PADD 5 & California Transportation Fuel Overview

Western Regional Emergency Fuel Coordination Meeting

California Energy Commission

Sacramento, CA

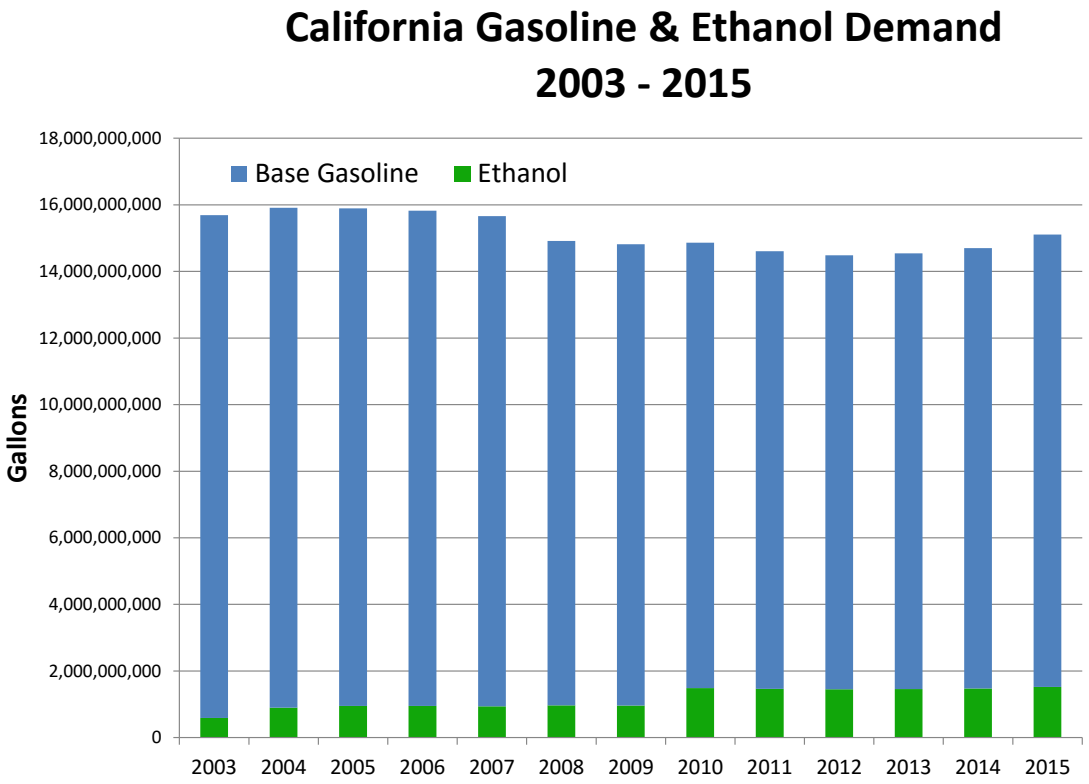
September 29, 2016

Gordon Schremp

California Energy Commission

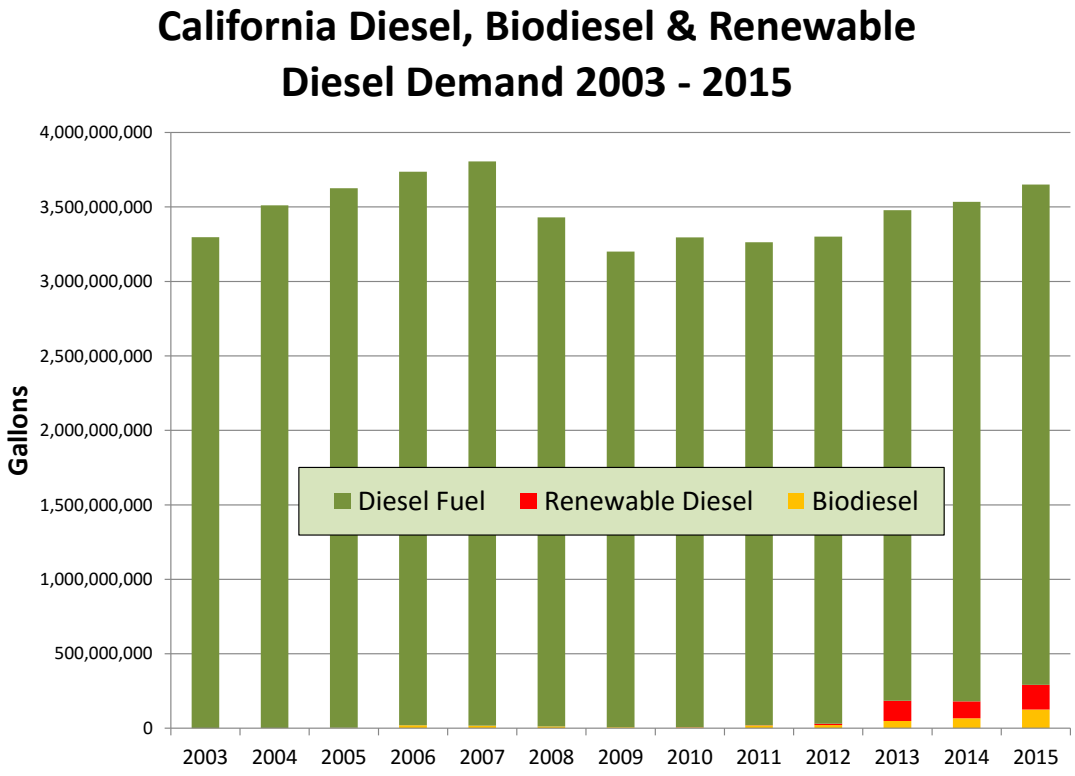
California Transportation Fuels

- 15.11 billion gallons of gasoline consumed in 2015
- Base gasoline demand up 3.9 percent between 2013 and 2015
  - Ethanol use increasing due to Renewable Fuel Standard
  - Ethanol use up to 1.52 billion gallons during 2015
  - 158 percent increase since 2003
  - Ethanol accounted for 10 percent of total gasoline gallon during 2015



