

**Modeling
Electric Load-Based
CO₂ Cap-and-Trade**

Oregon Carbon Allocation
Task Force

October 5, 2006

The Oregon Clean Energy Planning Model

Developed by Dr. Hal Nelson
Claremont Graduate University
&

Research Fellow at Portland State
University

Model Framework

- **Baseline:** No new renewables and current level of energy efficiency spending (1.7 % of retail revenues)
- **RPS:** Pre-2009: Yearly new renewables at 0.5% of load, 1.0% thereafter.
- **Climate Policy:** On top of RPS. Consistent with median proposal. Min. EE spending @ 3.5% of revenue.

Key Inputs

- Load Growth
- Avoided Costs
- Conservation Supply Curves
- Renewable Supply Curves
- Allocation of Renewables
between PacifiCorp and Portland
General Electric

Key Outputs

- The Model Minimizes Costs of Climate Policy for:
 - Renewables: by resource type
 - Above-Market Energy Efficiency
- Outputs:
 - Levels of CO₂ emissions
 - Price Impacts: by utility type
 - Bill Impacts: by utility type

Annual Sales Growth

Oregon Utility Sales: Historical

- 1980-2004 +1.2% (24 years)
- Ranges: 1996-2004 Negative 0.1% (8 yrs)
1987-1998 +2.7% (11 yrs)

NWPPC Forecast Ranges 2005-2025

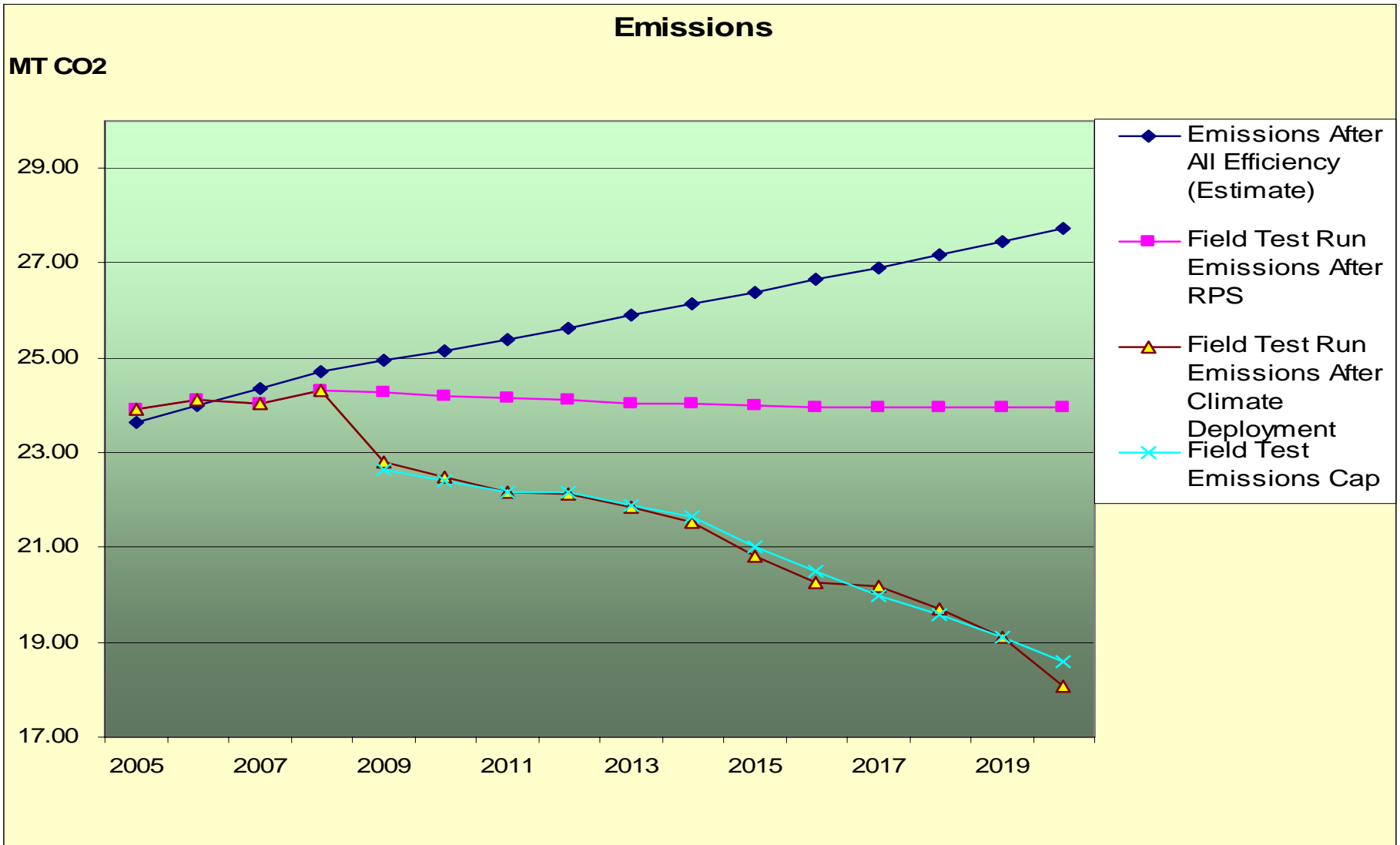
(For Utility Sales, May 2005 page A-39)

