

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
- 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

Outline

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

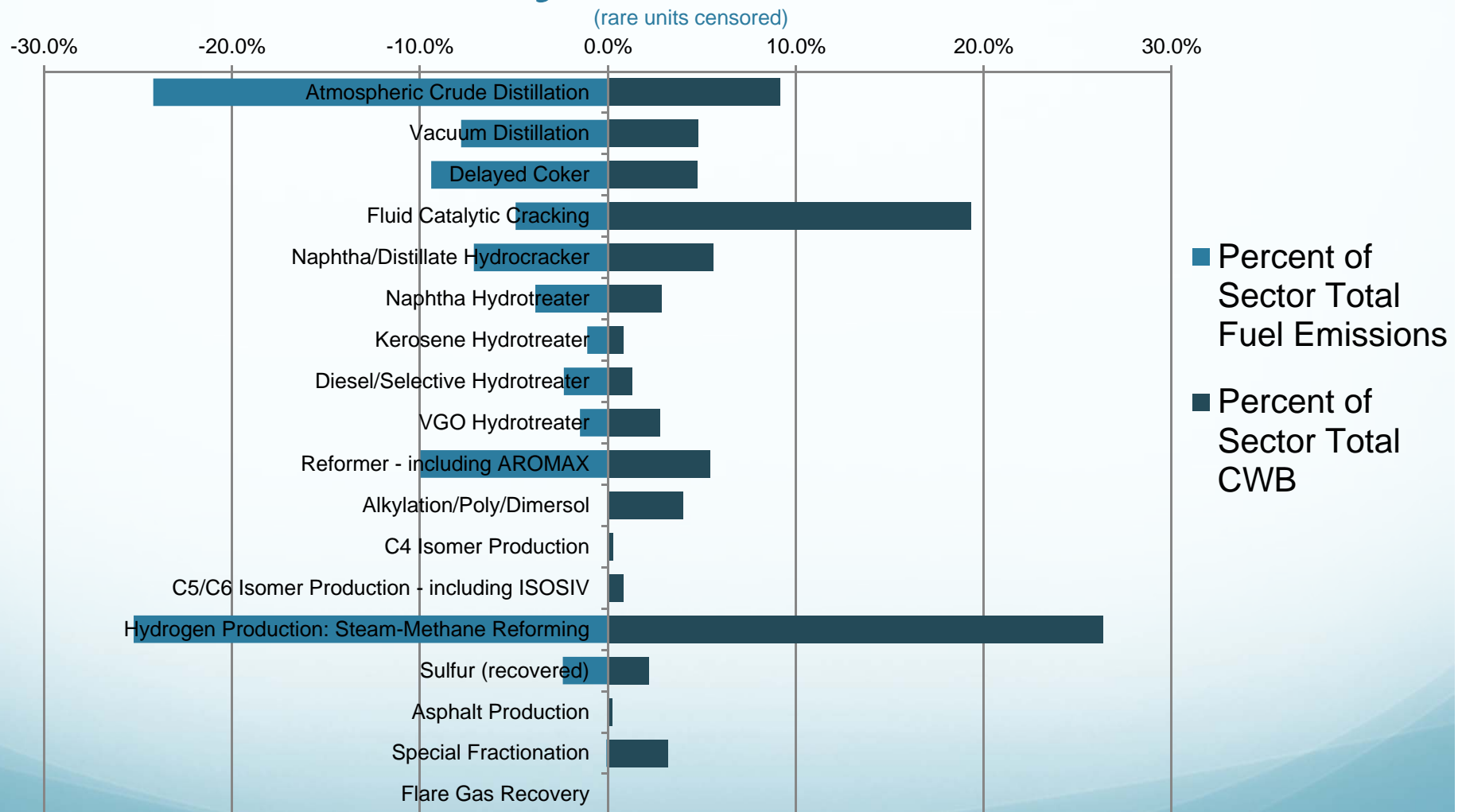
CWT and CWB As Basis for Allocation

- The Complexity Weighted Barrel (CWB) methodology is proposed as the basis for refinery allowance allocation starting in the 2nd 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

