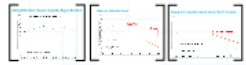


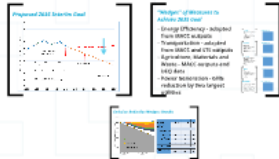
# Meeting of the Oregon Global Warming Commission

2015 Report to the Legislature

## Emissions: Historical and Projection



## Proposed 2035 Goal and Emission Reduction Measures



## Today's topics

- Review first draft material from April meeting
- Describe new material in current version
- Discuss next steps

## New Material: Effect of a Carbon Price?

Question: Can a carbon price (market) help reduce emissions faster to close the gap to meet our goal?

Approach: Similar to original PEI study for Oregon as a whole this study focuses on the 2015-2035 period and how a carbon price would affect emissions and how it compares to the current regulatory approach.

## Other changes in response to Commission feedback



## Next Steps...

Today, the Commission will consider additional legislative changes (drafted and revised) to the bill.

The Commission will also be asked to adopt the report and make additional changes to the bill as needed.

By September 20, the bill will be introduced and the Commission will be asked to take action on the bill.

Additional information and reports will be provided to the Commission.

Thank you for your participation in the Commission's work.



# Meeting of the Oregon Global Warming Commission

2015 Report to the Legislature

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**Proposed 2035 Decarbon Goal**

**"Wedges" of Measures to Achieve 2035 Goal**

- Energy Efficiency - adapted from MACC outputs
- Transportation - adapted from MACC and STE outputs
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Approach: Similar to original PSU study for Oregon as a whole (no sub-regions), but with new baseline emissions and fuel prices resulting from the emission reduction measures

### Other changes in response to Commission feedback

### Next Steps...

Today: 1) Commission review additional suggested language changes (received prior to today's meeting)

2) Commission vote on whether to adopt draft report  
May include additional language changes as discussed today

By September 25: Staff will finalize changes and formatting

September 28: Legislative staff presentation on Clean Power Plan and distribute Report to Legislative Committee Members

November Legislative Dept. Possible Report presentation to Committees



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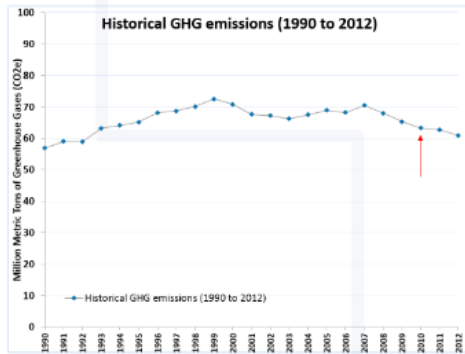
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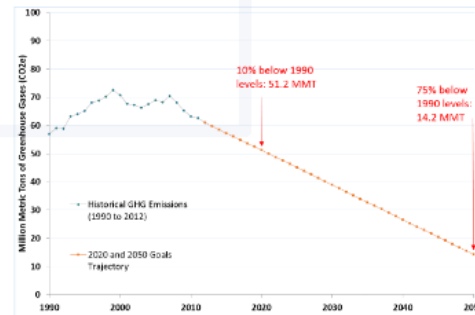


# Emissions: Historical and Projection

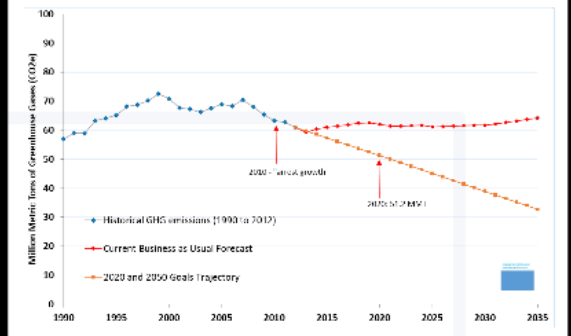
2010 GHG Goal: Arrest Growth, Begin Decline



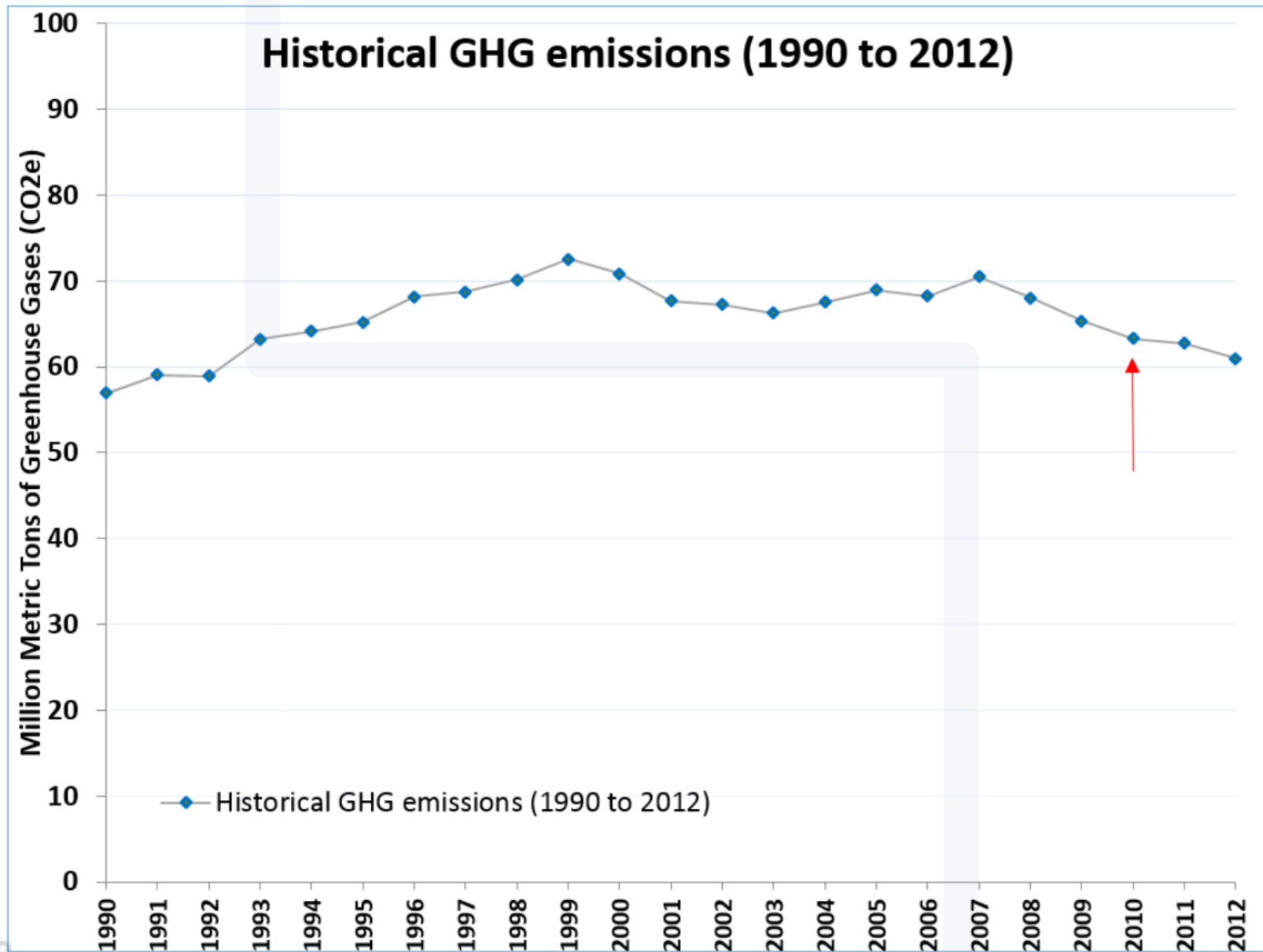
2020 and 2050 GHG Goals



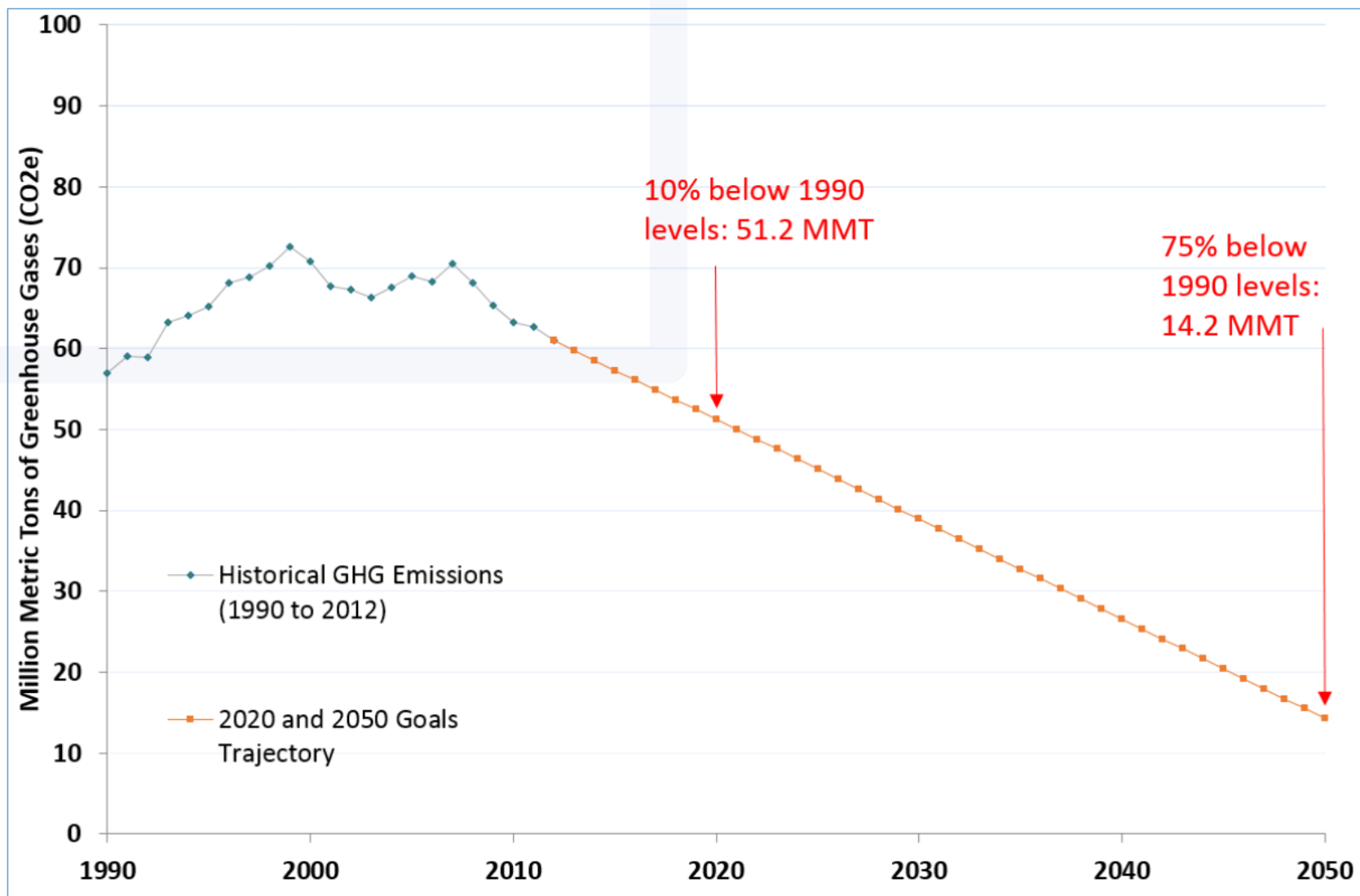
Oregon's Current Business As Usual ("BAU") Forecast



