



PCWP MACT for Composite Panels

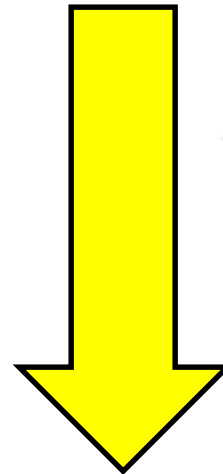
RTO Costs and Challenges

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PCWP MACT Regulatory Impact Analysis

- Estimated Emissions Reductions
 - -27,000 TPY VOC (-13,000 MDF/HB/PB)
 - -11,000 TPY HAPs (-7,000 MDF/HB/PB)
 - -11,000 TPY CO
 - -13,000 TPY PM₁₀
 - +7,000 TPY NO_x



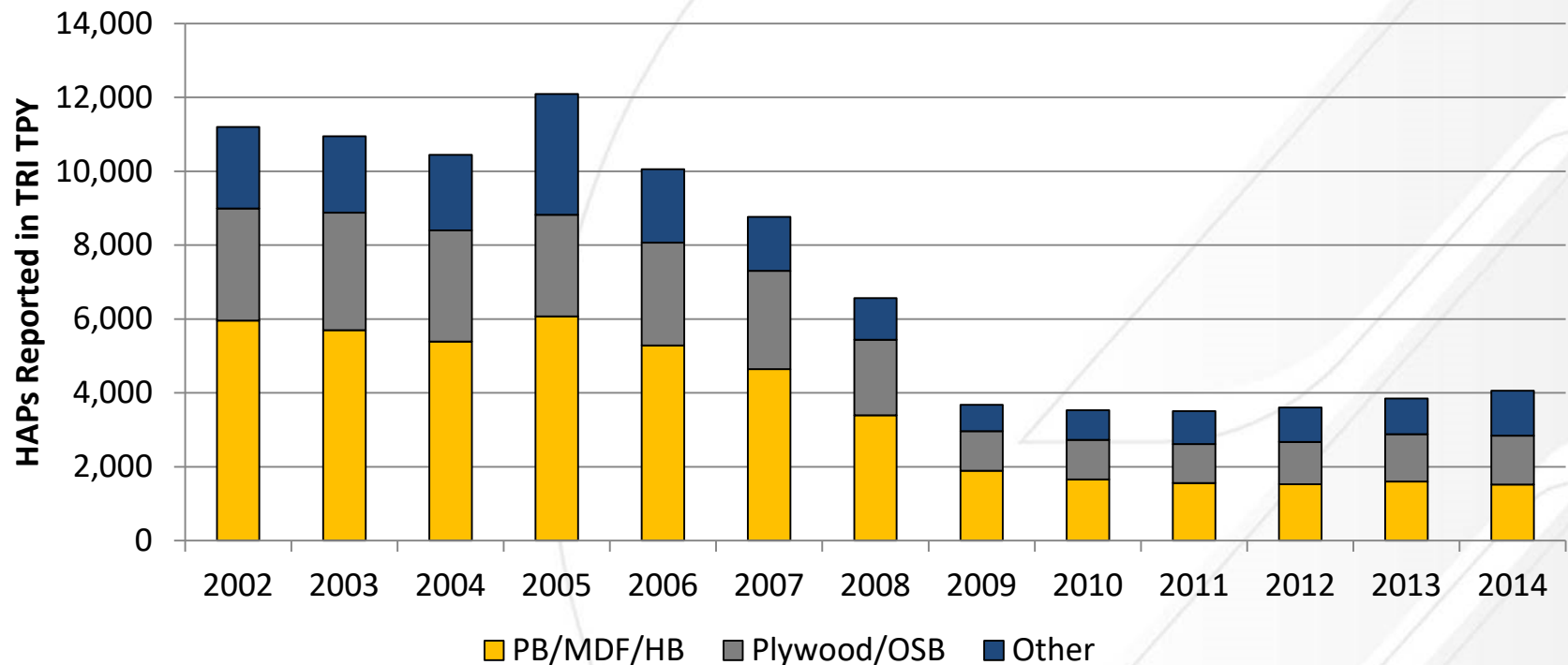
Net Reduction of 59% Total HAPs for MDF, PB, and HB facilities

EPA's Projected Cost to Industry PCWP MACT

- Total capital costs of \$479 million (58% of burden to fall on MDF/HB/PB).
- \$143 million in additional compliance burden, controls, monitoring, and recordkeeping (1999).
- \$135.1 million in social costs.
- Impact of 0.9-2.5% production costs and reduction of 0.1-0.7% output.