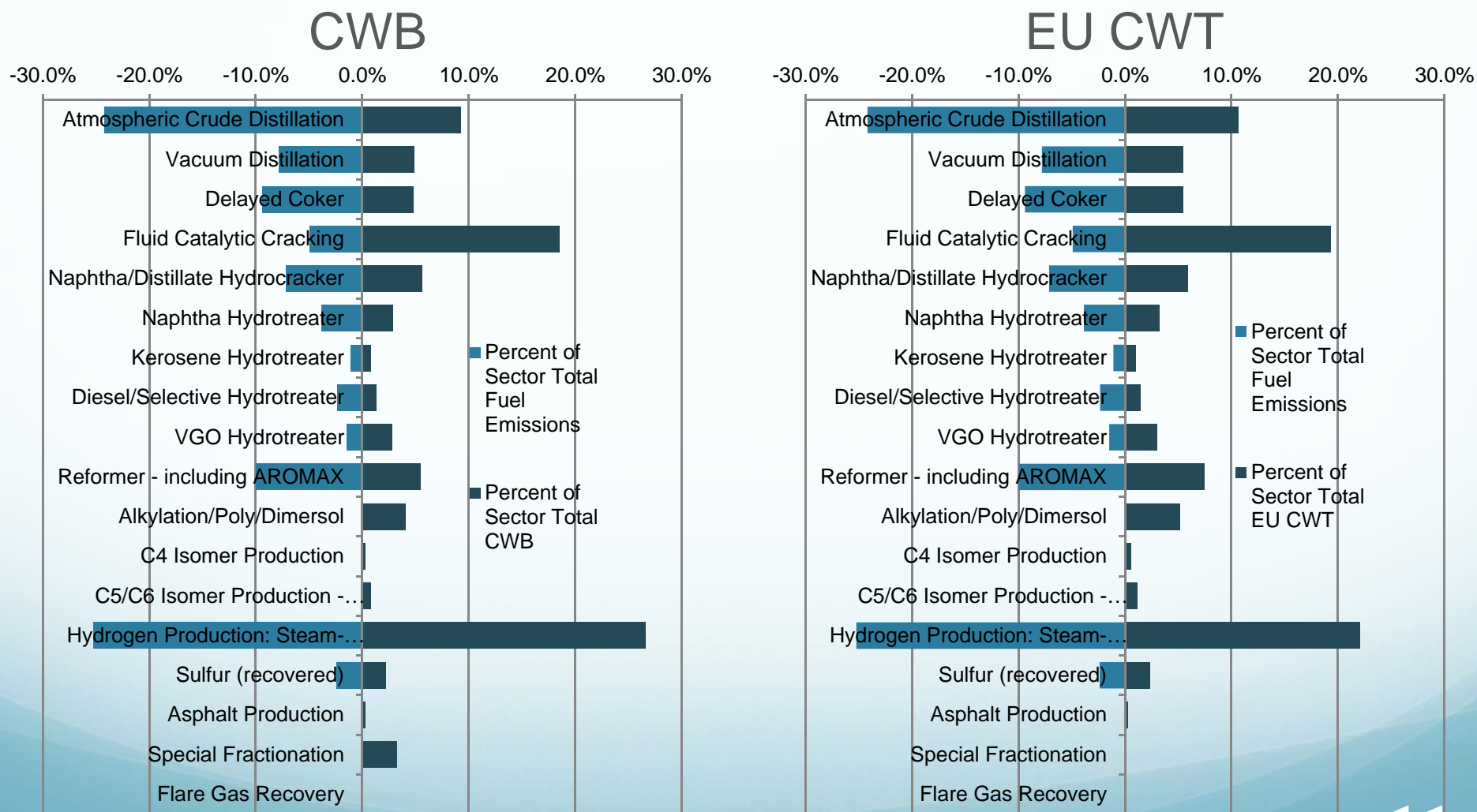
CWB vs. Emissions

- 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 Average Percent of Obligation Covered | Unweighted 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

