# Revised Predictive Model
# Costs and Project Time Line Assessments

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# Presentation Topics

- Background
- Staff findings
- Ethanol supply outlook
- Refinery operation impacts
- Cost impacts
- Project time lines & compliance date
- Fungibility of gasoline market

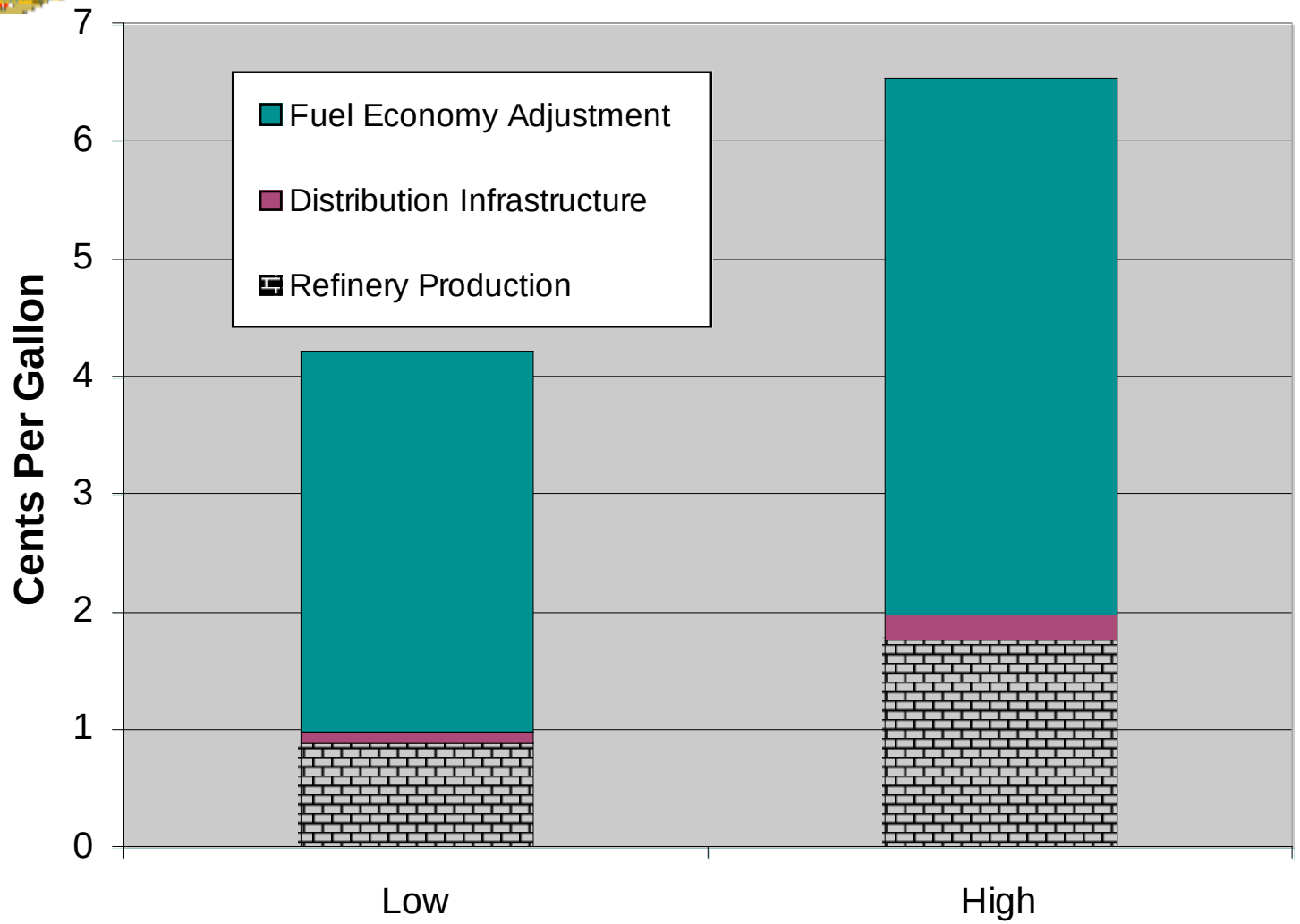
# Background

- One California Energy Commission mission is to monitor and assess adequacy of transportation fuel supplies for California consumers and businesses
- We analyze new fuel regulations to determine potential costs to consumers, impacts on fuel availability, and adequacy of lead time for full compliance
- Similar approach used during proceedings involving the phase-out of MTBE and transition to ethanol

# CEC Staff Findings

- California gasoline market likely to shift from E6 to E10
- Domestic ethanol production capacity should grow enough to be able meet California's incremental demand
- Majority of California refineries will require modifications before transition to E10 can occur
- Cost to consumers and businesses 4.2 to 6.5 cents per gallon of gasoline ($716 million to $1.1 billion per year)
- Imports of more expensive gasoline blending components expected to further increase consumer costs