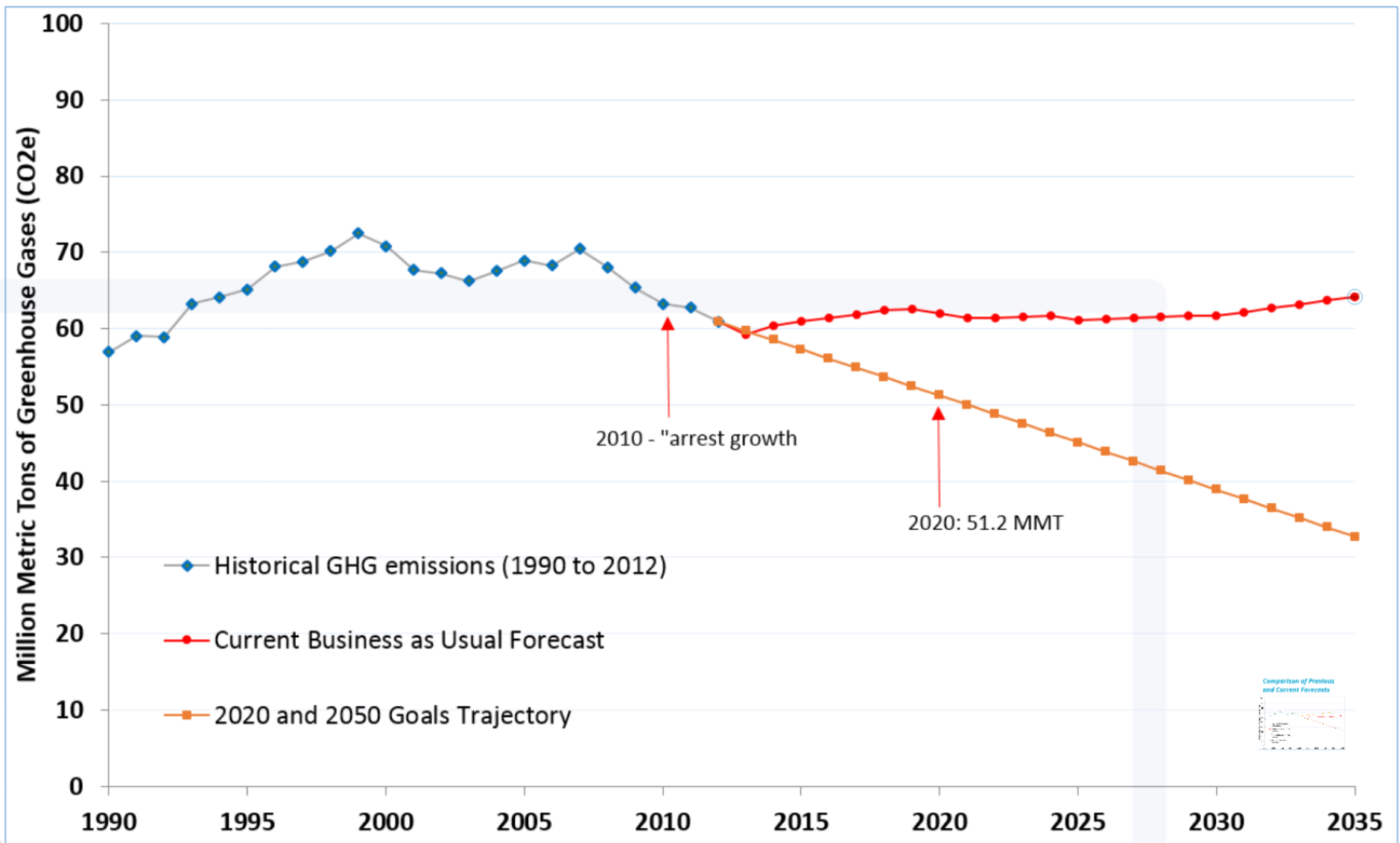
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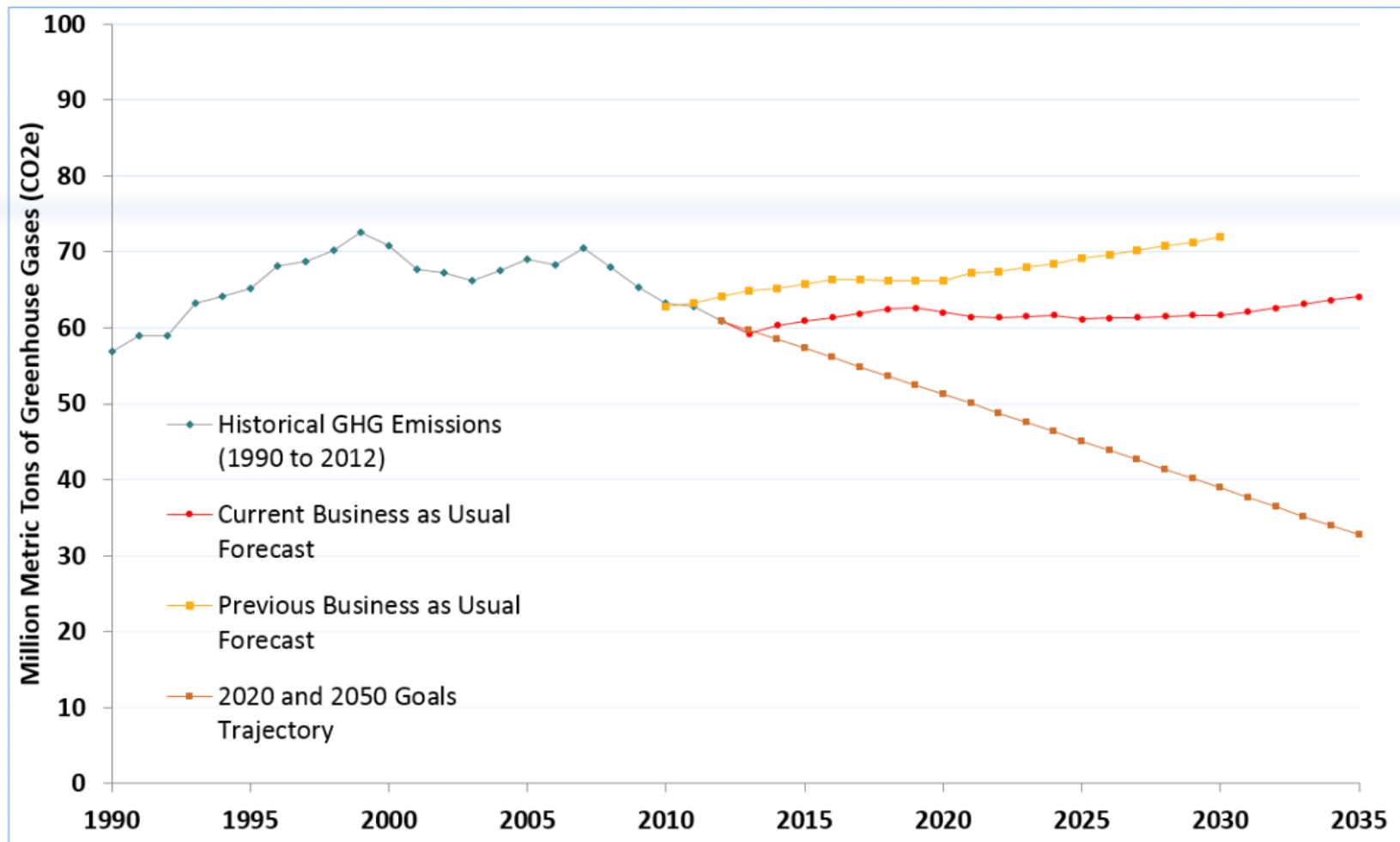




***Reminder: Now Included in the BAU Forecast...***

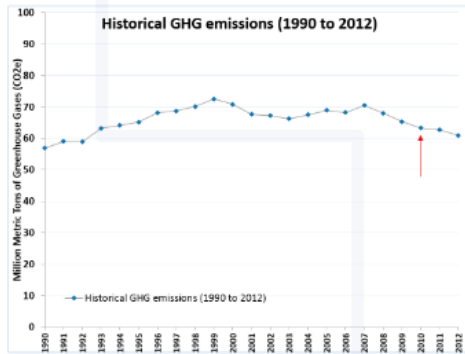
- **Effects of Oregon's RPS - using forecasts from utilities**
- **Boardman - current (as of last IRP) projection of what will occur**
- **Clean Fuels - estimate in-boundary emission reductions**
- **Fuel economy standards - incorporated into EPA's projection tool**

