

# Refinery Allocation Under Cap-and-Trade

## Proposed 2013 Amendments

# Participation and Comments

- Presentation and proposed CWB language posted at <http://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm>
- Email questions to [coastalm@calepa.ca.gov](mailto:coastalm@calepa.ca.gov)
- Comment period on this workshop ends 10/14, but 45 day comments accepted until October Board Hearing

# Regulatory Context

- Today's workshop is within the 45-day comment period which precedes the October 24-25 Board Hearing
  - All comments received will be included in FSOR
- Staff will make a proposal regarding the refinery sector at the October Board Hearing
  - Board can direct staff to make 15-day changes

# Mandatory Reporting Regulatory Deadlines

- Updates to MRR requirements to allow CWB would need to be presented at October 24-25 Board Hearing for MRR amendments
- Proposed changes would be included in 15-day review of modified text language
- To ensure MRR is effective by January 1, 2014, the 15-day review period would start October 28

# Process to Date

- Received proposal in May
- Conducted a survey to collect information from California refineries to evaluate CWB proposal and determine benchmark
- Conducted workshop in August to discuss initial staff thinking
- Revised proposal based on input from workshop, final data gathering, and further data analysis

# Outline

- CWB Analysis
- Proposal as a Whole
- Process Units
- Electricity and Steam
- Typical vs. Atypical Refineries
- Hydrogen
- Calcining

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# CWT and CWB As Basis for Allocation

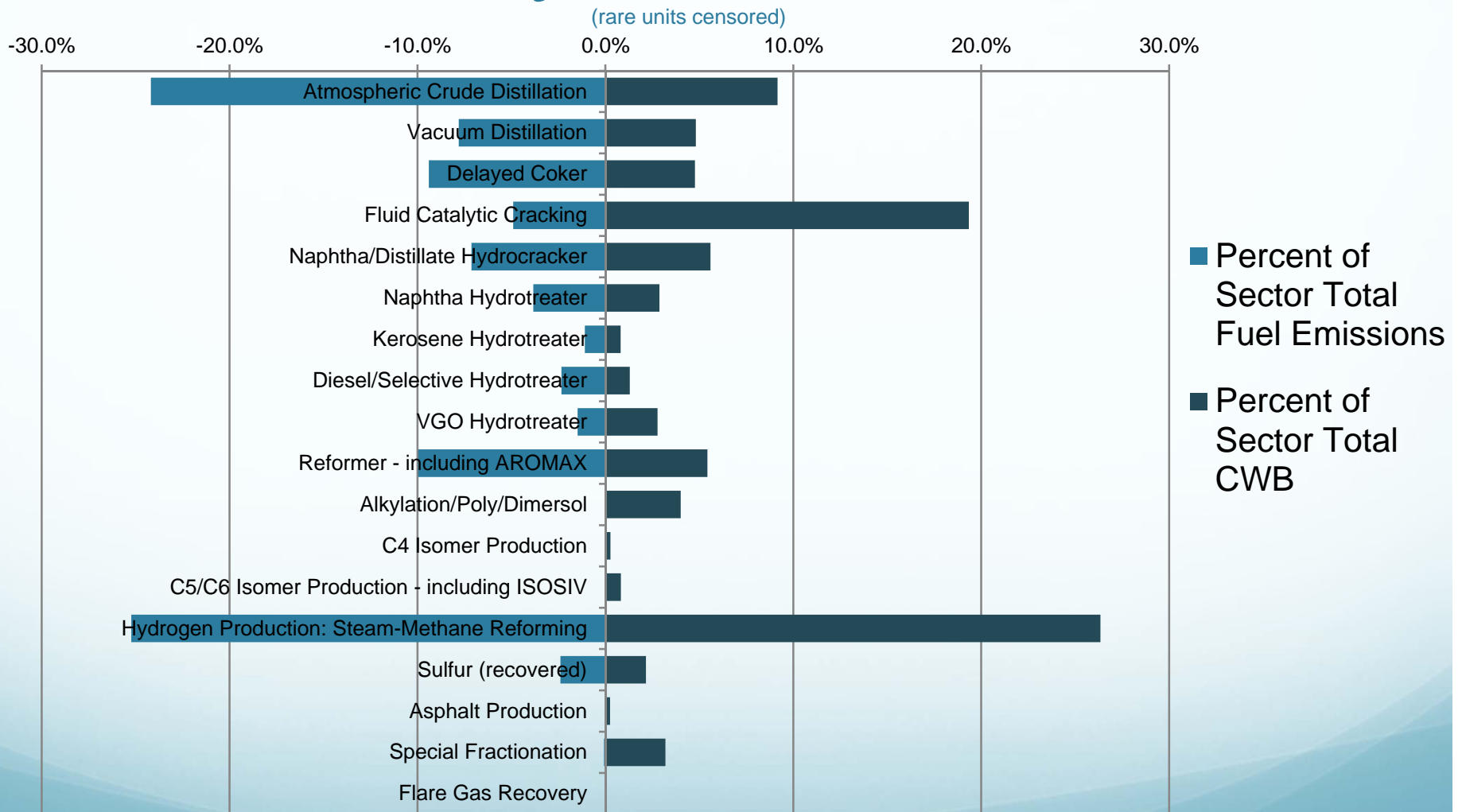
- The Complexity Weighted Barrel (CWB) methodology is proposed as the basis for refinery allowance allocation starting in the 2<sup>nd</sup> compliance period
- If adopted, would replace Carbon Dioxide Weighted Tonnes (CWT)
- Both are methods of assessing GHG emissions associated with each “process unit” at a refinery
- The “CWB factor” for each process unit is multiplied by the throughput for that unit and these are summed to get the total CWB
- Both rely on data and CWB factors from Solomon Associates