# Cost Impacts - Summary



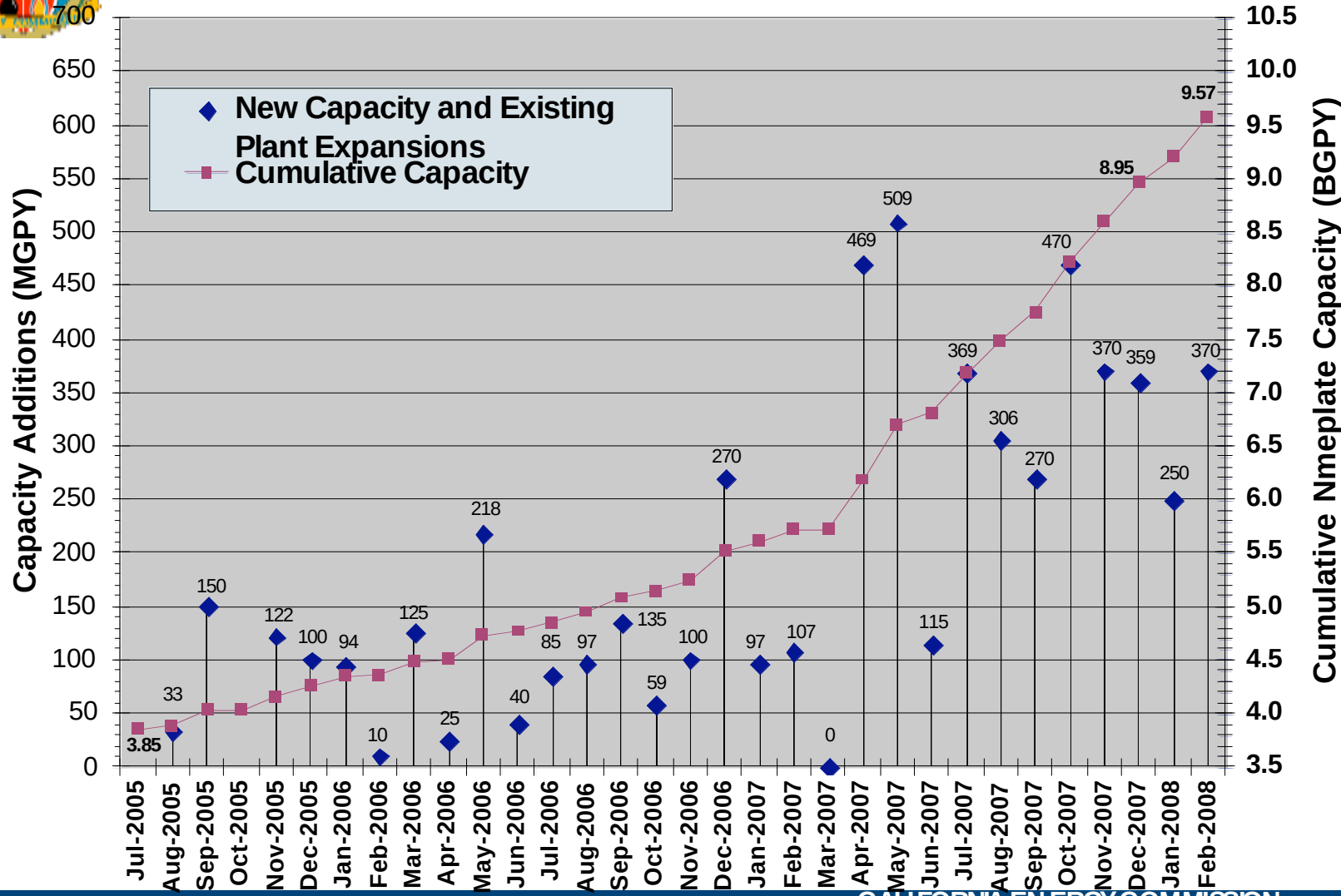
# CEC Staff Findings

- Optimal time to transition to full compliance with the revised Predictive Model is during the winter season
- Time to complete modifications:  45 to 59 months
- ARB staff's proposed December 31, 2011, deadline versus possible slippage to January 31, 2013, have different risk of supply difficulties and associated price spikes
- Later deadline more likely to minimize the risks

# Ethanol Supply Outlook

- California's demand for ethanol – 951 million gallons in 2006 –average concentration of 6 percent
- If the gasoline market transitions to ethanol concentration of 10 percent, 2013 demand could be 1.7 billion gallons – an increase of nearly 750 million gallons
- U.S. ethanol nameplate production capacity is nearly 6 billion gallons per year and could reach the 2012 RFS goal of 7.5 billion gallons some time this summer – assuming no additional construction delays or deferrals
- Additional ethanol production capacity should therefore be sufficient to meet California's incremental demand