California Transportation Fuels

- 3.65 billion gallons diesel consumed during 2015
- Base diesel fuel demand up 2.0 percent between 2013 and 2015
  - Biodiesel use increasing due to Renewable Fuel Standard and the Low Carbon Fuel Standard (LCFS)
    - 126 MM gallons during 2015
  - Renewable diesel fuel use up to 165 MM gallons during 2015 due to LCFS
  - Combined renewable component accounted for 8.0 percent of total diesel gallon



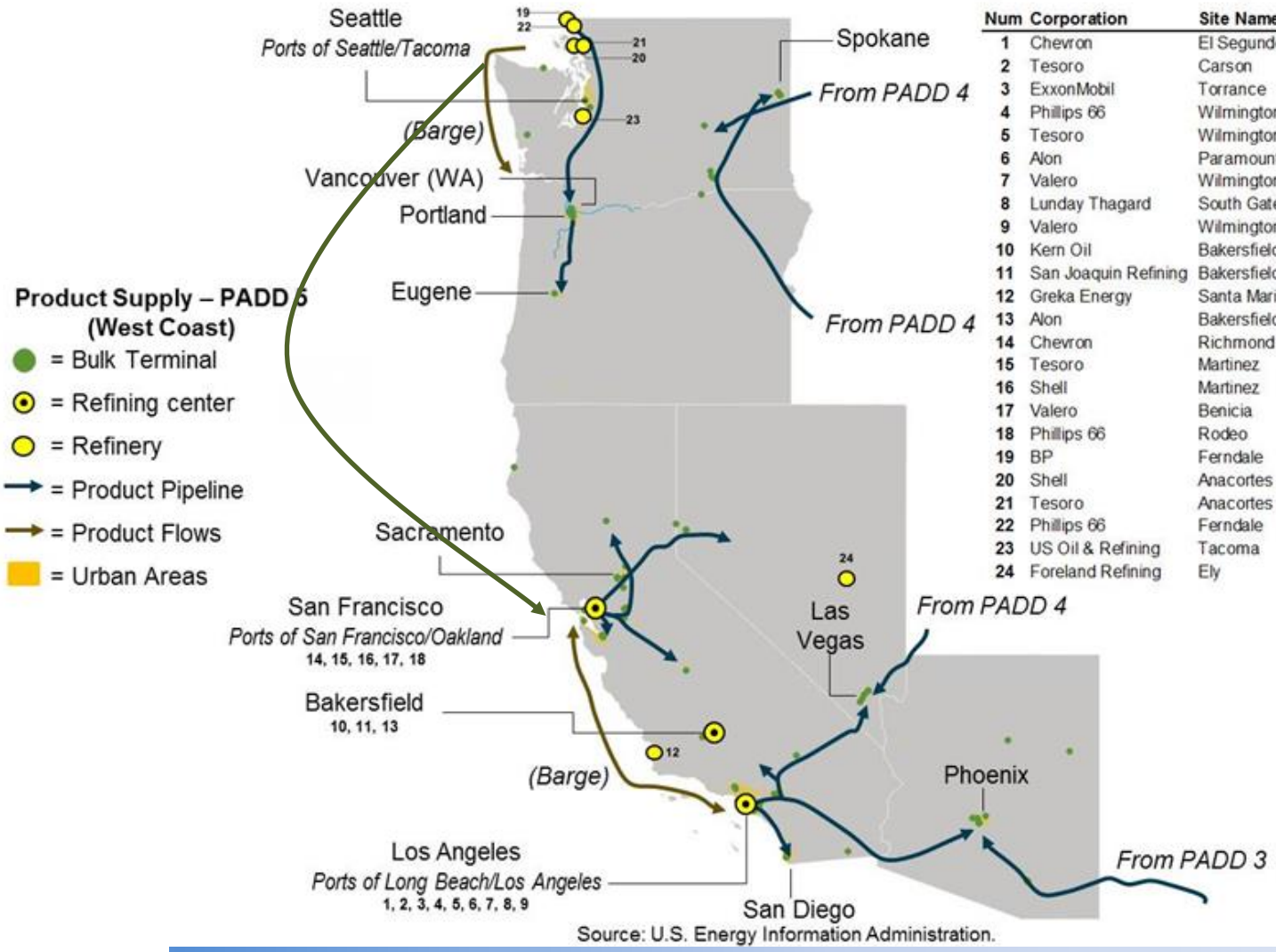
Transportation Fuel Infrastructure Overview

Fuel Infrastructure – Key Elements

- The California transportation fuel "infrastructure" consists of several interconnected assets operated by a combination of refiner and third-party companies
  - Refineries
  - Marine terminals
  - Pipelines
  - Storage tanks
  - Rail
- Crude oil and petroleum product infrastructure assets are separate and distinct from one another – not interchangeable
- Unlike with the electricity distribution system, Northern California is not directly connected to Southern California

Western States More Isolated than Rest

West Coast petroleum product supply map



Num	Corporation	Site Name	Capacity (bbl/d)
1	Chevron	El Segundo	269,000
2	Tesoro	Carson	251,000
3	ExxonMobil	Torrance	149,500
4	Phillips 66	Wilmington	139,000
5	Tesoro	Wilmington	104,500
6	Alon	Paramount	Idle
7	Valero	Wilmington	78,000
8	Lunday Thagard	South Gate	8,500
9	Valero	Wilmington (asphalt)	6,300
10	Kern Oil	Bakersfield	26,000
11	San Joaquin Refining	Bakersfield	15,000
12	Greka Energy	Santa Maria	9,500
13	Alon	Bakersfield	No CDU
14	Chevron	Richmond	245,271
15	Tesoro	Martinez	166,000
16	Shell	Martinez	156,400
17	Valero	Benicia	132,000
18	Phillips 66	Rodeo	120,200
19	BP	Ferndale	225,000
20	Shell	Anacortes	145,000
21	Tesoro	Anacortes	120,000
22	Phillips 66	Ferndale	101,000
23	US Oil & Refining	Tacoma	40,700
24	Foreland Refining	Ely	2,000