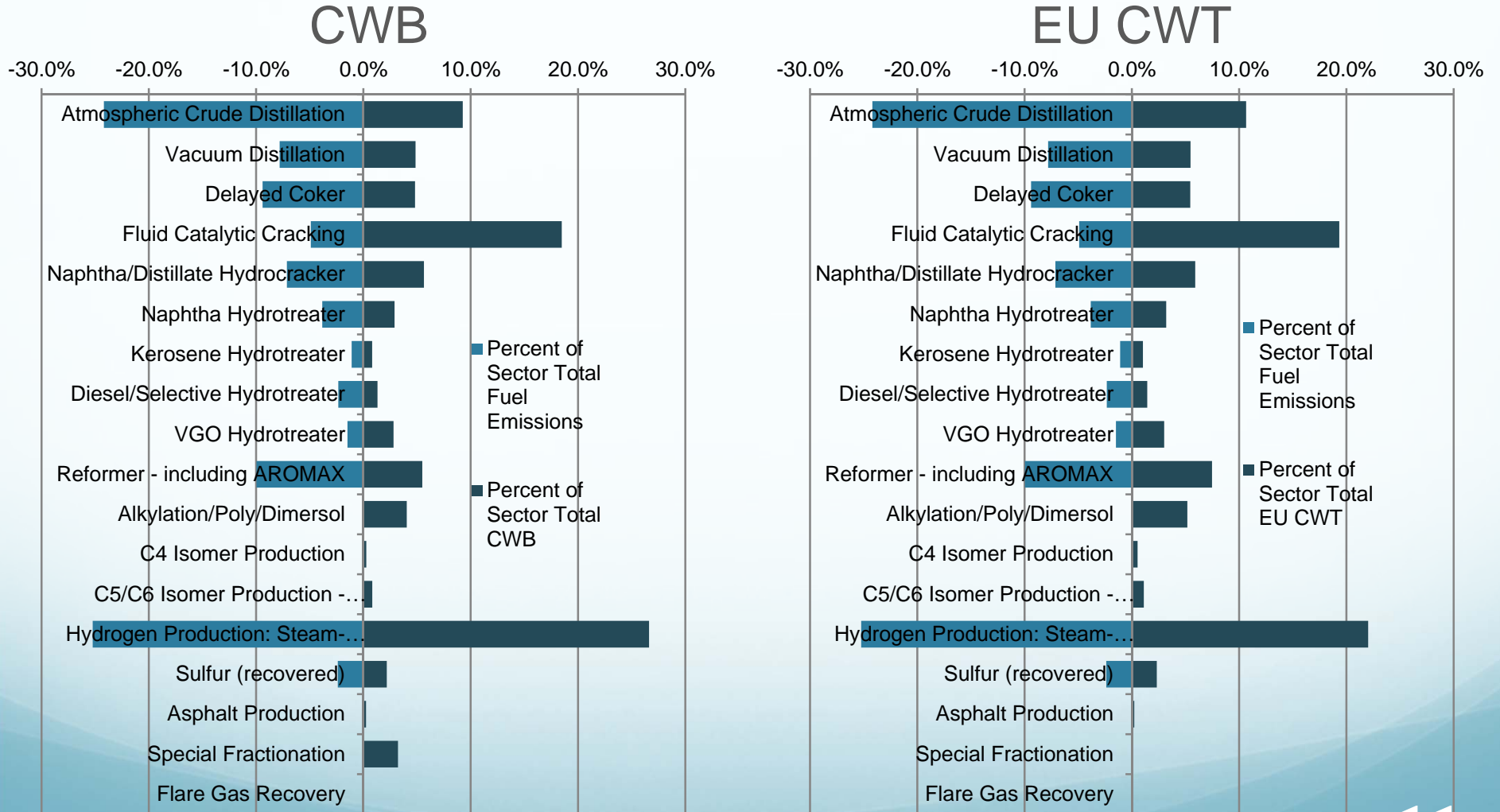
# CWB vs. Emissions

- California refineries' CWB is closely related to their emissions under the benchmark:
  - $CWB = 0.8476 * (\text{emissions in benchmark})$
  - $R^2 = 0.9813$

# Fuel-Based Emissions and CWB by Process Unit



# Comparing CWT and CWB Alignment with Fuel-Based Emissions



# Comparing CWT and CWB Net Impacts on Refineries

	All Refineries		
	Weighted	Unweighted	
	Average Percent of Obligation Covered	Average Percent of Obligation Covered	SD of Percent of Obligation Covered
CWB	83%	76%	21%
CWT	85%	81%	23%

CWB values above are as defined in WSPA proposal

CWT values are based on EU CWT definitions and ARB survey data

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- **Staff Proposal as a Whole**
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# Staff Proposal: Summary

Staff propose 15-day regulatory amendments which would:

- Use Complexity-Weighted Barrel (CWB) instead of Carbon Dioxide-Weighted Tonne (CWT)
- Not change any process unit factors, including off-site adjustment, from those provided by Solomon Associates
- Exclude electricity purchased and sold and include steam consumption in ARB benchmark, consistent with other benchmarks
- Calculate separate CWB benchmark for “atypical” refineries
- Allocate for hydrogen production separately from CWB
  - Same benchmark and thus consistent incentives for on-site and off-site hydrogen
- Allocate for calcining separately from CWB, using standard process to calculate benchmark

# Staff Proposal: Mandatory Reporting

- Staff propose new CWB Data Reporting & Verification Requirements
- Updates needed in MRR to accommodate CWB reporting (document handouts)
  - CWB reporting and verification language,
  - Table of CWB functions and factors, and
  - Definitions (necessary for reporting consistency and verification)
  - Definitions and table developed in conjunction with stakeholders and the cap and trade benchmarking group