# U.S. Ethanol Plant Nameplate Capacity Growth
## July 2005 - Feb 2008

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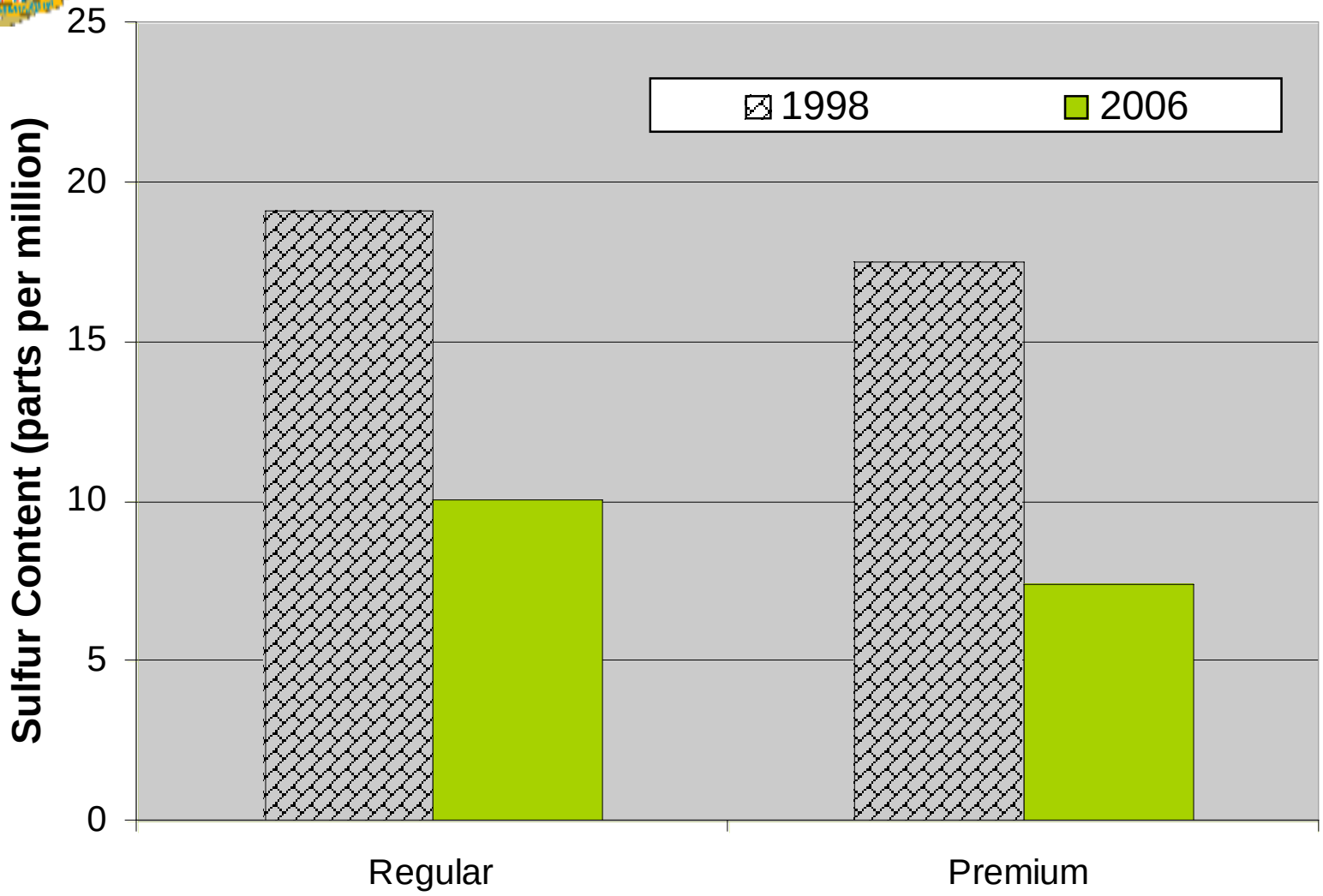
# Refinery Operation Impacts

- Gasoline properties have evolved over time in response to new gasoline regulations
  - Lower sulfur content
  - Increasing use of ethanol
- These trends are expected to continue as the majority of refiners modify their facilities to comply with the revised Predictive Model
- Sulfur in regular grade gasoline decreased from 19.1 in 1998 to 10.1 parts per million in 2006, a 47 percent decline
- Sulfur content in premium grade gasoline decreased by 57 percent over the same period of time

