High Carbon Intensity Crude Oil

Transportation Committee Workshop on Transportation Energy Demand and Fuel Infrastructure Issues

Transportation Committee Workshop

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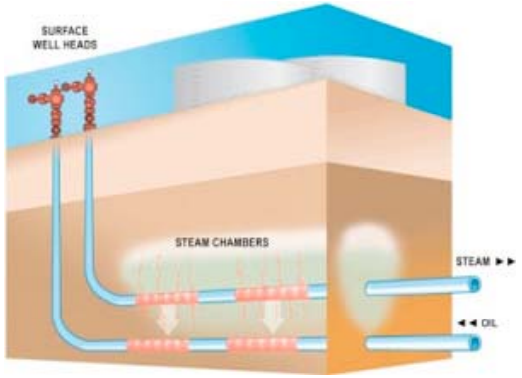
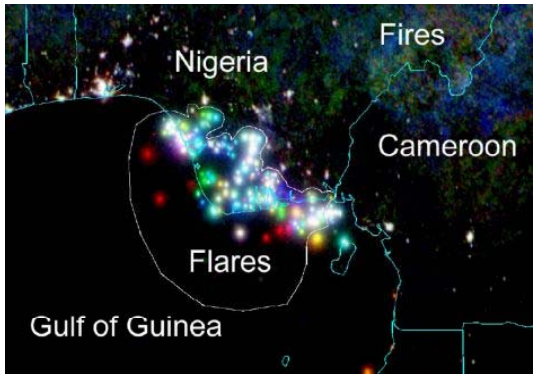
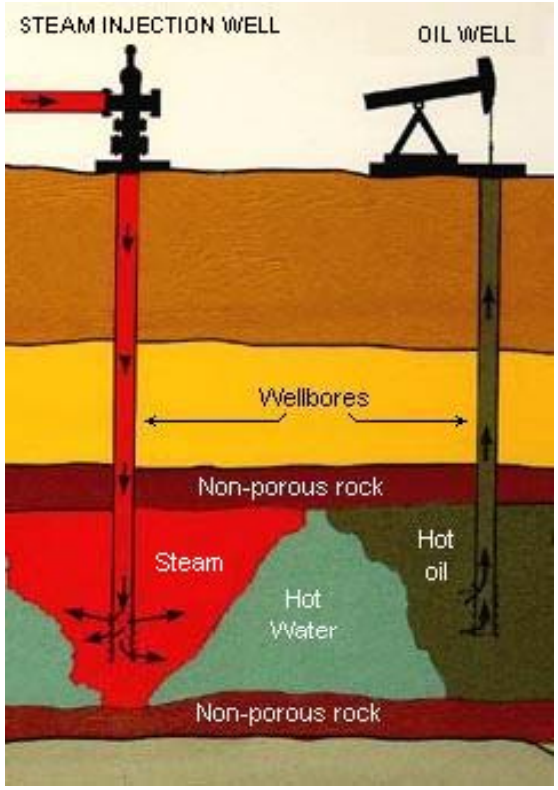
High-Carbon Intensity Crude Oil (HCICO)