Toxic Release Inventory 2002-2014

NAICS 321



Using baseline of 2002-2007, PB/HB/MDF were 52% of total reported HAPs emissions for NAICS 321 and since 2008 mills have reduced total HAPs emissions by 70% (2009-2014). Other industries combined for 59% reduction in total HAPs per year.

MACT is not the only story in 2008... *Economic downturn, ATCM, and inaccurate reporting.*

Control Device Installations

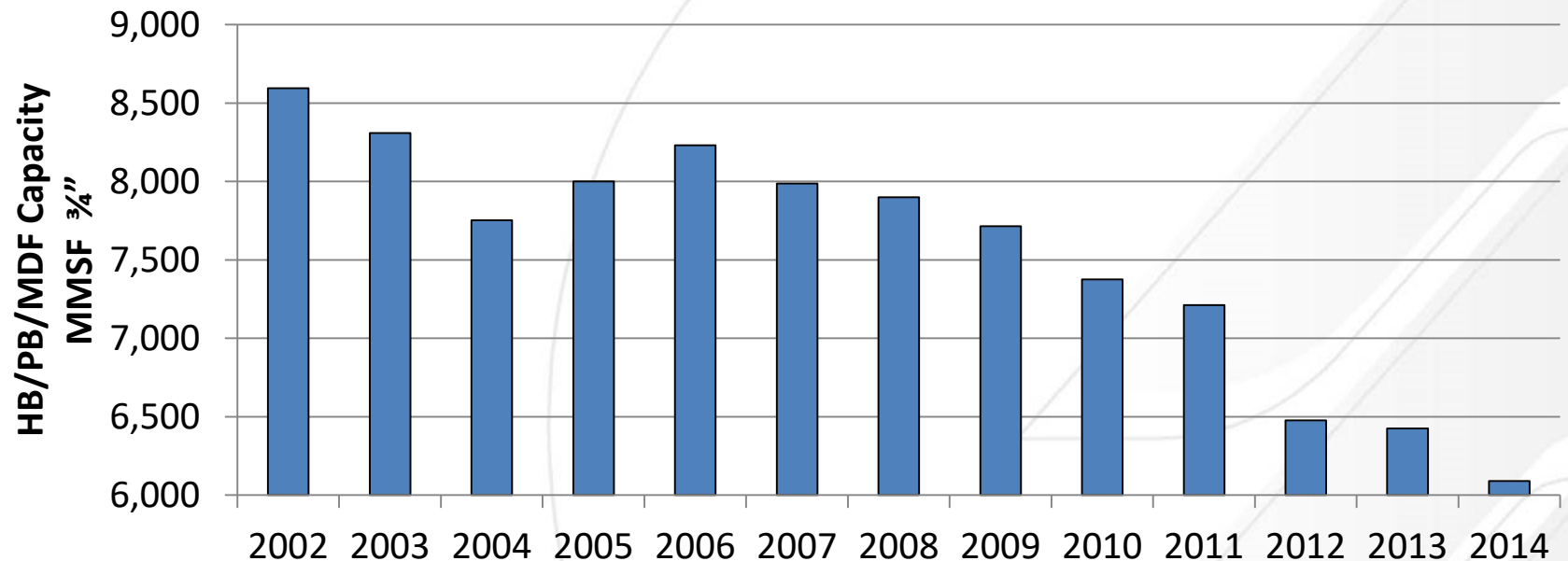
Hardboard, MDF, PB

Process Control Scenario	Equipment with CD Strategy Baseline 1999	Equipment Controlled '99-'16	Equipment Currently Operating
Press Oxidizer	12	+11	18
Press Bio-unit	3	+22	18
Dryers Oxidizer	23	+6	24
Dryers Bio-unit	0	+17	13
Other Technology	0	+5	2

- Based on Title V operating permits, PCWP Background Document, and industry interviews.