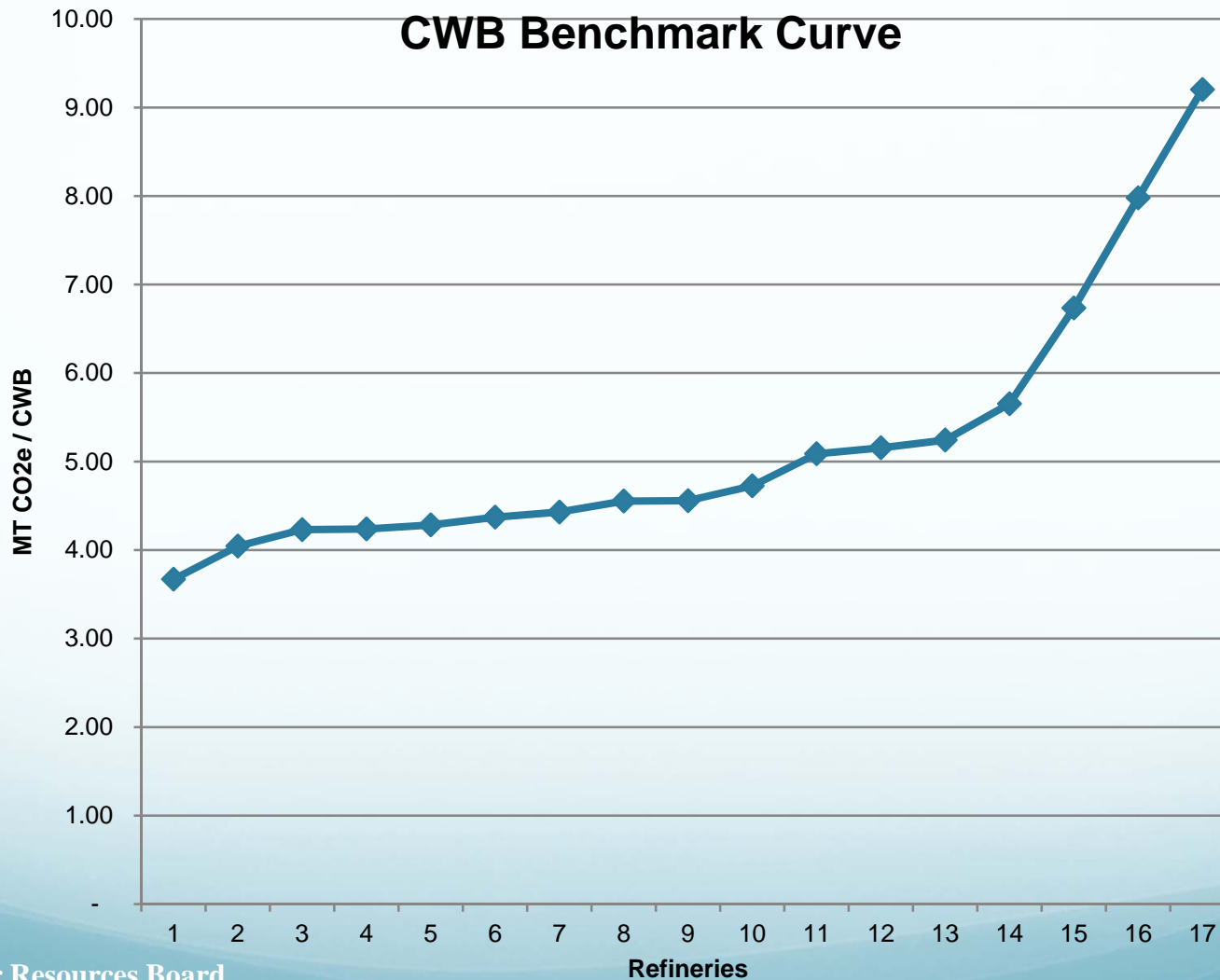
# Main Refinery Benchmark

Benchmark Production Unit	Benchmark (Allowances/CWB)
CWB with all modifications	4.08

CWB units reflect the use of 1,000's of barrels per year as units for most process units



# Refinery Distribution Under This Proposal



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# Staff Proposal: Process Unit Factors Under CWB

