



California Transportation of Petroleum

Second Northern California Refinery Safety Forum Crockett, CA

March 26, 2015

Gordon Schremp

Energy Assessments Division

California Energy Commission

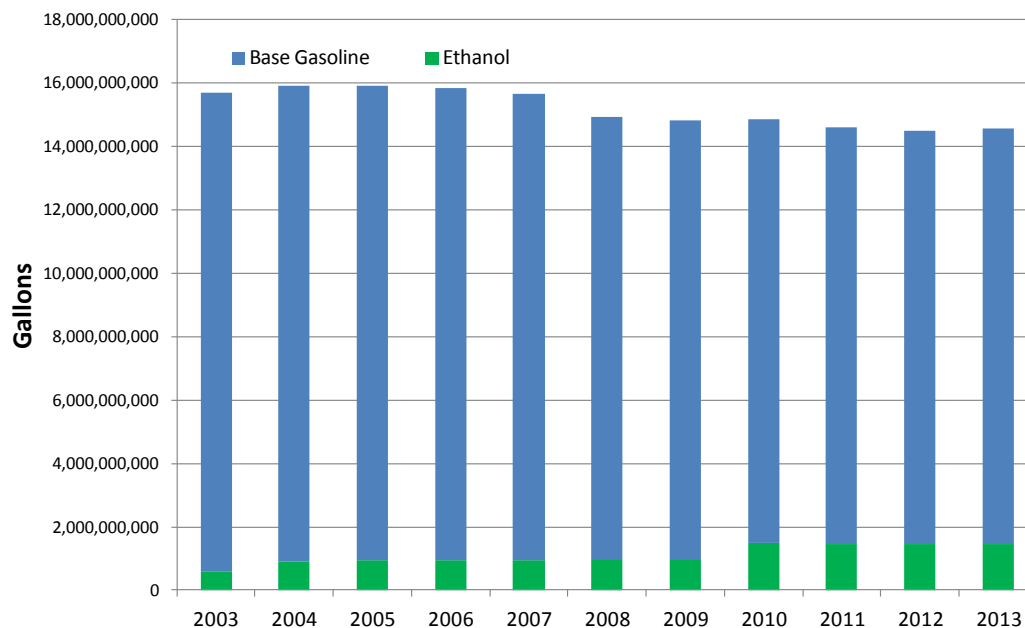
gordon.schremp@energy.ca.gov



California On-road Transportation Fuels

- 14.54 billion gallons of gasoline consumed in 2013
- Base gasoline demand down 13.4 percent between 2003 and 2013
 - Ethanol use increasing due to Renewable Fuel Standard
 - Ethanol use up to 1.46 billion gallons during 2013
 - 148 percent increase since 2003
 - Ethanol accounted for 10 percent of total gasoline gallon during 2013