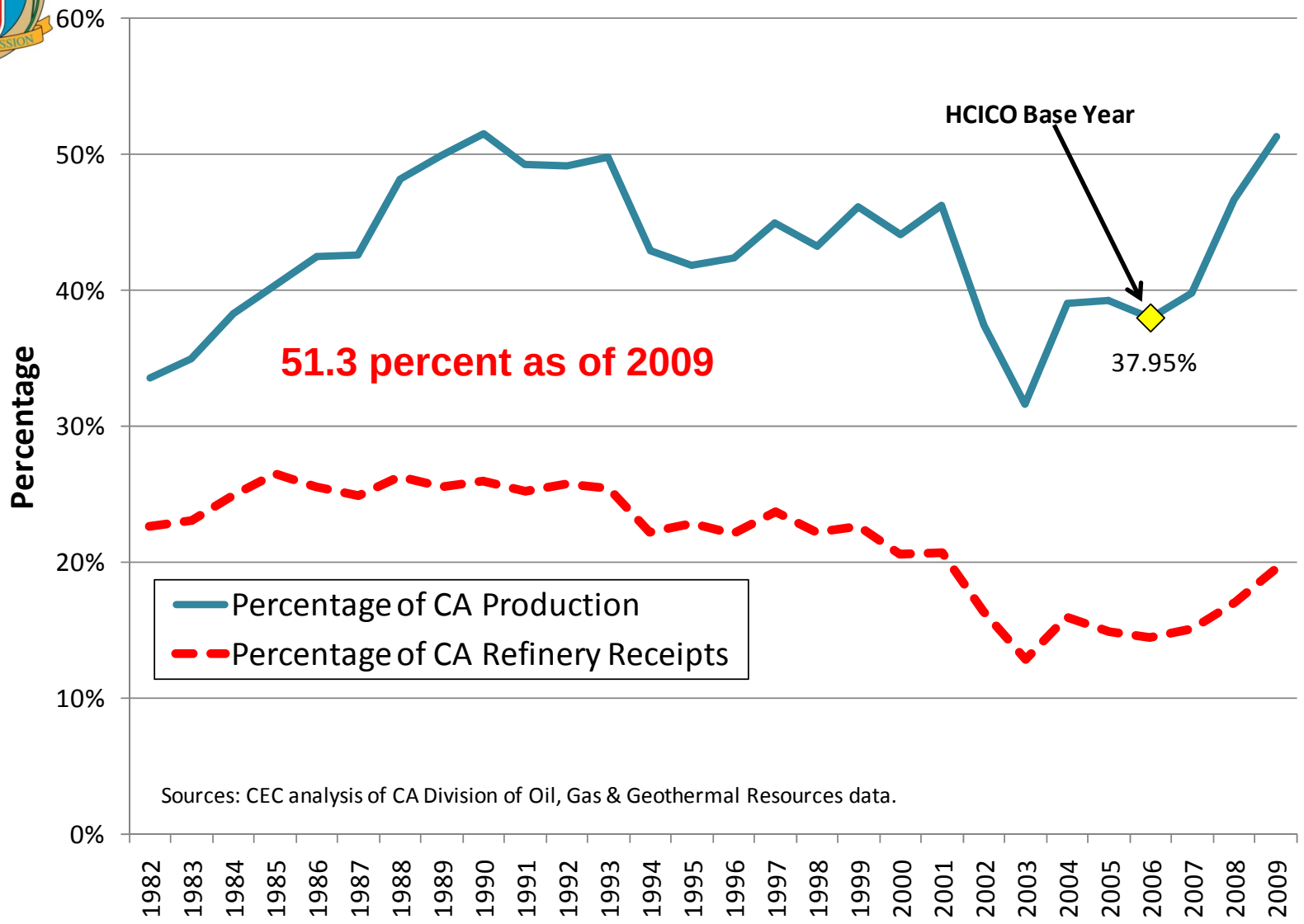
Background

- The purpose of this provision of the LCFS is to ensure that any rise in petroleum-related lifecycle emissions due to a movement of crudes with high extraction emissions is captured in the LCFS and mitigated
- Energy Commission staff conducted an initial screen of 248 Marketable Crude Oil Names (MCONs) that were available globally during 2006-2010 to identify what portion were potential HCICOs
- Purpose of the work was to determine to what extent refiners in California would have to either compensate or defer purchase for processing in California

Types of Potential HCICOs

- Oil sands (bitumen) mining - ***potential HCICO***
  - Exclusive to Canada
- Heavy oil upgrading – Canada & Venezuela
  - Processing heavy crude oil in upgrader to produce lighter synthetic crude oil - ***potential HCICO***
- Flaring of associated natural gas
  - Countries that have average crude oil flaring intensities greater than 10 standard cubic meters per barrel - ***potential HCICO***
  - Russia, Nigeria & 6 other countries
- Enhanced oil recovery (EOR)
  - water flooding
  - injection of natural gas, carbon dioxide or chemicals
  - thermally enhanced oil recovery (TEOR) – ***potential HCICO***