# Comparison of Previous and Current Forecasts

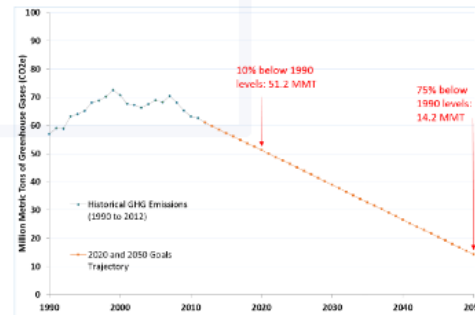


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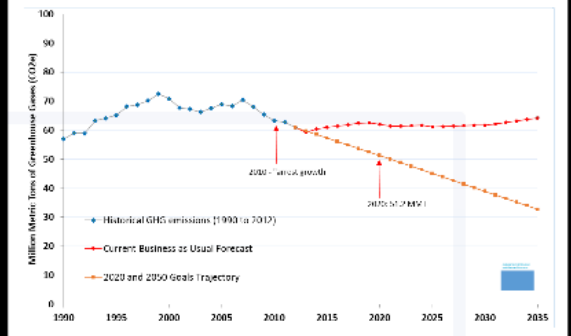
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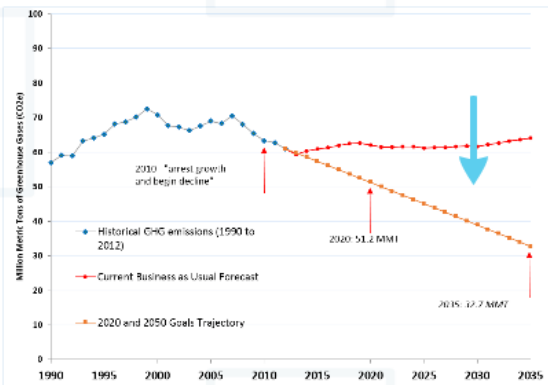


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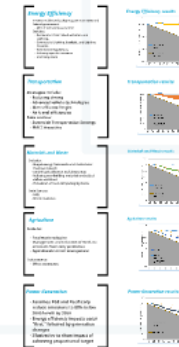
# Proposed 2035 Goal and Emission Reduction Measures

## Proposed 2035 Interim Goal

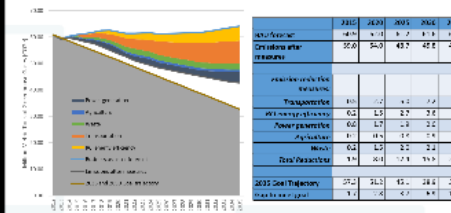


## "Wedges" of Measures to Achieve 2035 Goal

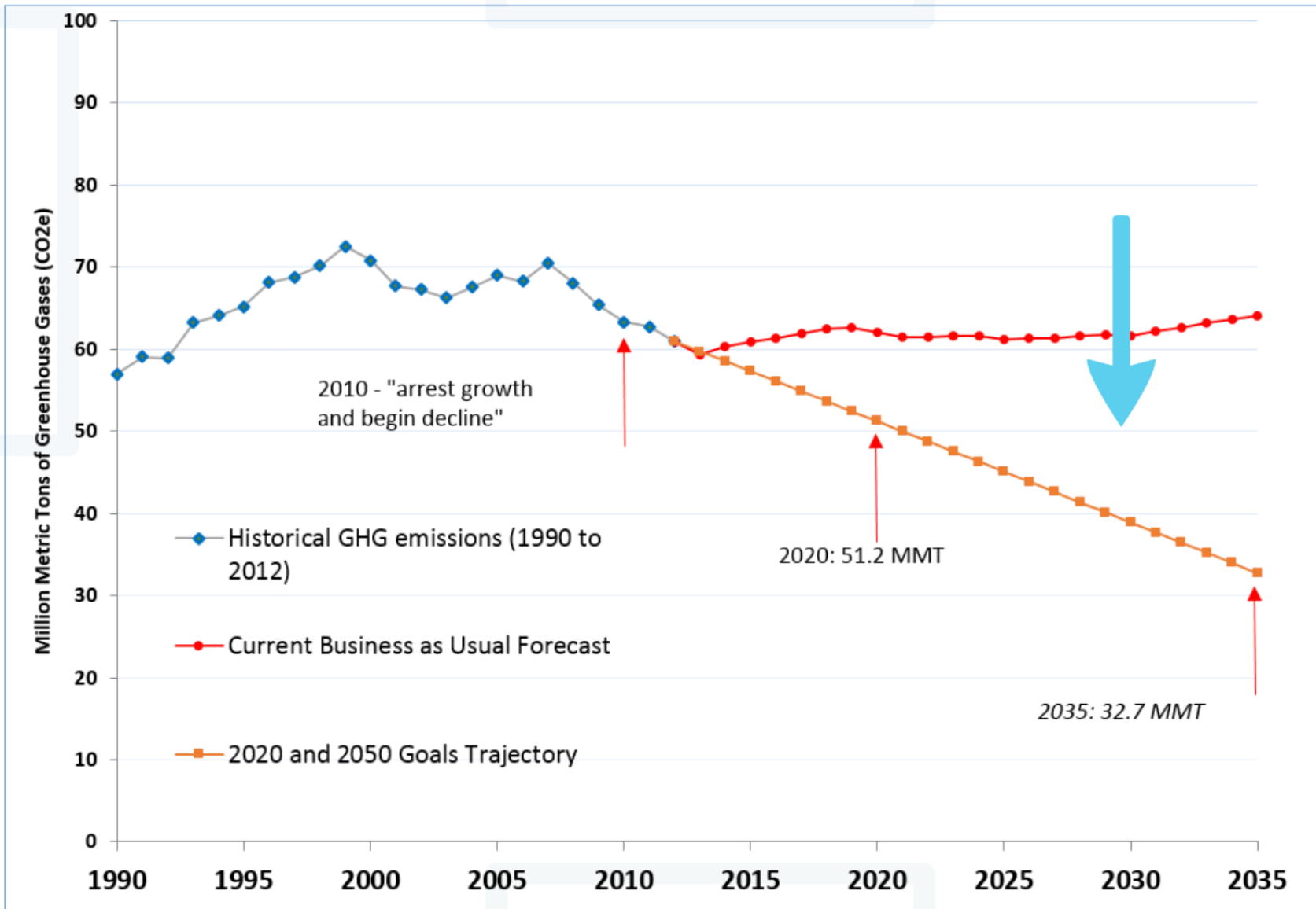
- Energy Efficiency - adapted from MACC outputs
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## Emission Reduction Wedges: Results



# Proposed 2035 Interim Goal



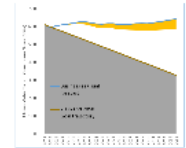
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## Energy Efficiency

Assumes additional policy support from state and federal government  
- 80% of achievable potential  
Includes:  
- Residential HVAC, Weatherization, and Lighting  
- Commercial Lighting, Daylight, and Lighting Controls  
- Commercial Appliances  
- Industry-specific measures  
- and many more

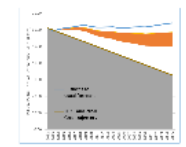
## Energy Efficiency results



## Transportation

Strategies include:  
- Reducing driving  
- Advanced vehicle technologies  
- More efficient freight  
- Air travel efficiencies  
Data sources:  
- Statewide Transportation Strategy  
- MACC measures

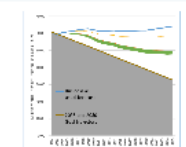
## Transportation results



## Materials and Waste

Includes:  
- Biogas energy from waste and wastewater treatment plants  
- Landfill gas collection and destruction  
- Reducing new building materials embedded carbon emissions  
- Prevention of food and packaging waste  
Data Sources:  
- DEQ  
- MACC measures

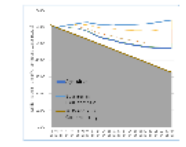
## Materials and Waste results



## Agriculture

Includes:  
- Food waste reduction  
- Management and reduction of methane emissions from dairy production  
- Agricultural nutrient management  
Data source:  
- MACC measures

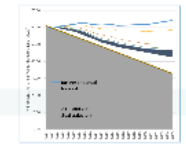
## Agriculture results



## Power Generation

- Assumes PGE and PacifiCorp reduce emissions to 80% below 2005 levels by 2050  
- Energy efficiency impacts occur "first," followed by generation changes  
- Illustrative to show impact of achieving proportional target

## Power Generation results



# *Energy Efficiency*

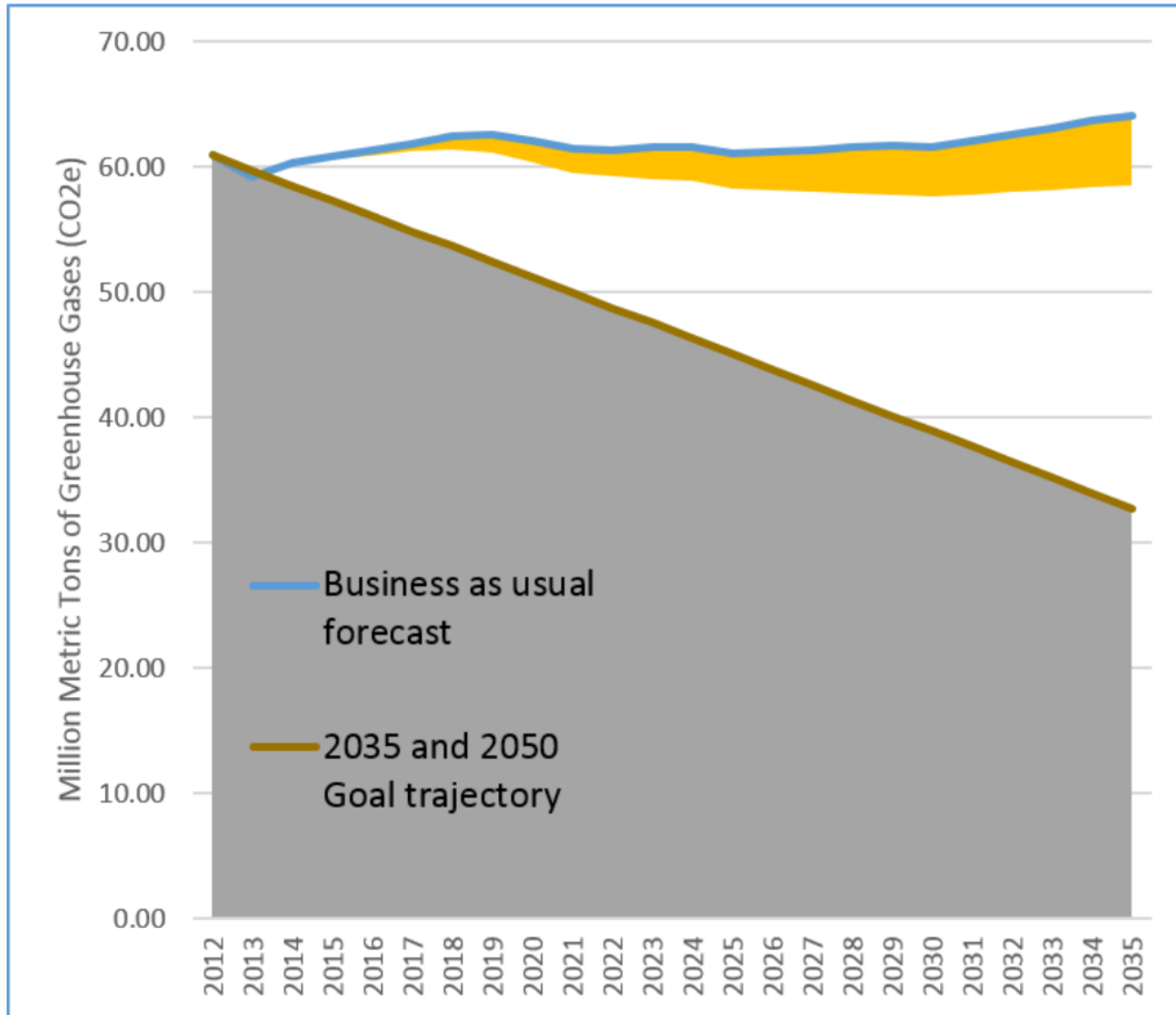
**Assumes additional policy support from state and federal government**

