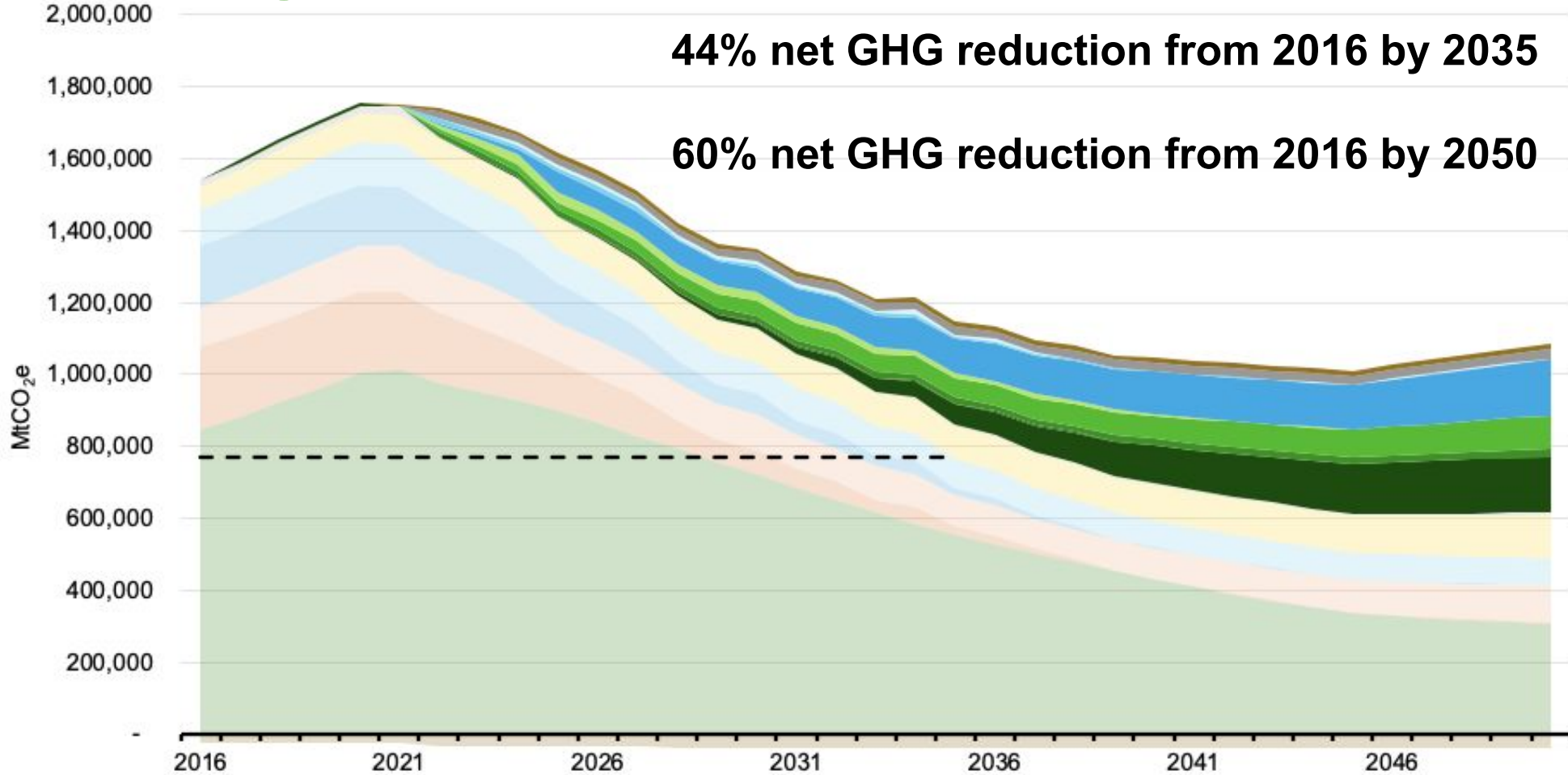
\*Target scenario reductions are interdependent and impact should not necessarily be inferred as relative impact may change if one or more other reductions is not achieved