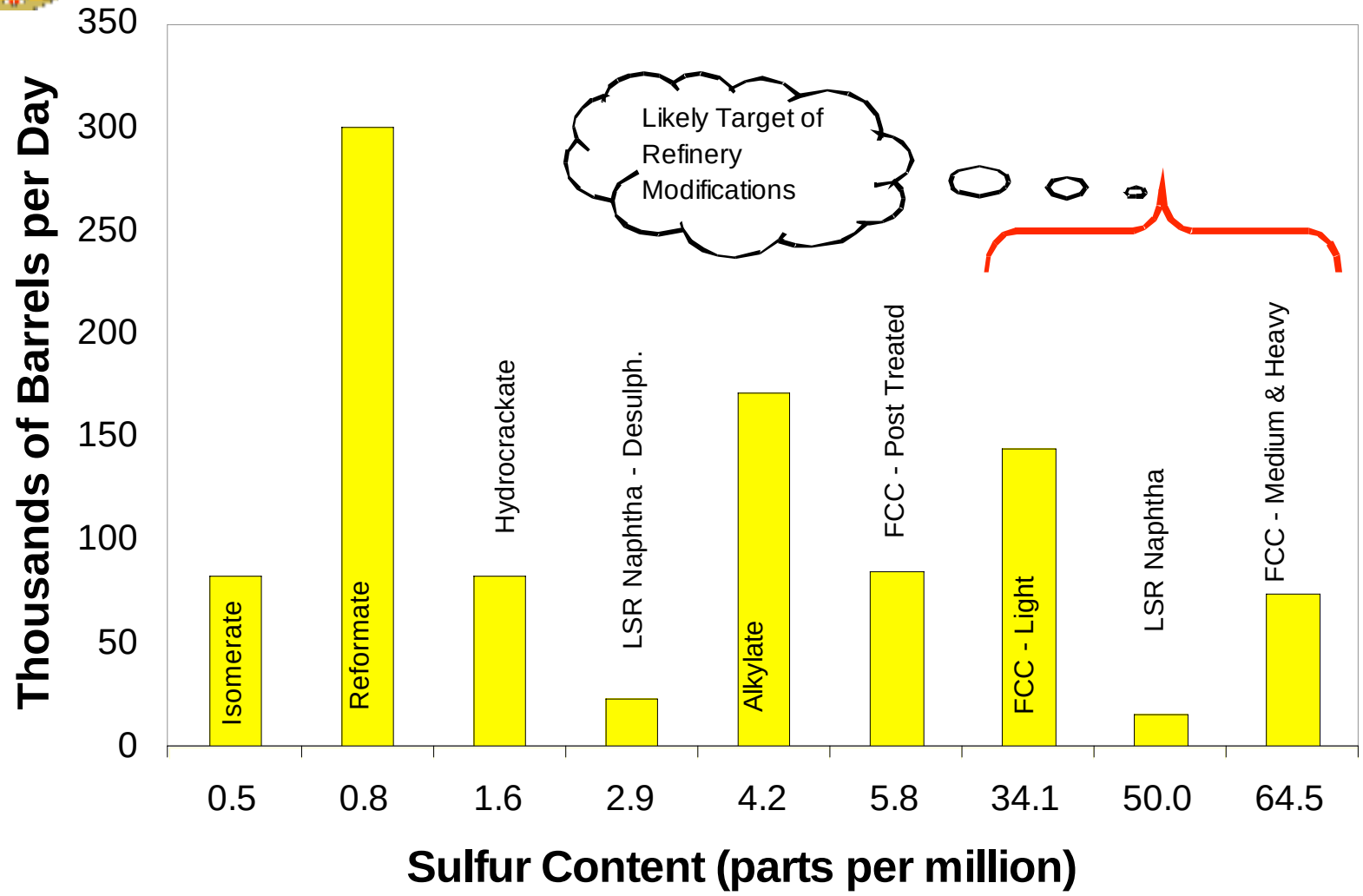
# Refinery Impacts – Lower Sulfur



# Refinery Impacts - Modifications

- Refiners are expected to increase the amount of ethanol in gasoline in response to the revised Predictive Model
- Greater concentration of ethanol will result in higher $NO_x$ emissions unless offset by decreased levels of sulfur
- Most companies will comply with the revised Predictive Model by reducing the sulfur content of specific gasoline blendstock streams associated with the Fluidized Catalytic Cracking (FCC) units in their refineries
- Other gasoline streams, such as light straight run (LSR) naphtha, will likely require desulphurization

# Refinery Impacts – Additional Desulphurization



# Four Types of Cost Impacts

- Estimated cost impacts for California consumers and businesses in:
  - Production
  - Distribution
  - Energy content
  - Imports
- Production & distribution infrastructure costs include modifications to refineries and the distribution terminals
- Lower energy content of a greater concentration of ethanol will result in decreased fuel economy – consumers will need to purchase additional gallons of gasoline to travel the same distance
- Change in gasoline market supply/demand balance somewhat uncertain - difficult to quantify change in cost of gasoline imports

# Cost – Refineries

- Based on aggregate refinery modeling work (MathPro) and individual refiner meetings
- Refinery modifications costs estimated at $825 million to $1.2 billion
- Increased refinery production costs of 0.9 to 1.8 cents per gallon
- These estimates are based on the aggregated California refinery responses and could understate the total impact on the refinery sector due to:
  - Variations in sulfur levels for individual refineries
  - Less processing flexibility than indicated by the aggregate refinery model