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# Energy Efficiency results





# *Transportation*

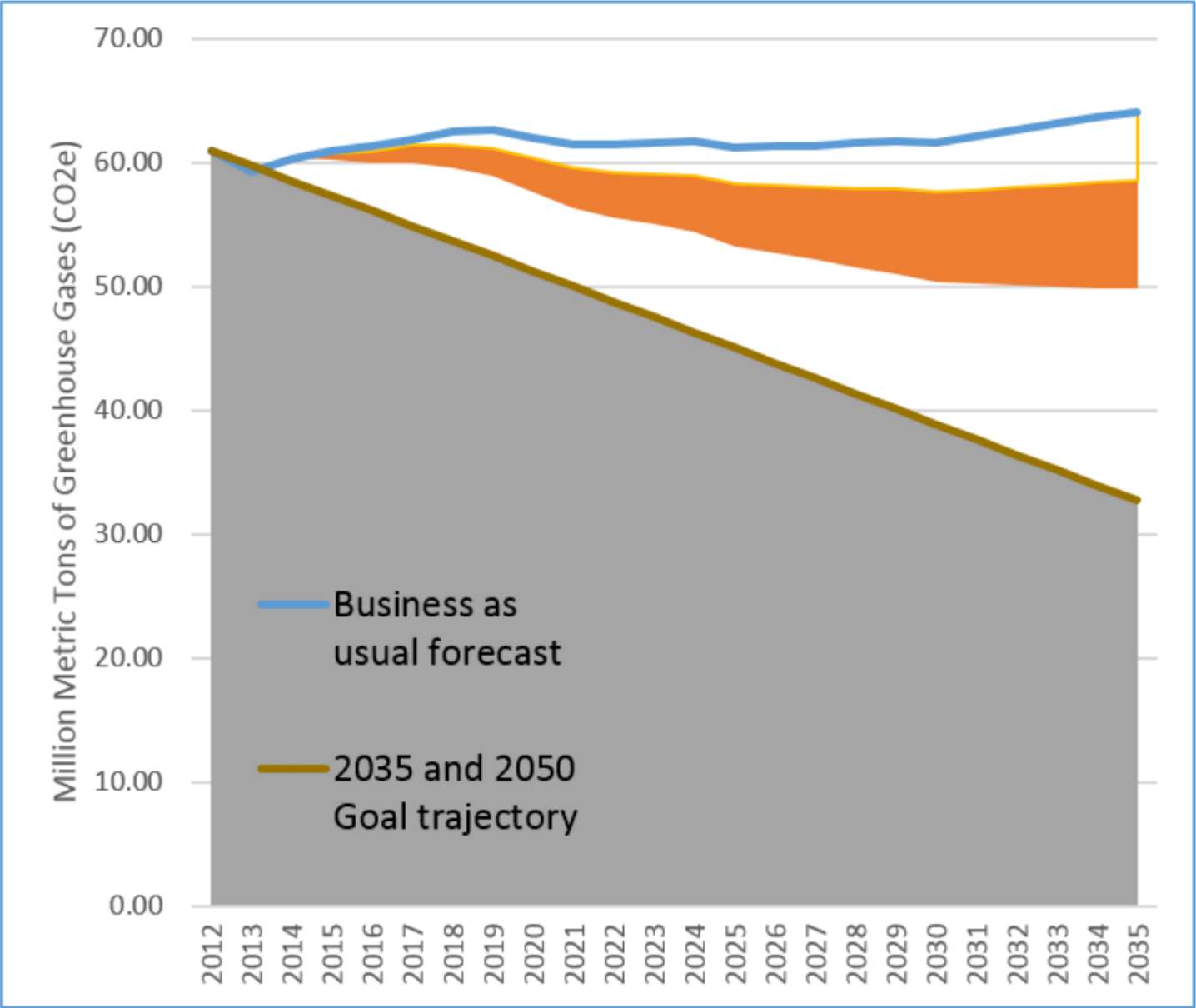
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# Transportation results



# ***Materials and Waste***

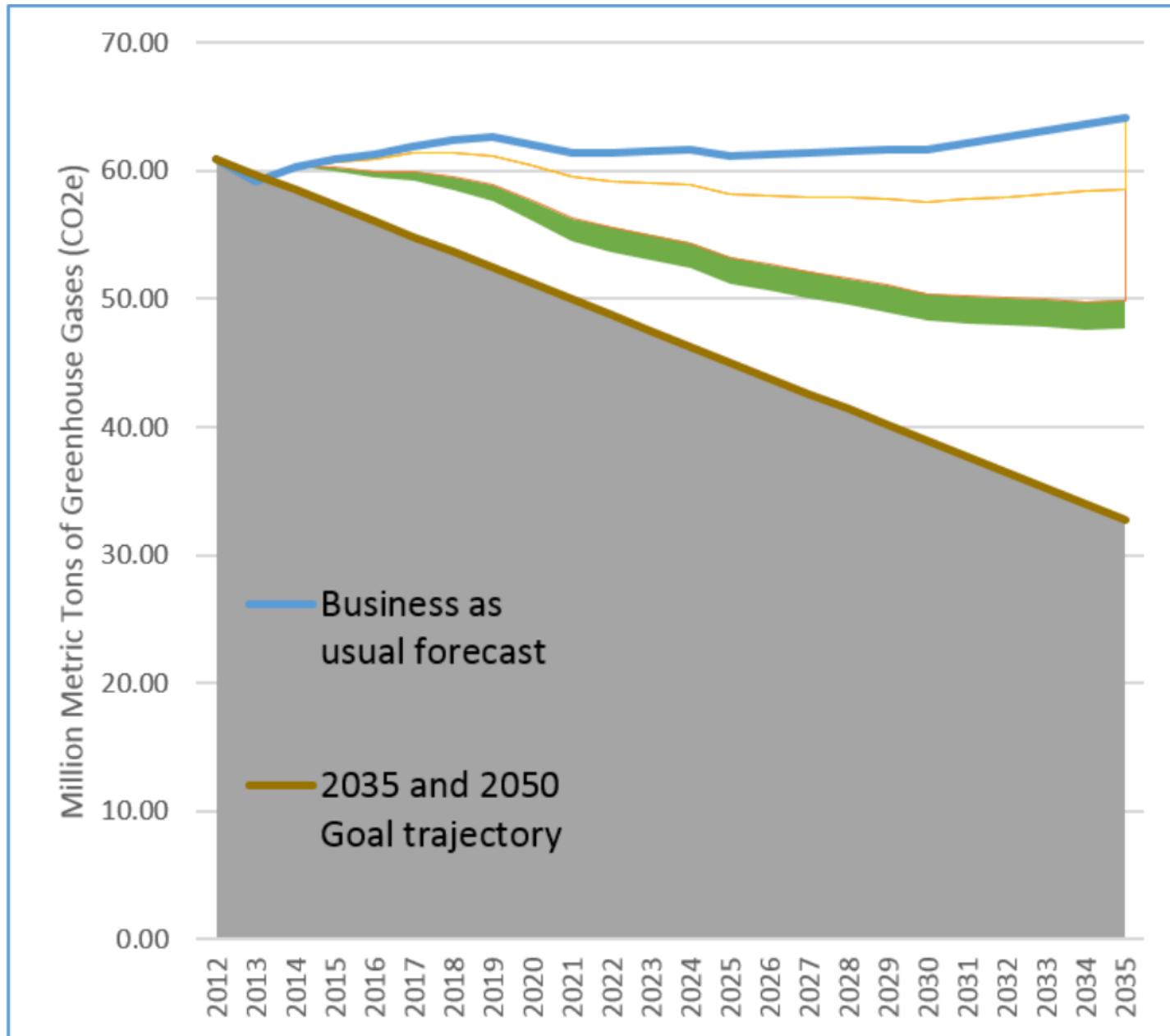
## **Includes:**

- **Biogas energy from waste and wastewater treatment plants**
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- **Prevention of food and packaging waste**

