

# 2006 Integrated Resource Plan

CO<sub>2</sub> Emission Profiles for IRP Candidate Portfolios

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Pacific Power | Rocky Mountain Power | PacifiCorp Energy

# Introduction

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- Purpose of today's meeting is to provide the CO<sub>2</sub> emission profiles for the 2006 IRP Candidate Portfolios
  - ▶ Candidate Portfolios are portfolios developed for detailed stochastic simulation and risk analysis
  - ▶ All Candidate Portfolios include:
    - » 95 MW of additional Class 1 DSM
    - » 300 MW of additional peak load reduction by 2016 from Class 2 DSM
    - » 1400 MW of wind
      - Candidate Portfolio 3, 7, 11, and 12 include an additional 600 MW of wind
  - ▶ CO<sub>2</sub> emissions determined by Planning and Risk Module (PaR)
  - ▶ Profiles shown for the following CO<sub>2</sub> adder levels: \$0/ton, \$8/ton (2008 dollars) and \$61/ton (2008 dollars)

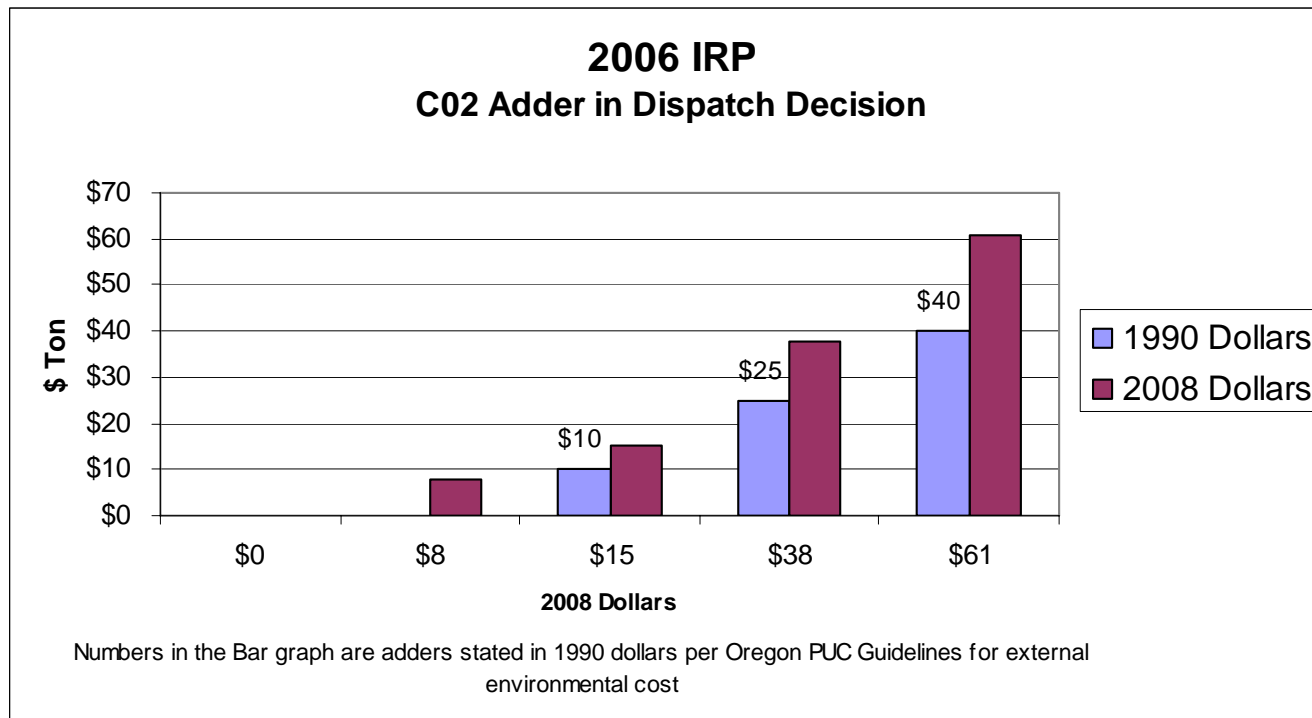
## Approach and Method

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- The CO<sub>2</sub> emissions in the 2006 IRP include Direct (Generation) and Indirect (Purchase Power) emissions
- The Indirect CO<sub>2</sub> emissions are calculated by multiplying purchased power in GWh by a system average emissions factor of 0.565 tons/MWh
  - ▶ Factor based on actual 2005 purchases, and is applied through the 20-year forecast
- CO<sub>2</sub> emissions calculations do not reflect potential wholesale sales credits (worst case look)