- Staff proposes no amendments to Solomon Associates' values for process unit factors
- Combining process units for cokers and catalytic crackers was considered
  - Variation in products makes combining them problematic
- Removing the off-site and non-process steam adjustments was previously considered
  - This small factor is related to refinery size (but not complexity per se), but including it is supported by refineries of all levels of complexity

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# Staff Proposal: Treatment of Steam and Electricity

- Staff proposes to follow ARB Standard Benchmarking Approach
  - Direct emissions plus steam and electricity purchased emissions minus steam and electricity sold emissions included by Solomon in CWB factors
  - Direct emissions plus steam purchased and minus steam and electricity sold included in ARB benchmark
  - Electricity purchased emissions handled by CPUC – assume similar approach to their proposal for other sectors
- Considered proposal to calculate one benchmark and use a ratio to divide up the allocation between ARB and CPUC

# Comparison with “Ratio” Approach for Steam and Electricity

Policy Goals	Accomplished Under Ratio Approach?	Accomplished Under ARB Standard Approach?
Equitable Treatment of On and Off-site Steam and Electricity Sources	Partially	Yes
Conceptual Consistency with CWB Creation	Yes	Yes
Consistency with ARB and CPUC Treatment of Other Sectors	No	Yes
Consistent Incentives to Reduce Direct and Indirect Emissions	Partially	Yes
Minimize Unnecessary Calculations	No	Yes

# Ratio and ARB Approaches Under Ideal v. Realistic Conditions

- The ratio approach and ARB standard approach will both accomplish the same thing, if:
  - All purchased electricity has same emissions intensity
  - CPUC valuation of an allowance exactly equals actual allowance value
- If these conditions do not hold,
  - The ratio approach creates idiosyncratic effects
  - The standard approach creates equitable results

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# Staff Proposal: Typical and Atypical Benchmarking