## **Data Sources:**

- **DEQ**
- **MACC measures**

# Materials and Waste results



# ***Agriculture***

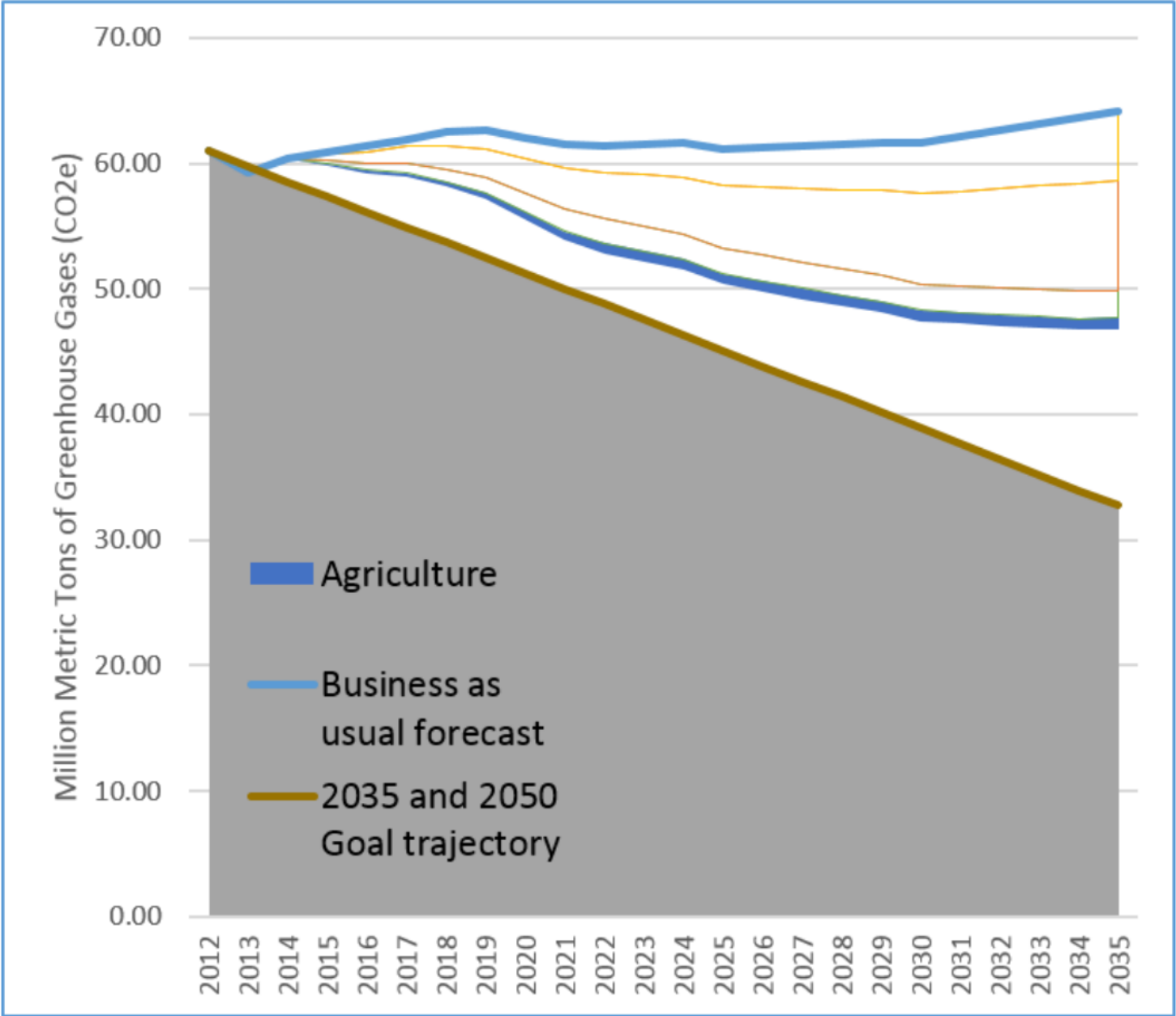
## **Includes:**

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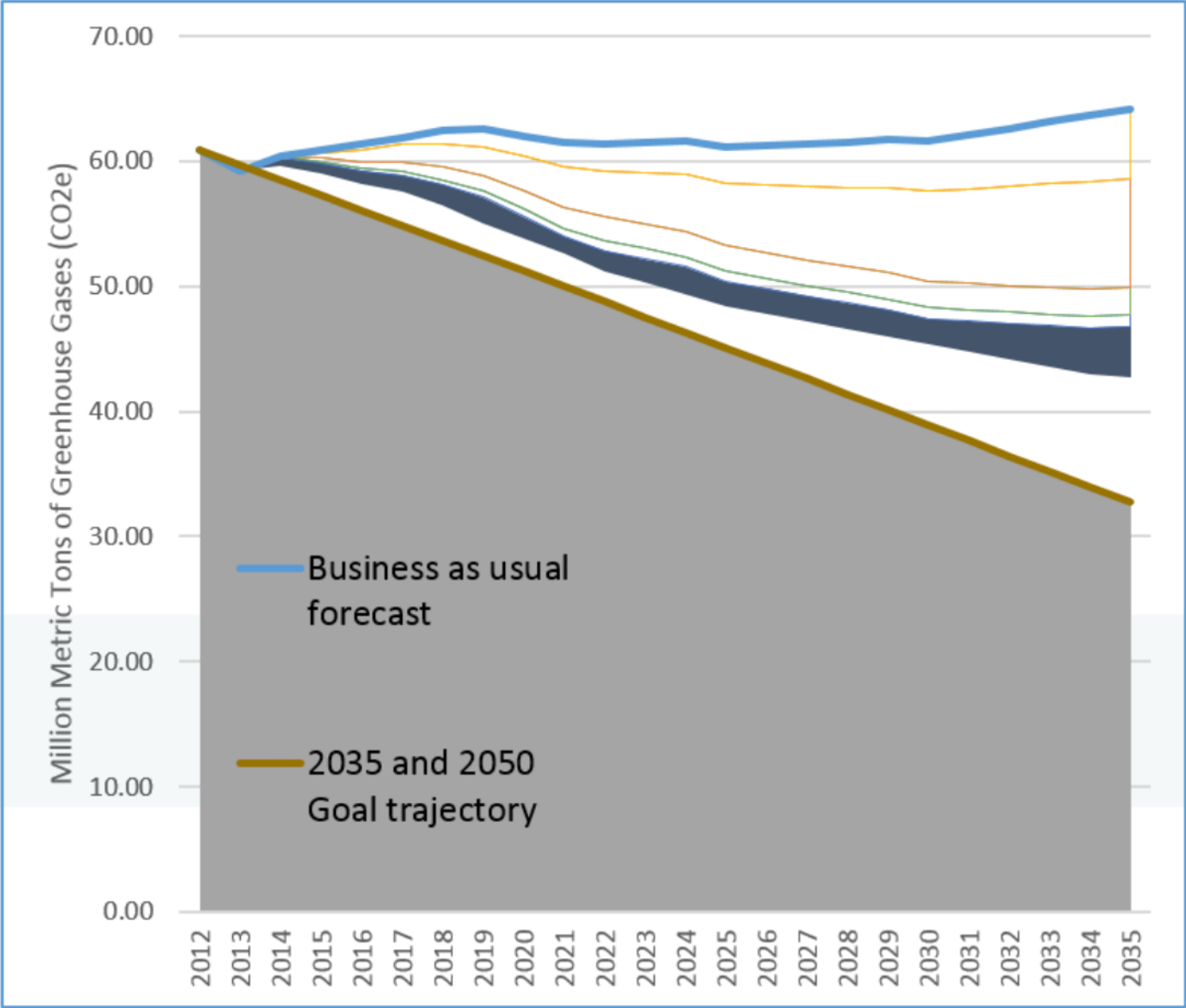
# Agriculture results



# ***Power Generation***

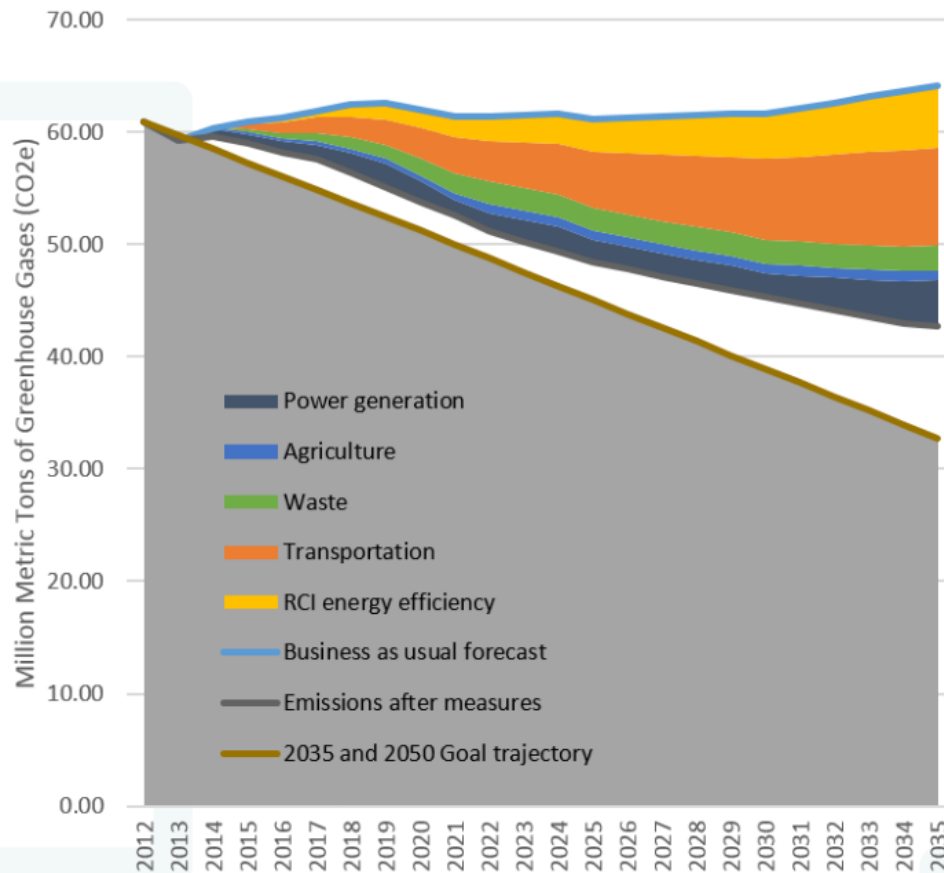
- **Assumes PGE and PacifiCorp reduce emissions to 80% below 2005 levels by 2050**
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# Power Generation results