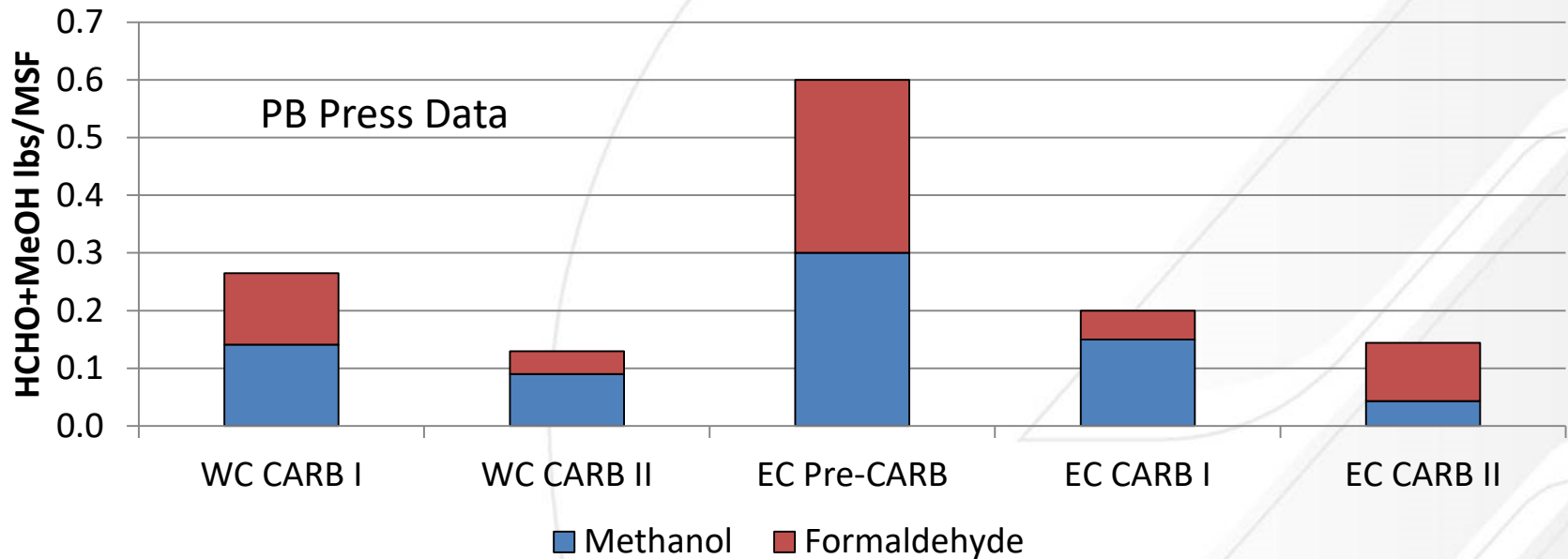
Market Changes

Larger Automated Mills, Imports, Recession, Decreased Demand



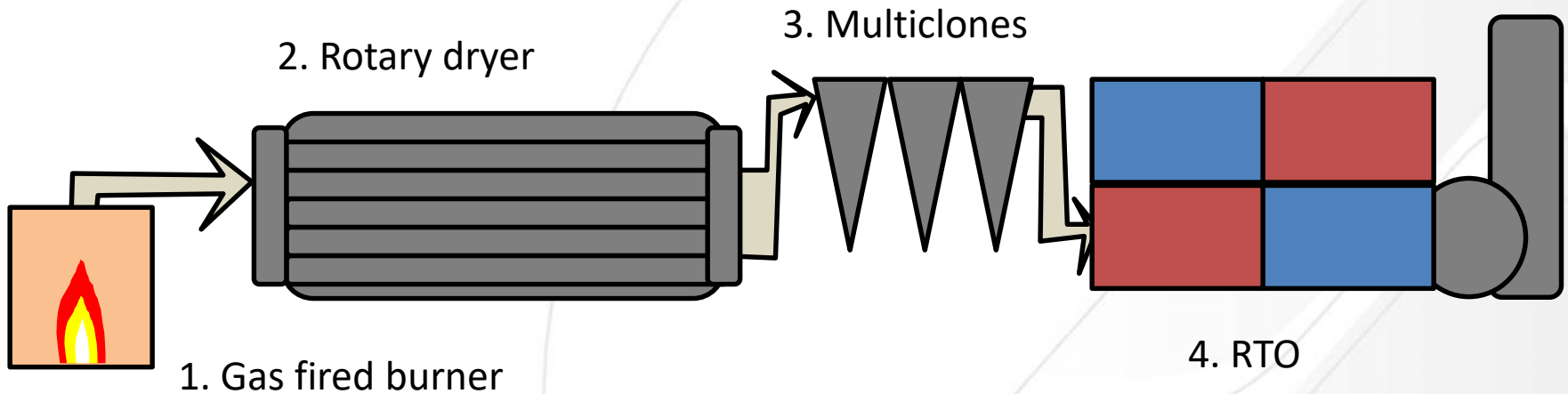
- 2015 shipments of HB/PB/MDF were ~70% of 2005 (pre-recession peak).
- Only 49% of facilities remain from 1997 regulatory impact analysis.
- Average PB facility is 42% larger than 1997 RIA.
- Average MDF facility is 68% larger than in 1997 RIA.

CARB ATCM effect on Emissions