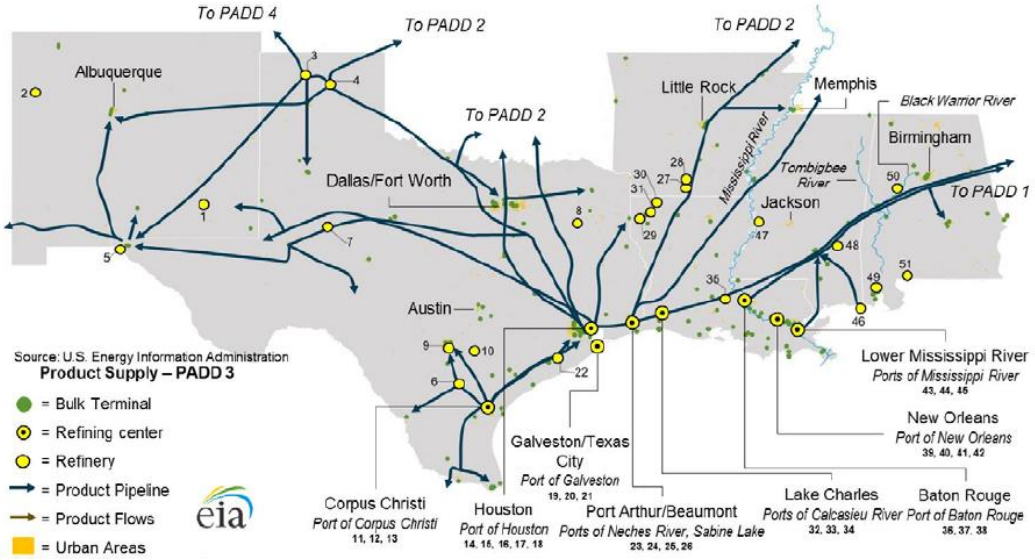
Source: U.S. Energy Information Administration.

California Fuel Market - Isolated

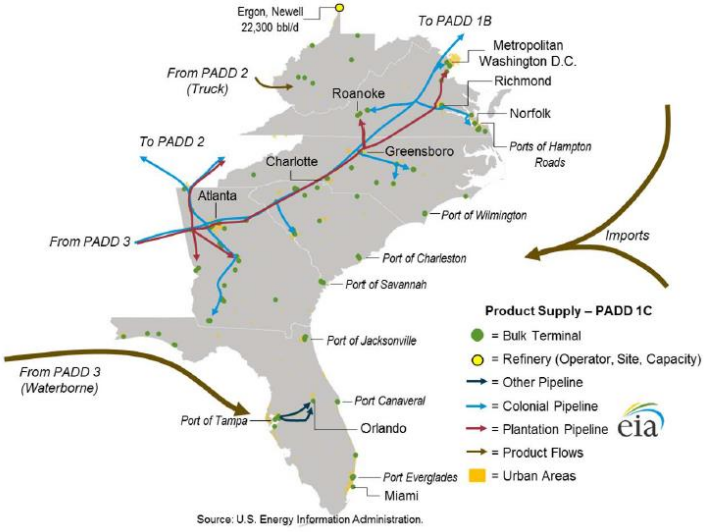
- California's fuel market is nearly self-sufficient, so supplies of gasoline & diesel fuel from outside of California are not routinely needed to balance out supply with demand
  - Imports of gasoline and blending components account for only 3 to 6 percent of supply
- The California market is geographically isolated from other locations in the United States that produce refined products
- Pipelines connect California refining centers to distribution terminals in Nevada and Arizona, but these pipelines only operate in one direction – sending gasoline and other transportation fuels to these neighboring states
- California market is isolated by time and distance from alternative sources of re-supply during unplanned refinery outages

Balance of Other Regions Varies

- Unlike other areas, California is nearly self-sufficient
  - Primary sources of transportation fuels originate from *inside* the state
  - Marine imports normally account for less than 5 percent of gasoline supply
- Catastrophic disaster in greater SF Bay Area or Los Angeles Basin directly impacts source of fuel supply



Large net ***exporting*** region



Large net ***importing*** region

Key Elements - Refineries

- 3 primary refinery locations
- 12 refineries produce transportation fuels that meet California standards
- 8 smaller refineries produce asphalt and other petroleum products
- California refineries provide majority of transportation fuel to neighboring states
- Process between 1.6 and 1.7 million barrels per day of crude oil

Key Elements - Refineries

- Refineries are a primary hub of logistical activity
  - Raw materials imported & finished products shipped
- Crude oil receipts during 2015 received by
  - Marine vessels (foreign) – 885.8 TBD
  - Marine vessels (Alaska) – 200.5 TBD
  - California source via pipelines – 612.8 TBD
  - Rail/truck – 4.8 TBD
- Process units operate continuously at or near maximum capacity, except during periods of planned maintenance or unplanned outages