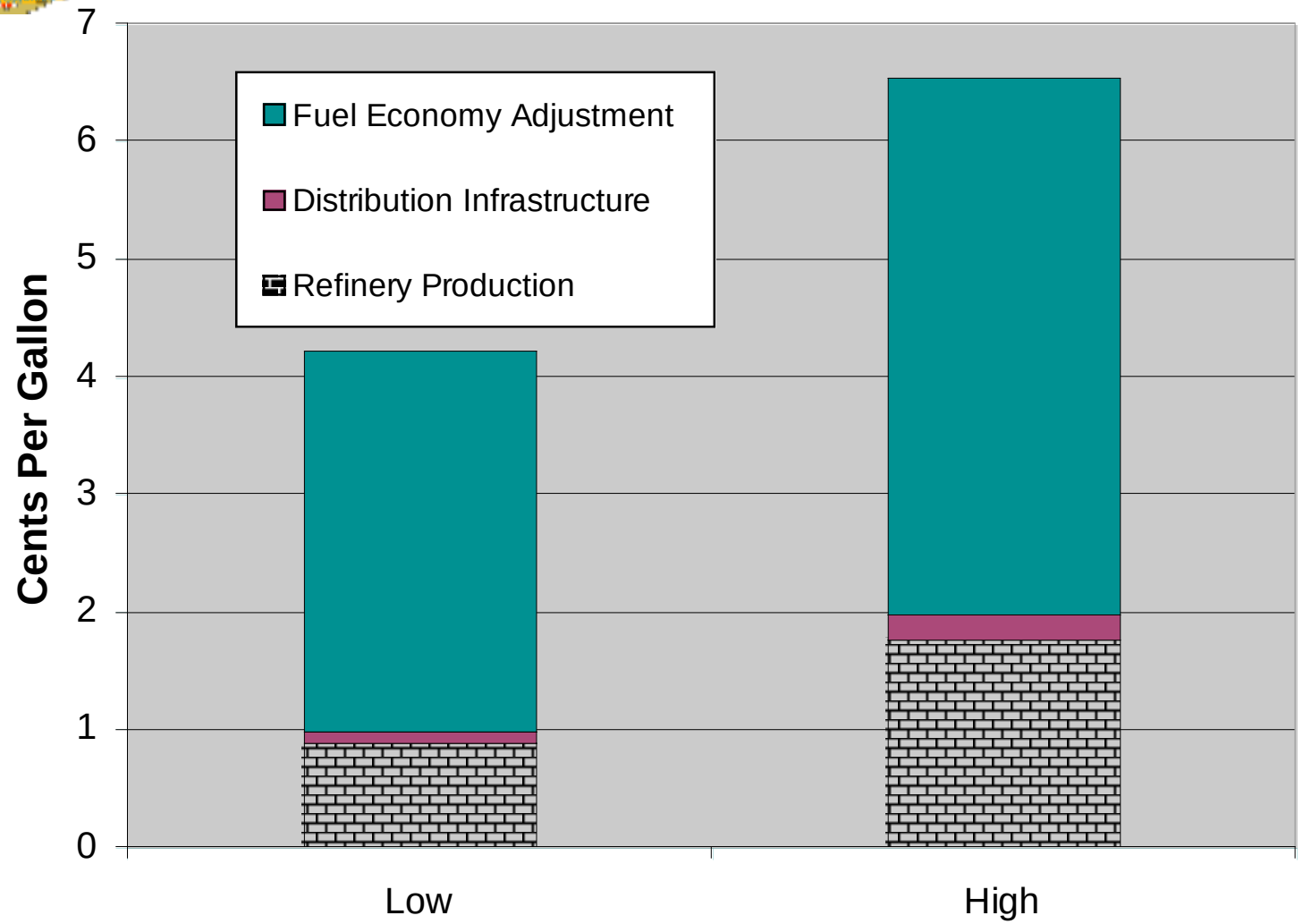
# Cost – Distribution Infrastructure

- California's gasoline is blended with ethanol when tanker trucks are loaded at one of about 50 distribution terminals scattered throughout the state
- Most distribution terminal will require varying degrees of modification to enable the receipt, storage, and distribution of nearly 70 percent more ethanol than today
- The aggregated capital costs are expected to be rather modest – less than $100 million statewide
- Expected to contribute less than 0.2 cents per gallon to gasoline costs

# Costs – Lower Gasoline Energy Content

- Ethanol has less energy content than gasoline
- Increasing the average concentration of ethanol in finished gasoline from 6 to 10 percent is estimated to decrease the energy content by approximately 1.3 percent
- Consumers will have to increase their gasoline purchases by an equivalent amount to compensate for the fuel economy adjustment
- Estimated cost increase of $520 to $730 million per year or an average of 3.2 to 4.5 cents per gallon