**California Gasoline & Ethanol Demand
2003 - 2013**

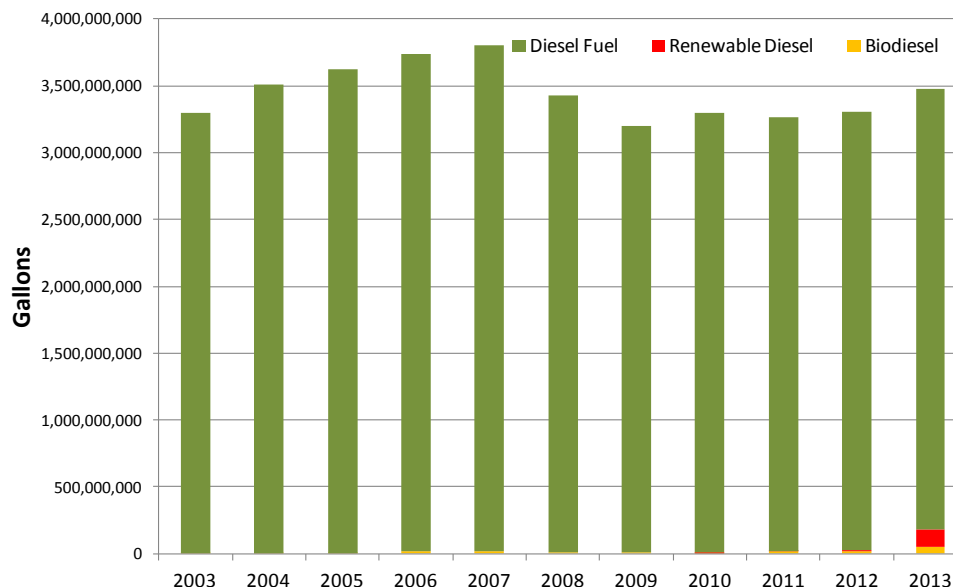




California On-road Transportation Fuels

- 3.48 billion gallons diesel consumed during 2013
- Base diesel fuel demand unchanged between 2003 and 2013
 - Biodiesel use increasing due to Renewable Fuel Standard and the Low Carbon Fuel Standard (LCFS)
 - 49 MM gallons during 2013
 - Renewable diesel fuel use up to 136 MM gallons during 2013 due to LCFS
 - Combined renewable component accounted for 5.3 percent of total diesel gallon