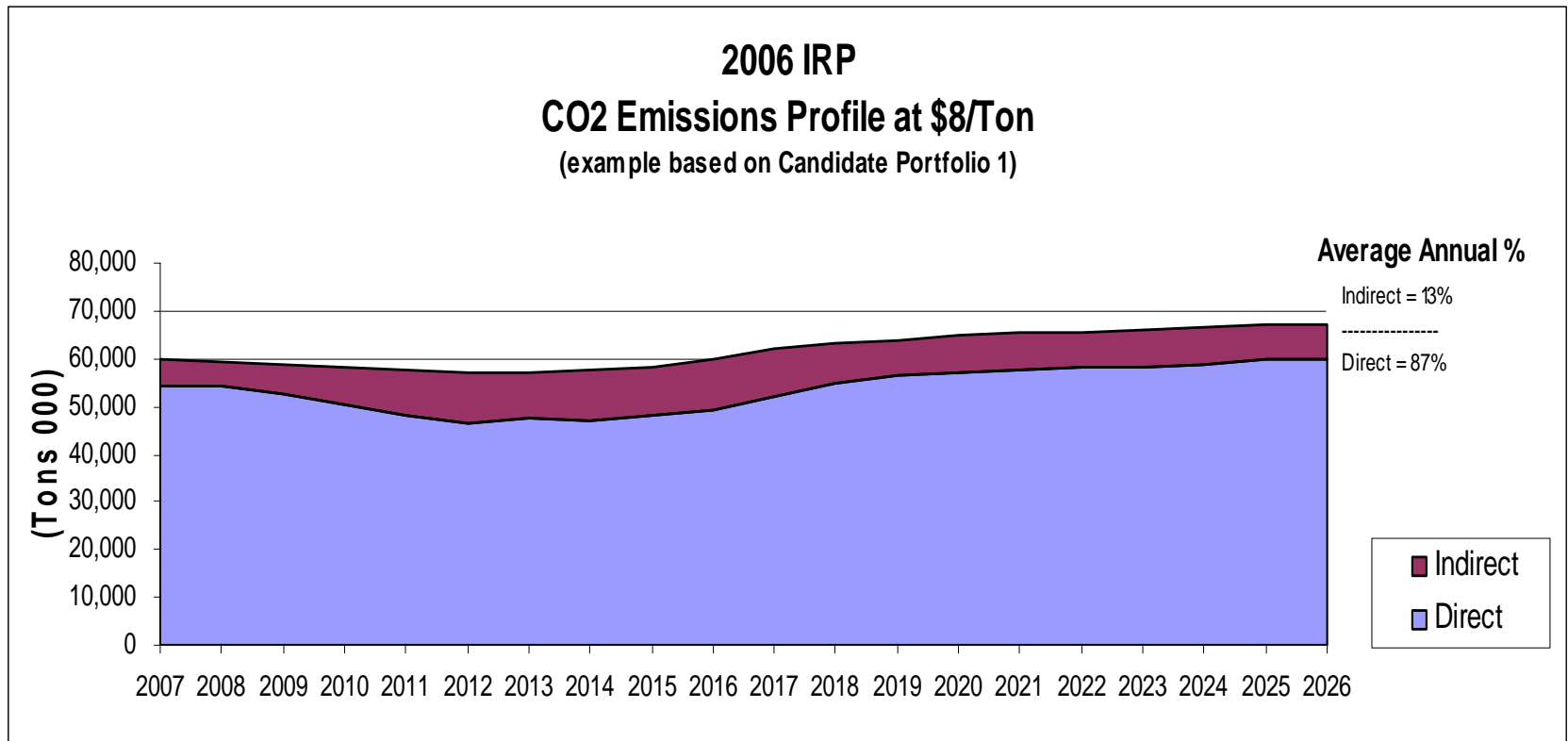
# CO<sub>2</sub> Adder under IRP Scenarios

- The chart shows the five CO<sub>2</sub> adder levels modeled for the 2006 IRP in 2008 dollars; values also shown in 1990 dollars corresponding to prices cited in the Oregon PUC's guidelines for external environmental cost sensitivity studies
- The CO<sub>2</sub> adder increases resource variable costs starting in 2010 when the adder is assumed to be instituted
- The adder is used in the PaR resource dispatch decision