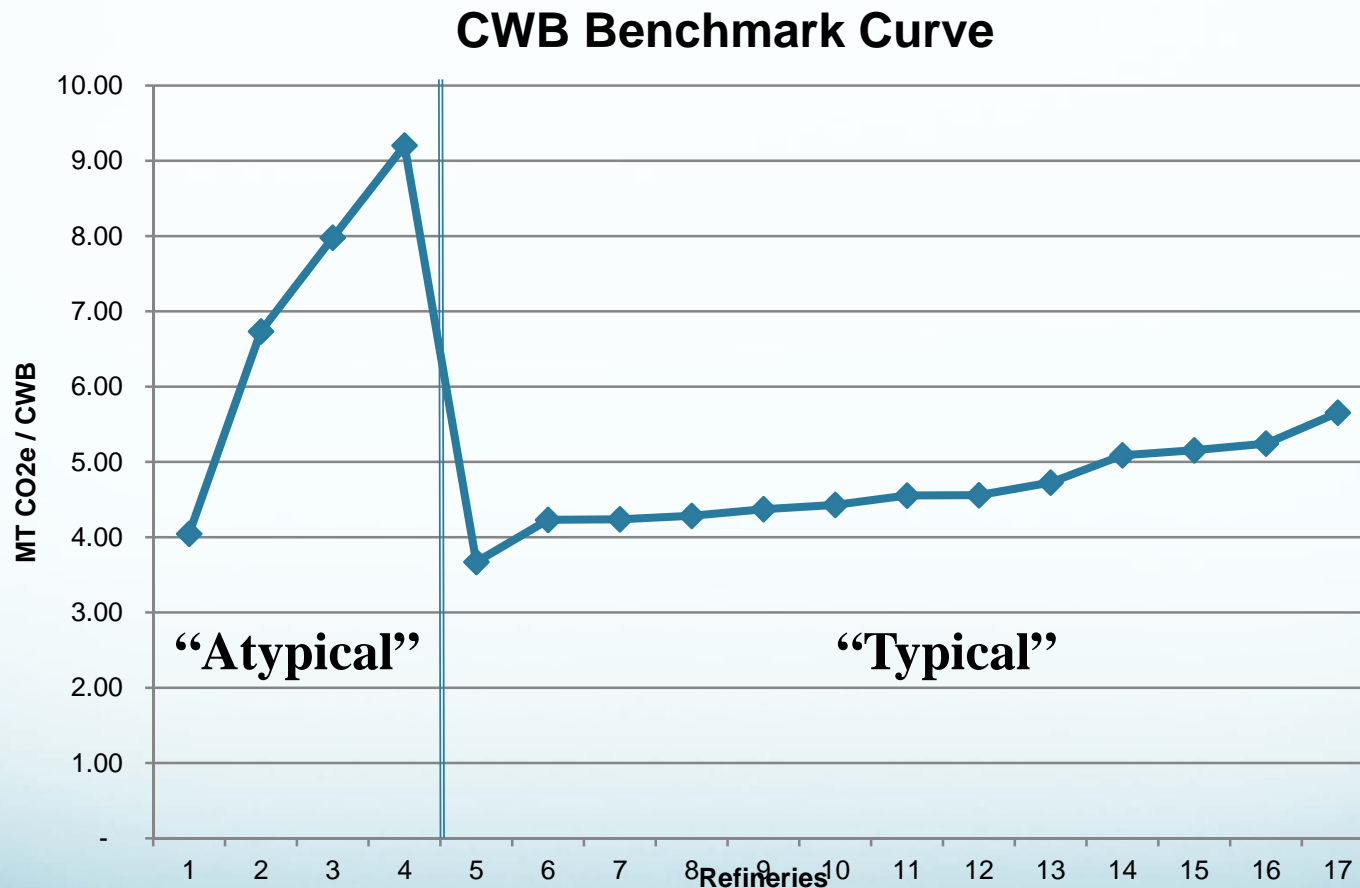
- Staff proposes to benchmark atypical refineries separately under CWB
- Atypical proposal:
  - Defined as having < 12 process units and < 20 million barrels crude through the atmospheric distiller / year (during allocation year)
  - If jointly operated with another refinery, must meet those criteria for the combined facilities
  - Includes 5 refineries, based on 2008 and 2010 data

# Emissions of Typical and Atypical Refineries

	<b>Atypical Refineries (N = 4)</b>	<b>Typical Refineries (N=13)</b>	<b>Total of 17 Refineries</b>
<b>Portion of Total Emissions</b>	2%	98%	100%
<b>Total Emissions</b>	510,800	31,467,055	31,977,855