**California Diesel, Biodiesel & Renewable
Diesel Demand 2003 - 2013**





Transportation Fuel Infrastructure Overview





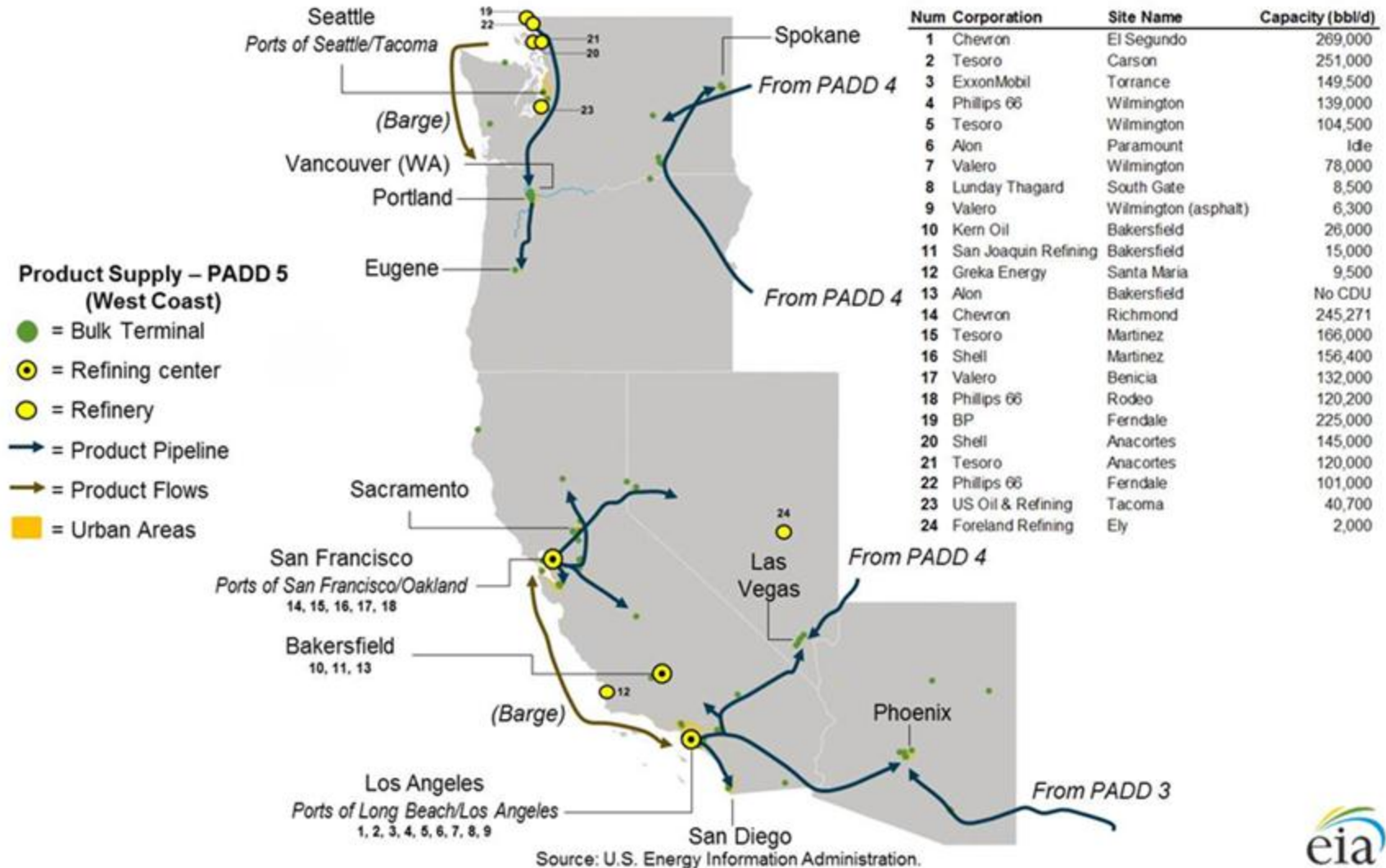
Fuel Infrastructure – Key Elements

- The California transportation fuel “infrastructure” consists of several interconnected assets operated by a combination of refiner and third-party companies
 - Refineries
 - Pipelines
 - Marine terminals
 - 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 of U.S.

West Coast petroleum product supply map





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 over 1.6 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 2014 received by
 - Marine vessels (foreign) - 787.1 TBD
 - Marine vessels (Alaska) – 190.5 TBD
 - California source via pipelines – 664.8 TBD
 - Rail/truck – 15.7 TBD
- Process units operate continuously at or near maximum capacity, except during periods of planned maintenance or unplanned outages



Supply in Northern California

- The minority of transportation fuels used in California are produced in Northern California

- California share

- CARB Gasoline 39.9 %
- CARB Diesel 48.7 %
- Jet Fuel 34.4 %
- Export Fuel 45.2 %

- Crude oil processing

- 754.8 TBD

- Crude marine imports

- Foreign – 415.4 TBD
- Alaska – 70.9 TBD
- North Dakota – 3.4 TBD

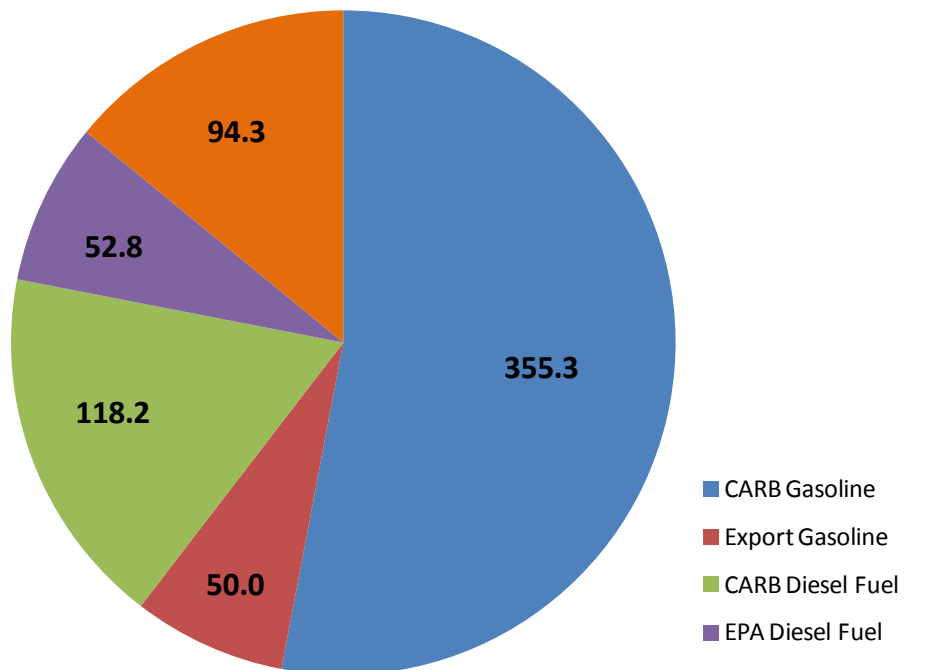
- Crude rail imports

- Domestic – 3.5 TBD

- Pipeline receipts

- San Joaquin Valley – 261.6 TBD

Northern California Refinery Production
Thousands of Barrels Per Day



Source: California Energy Commission - Weekly Refinery Reports



Key Elements – Refineries (cont)