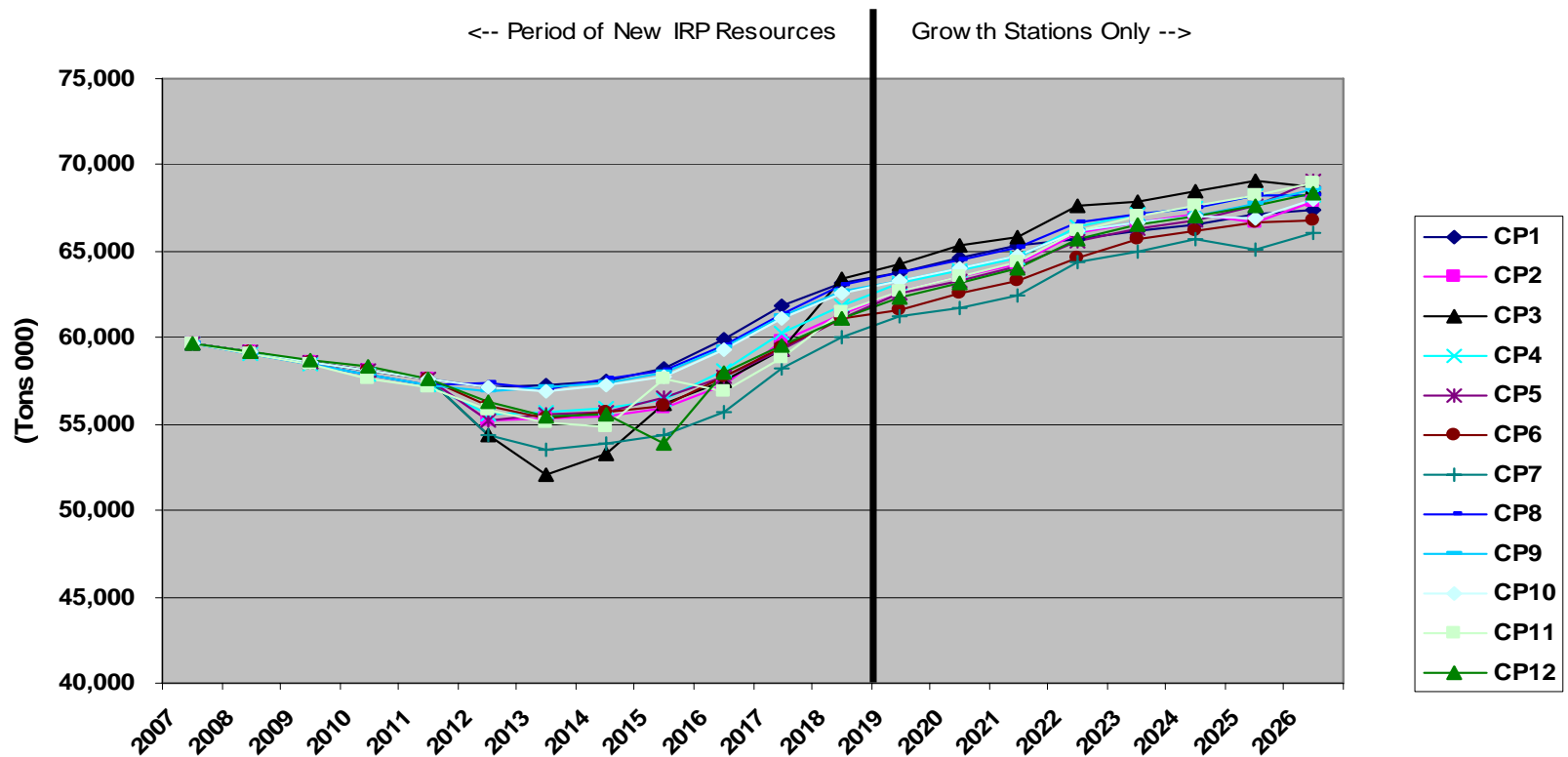
## Direct versus Indirect Emissions

- Direct emissions comprise the bulk of candidate portfolio emissions
- The chart below shows the relative annual contributions of each emission source to total CO<sub>2</sub> emissions, using Candidate Portfolio 1 (CP1) as an example