Outline

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

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

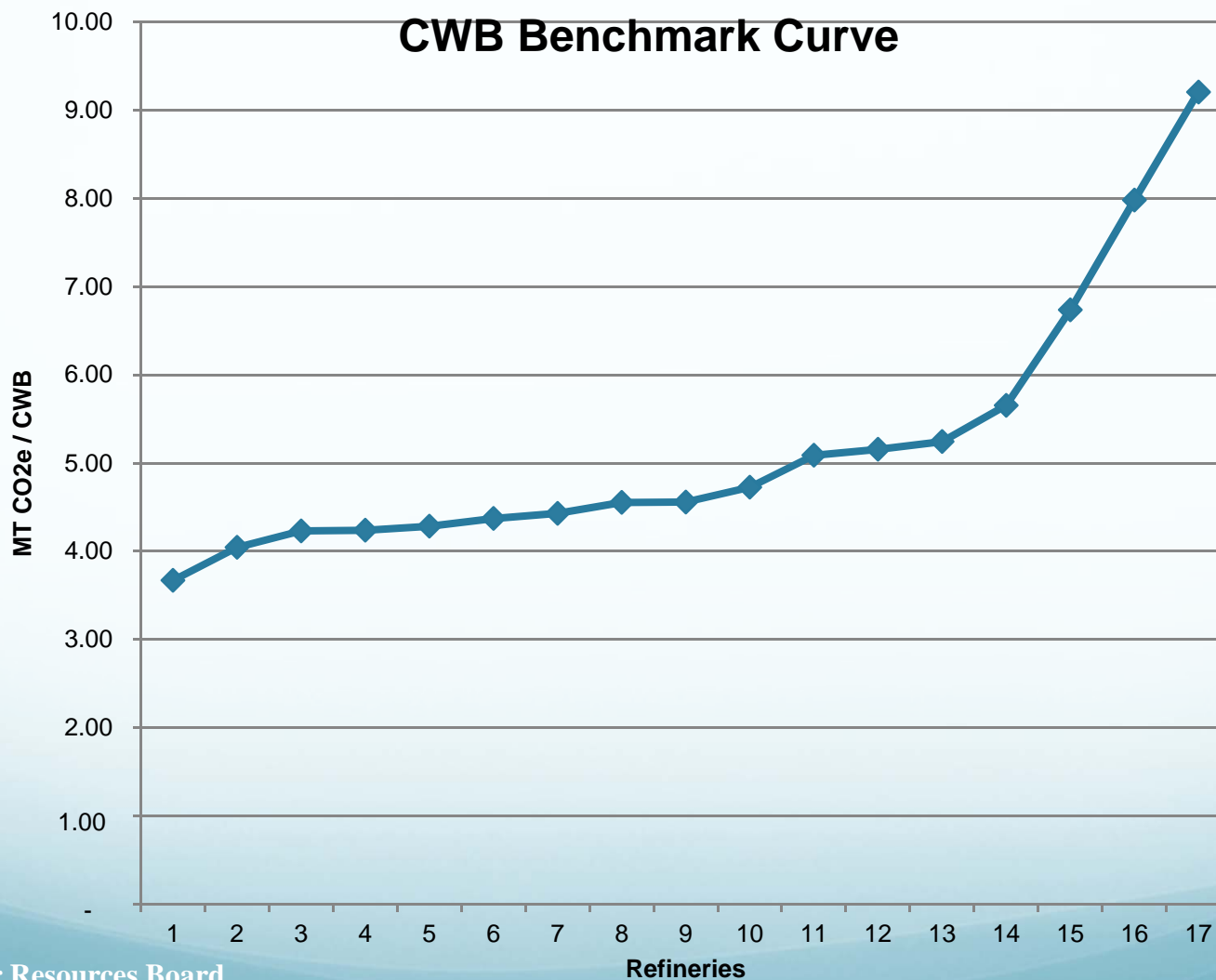
- Staff propose new CWB Data Reporting & Verification Requirements
- Updates needed in MRR to accommodate CWB reporting (document handouts)
 - CWB reporting and verification language,
 - Table of CWB functions and factors, and
 - Definitions (necessary for reporting consistency and verification)
 - Definitions 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