	Med-		Med-	
Low	Low	Medium	High	High
0.18%	0.94%	1.43%	1.94%	2.69%

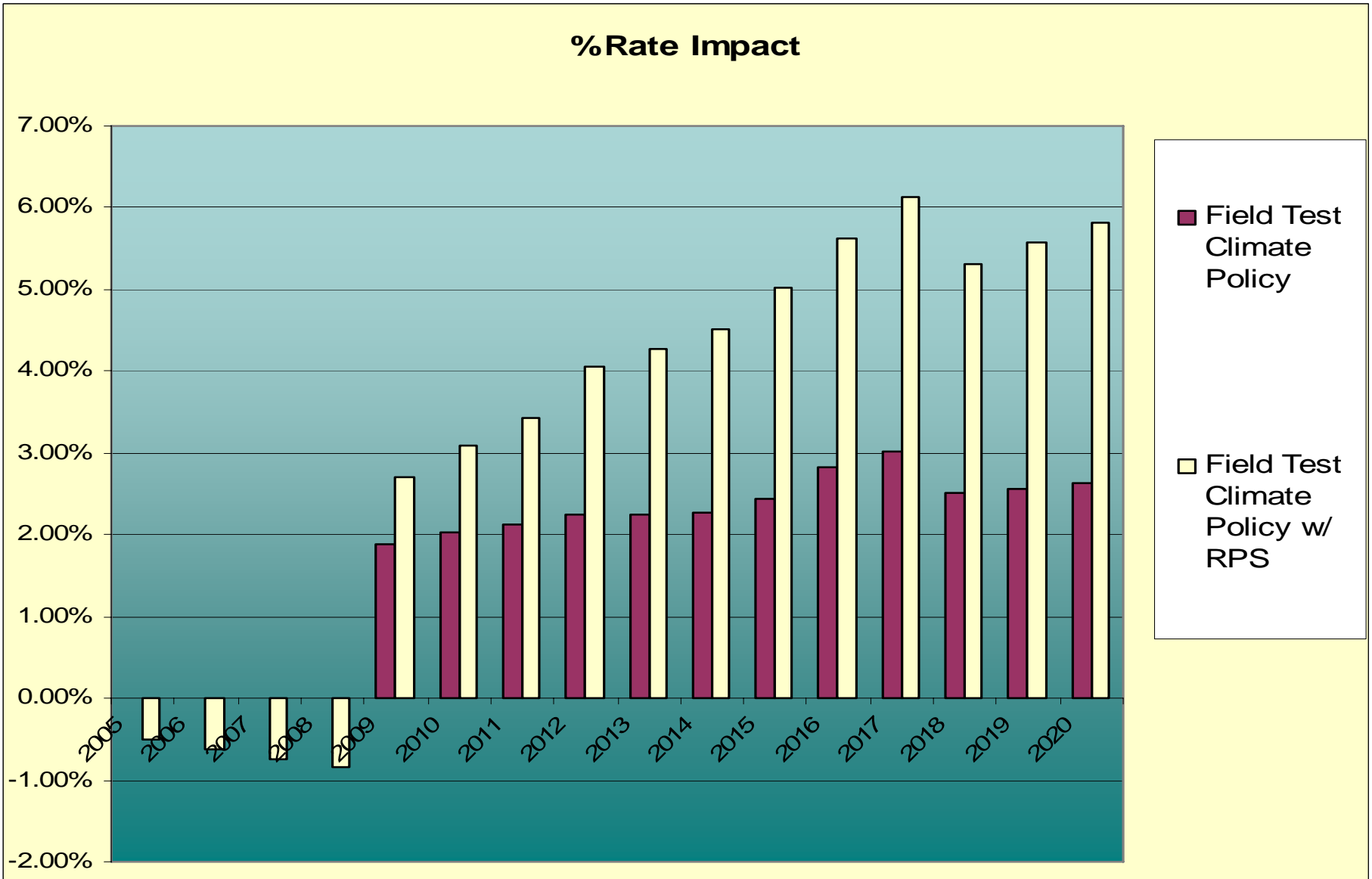
Load Growth Scenarios

- **For the period 2004-2020**
- **Low Scenario:** 0.7% per year
- **Moderate Scenario:** 1.7% per year