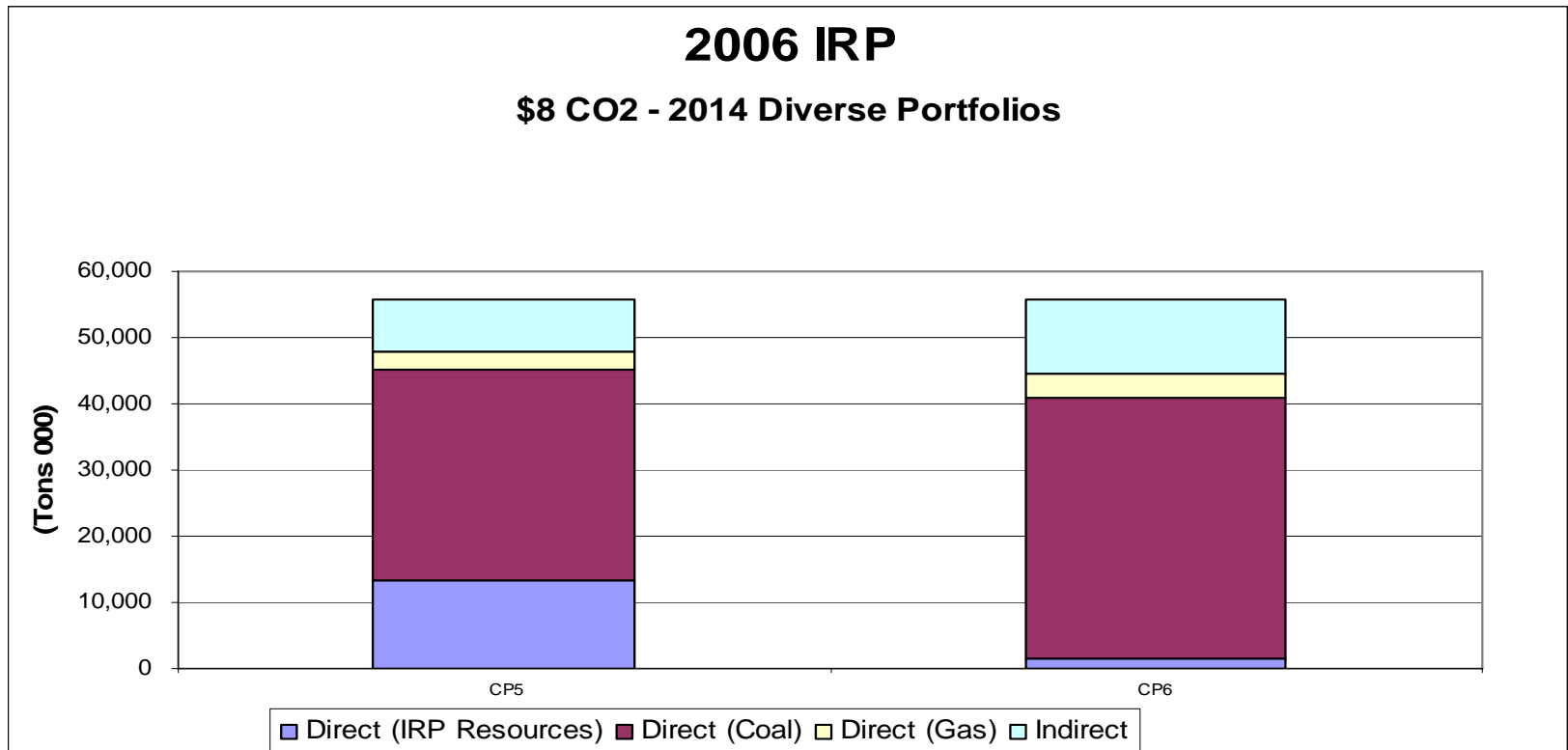
# Emission Profile for Candidate Portfolios

- Chart shows annual CO<sub>2</sub> emissions for 2007 through 2026 under the \$8/ton CO<sub>2</sub> adder scenario
  - ▶ Emissions drop in all portfolios due to early wind additions and the assumed start of CO<sub>2</sub> regulation in 2010
  - ▶ Average annual emissions for the 20-year period vary by +/-1.8% among portfolios and grow at an average rate of 0.8%