Outline

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

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

Outline

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

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

Outline

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

Staff Proposal: Typical and Atypical Benchmarking

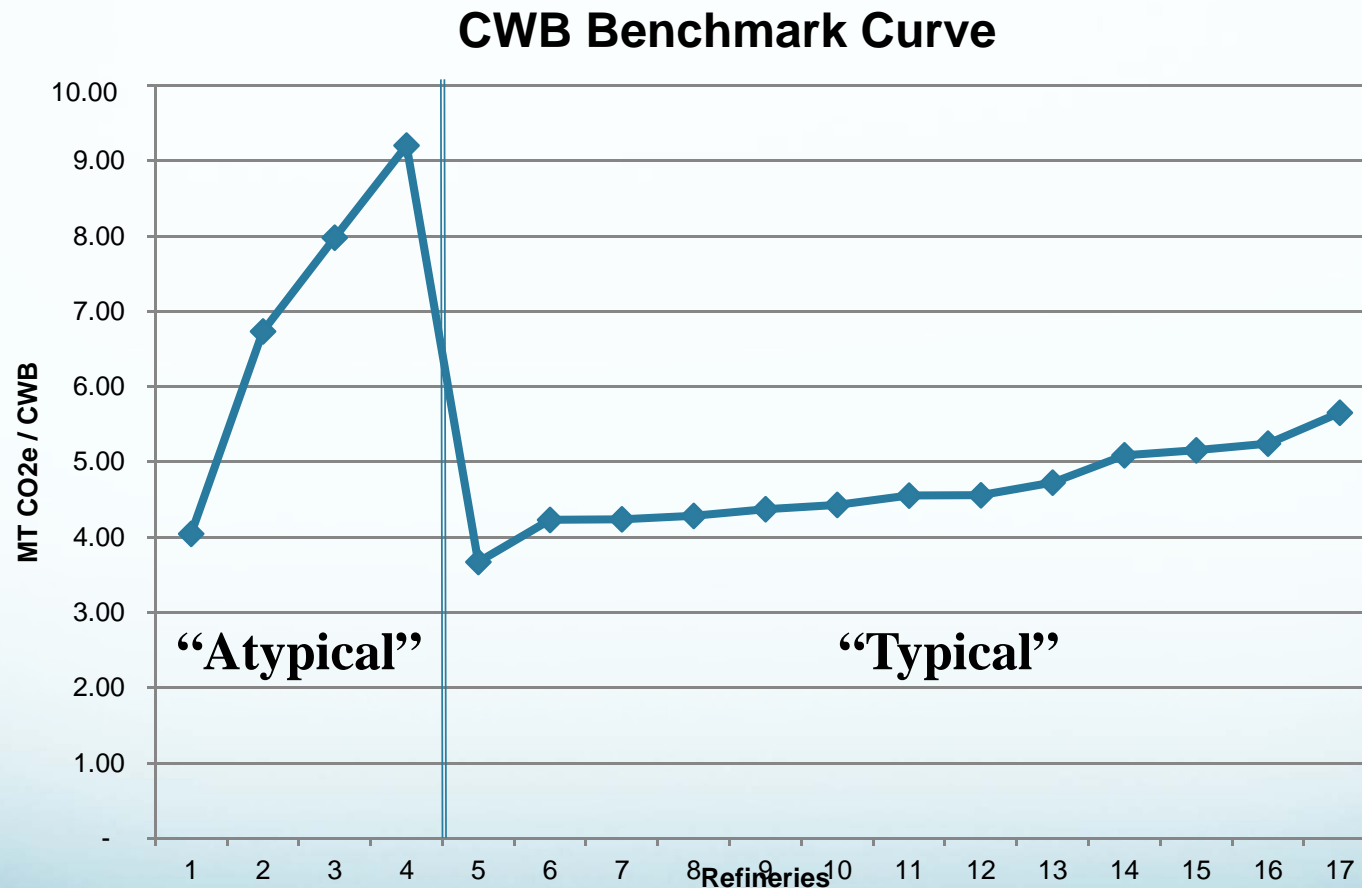
- Staff proposes to benchmark atypical refineries separately under CWB
- Atypical proposal:
 - Defined as having < 12 process units and < 20 million barrels crude through the atmospheric distiller / year (during allocation year)
 - If jointly operated with another refinery, must meet those criteria for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