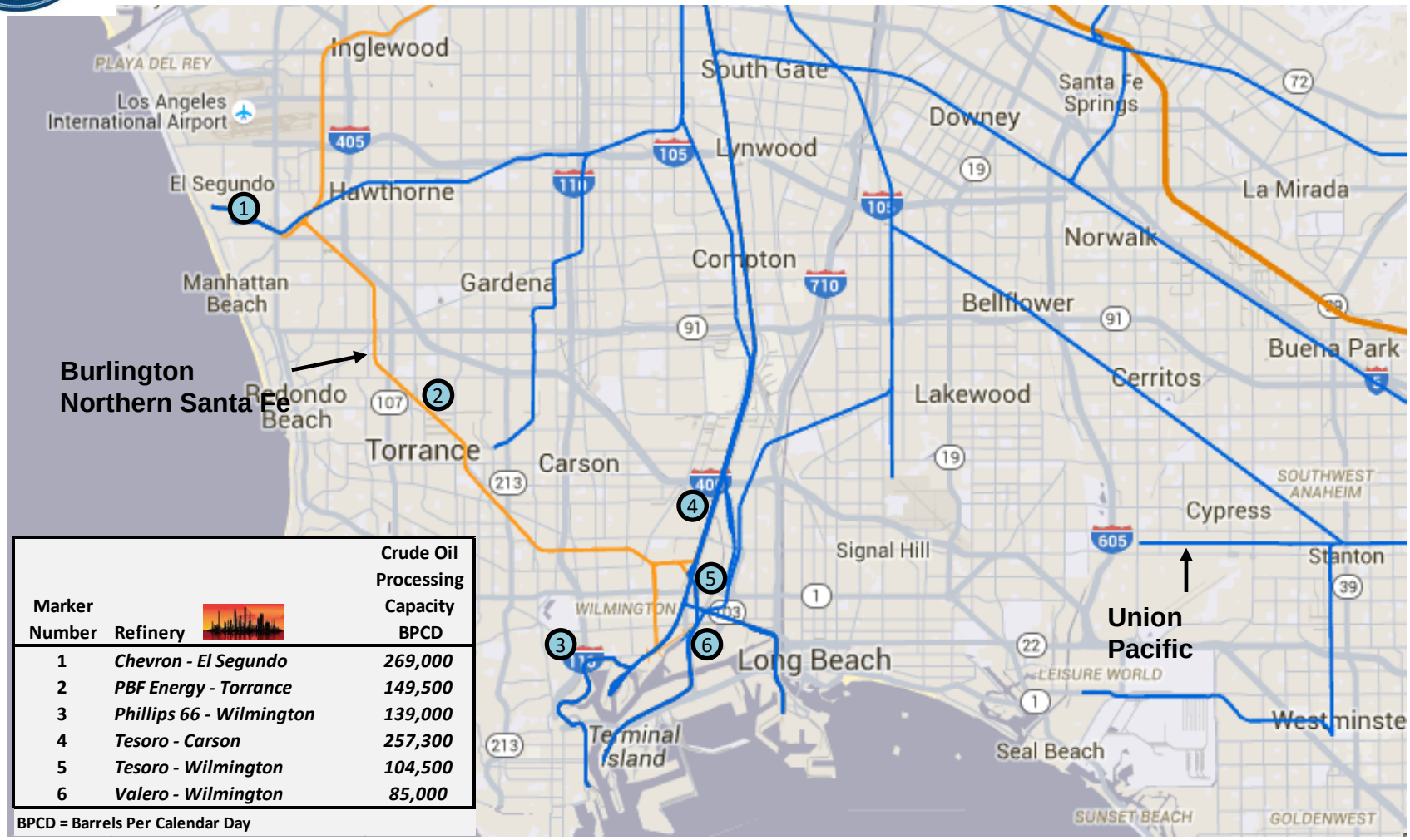
Northern California Refineries

Marker Number	Refinery	Crude Oil Processing Capacity BPCD
1	*Chevron - Richmond*	*245,271*
2	*Phillips 66 - Rodeo*	*120,200*
3	*Shell - Martinez*	*156,400*
4	*Tesoro - Golden Eagle*	*166,000*
5	*Valero - Benicia*	*145,000*

BPCD = Barrels Per Calendar Day

Sources: Oil Change International base map, Energy Information Administration refinery data and California Energy Commission analysis.

Southern California Refineries



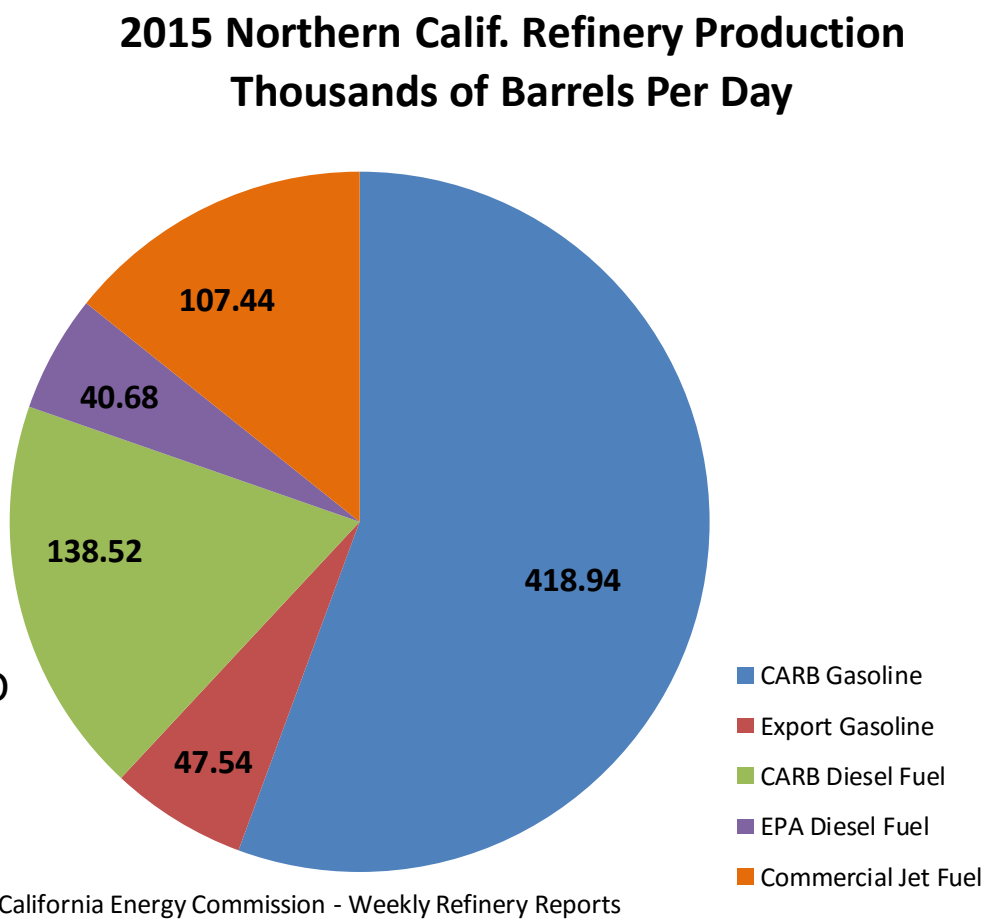
Marker Number	Refinery	Crude Oil Processing Capacity BPCD
1	*Chevron - El Segundo*	*269,000*
2	*PBF Energy - Torrance*	*149,500*
3	*Phillips 66 - Wilmington*	*139,000*
4	*Tesoro - Carson*	*257,300*
5	*Tesoro - Wilmington*	*104,500*
6	*Valero - Wilmington*	*85,000*

BPCD = Barrels Per Calendar Day

Sources: Oil Change International base map, Energy Information Administration refinery data and California Energy Commission analysis.