- 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 2013
 - Gasoline – 39.84 MM gal/day
 - 4,980 tanker deliveries/day
 - Diesel fuel – 9.53 MM gal/day
 - 1,191 tanker deliveries/day





Bay Area Gas Stations – Average Sales

Analysis of A15 Retail Survey Data From CY 2012

California Bay Area County	Retail Sites	Average Gasoline Throughput Gallons/Month	Retail Sites 500,000 to 1,000,000 Gallons/Month	Average Gasoline Throughput Gallons/Month	Retail Sites Greater Than 1,000,000 Gallons/Month	Average Gasoline Throughput Gallons/Month
Alameda	371	127,583	32	671,635	15	1,572,757
Contra Costa	291	119,989	37	695,126	8	1,678,949
Marin	68	131,127	8	661,454	2	1,822,102
Napa	37	130,631	5	649,739	1	2,102,774
San Francisco	100	124,167	12	701,016	2	1,187,214
San Mateo	197	129,442	19	651,417	6	1,777,563
Santa Clara	393	147,795	28	651,525	13	1,660,441
Sub totals	1,457	131,778	141	672,228	47	1,646,712

Source: California Energy Commission



Key Elements – 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 90% of supply
 - AZ – Over 50% 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



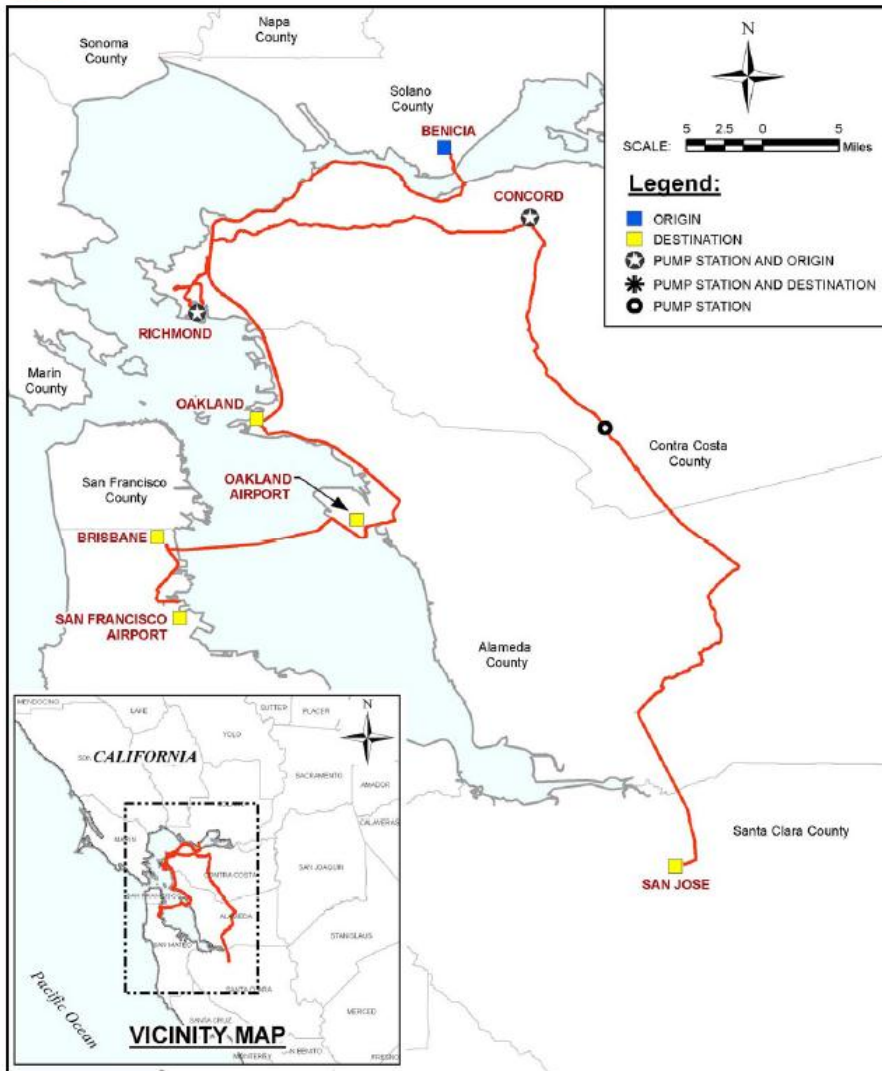
Key Elements - Pipelines (cont)