# Mid-Range + Salem Actions

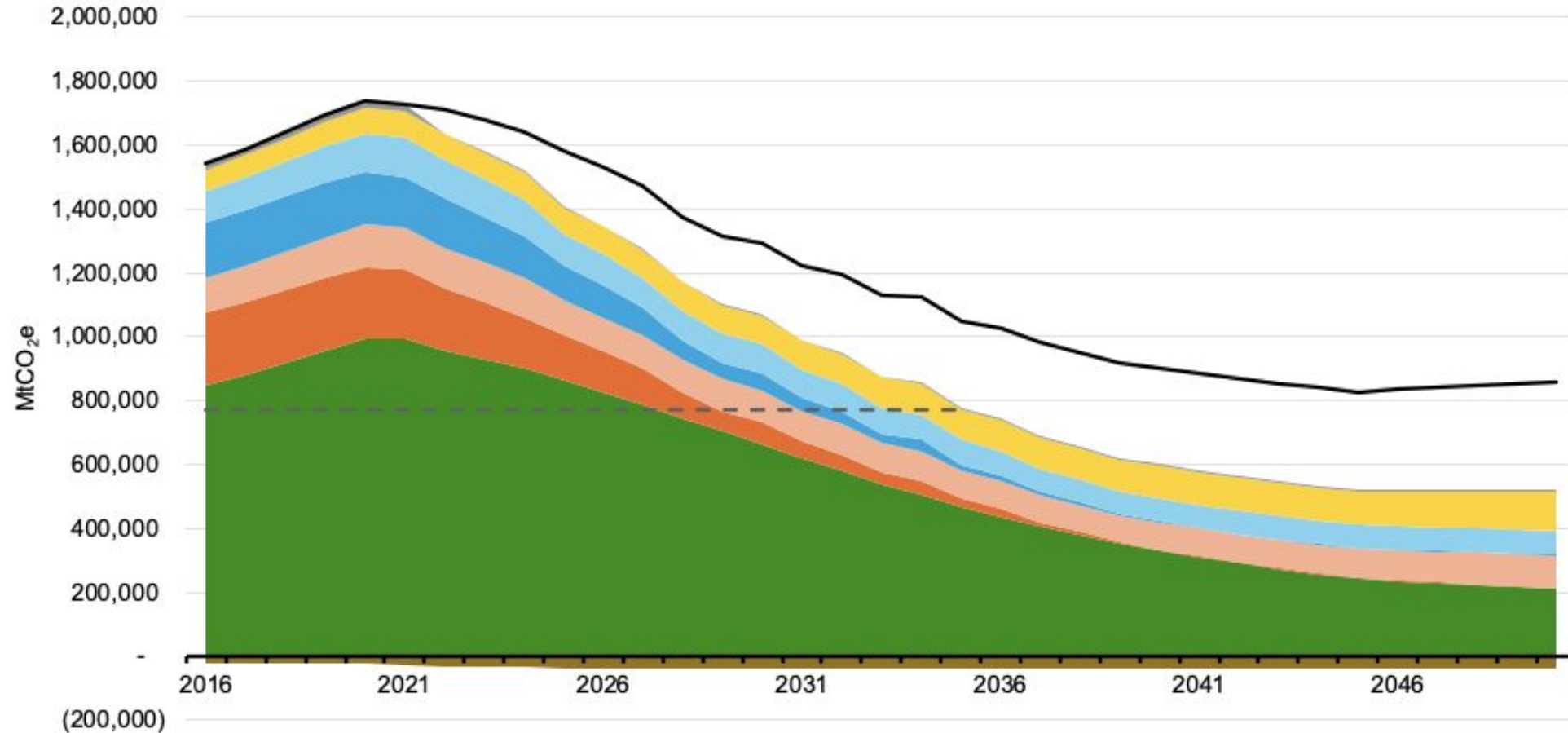


# Mid-Range + Salem Actions



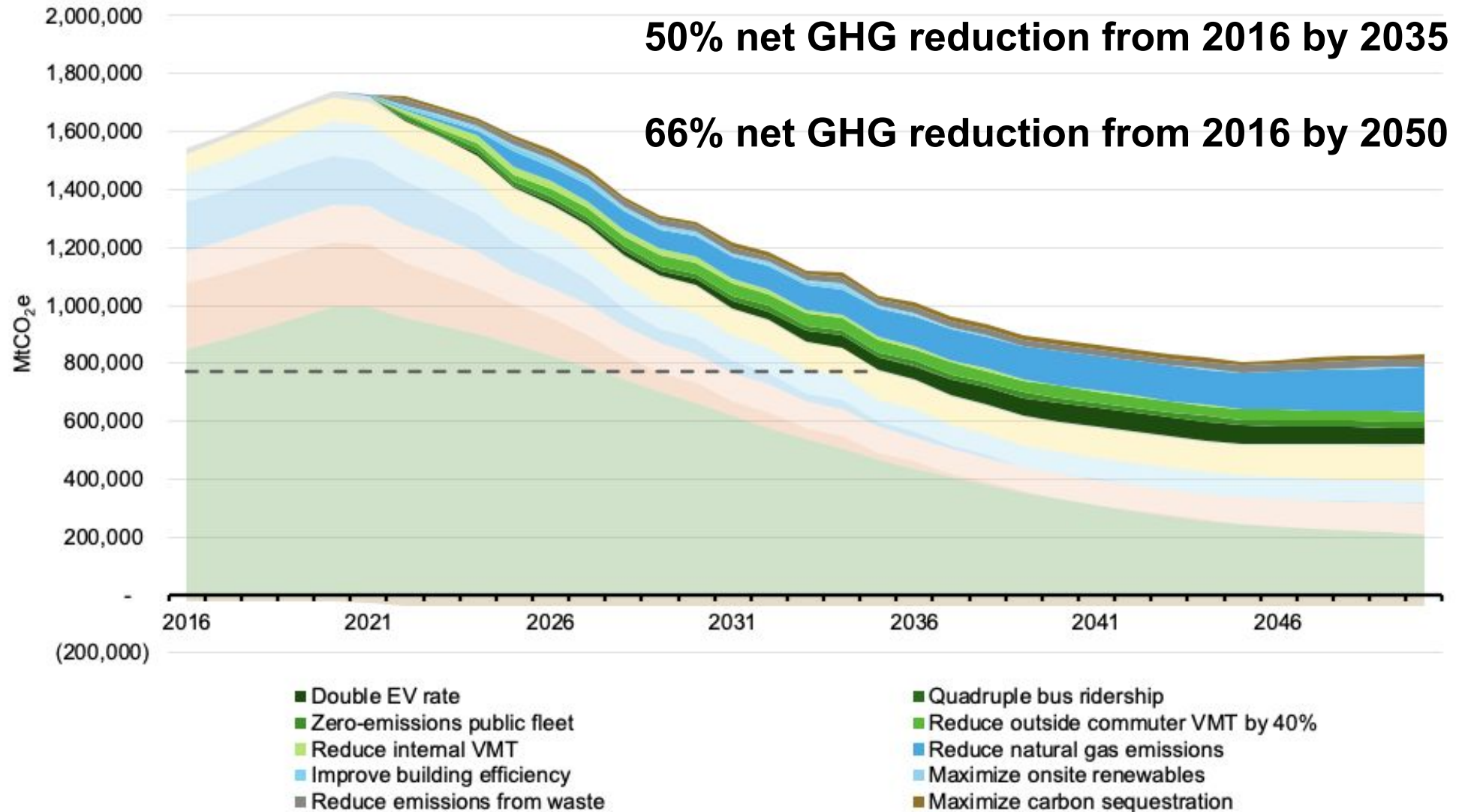
- Double EV rate
- Reduce outside commuter VMT by 40%
- Improve building efficiency
- Maximize carbon sequestration
- Quadruple bus ridership
- Reduce internal VMT
- Maximize onsite renewables
- Zero-emissions public fleet
- Reduce natural gas emissions
- Reduce emissions from waste