One refinery which was non-operational in 2010 was omitted from this analysis

# Refinery Benchmark Curve by Atypical and Typical Refinery Type



# Comparing Benchmark Performance by Refinery Type

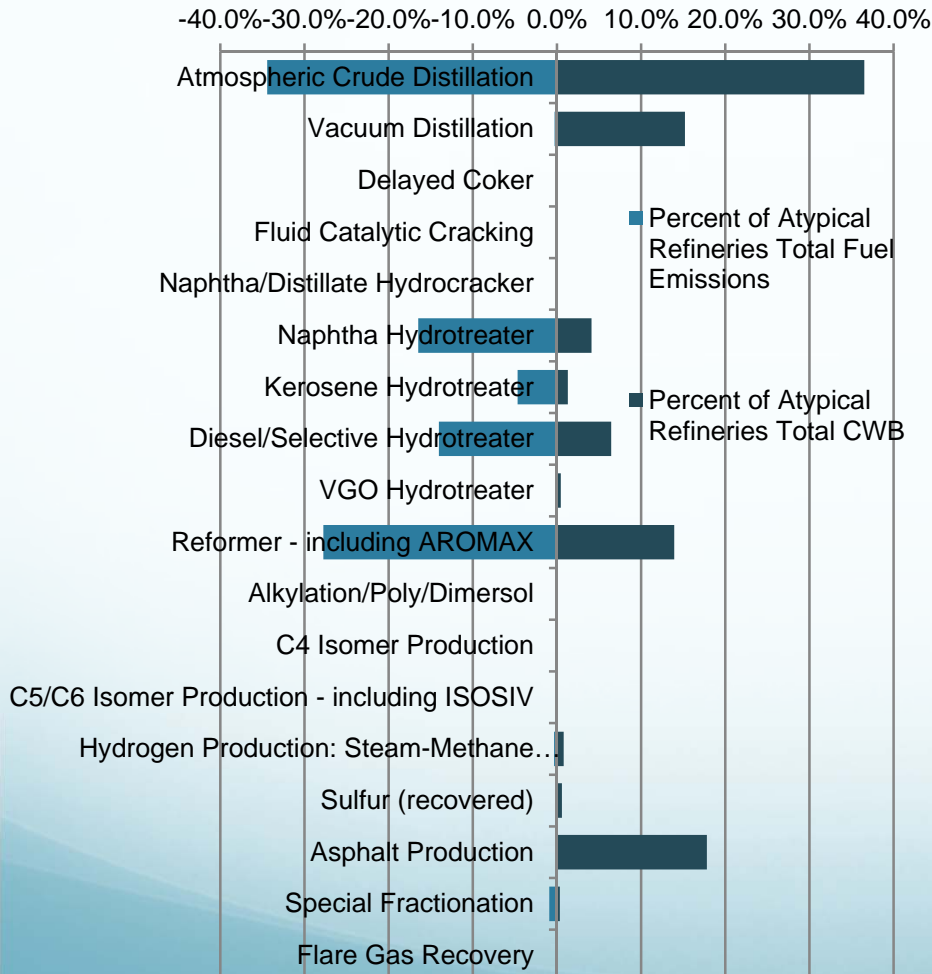
	Benchmarks (allowances/CWB)		Percent that Typical is Lower Than Atypical
	Atypical Refineries Only (N=4)	Typical Refineries Only (N = 13)	
CWB	6.78	4.08	40%
CWB Best in Class	X	X	9%
CWT	46.18	33.10	28%