- 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

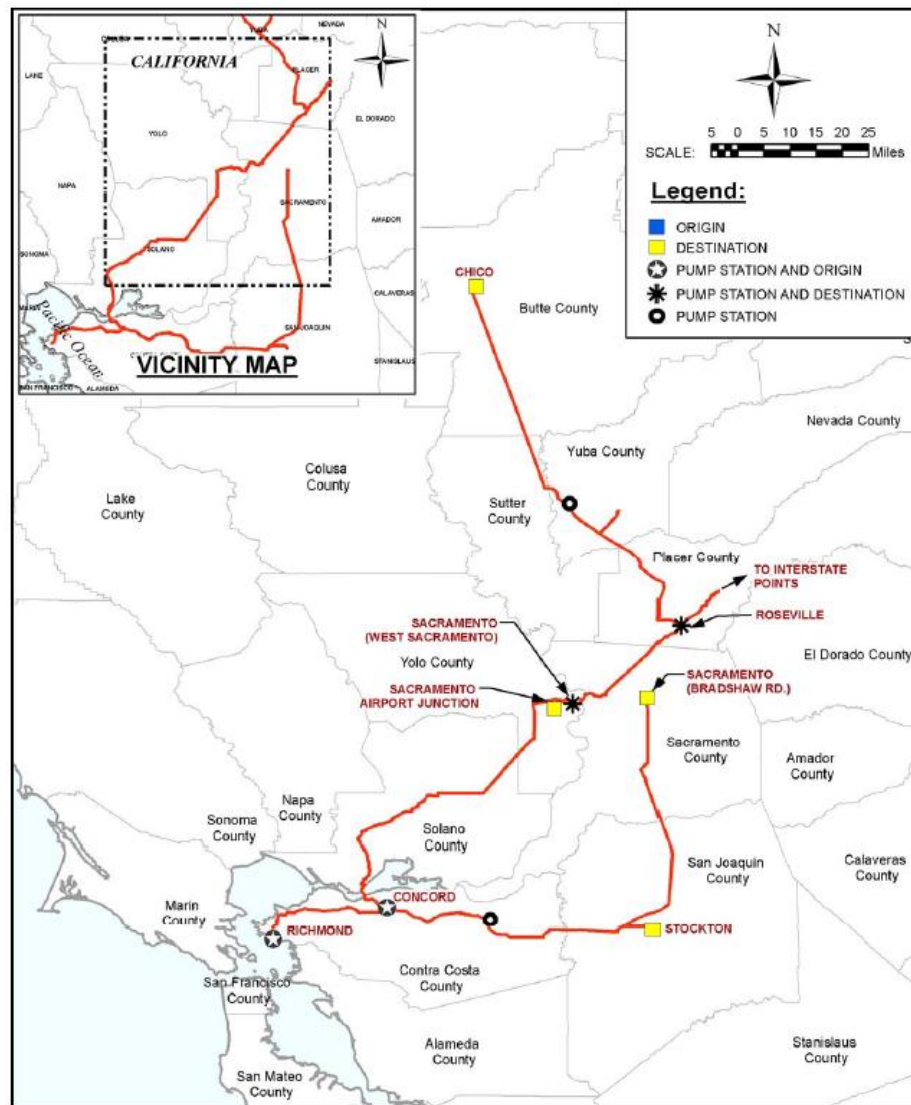


- The sole source of fuels for Bay Area airports
- Trans-bay crossing to Brisbane and SFO
- Distribution to Brisbane and San Jose terminals augments supply from truck racks linked to Bay Area refineries
- 75 to 85 percent of gasoline and diesel fuel is distributed through pipelines from refineries to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