# Optimistic + Salem Actions

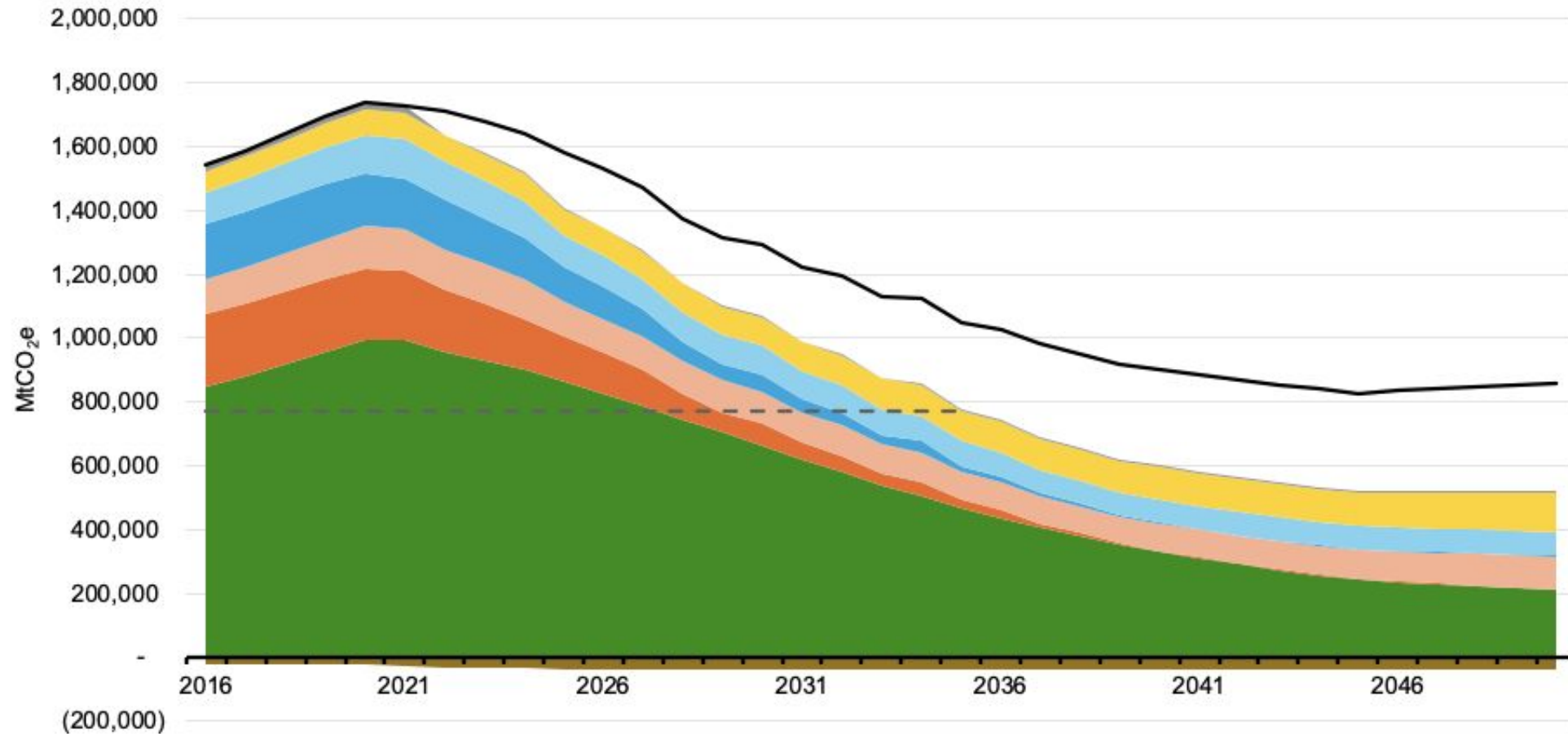


- Mobile
- Commercial Electricity
- Commercial Stationary Combustion
- Residential Electricity
- Residential Stationary Combustion
- Wastewater
- Waste
- Carbon Sequestration