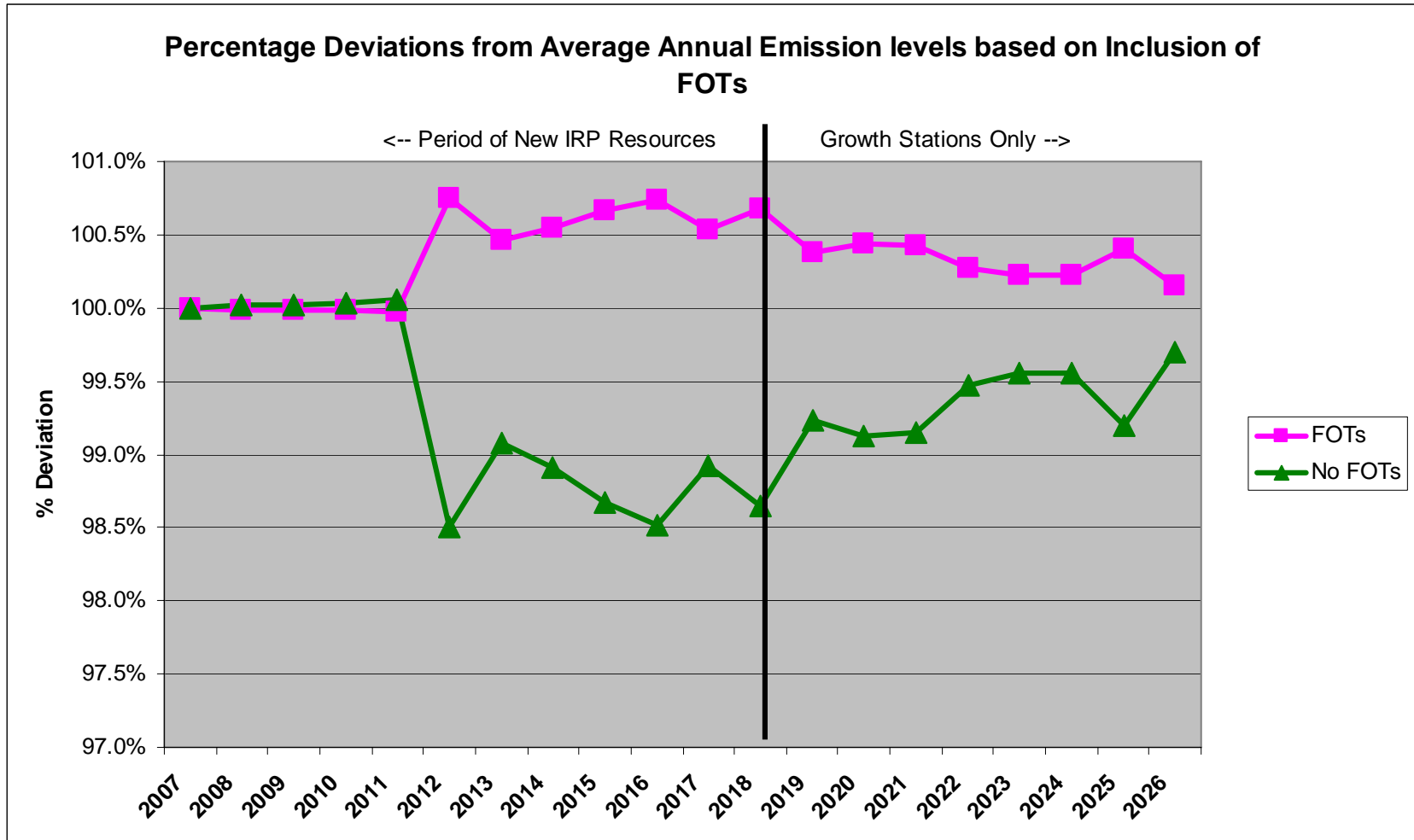
# 2014 Comparison of Diverse Portfolios

- CP5 has no Front Office Transactions and 4 coal plants by 2014; CP6 includes Front Office Transactions and has no coal plants by 2014
  - ▶ The difference in emissions between CP5 and CP6 is 61,000 tons in 2014
  - ▶ For CP5, emissions for new efficient plants *displace* emissions from older plants; For CP6, the emission profile results from more reliance on purchase power and less efficient existing plants
  - ▶ The \$61 case shows a similar system dispatch with a difference in total emissions of 610,000 tons in 2014