# Cost Impacts - Summary



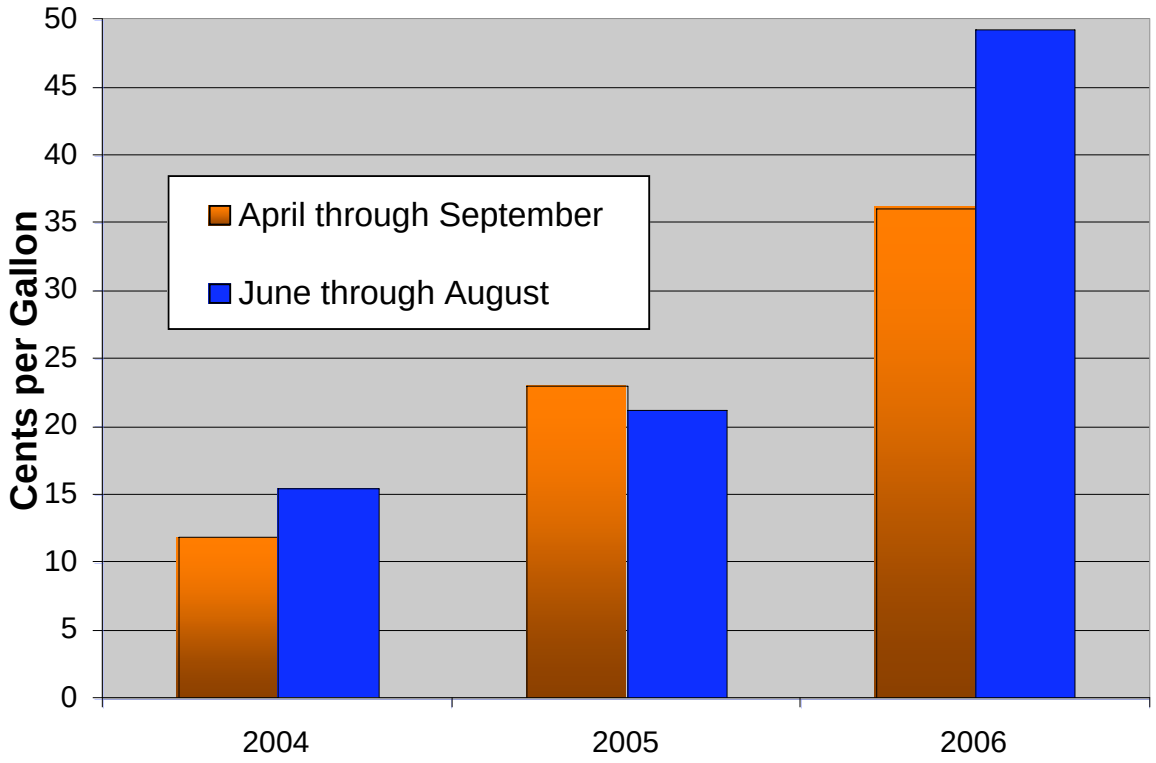
# Additional Costs - Imports

- California demand for gasoline exceeds the current production capability of refineries in the state
- Additional quantities of gasoline and blending components must be imported to help augment local supply to meet consumer demand
- As such, the market clearing price of gasoline in California must reach a sufficiently high level in order to attract additional gasoline supplies from distant sources – referred to as import parity
- This means that all gasoline produced and imported is valued in the market place at the same level

# Additional Costs - Imports

- Between now and 2013, imports of gasoline and blending components are forecast to increase
- Average quality of imported blending components will need to improve – including lower sulfur levels
- Increased demand for these even cleaner gasoline blending components will place upward pressure on their price
- Therefore, the cost of imported gasoline is expected to increase
- This additional cost impact is difficult to precisely quantify, but there are indications of what increases may be in store for consumers when we examine the price of alkylate – an important gasoline blending component

# Alkylate Less CARBOB Prices
# Southern California




- Differential has continued to increase over the last three summer seasons – an indication of costlier imports
- An additional cost of at least 5 cents per gallon attributable to more expensive imports would be a rather conservative estimate

# Project Time Lines & Compliance Date

- Elements of project
  - Design, engineering & internal approval
  - Preparation of the Draft EIR
  - CEQA review & permit to construct
  - Construction & start-up
- Mostly sequential, with some parallel activities
- Long lead time for specially fabricated refinery process equipment means that orders will have to be placed prior to completion of the CEQA process
- Assessment is based on information received during company-specific meetings and a confidential survey of companies conducted during early June