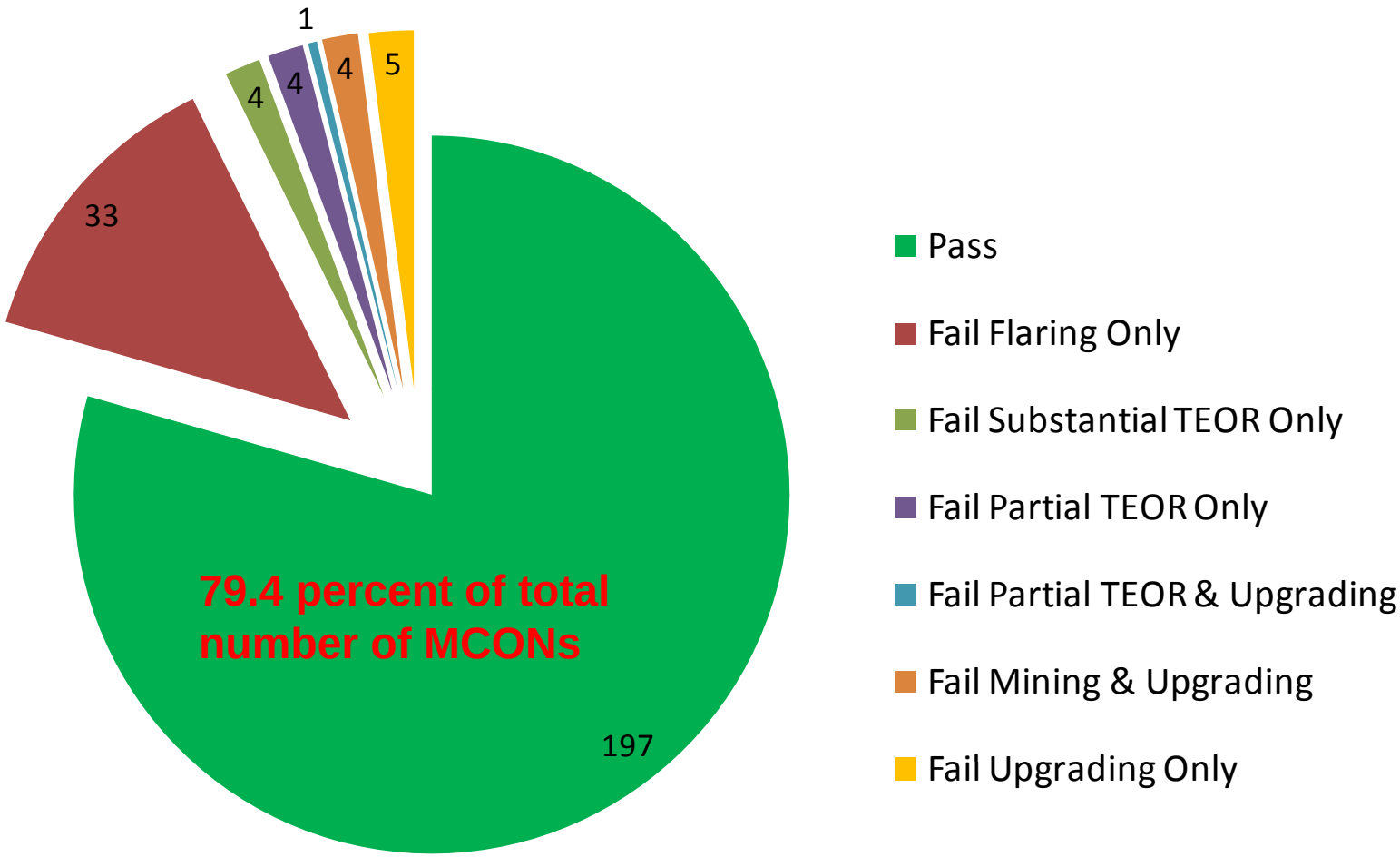
California Produces TEOR Crude Oil



California Energy Commission

Source: CEC Analysis.