Emissions of Typical and Atypical Refineries

| | Atypical Refineries (N = 4) | Typical Refineries (N=13) | Total of 17 Refineries |
|----------------------------------|-----------------------------------|---------------------------------|---------------------------|
| Portion of Total Emissions | 2% | 98% | 100% |
| Total Emissions | 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

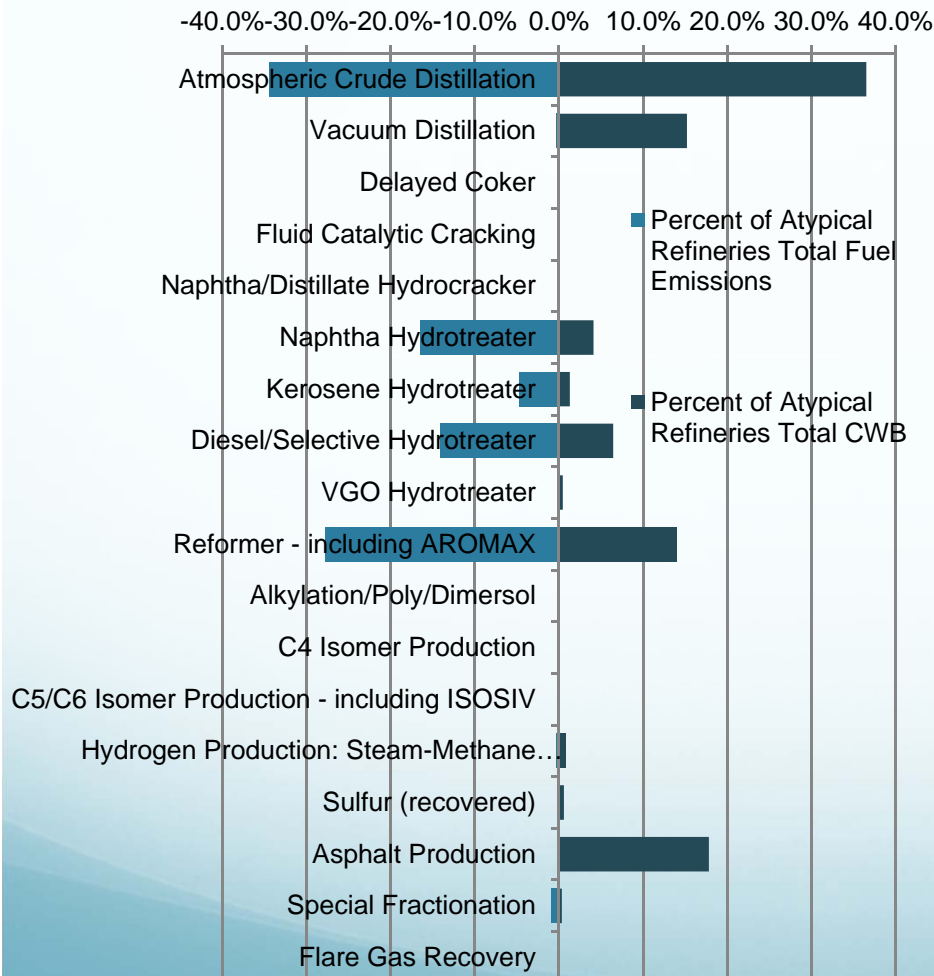
| | Benchmarks (allowances/CWB) | | Percent that Typical is Lower Than Atypical |
|----------------------|--------------------------------------|--|--|
| | Atypical Refineries Only (N=4) | Typical Refineries Only (N = 13) | |
| CWB | 6.78 | 4.08 | 40% |
| CWB Best in Class | X | X | 9% |
| CWT | 46.18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