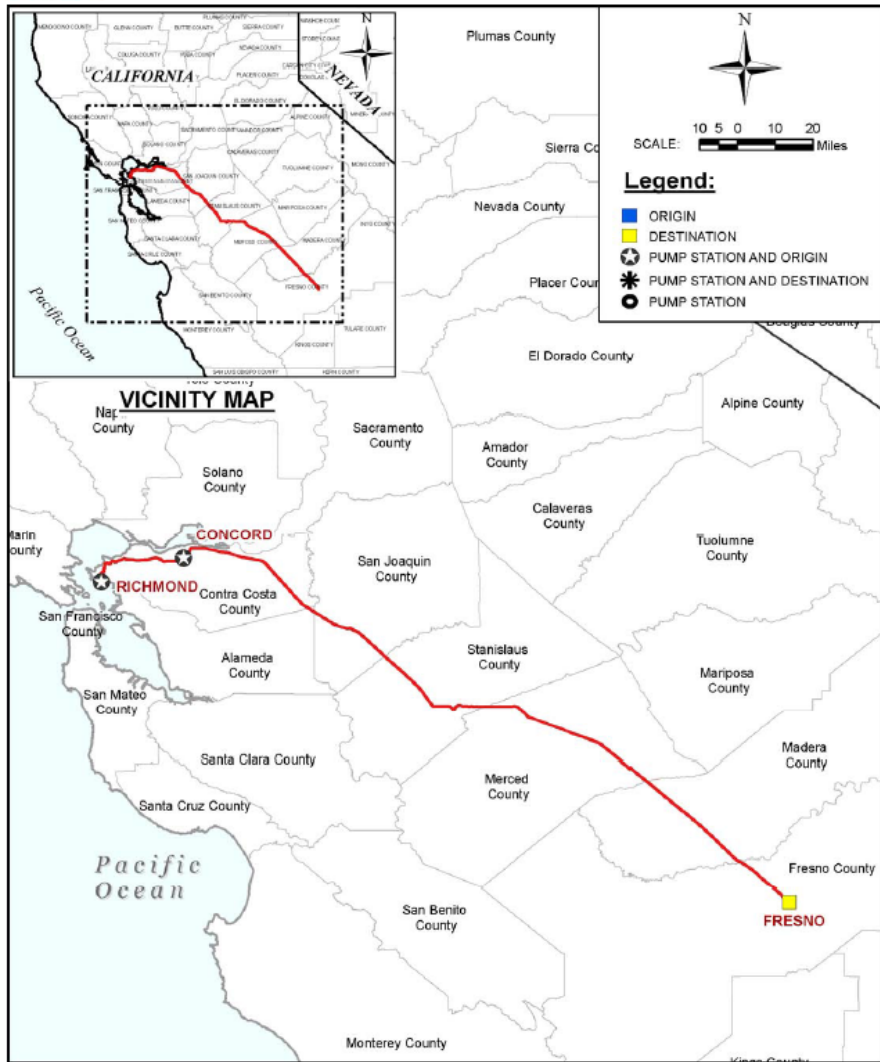
Bay Area – Kinder Morgan North Lines

- 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 – 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





Rail Logistics - Ethanol

- State receives ethanol via rail unit trains at two locations
 - Lomita Rail Terminal in Carson
 - West Colton Rail Terminal
- Ethanol is then trucked to gasoline distribution terminals
 - – 4.0 MM gal/day during 2013 or 500 tanker truck deliveries/day