Supply in Northern California

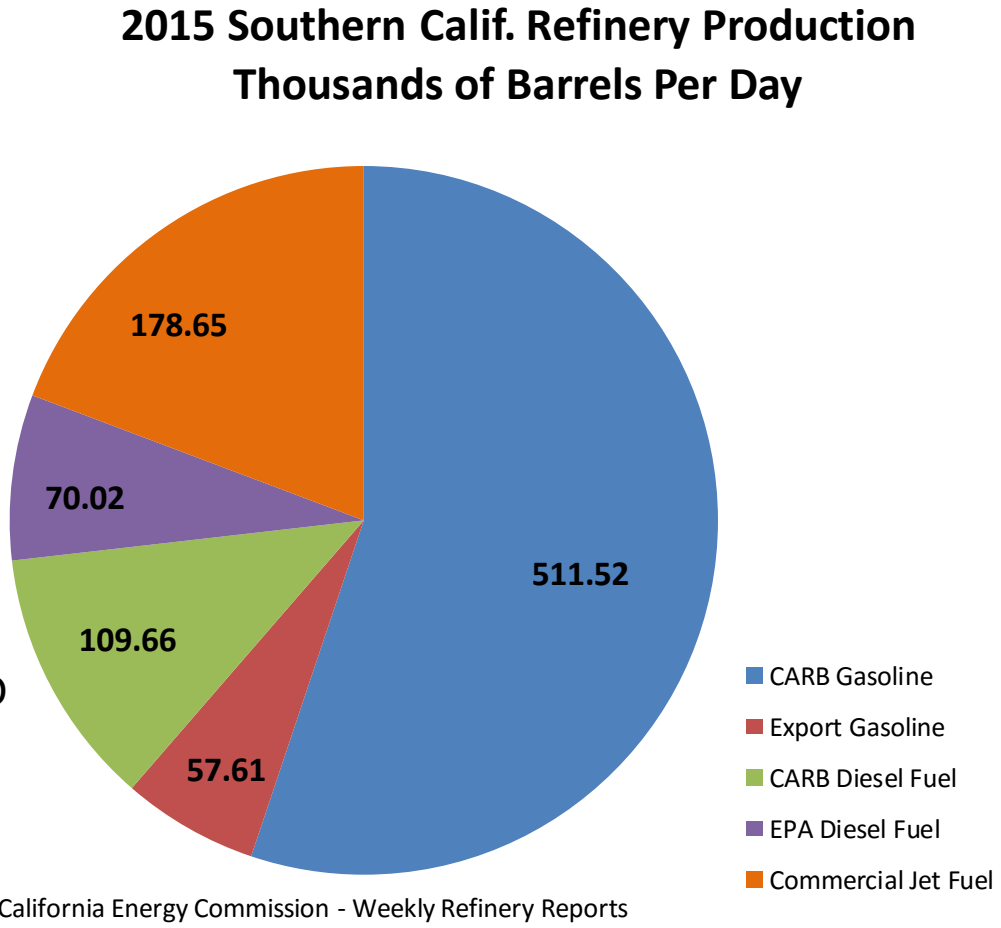
- The minority of transportation fuels used in California are produced in Northern California
- California share
  - CARB Gasoline 45.0 %
  - CARB Diesel 55.8 %
  - Jet Fuel 37.5 %
  - Export Fuel 40.9 %
- Crude oil processing
  - 781.9 TBD
- Crude marine imports
  - Foreign – 407.2 TBD
  - Alaska – 80.2 TBD
- Pipeline receipts
  - San Joaquin Valley – 294.5 TBD



Source: California Energy Commission - Weekly Refinery Reports

Supply in Southern California

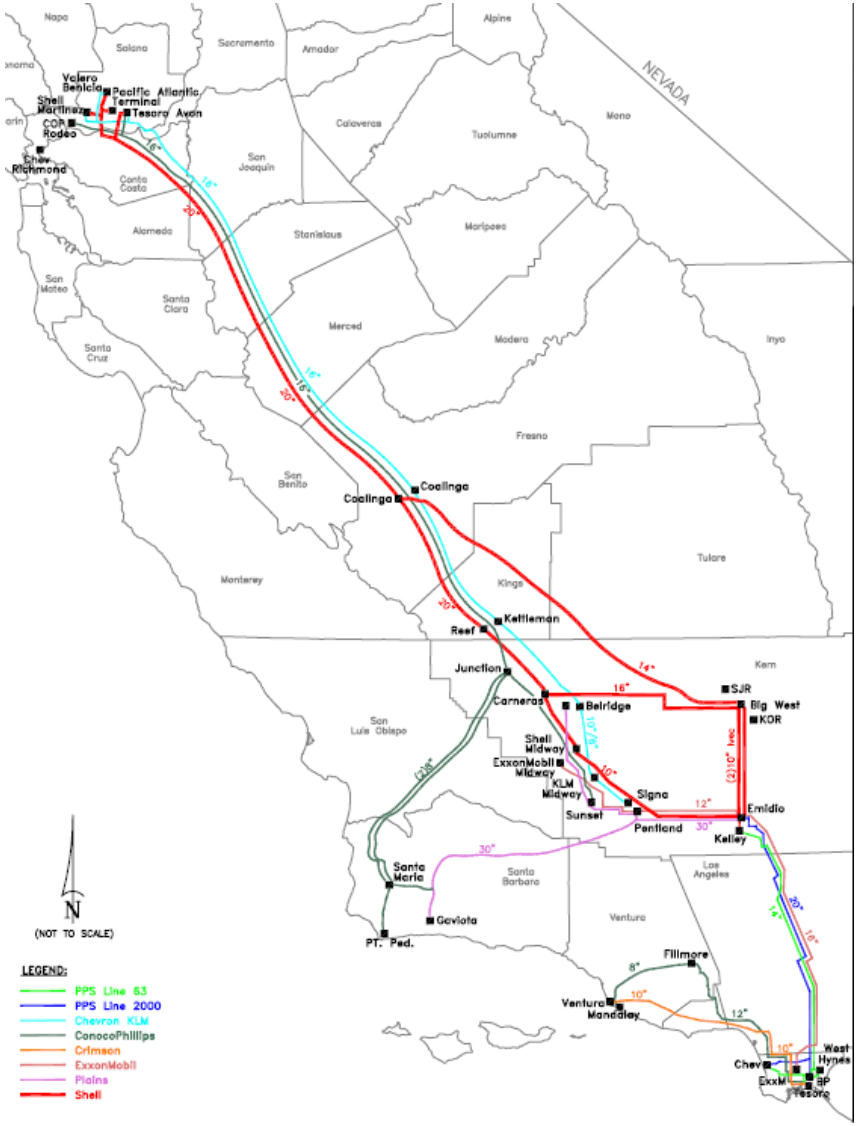
- The minority of transportation fuels used in California are produced in Northern California
- California share
  - CARB Gasoline 55.0 %
  - CARB Diesel 44.2 %
  - Jet Fuel 62.5 %
  - Export Fuel 59.1 %
- Crude oil processing
  - 922.0 TBD
- Crude marine imports
  - Foreign – 478.6 TBD
  - Alaska – 120.3 TBD
- Pipeline receipts
  - San Joaquin Valley – 323.1 TBD