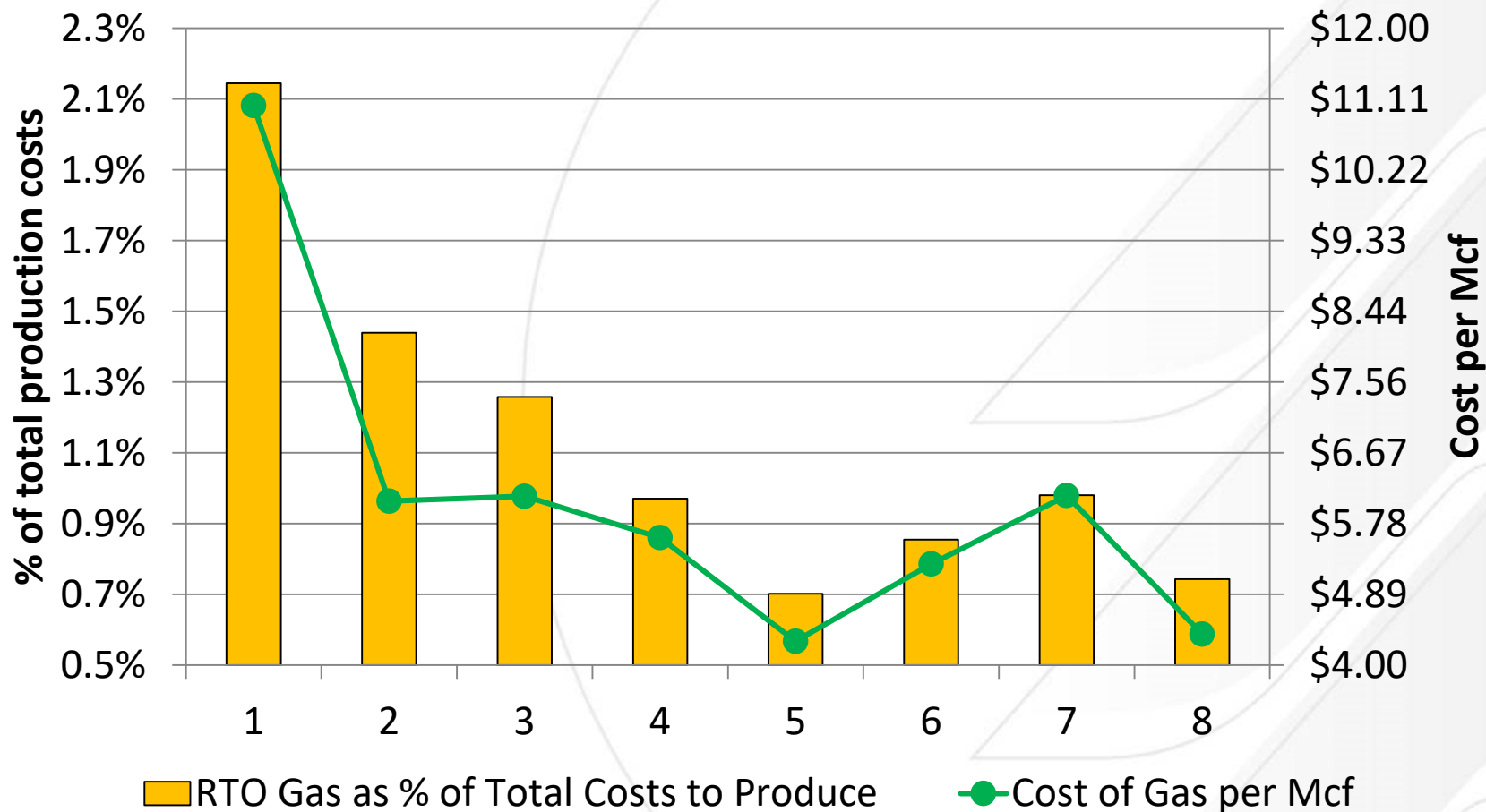
- NAF or CARB Phase II UF resins are now capable of complying with press production based compliance option (0.3 lbs HAPs/MSF).
- HAPs reduction target of 90% in MACT is more challenging with 3X (or more) lower inlet concentrations from press exhaust due to non-detect outlets or BDL for sampling methods. Processes that are indirectly affected by resin (i.e. particleboard dryers) also have reduced HAPs emissions.