- **High Scenario:** 2.7% per year

With Moderate Load Growth



With Moderate Load Growth



Bill Payer Impacts of Climate Policy

Annual Millions \$ in 2020

With Moderate Load Growth

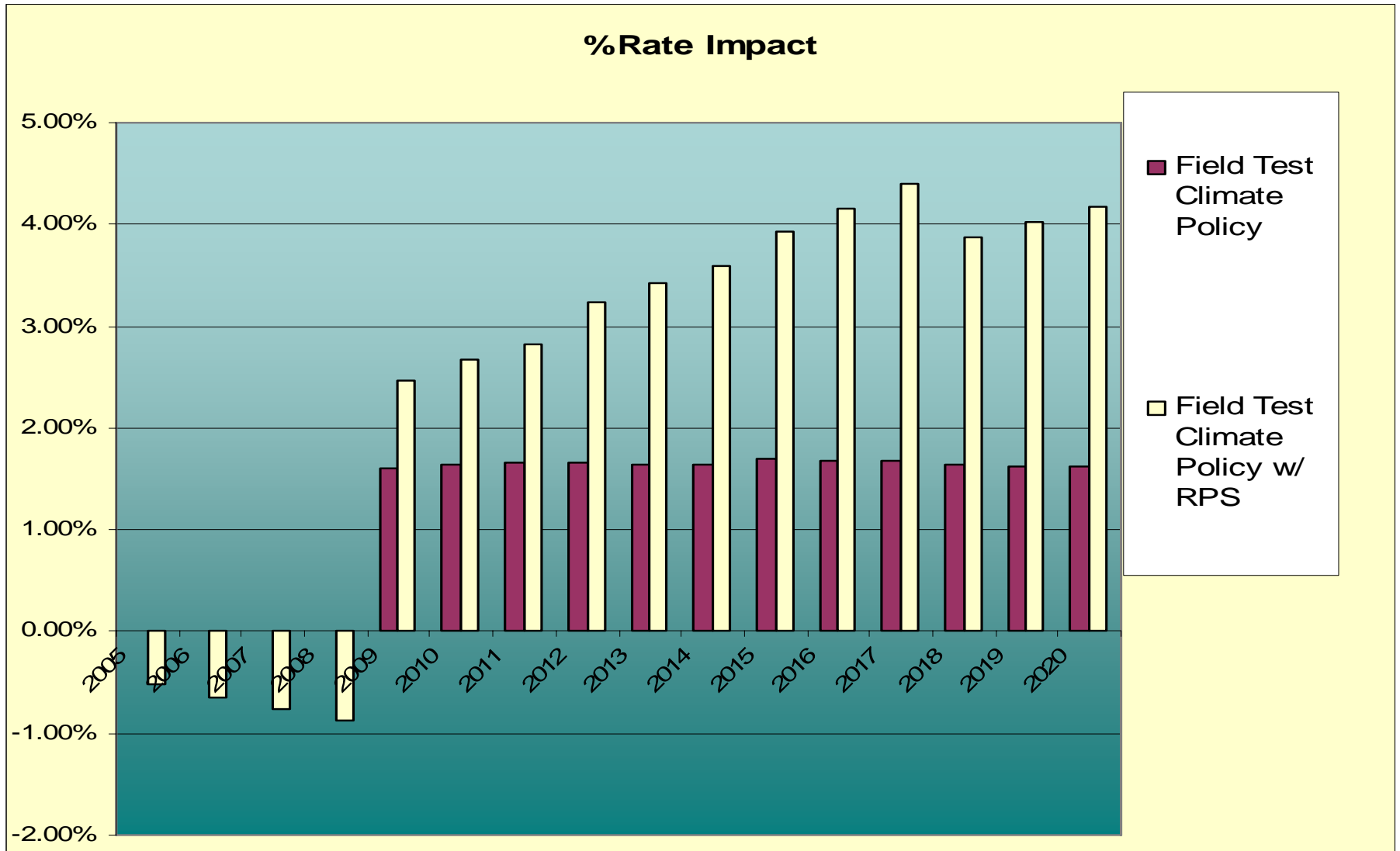
Pacific \$ 14

PGE \$ (15)