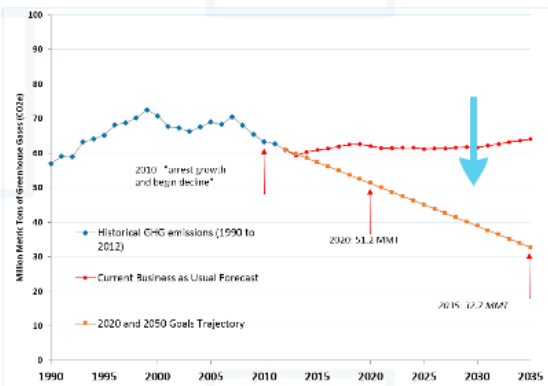
# Emission Reduction Wedges: Results



	2015	2020	2025	2030	2035
<b>BAU forecast</b>	60.9	62.0	61.2	61.6	64.1
<b>Emissions after measures</b>	59.0	54.0	48.7	45.8	43.4
<b>Emission reduction measures:</b>					
<b>Transportation</b>	0.5	2.7	5.0	7.2	8.7
<b>RCI energy efficiency</b>	0.2	1.5	2.7	3.6	4.9
<b>Power generation</b>	0.8	1.7	1.9	2.0	4.1
<b>Agriculture</b>	0.2	0.5	0.8	0.9	0.9
<b>Waste</b>	0.2	1.5	2.0	2.1	2.2
<b>Total Reductions</b>	1.9	8.0	12.4	15.8	20.8
<b>2035 Goal Trajectory</b>					
<b>2035 Goal Trajectory</b>	57.3	51.2	45.1	38.9	32.7
<b>Gap to meet goal</b>	1.7	2.8	3.7	6.9	10.6

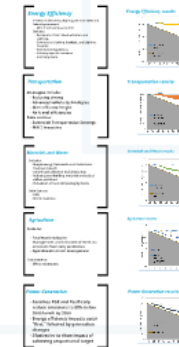
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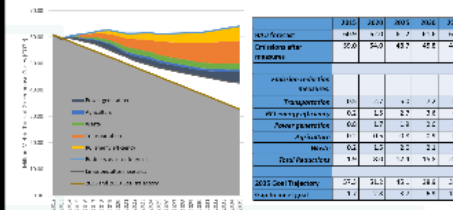


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## Emission Reduction Wedges: Results



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# New Material: Effect of a Carbon Price?

**Question:** Can a carbon price (\$60/ton) help reduce emissions further to close the gap to meet our goal?

**Approach:** Similar to original PSU study for Oregon as a whole (no sub-regions), but with new baseline emissions and fuel prices resulting from the emission reduction measures

## Results and Comparisons

2035 emission reductions due to carbon price

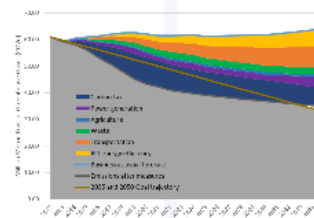
- 7.2 MMT (this analysis) vs. 14.5 MMT (original study)

Total 2035 emission reductions

- 28.9 MMT (this analysis) vs. 14.5 MMT (original study)

Emission reduction measures work together with carbon price to achieve more than either separately

## Emission Reduction Measures plus Carbon Price: Results



## ***Results and Comparisons***

**2035 emission reductions *due to carbon price***

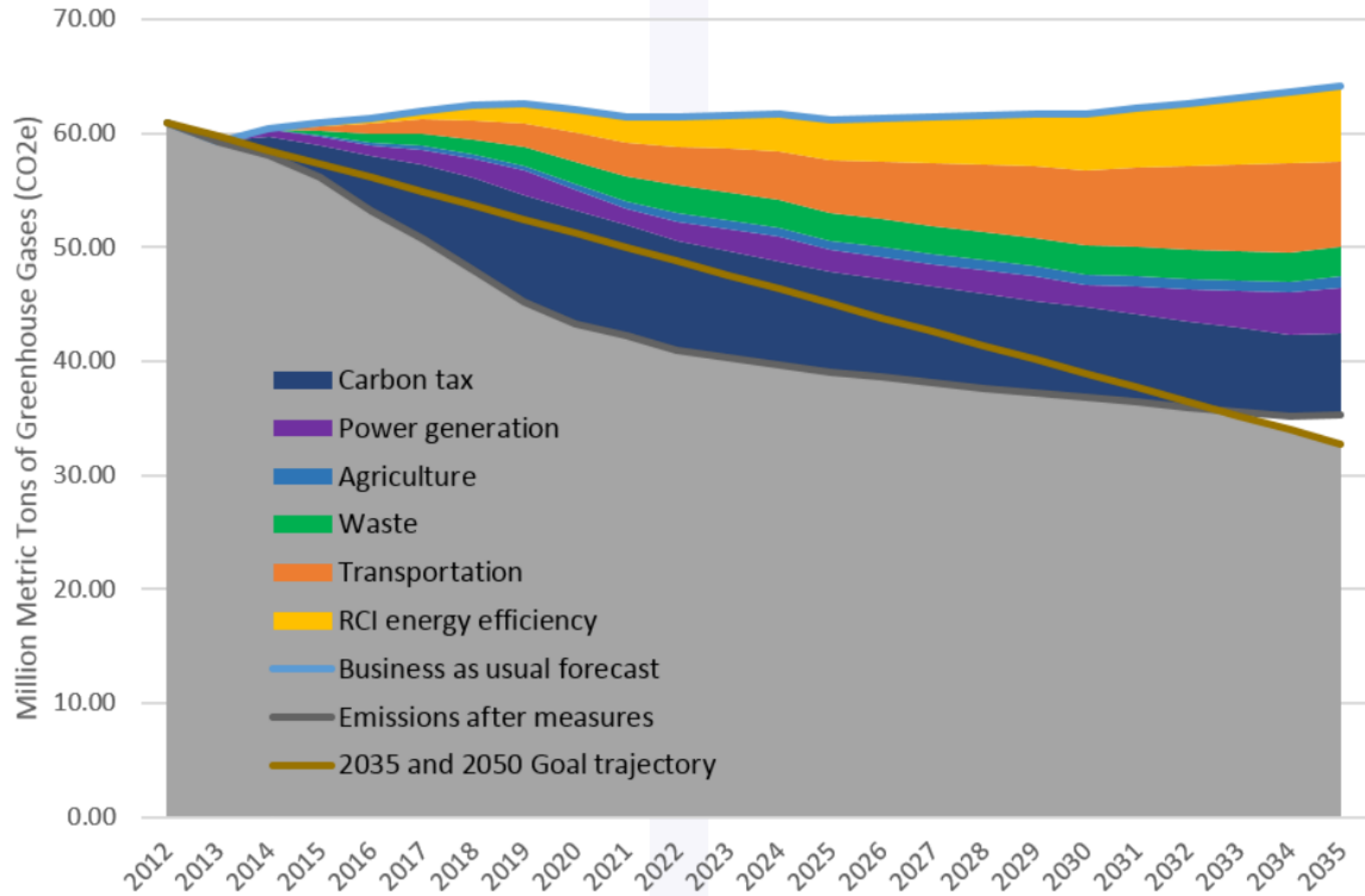
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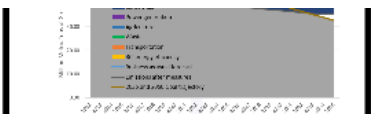
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# Emission Reduction Measures plus Carbon Price: Results



2012-2022 EMISSION TRENDS  
 - 28.9 MMT (this analysis) vs. 14.5 MMT  
 (original study)  
 Emission reduction measures work together  
 with carbon price to achieve more than either  
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# Other changes in response to Commission feedback

## Inclusion of per-capita and per-GDP emissions

Question: How can we be sure that recent declines in our emissions are not due to net migration or loss of economic activity?

While in-boundary emissions have declined since 2000, per capita emissions and the carbon intensity of our economy have also declined, while our state population and GDP have risen over the same time period.

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Total emissions (MMT) <sup>1</sup>	56.3	65.1	70.8	83.0	88.2	70.5	68.1	65.4	63.3	62.7	60.3
Statewide per capita emissions (MT) <sup>2</sup>	20.0	20.5	20.6	23.0	18.5	18.9	18.0	17.1	16.5	16.3	15.7
Midwestern City, per capita emissions (MT) <sup>3</sup>	15.4	15.3	15.5	12.9	13.2	12.5	11.9	11.3	10.6	10.6	10.1
Carbon Intensity (MT/\$2009 million GDP) <sup>4</sup>	877.0	705.9	335.9	447.0	406.0	407.4	375.6	363.0	332.0	316.0	296.0
State GDP (\$2009 Billions) <sup>5</sup>	64.8	81.9	132.1	234.2	187.8	175.1	181.3	180.2	190.1	197.8	205.7

## Black Carbon

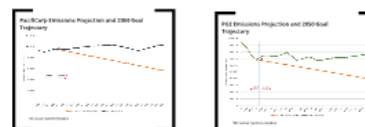
Question: What is it, and where does it belong in our GHG tracking?

Not able to include in GHG inventory yet, but new text box addresses the importance of BC (Page 24 of Final Draft):

**Black Carbon**  
 Black carbon is a potent climate forcer, contributing to global warming by absorbing solar radiation. It also contributes to air quality degradation and human health impacts. Black carbon emissions are primarily from the combustion of fossil fuels, biomass, and coal. While not included in the current GHG inventory, black carbon emissions are tracked and reported separately. The importance of black carbon emissions is highlighted in the final draft of the report, where it is noted that black carbon emissions are a significant source of air pollution and contribute to climate change. The report recommends that black carbon emissions be included in the GHG inventory to provide a more comprehensive view of the state's climate impact.

## Utility Emissions: Goals vs. Projected Emissions

Question: Can we provide more clarity about how the power sector goals compare to projections?



## Conclusions and Recommendations to the Legislature

- Set a 2035 interim goal
- Develop a long-term strategy to meet our goals, including benchmarks
- Encourage technological development
- Begin with targeted emissions reductions from our biggest contributors
- Set state and local policies to support and leverage federal action
- Consider adopting consumption-based goals

Feedback?