Case Study: New RTO 90% vs. 95% THC DRE



New green rotary dryer at PB plant. Starting up dryer and commissioning RTO gave us opportunity to test inlet/outlet emissions at different temperatures to setup unit for compliance temperature testing.

Baseline RTO Natural Gas Usage for Example Facility



Expected Annual Operational Costs

New Green Rotary Dryer RTO

- NG → 37,000 MMBTU/yr in gas = +\$170k
- Electricity → 1.3 MMkWhr/yr = +\$80k
- New thermocouples per year = +\$2k
- Maintenance Labor TBD
- Media Rebuilds TBD
- Social Costs...?

Destruction Efficiencies

Across New RTO

Net ± in lbs/hr Pollutant		
THC (as propane)	-95%	-90%
NO _x	+244%	+177%
CO ₂	+31%	+14%

Note 1: Methane destruction 75% across RTO, CO destruction ~25%

Note 2: HAPs concentrations outlet tested BDL of Method 320 so HCHO and MeOH DRE were not reflective of actual DRE.

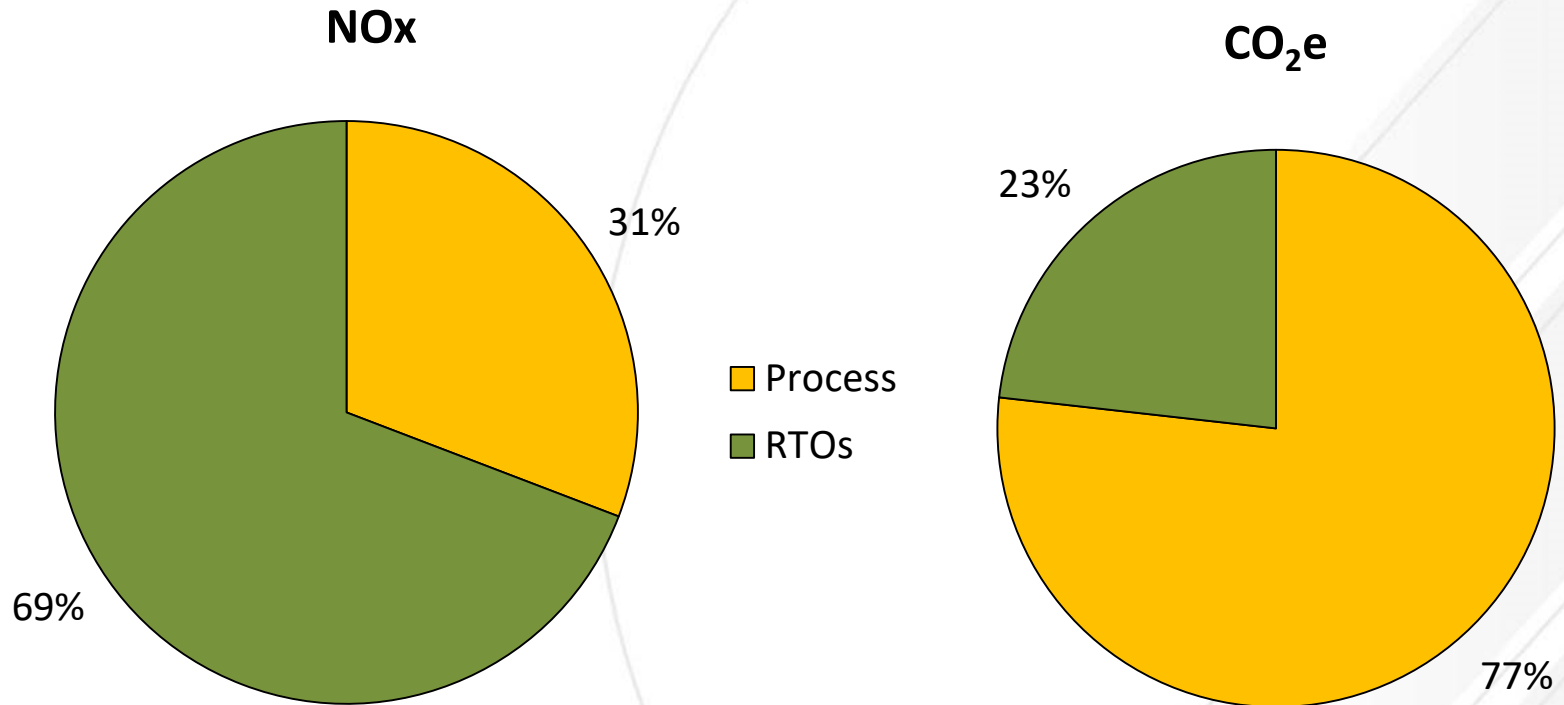
Emission Intensity Increases

Across New RTO

Net ± in lbs/ODT Pollutant		
	95% THC	90% THC
THC (as propane)	-3.89	-3.40
NO _x	+0.21	+0.16
CO ₂	+123	+66.8

For example, a facility that produces 150 MMSF/year at 1.25 ODT/MSF would decrease THC emissions by 45 TPY, increase NO_x emissions by 4 TPY, and increase CO₂ emissions by 5,000 TPY increasing a green dryer RTO from 90 to 95% THC destruction.

Site-wide Emissions *w/ New RTO*



RTO control devices significantly increase NOx emissions for the tested facility (natural gas fired facility).

Conclusions and Discussion

- MACT combined with CARB's ATCM, closures, and facility improvements resulted in MACT goal of final total HAPs emissions reductions and reduction efficiency for HAPs per plant.
- RTO technology emphasized in initial HAP background information significantly increases NO_x emissions for a plant site. GHG emissions increased by ~23% when controlling dryers with RTO.
- PSD BACT determinations for new/modified sites need to consider implications of additional GHG and NO_x. New combustion controls could result in conflicts between MACT, PSD, and O₃ NAAQS.
- Current oxidizer technology will struggle with >90% HAPs control requirements due to lowered inlet concentrations from MDF/PB presses and dryers. Low emitting sources will be very challenging to comply with 90% HAPs reduction (blenders/formers).