Highlighted cells show proposed benchmark values

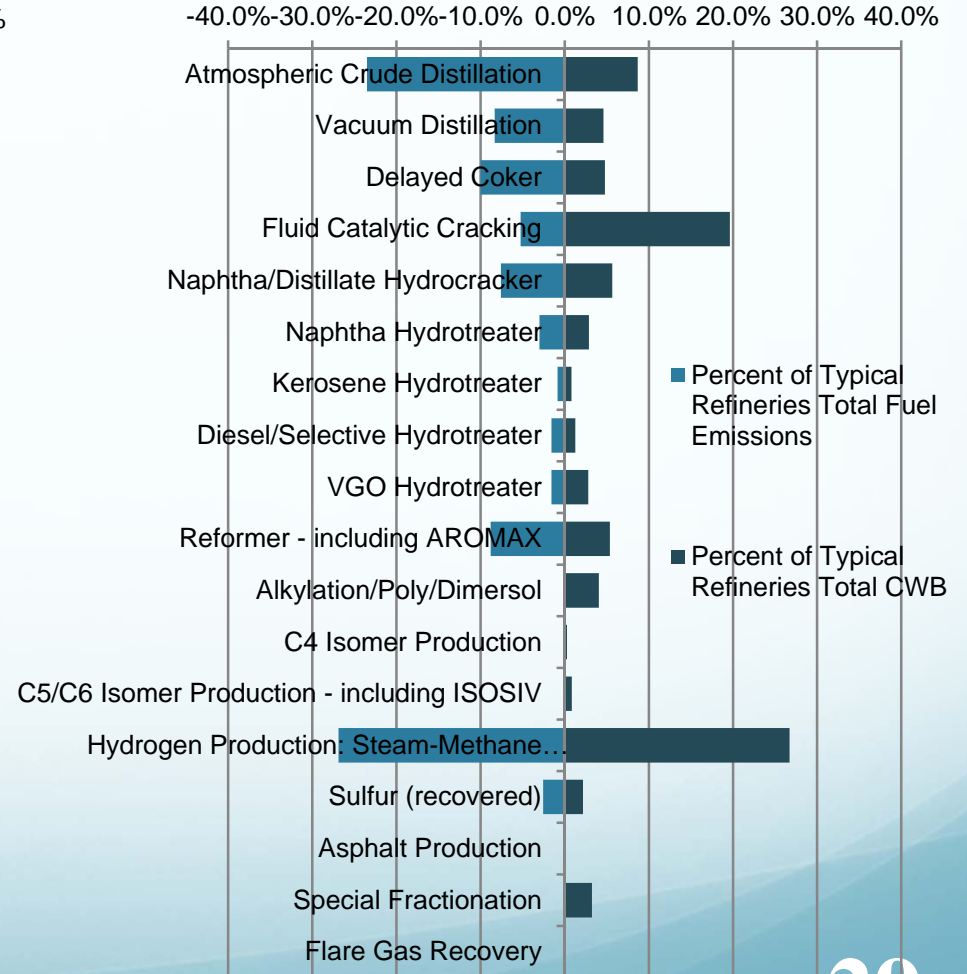
# Atypical v. Typical by Process Unit

(rare units censored)

## “Atypical”



## “Typical”



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# Staff Proposal: Separate Hydrogen Benchmarking

- Staff proposes to benchmark hydrogen separately from CWB
- Refinery hydrogen would be allocated not under CWB but under separate hydrogen benchmark based on California specific hydrogen data
- Achieves policy goals:
  - Consistent incentives between on-site and off-site hydrogen production
  - Avoiding over-allocation to off-site hydrogen that would occur if off-site hydrogen allocated through CWB

# Hydrogen Issues Under CWB

- Merchant hydrogen would be over-allocated under CWB relative to its GHG efficiency
- Therefore it would not have same degree of incentive to increase efficiency
- CWB factors are designed to work together, but hydrogen factor needs to work separately to appropriately allocate to off-site hydrogen



# Same Benchmark for Liquid Hydrogen

- Staff proposes to give liquid hydrogen the same benchmark as gaseous hydrogen
- Liquid hydrogen direct GHG emissions come primarily from producing hydrogen, not from condensing it to liquid
- Therefore, it is equitable to provide the same benchmark

# Hydrogen Benchmark

	Gaseous Hydrogen Benchmark (allowances / m scf)	Liquid Hydrogen Benchmark (allowances / m scf)