# Optimistic + Salem Actions

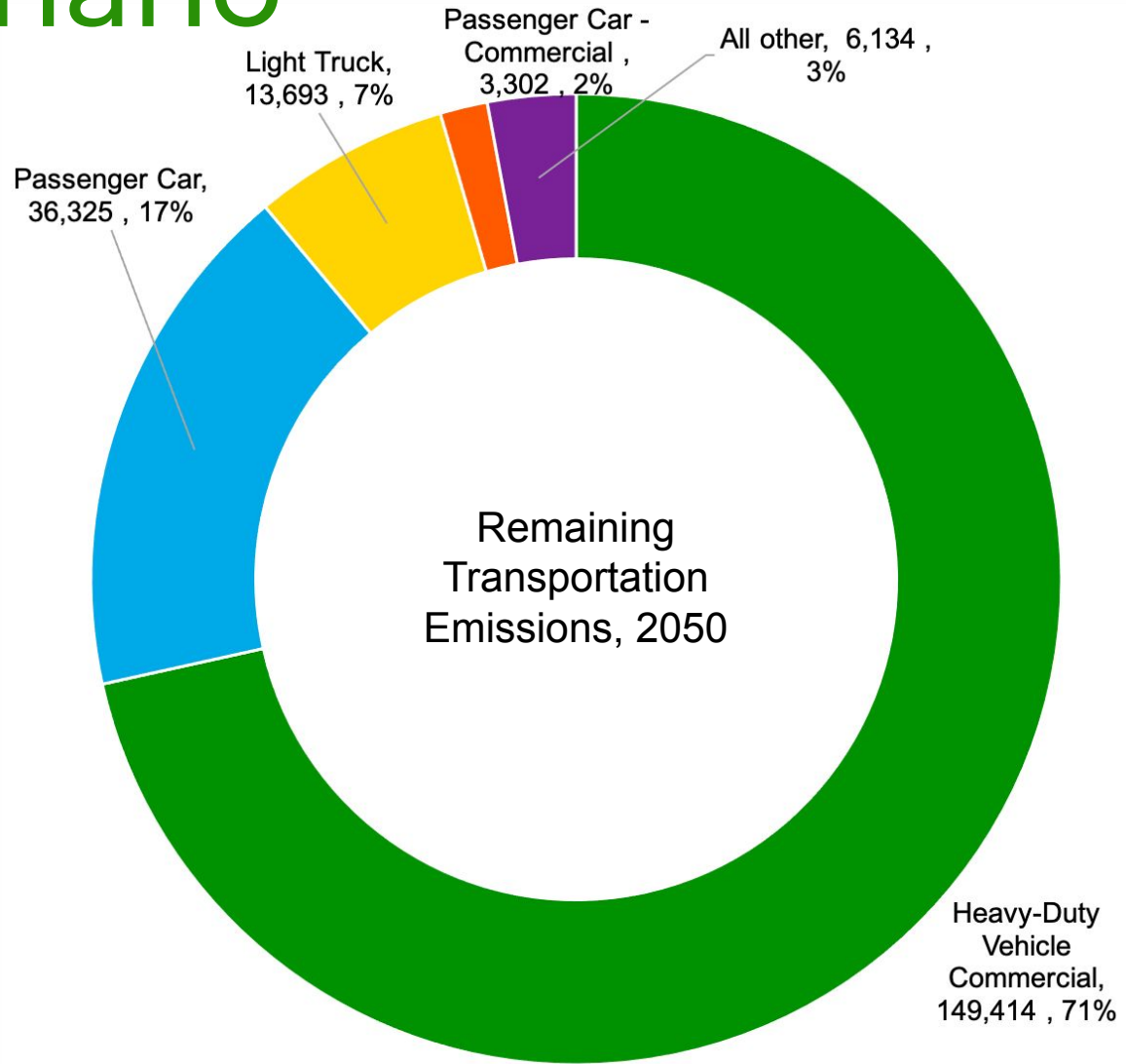
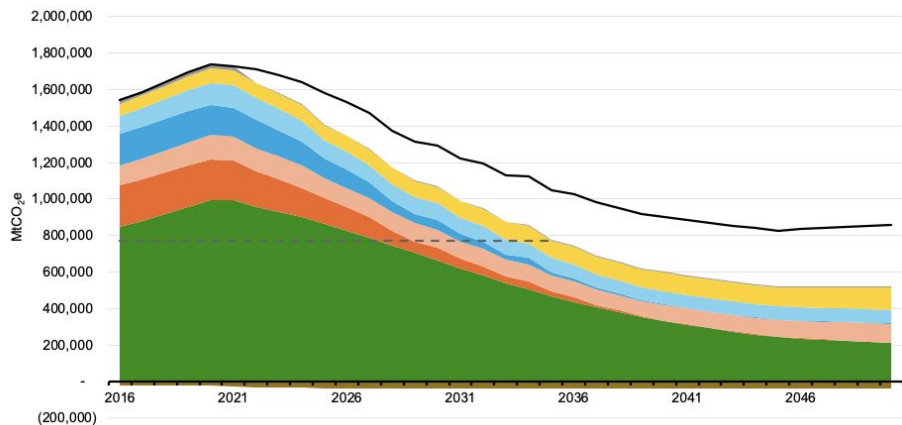