Source: California Energy Commission - Weekly Refinery Reports

Calif. Oil Sources – Pipelines

- Majority (64 percent) of crude oil received via marine vessels - 2015
- Loss of marine facilities could not be made up by these pipelines originating in Kern County – not enough supply nor excess pipeline capacity
- However, Plains rail facility in Taft is operational but currently not operating at maximum capacity due to poor transportation economics
- Rail capability increases flexibility to enhance supply options & reduces risk of crude oil receipt curtailment



Key Elements – Marine Facilities

- Marine facilities are located in sheltered harbors with adequate draught to accommodate typical sizes of petroleum product tankers and crude oil vessels
- Wharves usually have adjacent storage tanks that are used to temporarily hold petroleum products prior to transfer to a subsequent location
- Most refiners operate a proprietary dock
- Third party storage provides access to majors and independents
  - Kinder Morgan
  - Pacific Atlantic
  - NuStar
  - Petro-Diamond

Key Elements – Product Pipelines

- Pipelines are used throughout the distribution infrastructure to interconnect key elements
- Intra-state pipelines are used to convey petroleum products within California's borders
- Interstate pipelines are used to export transportation fuels to Arizona and Nevada
  - NV – Over 85% of supply
  - AZ – Over 45% of supply
- As is the case with refineries, pipeline systems normally operate on a continuous basis
- Pipelines can only operate if transportation fuels are available to push liquid through the system

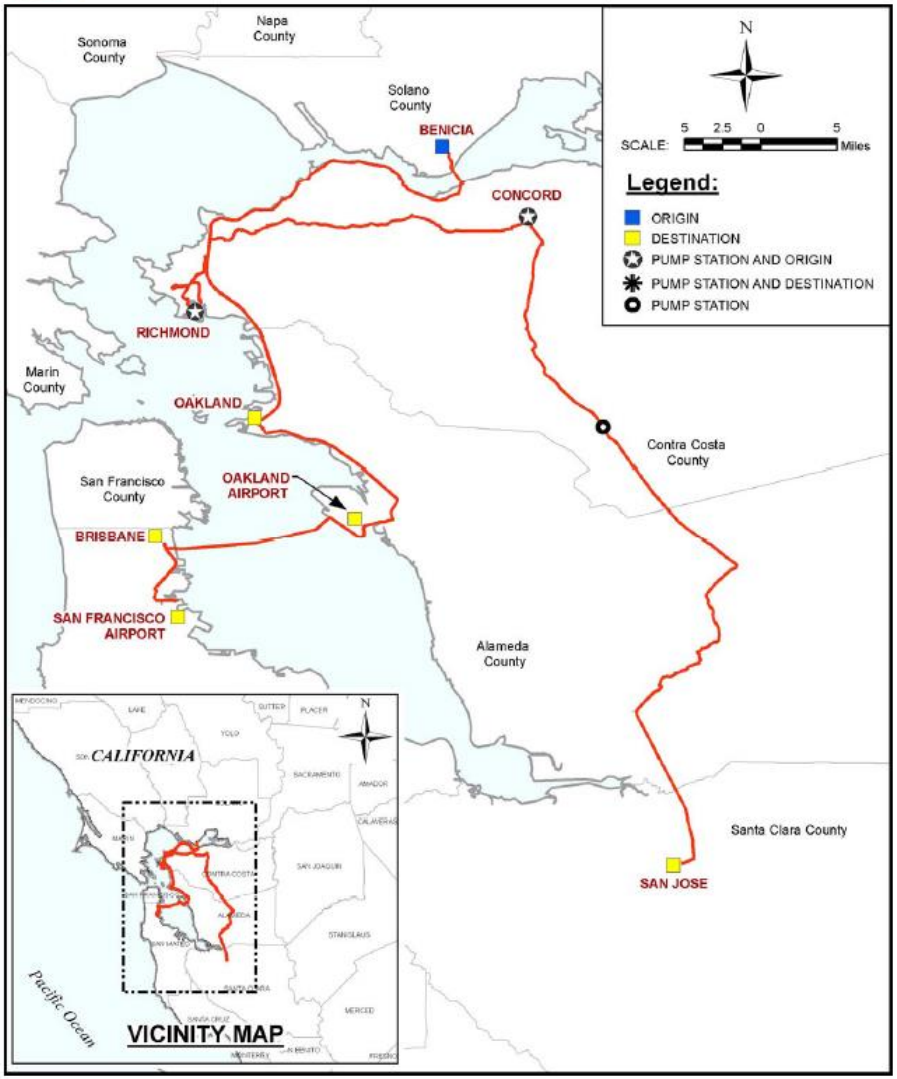
Key Elements – Product Pipelines

- Output from the refineries is usually placed in intermediate tanks prior to blending the finished products
- The majority of gasoline, diesel and jet fuel is shipped from the refinery by pipeline to over 60 distribution terminals
- Tanker trucks then transport fuel to retail & non-retail stations
- Several truck trips during 2015
  - Gasoline – 41.39 MM gal/day
    - 5,174 tanker deliveries/day
  - Diesel fuel – 10.00 MM gal/day
    - 1,250 tanker deliveries/day

Key Elements – Pipelines – N. Calif.