Hydrogen Benchmark, Calculated Using Standard Benchmarking Approach	20.00	20.00

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# Staff Proposal: Calcining Benchmarking

- Staff proposes to benchmark calcining separately from CWB
- Rationale:
  - Calcining can be done separately from refinery operations
  - Calcined coke is not a fuel, unlike most refinery products

# Calcining Benchmark

Calcining Benchmark, Calculated Using  
Standard Benchmarking Approach  
(allowances / MT calcined coke)

0.632

# Summary – Proposed Benchmarks

Product	Benchmark
CWB (typical refineries, allowances / CWB, using 1000's per year for throughputs)	4.08
CWB (atypical refineries, allowances / CWB, using 1000's per year for throughputs)	6.78
Gaseous Hydrogen (allowances / m scf)	20.00
Liquid Hydrogen (allowances / m scf)	20.00
Calcining (allowances / MT calcined coke)	0.632

Benchmarks are subject to change after final calculations completed

# Next Steps

- Most helpful if comments are submitted by October 14<sup>th</sup>, 5 PM:  
<http://www.arb.ca.gov/lispub/comm/bclist.php>
- Comments may be submitted during the entire 45-day comment period
  - If after October 14, it may be difficult to react to before Board Hearing
- Board Hearing October 24-25<sup>th</sup> for both MRR and Cap and Trade
- MRR amendments would need to be in effect Jan. 1, 2014

# Contacts

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