# What's left?



- Mobile
- Commercial Electricity
- Commercial Stationary Combustion
- Residential Electricity
- Residential Stationary Combustion
- Wastewater
- Waste
- Carbon Sequestration

# 2050 Transportation Emissions - Optimistic Scenario



# Salem's Goal in Context

- Target Scenarios produced 10-66% reduction in GHG emissions depending on forecast assumptions
- Certain emissions “baked in”
- Paris Agreement alignment requires USA net reduction of approximately 80% by 2050

# How do we Get to Net-Zero?

- Technological solutions that cannot yet be quantified that may be important by 2050
- Additional actions that may be infeasible today
- Offsets as a tool in the toolbox



# Key Takeaways

- Transportation emissions are the biggest piece of the pie, and fully eliminating these emissions is not feasible yet
- Gas and electricity utility goals are essential partners to Salem's success
- Salem's goal of 50% reduction by 2035 is currently achievable
- Reaching Salem's goal of 100% reduction by 2050 will be challenging to achieve; will be dependent on many variables including technology, behavioral changes to eliminate fossil fuel usage

# Next Steps

- Feedback survey on CAP strategies
- April 7th Task Force Workshop

# Questions?

**Brian Harmon**

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# Assumptions

## Population

Year	Population Salem
2016	162,060
2020	194,692
2025	206,712
2030	219,061
2035	231,260
2040	243,302
2045	255,373
2050	296,470

Derived from Portland State University [population estimates of Salem/Keizer UGB](#)

## Utility Emissions Factors

Year	PGE 2019 IRP Goal (MtCO <sub>2</sub> e/Mwh)	PGE 2040 Goal* (MtCO <sub>2</sub> e/Mwh)	Salem Electric (MtCO <sub>2</sub> e/Mwh)	NW Natural Efficiency*	NW Natural Efficiency (High Efficiency)*
2016	0.37	0.37	0.01	0%	0%
2020	0.3	0.30	0.01	0%	0%
2025	0.24	0.20	0.01	3%	12%
2030	0.26	0.09	0.01	6%	17%
2035	0.13	0.03	0.01	10%	43%
2040	0.09	0	0.01	11%	47%
2045	0.09	0	0.01	11%	47%
2050	0.08	0	0.01	11%	47%