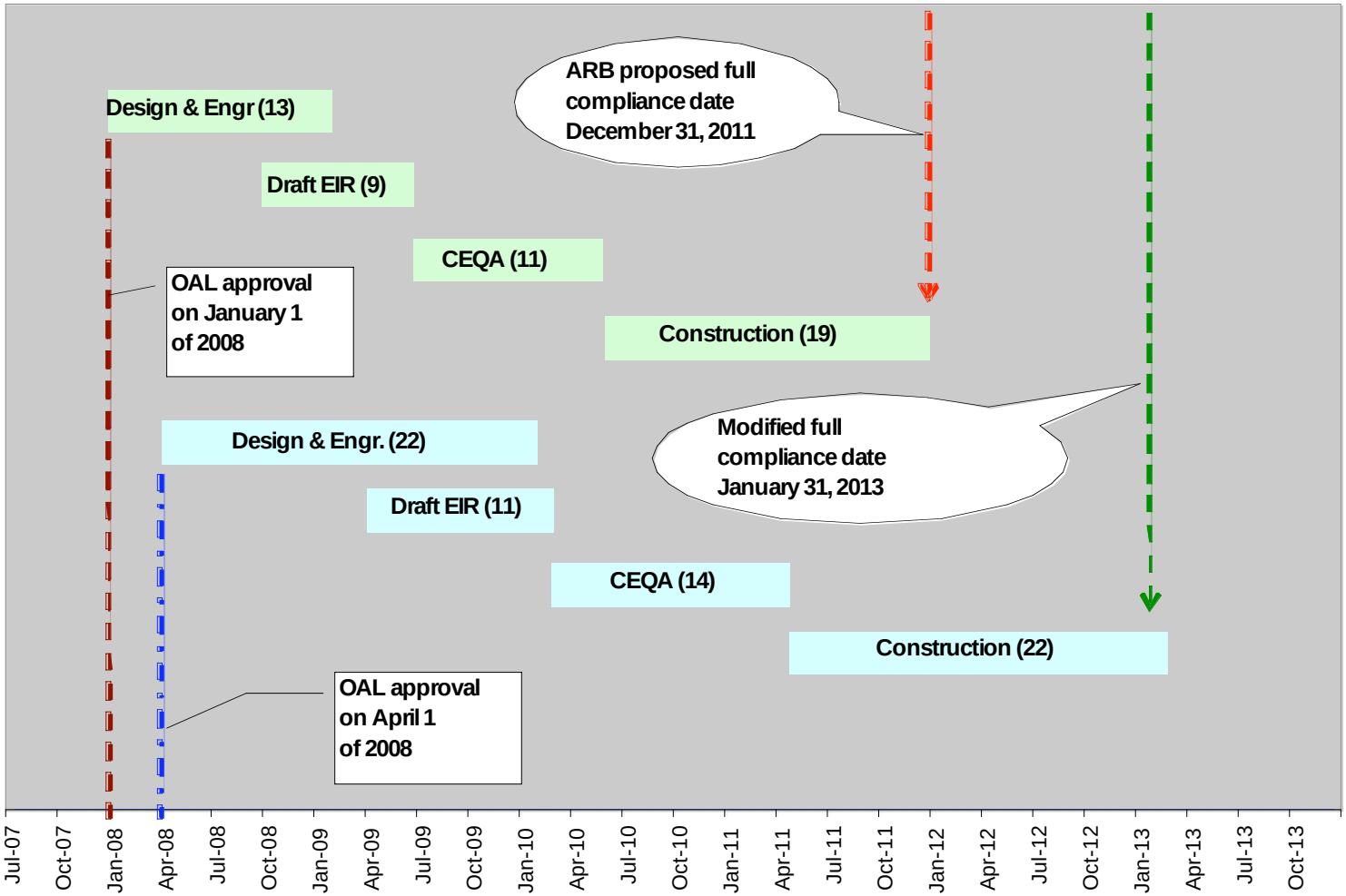
# Project Timeline

- The majority of refiners indicated they need between 45 and 59 months to complete their projects to comply with the revised Predictive Model
  - Design, engr. & internal approval….13 to 22 months
  - Preparation of the Draft EIR……9 to 11 months
  - CEQA review & permits……11 to 14 months
  - Construction & start-up……..19 to 22 months
- Distribution modifications also take time to complete – at least 26 to 34 months before the entire distribution system will be able to transition from E6 to E10

# Optimal Transition Period

- The gasoline market in California has two “seasons,” winter and summer
- Winter gasoline has higher volatility (Reid vapor pressure) and compliance with gasoline regulations is usually easier when compared to the summer specifications
- Optimal time to transition to full compliance with the revised Predictive Model is during the winter season

# Project Time Lines



# Project – Full Compliance Date

- If the Board approves the revised Predictive Model today, CEC staff believes the California refining industry will be at risk of not completing all of the necessary modifications by the proposed deadline of December 31, 2011
- Modifying the deadline to January 31, 2013, is more likely to allow adequate time to fully comply with the new Predictive Model, minimizing the risk of supply difficulties and associated price spikes for California consumers and businesses