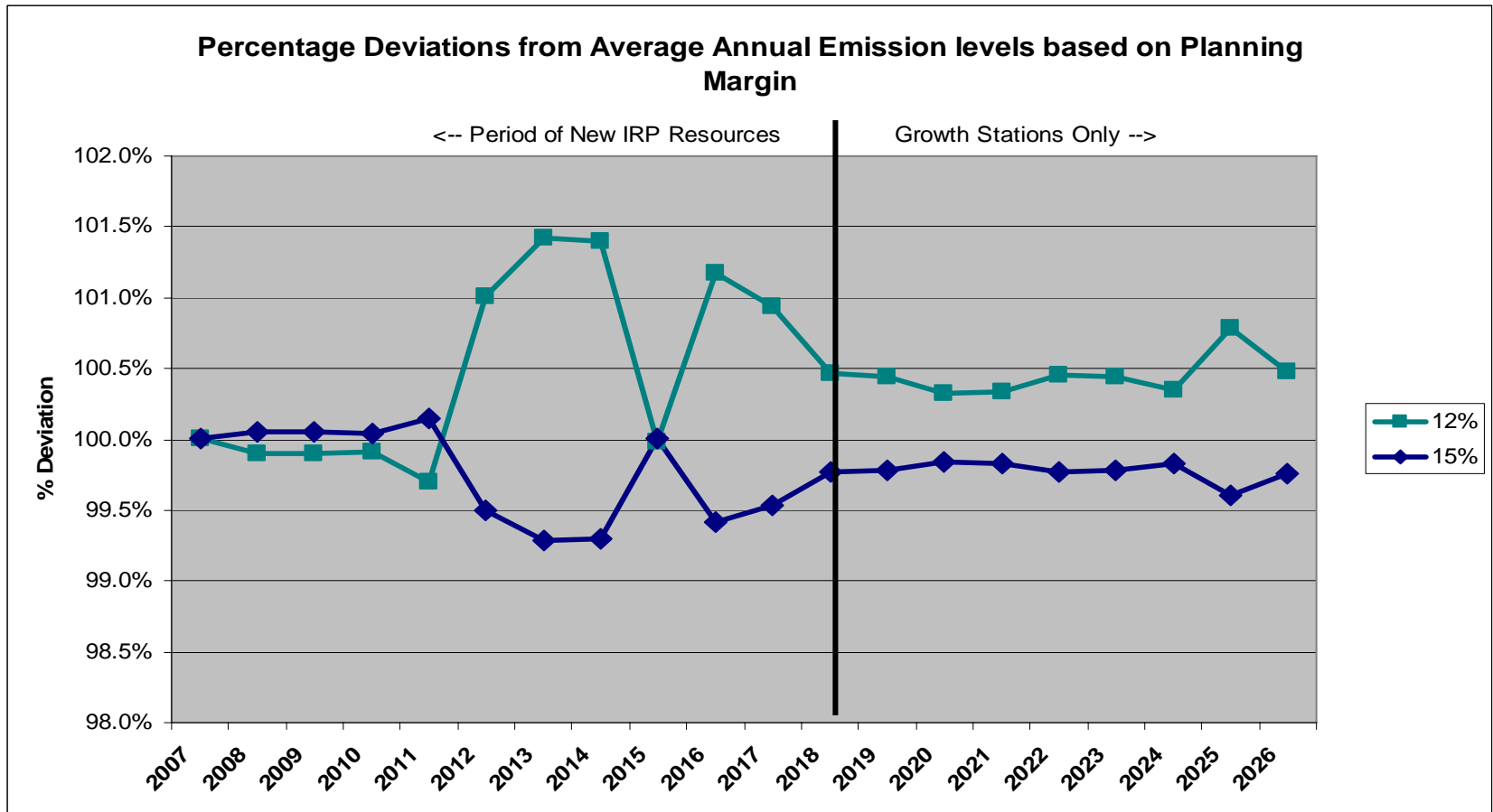
# Emission Profile for Candidate Portfolios

- Chart presents the percentage deviations from the average for all portfolios based on the inclusion or exclusion of Front Office Transactions