\*Straight-line relationship used to infer change in time between two point references. Actual change through time highly likely to differ from data presented

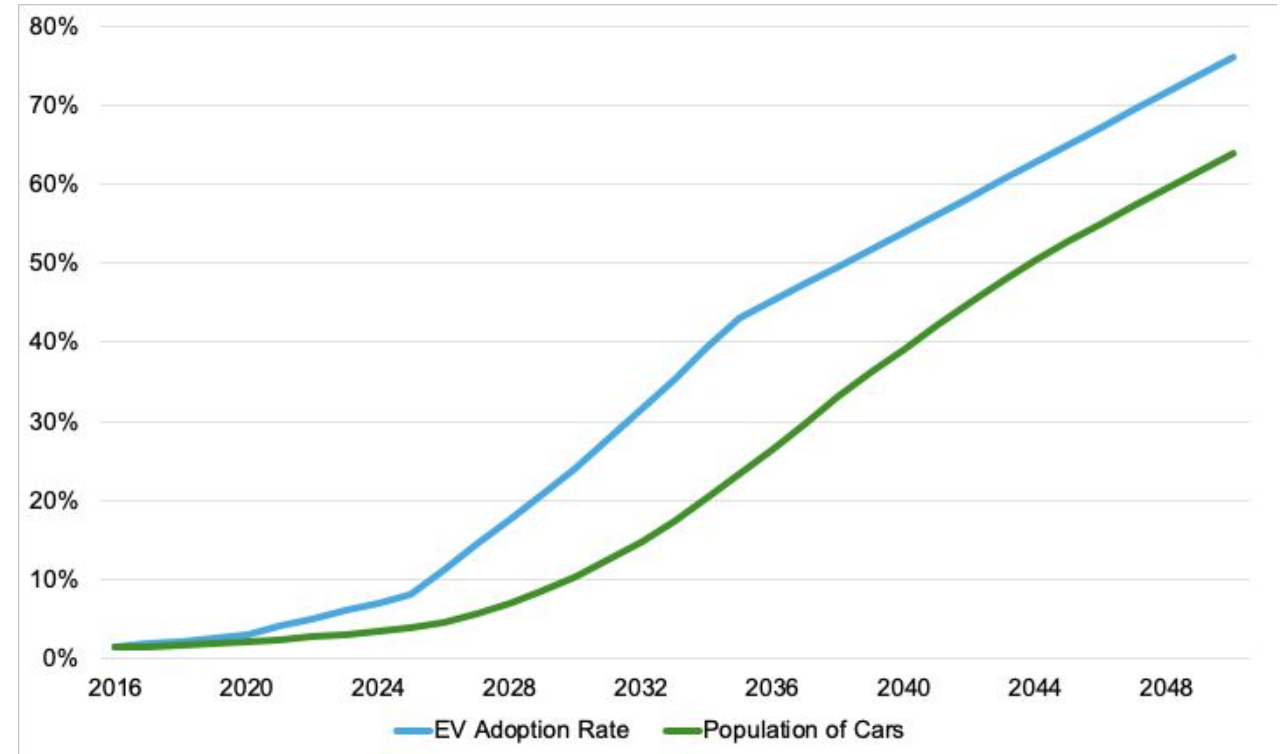
Emissions Factors and efficiency improvements provided by utility companies

# Assumptions

## Transportation

Year	MPG Efficiency Improvements	EV Adoption Rate*	Heavy Truck Efficiency
2016	25	1%	0%
2020	26	3%	0%
2025	40	8%	8%
2030	49	24%	17%
2035	57	43%	27%
2040	66	54%	36%
2045	74	65%	46%
2050	83	76%	55%

## EV Adoption Rate Lag



\*EV adoption rate exceeds percentage of EVs on road because of an assumed 12-year vehicle life cycle.

[MPG improvements](#), [EV rates](#), [Heavy trucking efficiency](#)