COUs \$ (14)

Total \$ **(15)** (w/ ESSs & ID-Power)

With Low Load Growth



Bill Payer Impacts of Climate Policy

Annual Millions \$ in 2020

With Low Load Growth

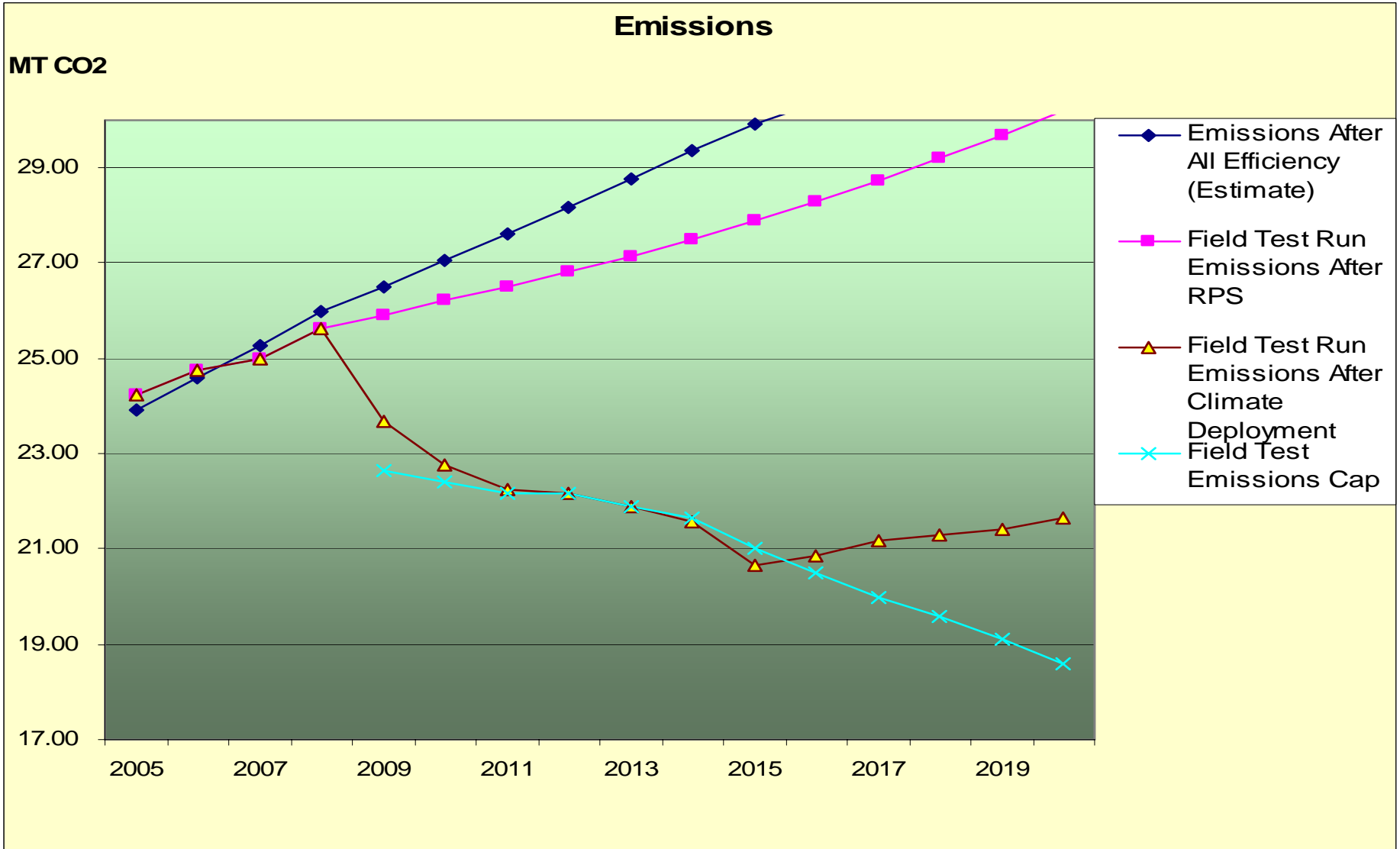
Pacific \$ (16)