## *Inclusion of per-capita and per-GDP emissions*

**Question: How can we be sure that recent declines in our emissions are not due to net migration or loss of economic activity?**

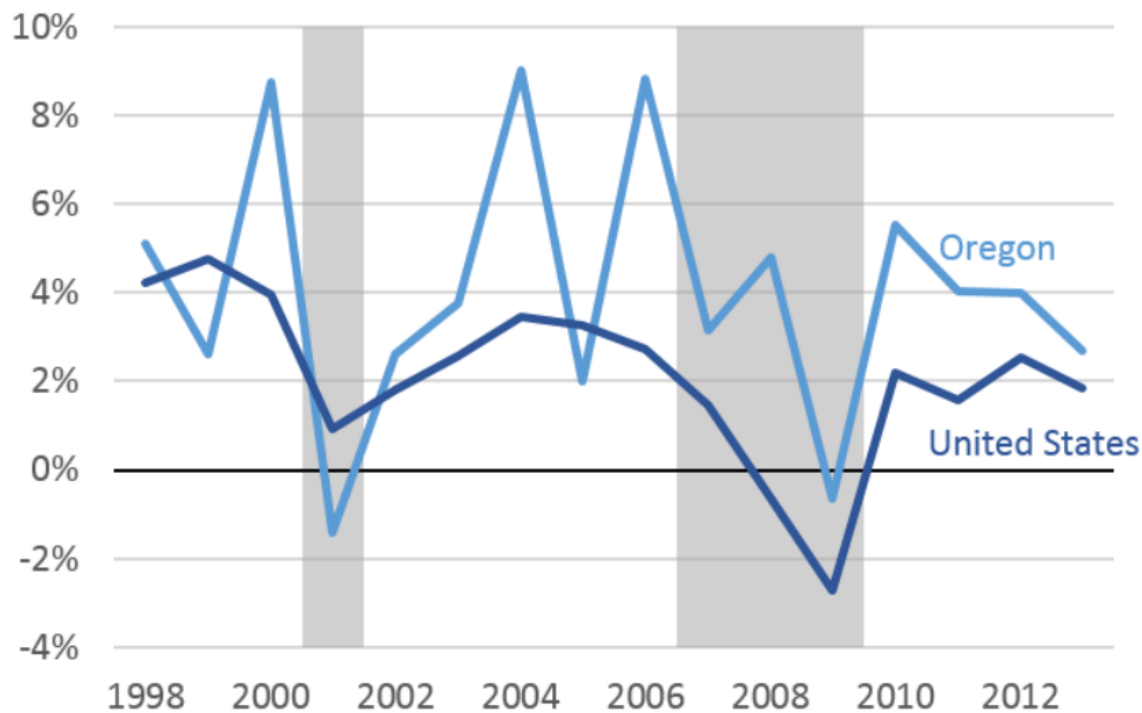
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<b>State GDP (\$2009 Billion)<sup>3</sup></b>	64.8	81.9	132.1	154.2	167.8	173.1	181.3	180.2	190.1	197.8	205.7





### Real GDP Growth



***Over the past 15 years, Oregon's state GDP typically grew 1-2 percentage points faster than the nation as a whole.***

## *Inclusion of per-capita and per-GDP emissions*

**Question: How can we be sure that recent declines in our emissions are not due to net migration or loss of economic activity?**

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# Black Carbon

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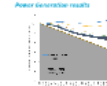
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## *Black Carbon – Important Warming Agent?*

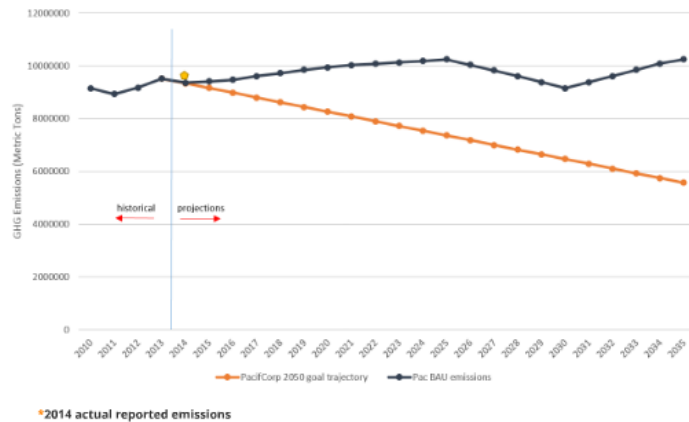
*Black carbon (BC) is a solid form of mostly pure carbon that is formed by the incomplete combustion of fossil fuels, biofuels and biomass. It is a significant part of particle pollution and absorbs solar radiation at all wavelengths. Recent research indicates that BC may play an important role in climate change and has been linked to a range of climate impacts, including increased temperatures, accelerated ice and snow melt and disruptions to precipitation patterns. BC is emitted directly to the atmosphere in the form of fine particulates (PM2.5) and is emitted along with other particles and gases. Its short atmospheric lifetime (days to weeks) combined with its strong warming potential make it a good target for reduction strategies that will provide climate benefits within the next several decades. In addition, emissions of BC and its effects are more localized than other greenhouse gases, meaning that mitigation actions will produce different climate results depending on the region, season, and sources in the area. Oregon does not yet track or attempt to directly mitigate our emissions of BC, largely due to the remaining scientific uncertainty about the particular global and regional climate effects and a lack of information and inventory protocols for doing so. However, given its potential importance for short-term climate change, the OGWC will track action at the federal level (via the US EPA) and may explore making recommendations about this pollutant in the future.*

# Utility Emissions: Goals vs. Projected Emissions

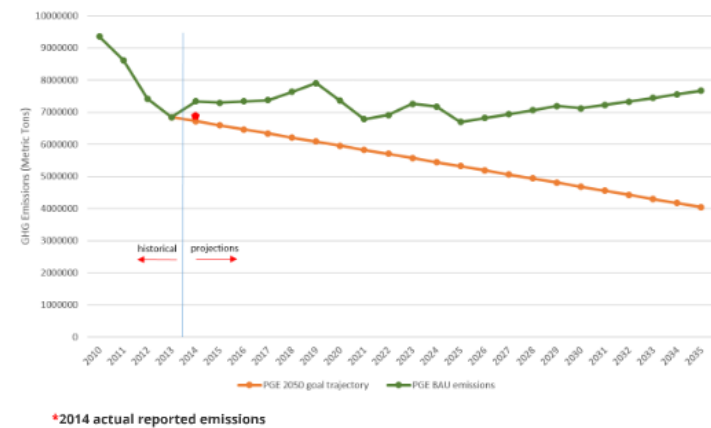
Question: Can we provide more clarity about how the power sector goals compare to projections?



PacifiCorp Emissions Projection and 2050 Goal Trajectory



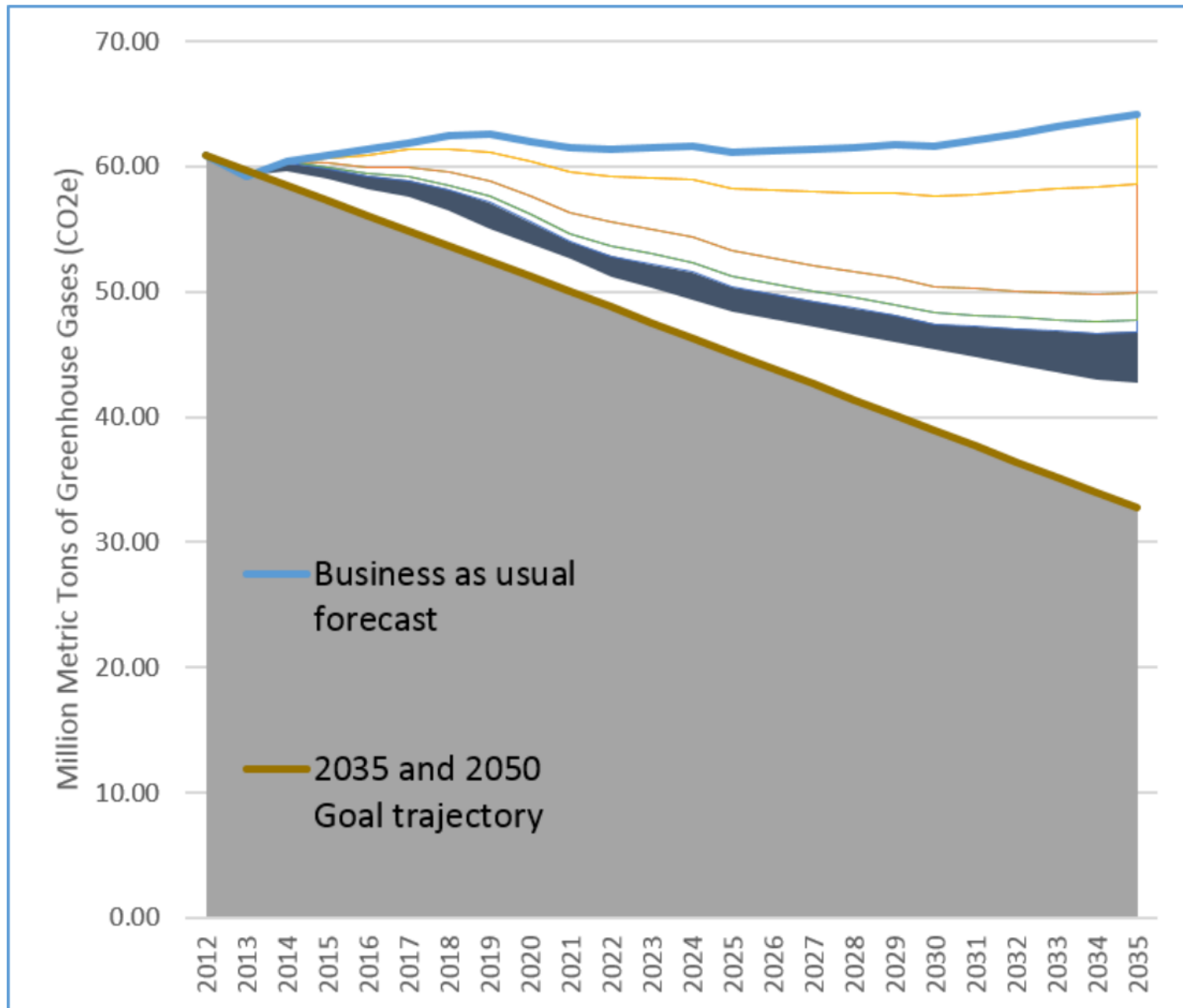
PGE Emissions Projection and 2050 Goal Trajectory