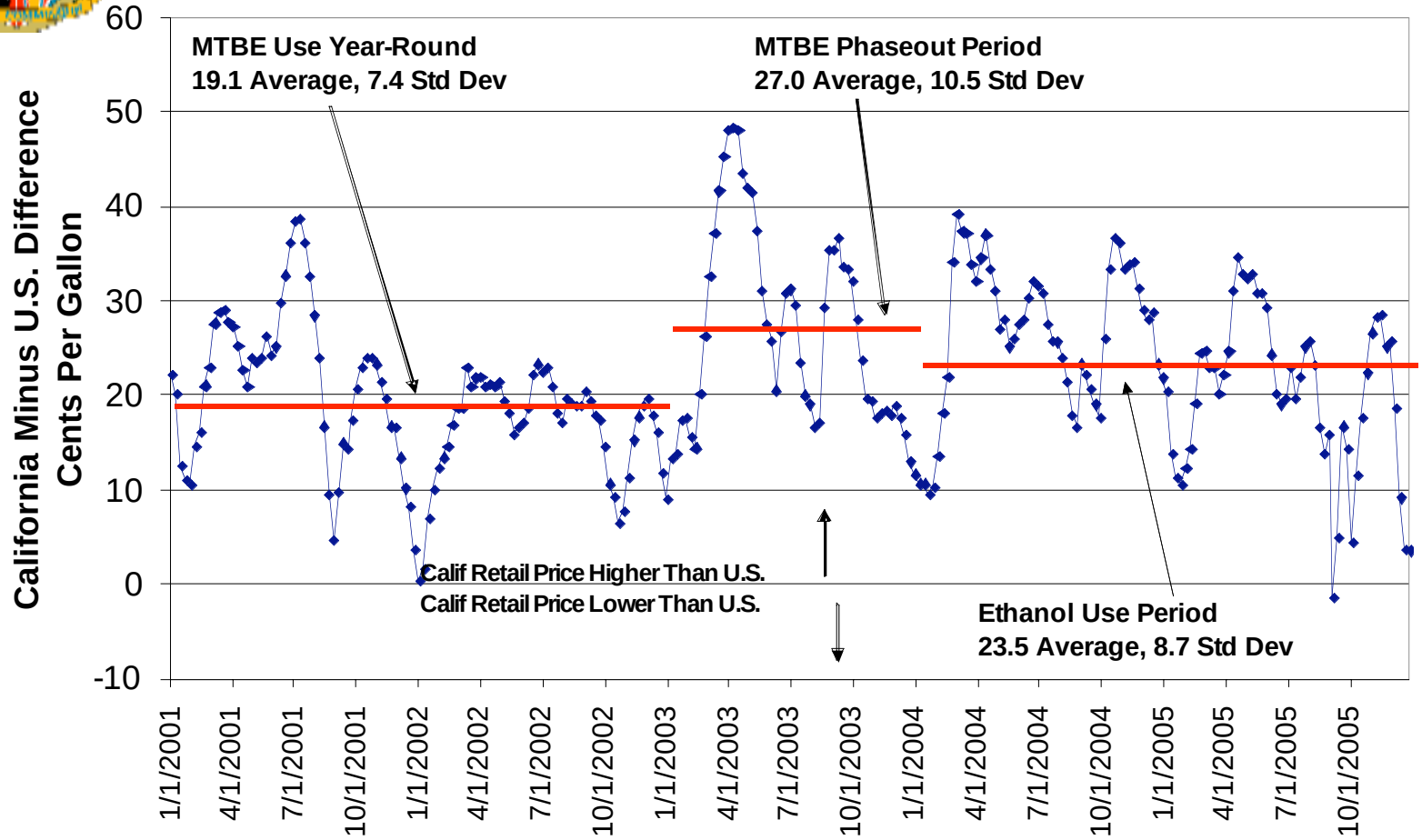
# Fungibility of Gasoline Market

- Majority of gasoline is dispensed using a petroleum product pipeline distribution infrastructure
  - Community storage tanks
- Only limited opportunities for different concentrations of ethanol in the market
  - Some refinery truck loading racks
  - Proprietary distribution systems
- Refiners want to maintain a fungible gasoline to optimize exchanges and allow the ability to obtain alternative supplies of gasoline during unplanned refinery outages

# Modified Schedule/Deadline

- The proposed individual one-year extension option for refiners that may not be able to meet a full compliance date provides some benefits
- Extensions issued on a case-by-case basis could result in a non-fungible gasoline market
- Non-fungible transitional gasoline markets create inefficiencies, reduce resupply options, and lead to incremental costs to consumers and businesses
- An example of this type of market occurred during 2003, when a portion of the refiners transitioned to ethanol use a year ahead of the full compliance date

# California Gasoline Volatility
# January 2001 to December, 2005




**Non-fungible gasoline market increased costs to consumers by 3.5 cents per gallon in 2003 or about $500 million**

# Contact Information

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