PGE \$ (30)

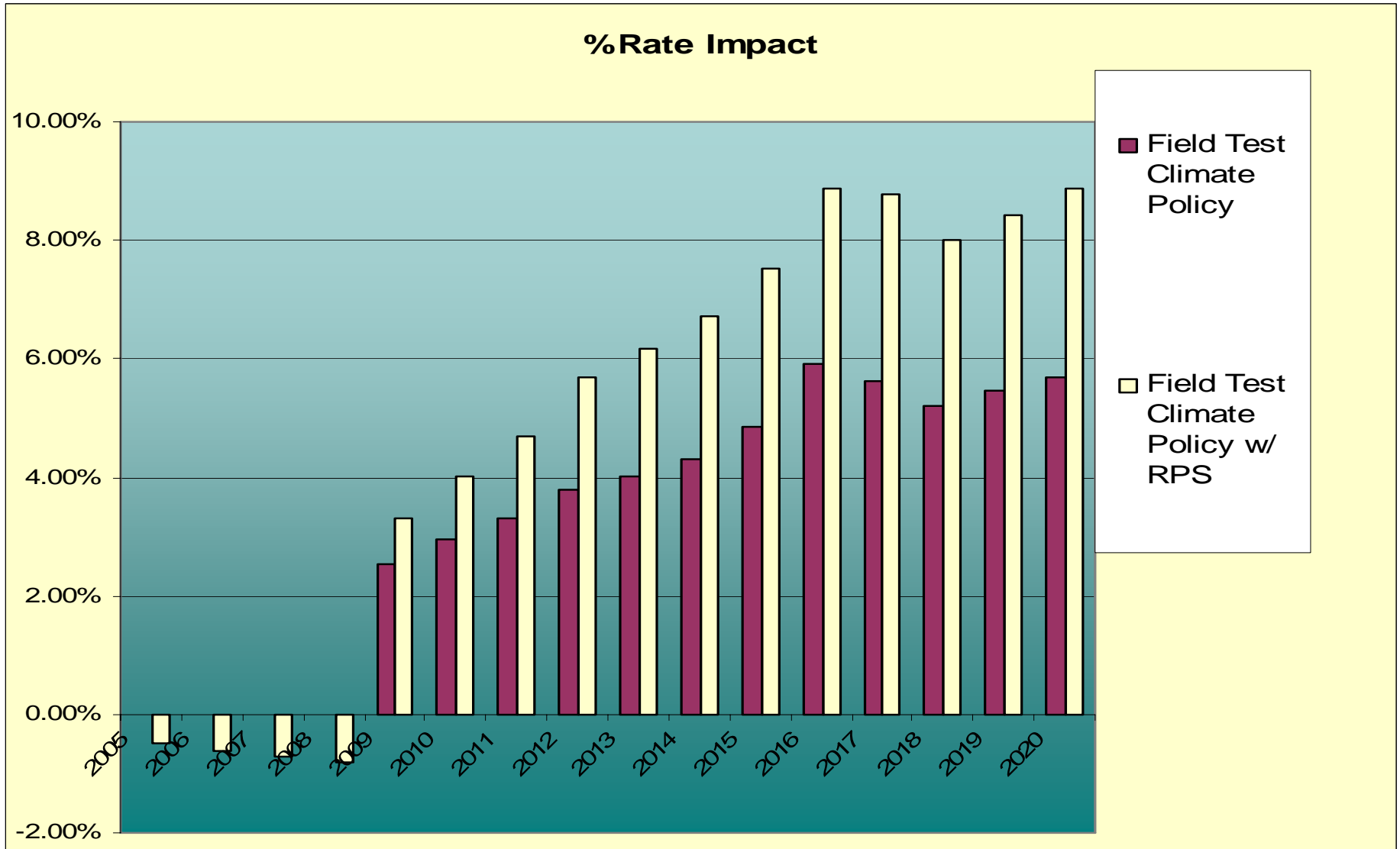
COUs \$ (17)

Total \$ **(65)** (w/ ESSs & ID-Power)