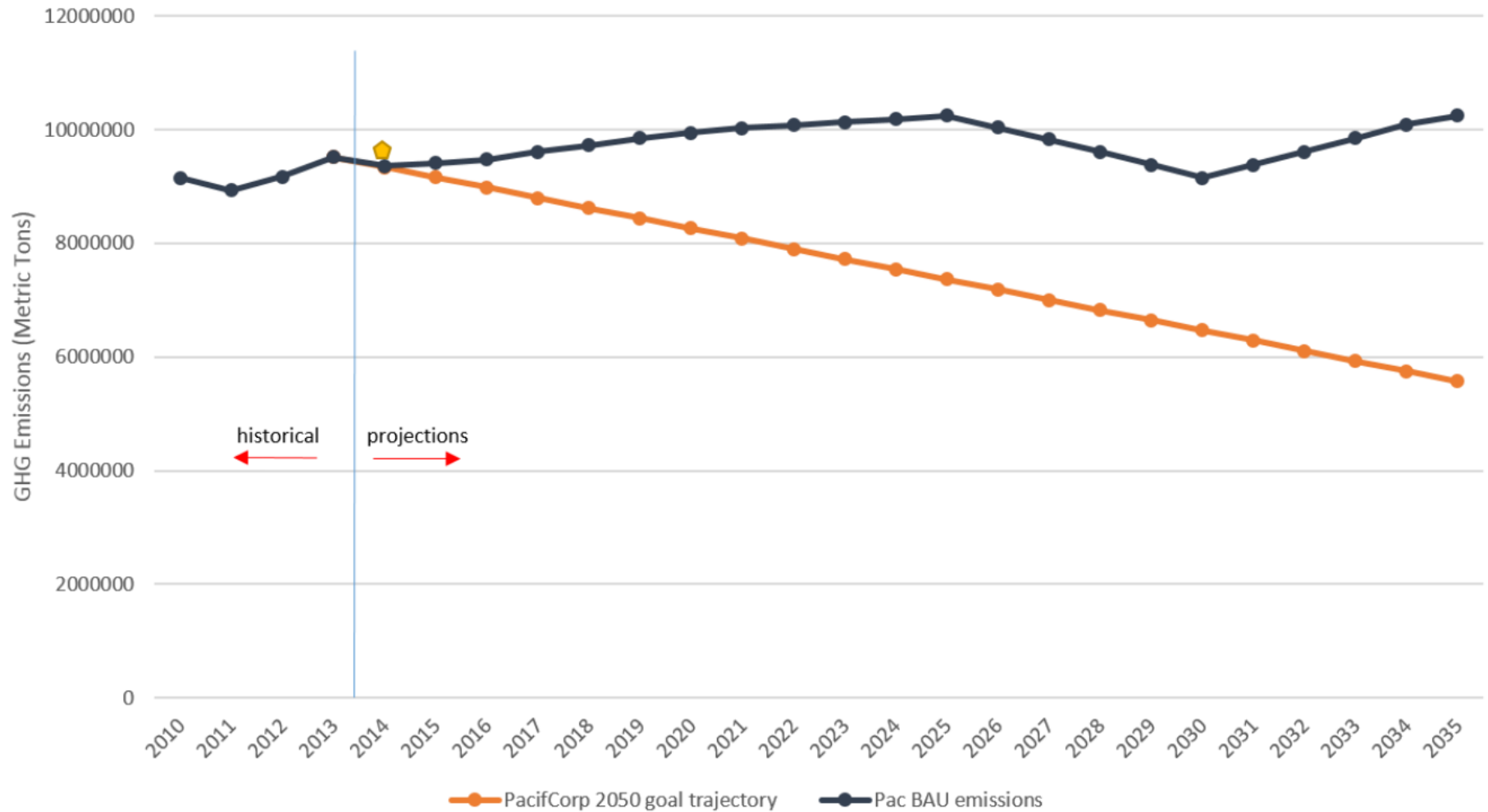
# ***Power Generation Measures***

- ***Reminder...***
  - **Assumes PGE and PacifiCorp reduce emissions to 80% below 2005 levels by 2050**
  - **Energy efficiency impacts occur "first," followed by generation changes**
  - **Illustrative to show impact of achieving proportional target**

# Power Generation results

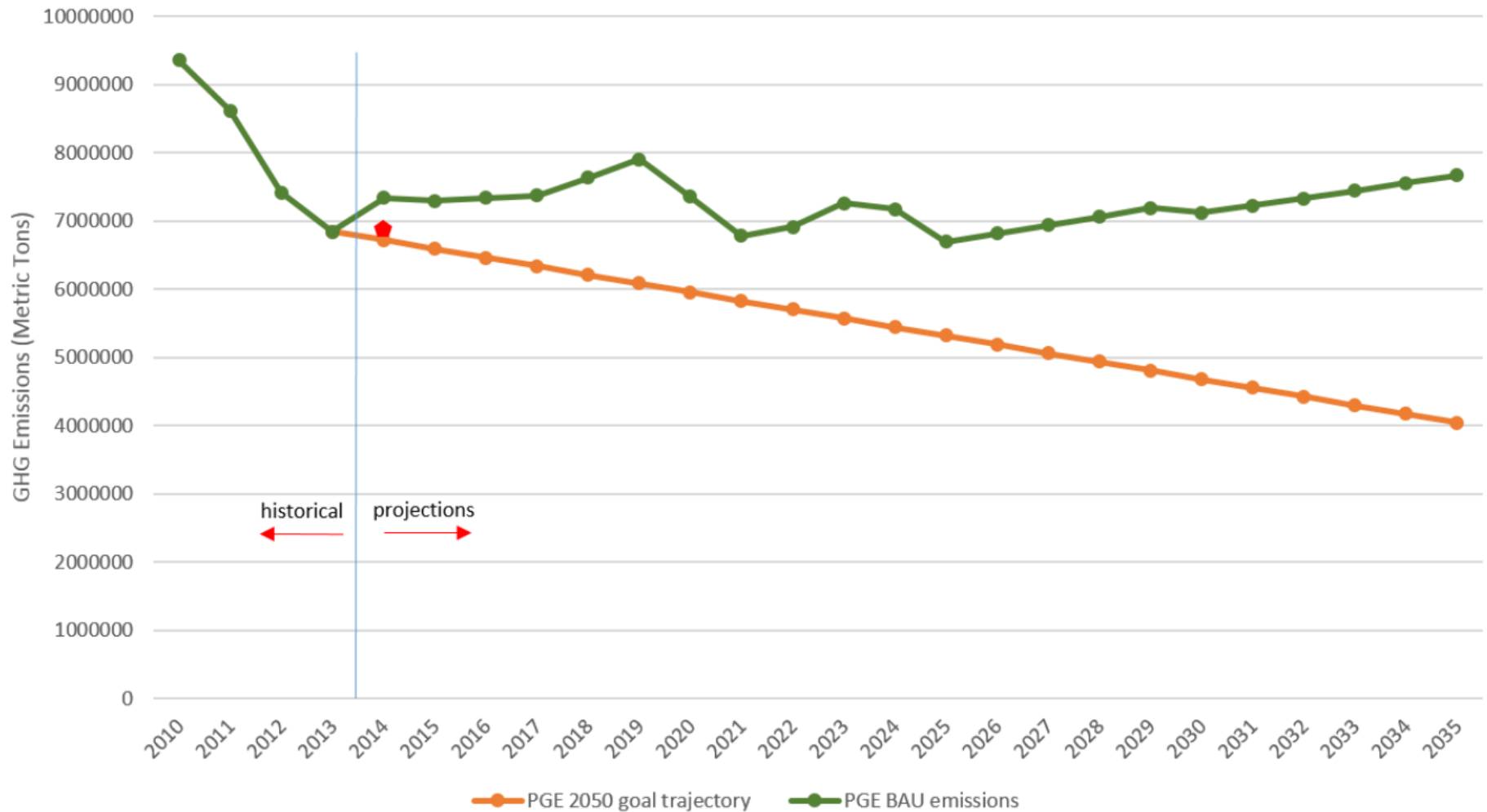


# PacifiCorp Emissions Projection and 2050 Goal Trajectory



\*2014 actual reported emissions

# PGE Emissions Projection and 2050 Goal Trajectory



\*2014 actual reported emissions



# ***Conclusions and Recommendations to the Legislature***

- **Set a 2035 interim goal**
- **Develop a long-term strategy to meet our goals, including benchmarks**
- **Encourage technological development**
- **Begin with targeted emissions reductions from our biggest contributors**
- **Set state and local policies to support and leverage federal action**
- **Consider adopting consumption-based goals**

***Feedback?***

# *Next Steps...*

**Today: 1) Commission review additional suggested language changes (received prior to today's meeting)**

**2) Commission vote on whether to adopt draft report**  
*May include additional language changes as discussed today*

**By September 25: Staff will finalize changes and formatting**

**September 29: Legislative days presentation on Clean Power Plan and distribute Report to Legislative Committee Members**

**November Legislative Days: Possible Report presentation to Committees**

# Meeting of the Oregon Global Warming Commission

2015 Report to the Legislature

### Emissions: Historical and Projection

### Proposed 2035 Goal and Emission Reduction Measures

**Proposed 2035 Decarbon Goal**

**"Wedges" of Measures to Achieve 2035 Goal**

- Energy Efficiency - adapted from MACC outputs
- Transportation - adapted from MACC and STE outputs
- Agriculture, Materials and Waste - MACC outputs and STE data
- Power Generation - GHG reduction by two largest utilities

### Today's topics

- Review first draft material from April meeting
- Describe new material in current version
- Discuss next steps

### New Material: Effect of a Carbon Price?

Question: Can a carbon price (\$60/ton) help reduce emissions further to close the gap to meet our goal?

Approach: Similar to original PSU study for Oregon as a whole (no sub-regions), but with new baseline emissions and fuel prices resulting from the emission reduction measures

### Other changes in response to Commission feedback

### Next Steps...

Today: 1) Commission review additional suggested language changes (received prior to today's meeting)

2) Commission vote on whether to adopt draft report  
May include additional language changes as discussed today

By September 25: Staff will finalize changes and formatting

September 28: Legislative staff presentation on Clean Power Plan and distribute Report to Legislative Committee Members

November Legislative Dept. Possible Report presentation to Committees