- The pipeline infrastructure in California is controlled by a combination of common carrier and private companies
- Kinder Morgan is the sole common carrier of petroleum product pipelines in the State and transports the majority of fuels through its system every day
- Other companies, such as Chevron, ExxonMobil, Shell, and Tesoro operate proprietary systems or segments that handle the balance of transportation fuels

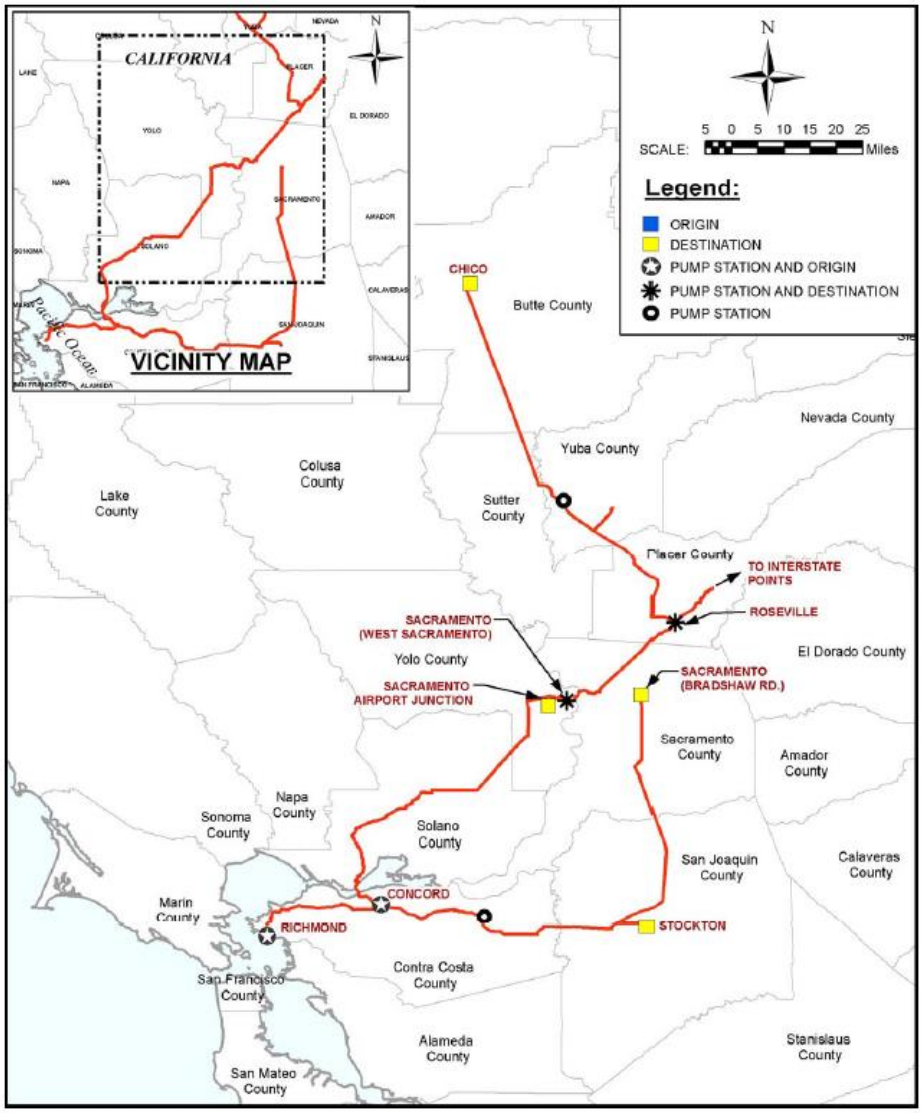
Bay Area – Kinder Morgan Lines



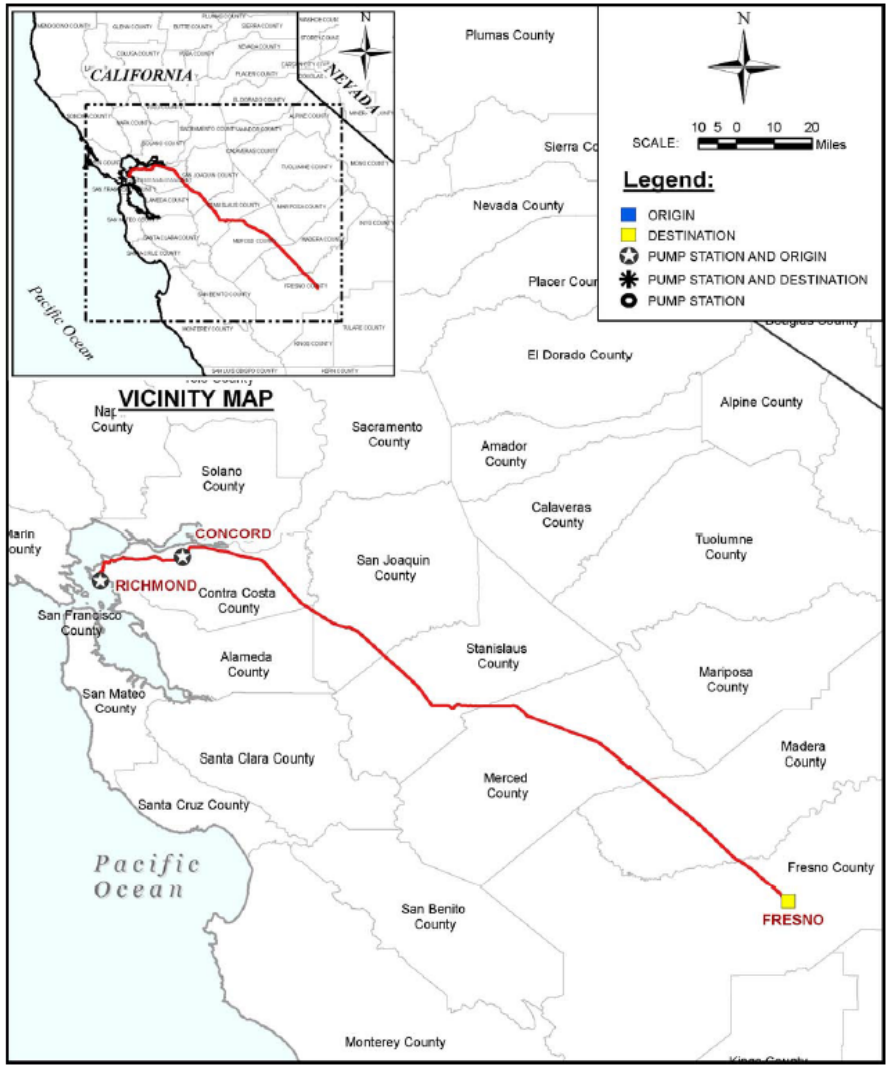
- The sole source of fuels for Bay Area airports
- Trans-bay crossing to Brisbane and SFO
- Distribution to Brisbane and San Jose terminals augments supply from truck racks linked to Bay Area refineries
- 75 to 85 percent of gasoline and diesel fuel is distributed through pipelines from refineries to distribution terminals

Bay Area – Kinder Morgan North Lines

- The Chico terminal is the northernmost extent of petroleum product pipeline system in California
- Pipeline continues to Reno (Sparks), Nevada
- Deliveries to Roseville for railroad use
- Separate pipeline delivers military jet fuel to Travis AFB (not shown on map) from Concord pump station
- Separate spur line to Beale AFB
- Sacramento Airport now receives commercial jet fuel via pipeline connection



Bay Area – Kinder Morgan Fresno Line



- The Fresno terminal is the southernmost extent of the petroleum product pipeline system originating from the Concord pump station
- Lemoore naval air station receives military jet fuel on a separate extension originating from the Fresno terminal (line segment not shown on this map)
- Fresno terminal can also receive fuel from pipeline segment originating from the ALON USA refinery in Bakersfield that is currently idle