With High Load Growth



With High Load Growth



Bill Payer Impacts of Climate Policy

Annual Millions \$ in 2020

- **With High Load Growth**

- Pacific \$52

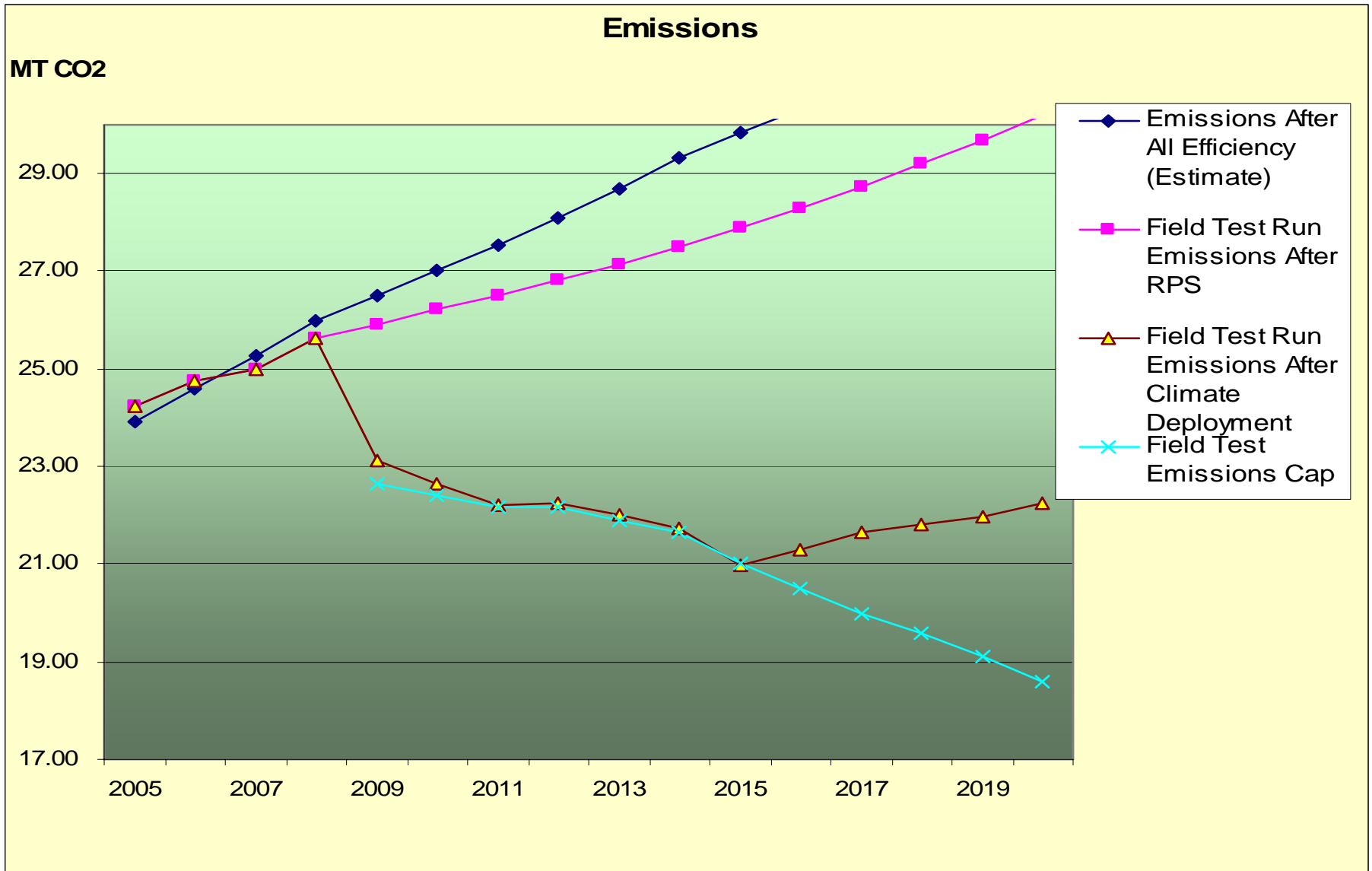
- PGE \$43

- COUs \$27

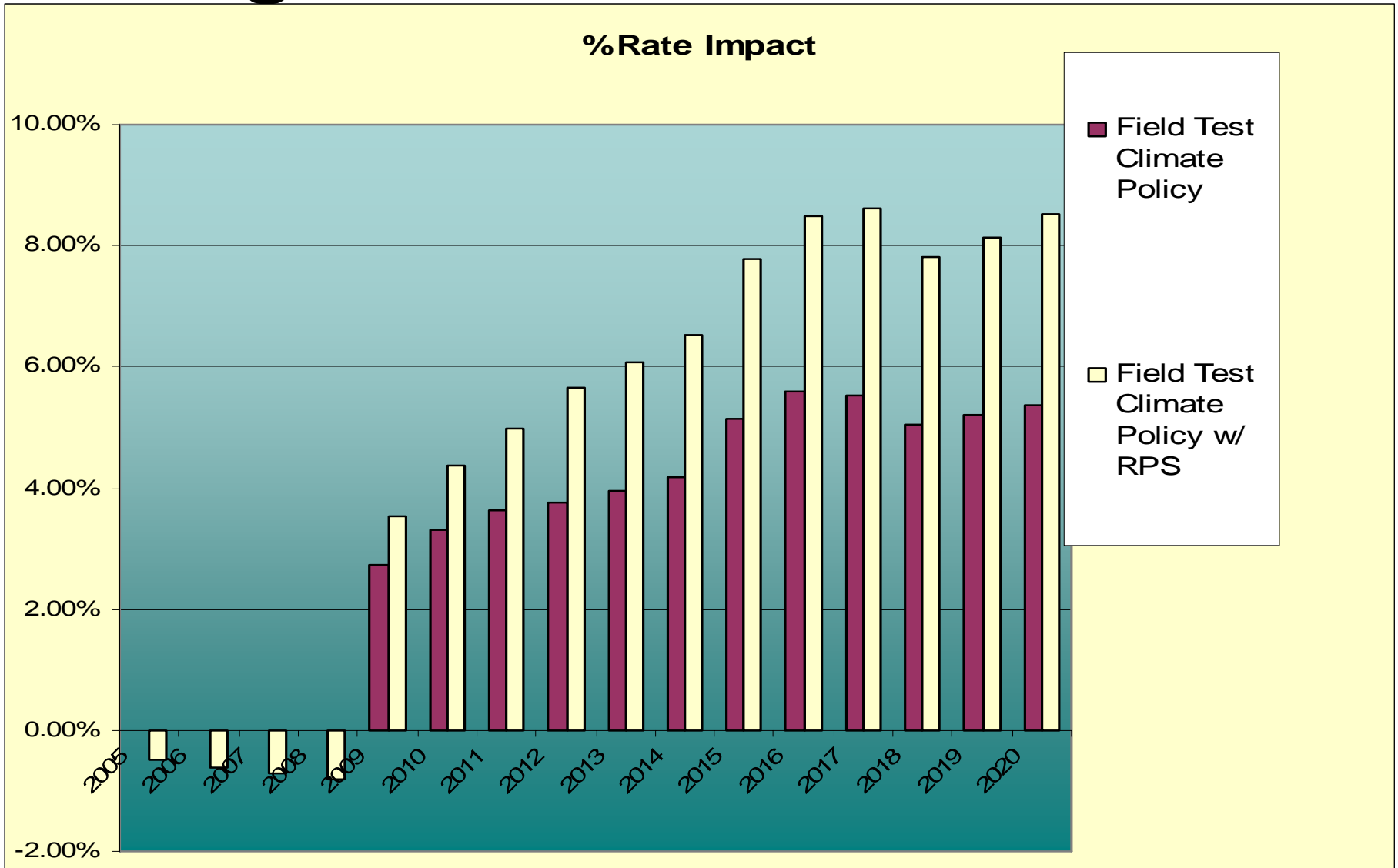
- **Total** **\$125** (w/ ESSs & ID-Power)

= 4.5% of 2004 Retail Revenue

High Loads with \$35 ACP



High Loads with \$35 ACP



Bill Payer Impacts of Climate Policy

2020 Annual Millions \$

- **High Load Growth
with \$35 ACP**

- Pacific \$46
 - PGE \$42
 - COUs \$22
 - **Total** **\$113** (w/ ESSs & ID-Power)
- = 4.0% of 2004 Retail Revenue**

Moderate Loads with \$35 ACP

- Under Moderate Load Growth -- there is no impact of lowering the ACP from \$40 to \$35 as the highest cost measures never exceed \$32 per tonne of CO₂.