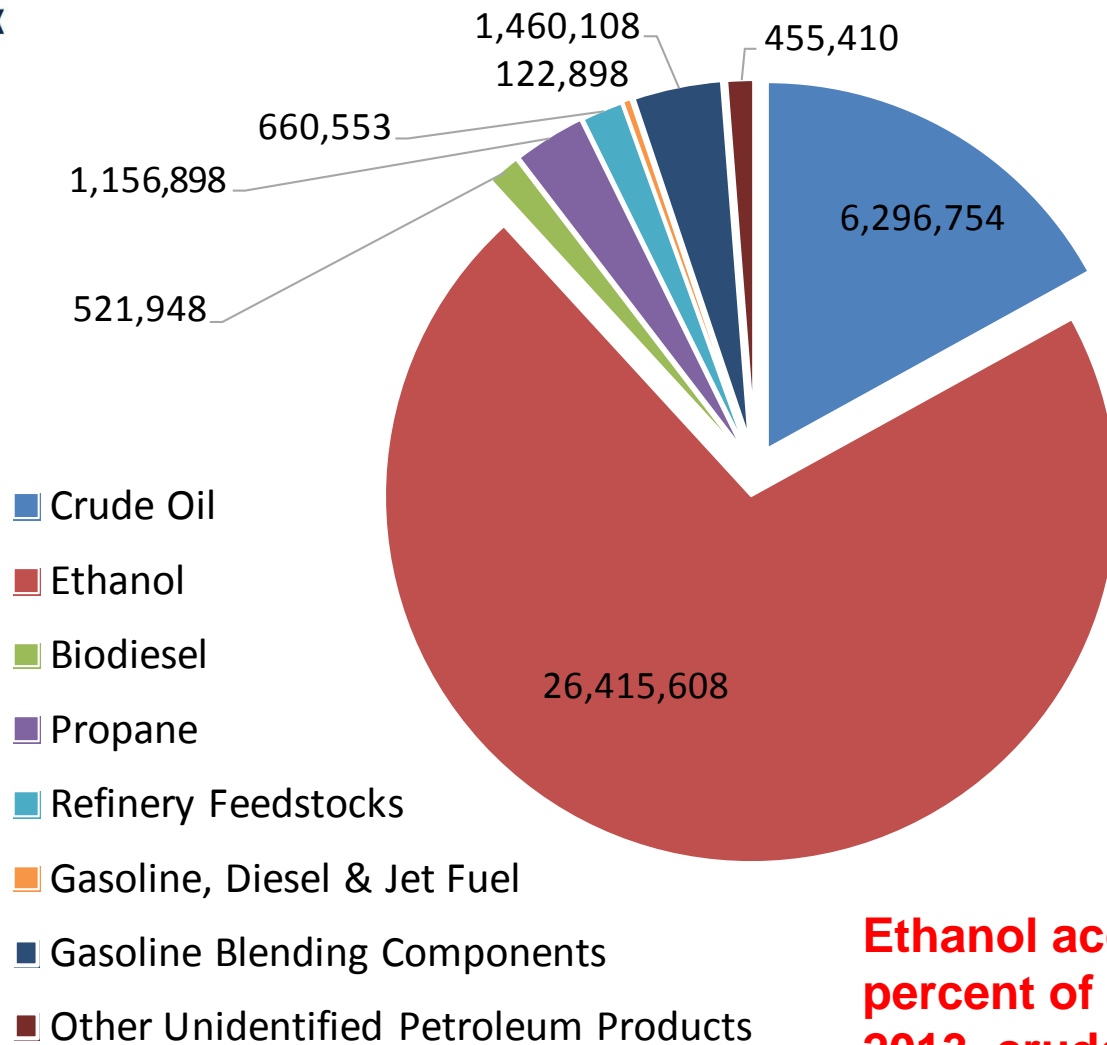
Rail Logistics – Other Uses

- 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 due to changing trends of increasing oil production and discounted prices