Key Elements – Pipelines – S. Calif.

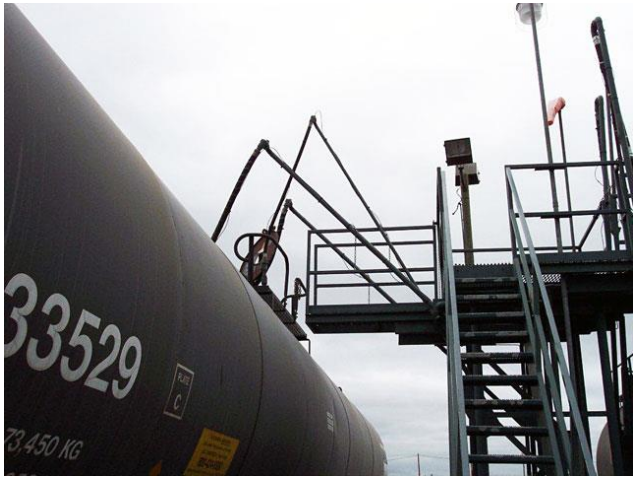
- Southwestern system includes portions to deliver transportation fuels into Southern Nevada and Arizona
  - NV – Over 85% of supply
  - AZ – Over 45% of supply
- Dependency on Southern California refineries lessened by deliveries from West Texas and Utah

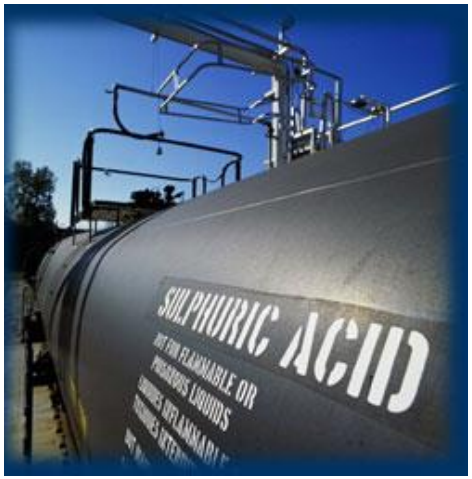
UNEV System – Utah to Las Vegas

- 427-mile, 12-inch refined products pipeline – 60,000 bpd capacity
- 600,000 bbls storage capacity
- Cedar City, UT
  - 2 truck loading bays & rail receipt
- North Las Vegas, NV
  - 2 truck loading bays & truck receipt

Rail Logistics – Other Uses

- Refiners use rail cars to routinely ship propane and seasonally send out and receive butane
- Rail cars are also used to deliver refinery feedstock such as gas oils and sulfuric acid for alkylation units
- More recently, California refiners have started using rail cars to import crude oil from Canada and domestic sources outside the state but this activity is less than 1 percent of supply due to poor transportation economics





Interdependencies

- Most California refineries have cogeneration capability
- But depend on other outside services to sustain operations
  - Source water for process steam
  - Wastewater discharge handling requirements
  - Natural gas to augment still gas fuel production
  - Hydrogen from merchant producers to enable operations of desulphurization processing equipment
  - Acid deliveries for operation of alkylation facilities
- Retail fuel stations provide majority of gasoline and diesel fuel to the public
- Retail stations need electricity to operate dispensers
- Even with back-up power, stations need telecommunication capability to process transactions

Questions?

gordon.schremp@energy.ca.gov 916-654-4887