Highlighted cells show proposed benchmark values

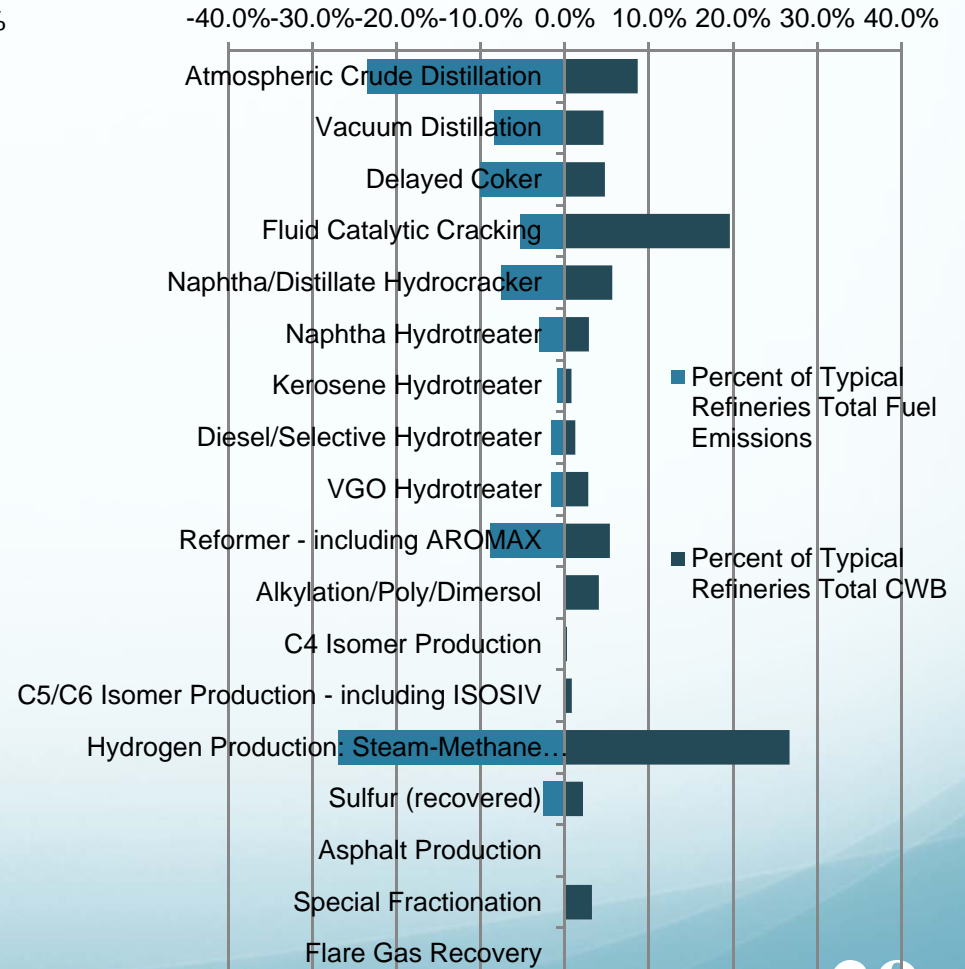
Atypical v. Typical by Process Unit

(rare units censored)

“Atypical”



“Typical”



Outline

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

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 |

Outline

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

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 14th, 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 24-25th for both MRR and Cap and Trade
- MRR amendments would need to be in effect Jan. 1, 2014

Contacts

- Cap and Trade Regulation – Refineries

Eileen Hlavka, lead staff

ehlavka@arb.ca.gov

(916) 322-7648

Elizabeth Scheehle, manager

escheehl@arb.ca.gov

(916) 322-7630

- Mandatory Reporting Regulation

Joelle Howe, lead staff

jhowe@arb.ca.gov

(916) 322-6349

Richard Bode, branch chief

rbode@arb.ca.gov

(916) 323-8413