Summary of Screening Results



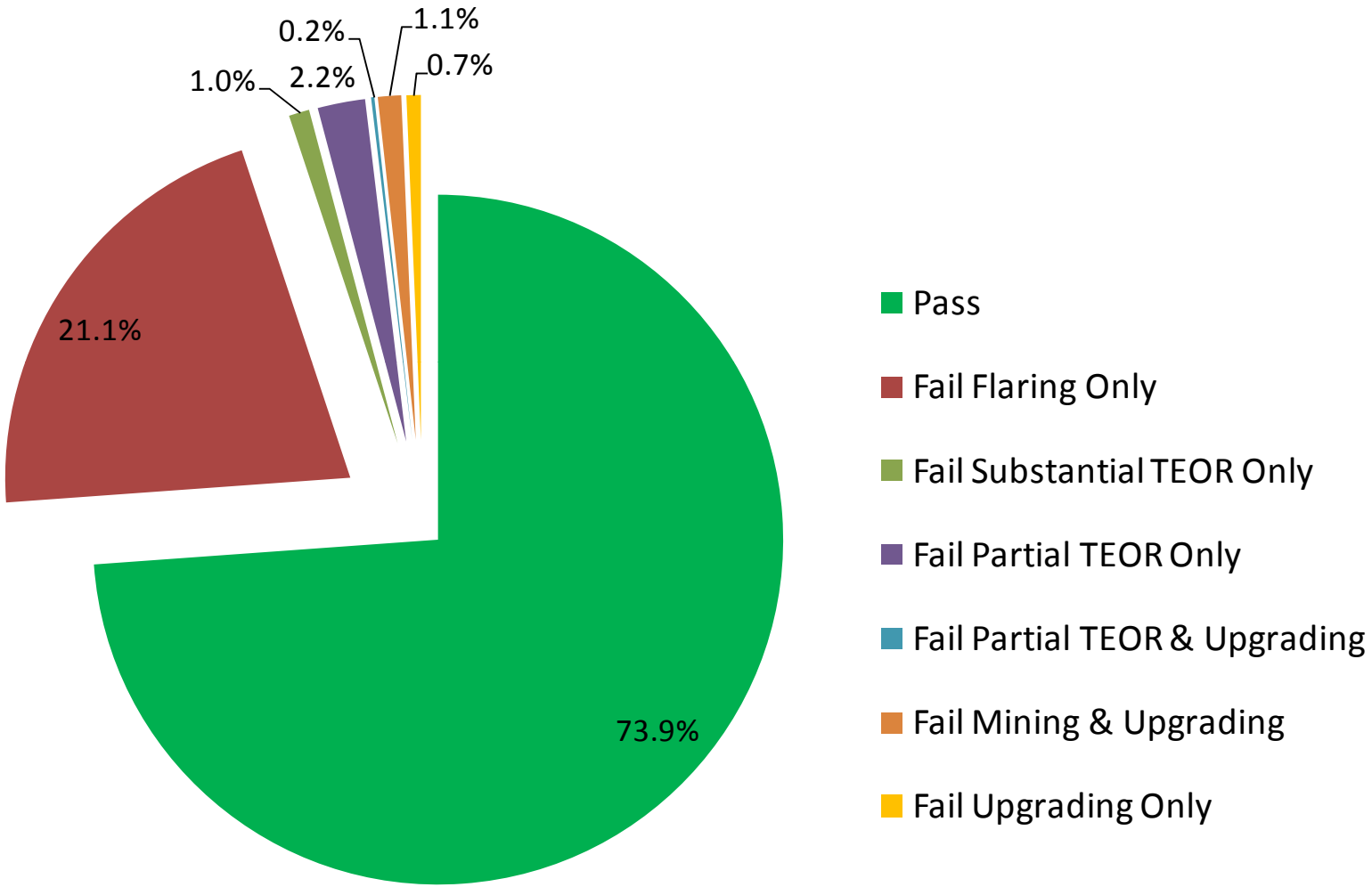
California Energy Commission

Source: CEC Analysis.