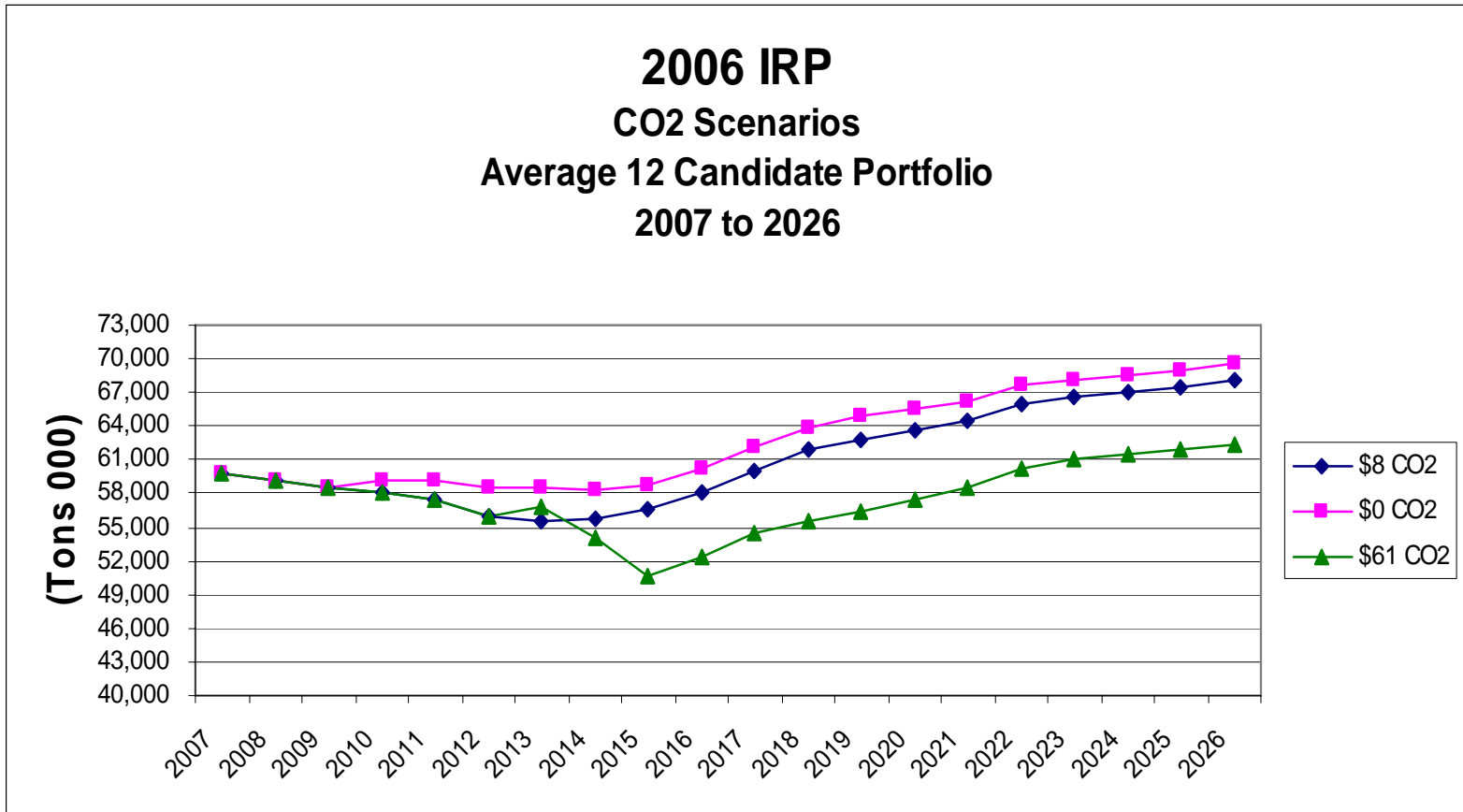
# Emission Profile for Candidate Portfolios

- Chart presents the percentage deviations from the average for all portfolios based on the level of a portfolio's Planning Reserve Margin



# Emissions Profiles under different CO<sub>2</sub> Adder levels

- The graph shows the average of 12 Candidate Portfolios
- CO<sub>2</sub> Emissions change under different CO<sub>2</sub> Scenarios



# Summary

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- Range of emission results (20 year Sum) vary by +/-1.8% among Candidate Portfolios with an average annual growth rate of 0.8%
- Emissions from new Thermal IRP Resource additions are offset in part by displacement of existing resources
- Market purchases have an impact on emissions indirectly based on power sources supplying the market
  - ▶ The exclusion of Front Office Transactions as a resource option decreases a portfolio's emissions
- The level of the Planning Reserve Margin also has an impact
  - ▶ Increasing the Planning Reserve Margin decreases a portfolio's emissions

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# Appendix