Potential HCICOs – Initial Screening Results

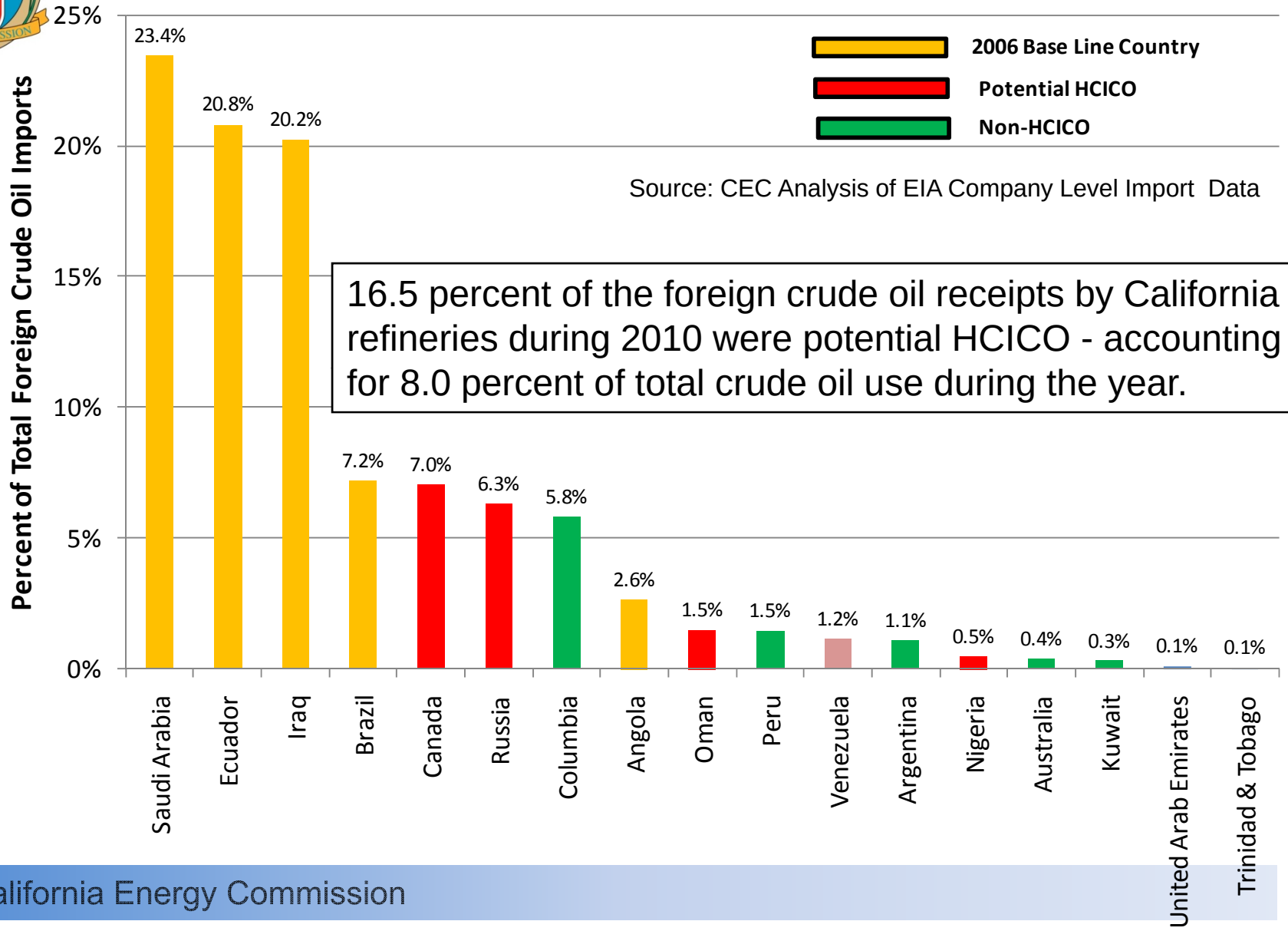
- 197 MCONs receive a "pass" – 32 from Base Line countries
  - **None** of the Base Line foreign country MCONs would have received a "fail"
  - Nearly 51% of California MCONs would fail TEOR screen, as of 2009
- 51 MCONs receive a "fail" and are potential HCICOs
  - 8 of 45 import MCONs during 2009
- 45 MCONs exceed the 10.0 m^3 per barrel limit – "fail" using the O&GJ crude oil production data for the intensity calculation
- 61 MCONs originate from countries that are listed in the Oil & Gas Enhanced Oil Recovery Survey in 2010
- 4 MCONs sourced from bitumen mines & "fail" screen
- 6 additional MCONs are processed by upgraders & "fail" screen

Screening Results – Volume Weighted



Source: Energy Commission analysis.

2010 Potential HCICO Imports



HCICO – Ability to Offset Emissions

- Refiners can use HCICOs, but need to offset the incremental carbon emissions or debt
- If refiners used a quantity of potential HCICOs similar to 2010 (roughly 8 percent), they would need to use ethanol from California & Brazil in all of the gasoline they produce – beginning this year
- Even if refiners were to use as little as 2 percent HCICOs in their mix of crude oil, use of ethanol from the Midwest would be effectively infeasible by 2013
- In fact, their are no sources of commercially available ethanol available that could completely offset the incremental carbon debt of using 2 percent HCICOs by 2016
- It is therefore assumed by staff that potential HCICOs would be unavailable for use in California

Oil Production Practices – Response Outlook

- HCICO provision is designed to "encourage emission reduction activities from these HCICO sources"
- Unlikely that companies or governments outside of the United States will alter crude oil production practices because:
  - Producers outside of California have alternative markets to sell their crude oil
  - California crude oil market is too small (between 1.2 percent and 2.1 percent) to justify an investment to reduce the carbon intensity of crude oil production operations
- Companies are making investments in many different countries that have a sufficient return on investment (ROI) achieved by either:
  - Lowering their production costs
  - Capturing natural gas that is being flared (to sell for an additional revenue stream and/or reduce the costs incurred from paying a flaring fee)
  - Avoiding carbon taxes imposed by a local jurisdiction or country

HCICO – Conclusion & Outstanding Issues

- The HCICO provision is not expected to restrict access to crude oil supplies in a way that could significantly impact fuel supply, but it could impact refiner profitability and the ultimate cost of petroleum fuel in California

Outstanding Issues

- Staff did not quantify the potential cost increase that could occur when refiners replace HCICOs with alternative crude oils
  - Would need to know changes in crude oil acquisition costs, impacts on refinery operating costs, and shifts in refined product output
- Staff did not assess potential for crude oil "shuffling"
  - What are the relative distances of sources of HCICOs and their replacements?
- Staff did not qualitatively assess any potential energy security implications of the HCICO provision
  - What framework should be used to rank various sources?

Additional Q & A

Sunset at Moonstone Beach – Humboldt County, California 9-2-2011