2013 California Rail Imports (Barrels)

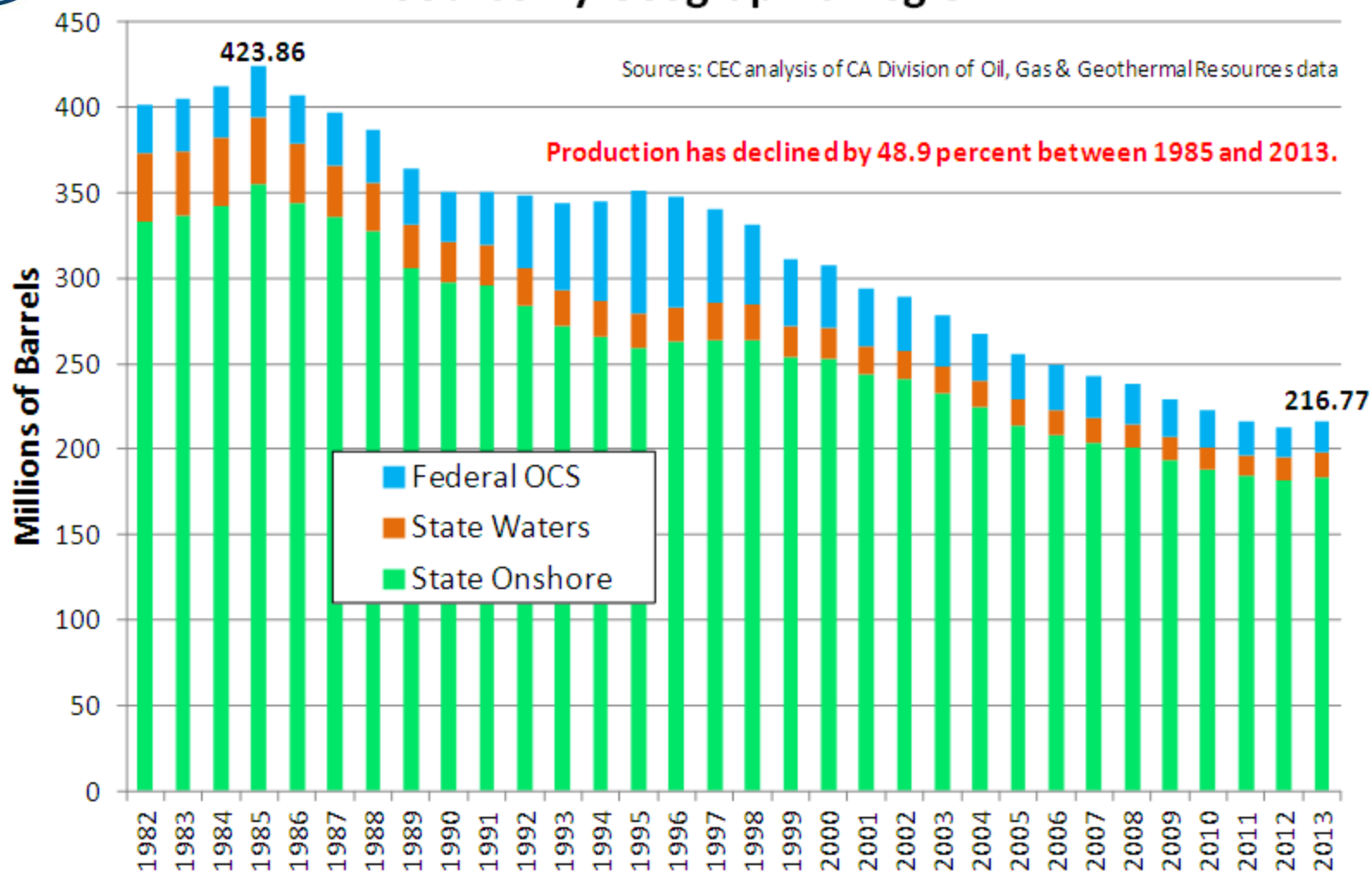


Ethanol accounted for 71.2 percent of volume during 2013, crude oil 17.0 percent.

Source: California Energy Commission



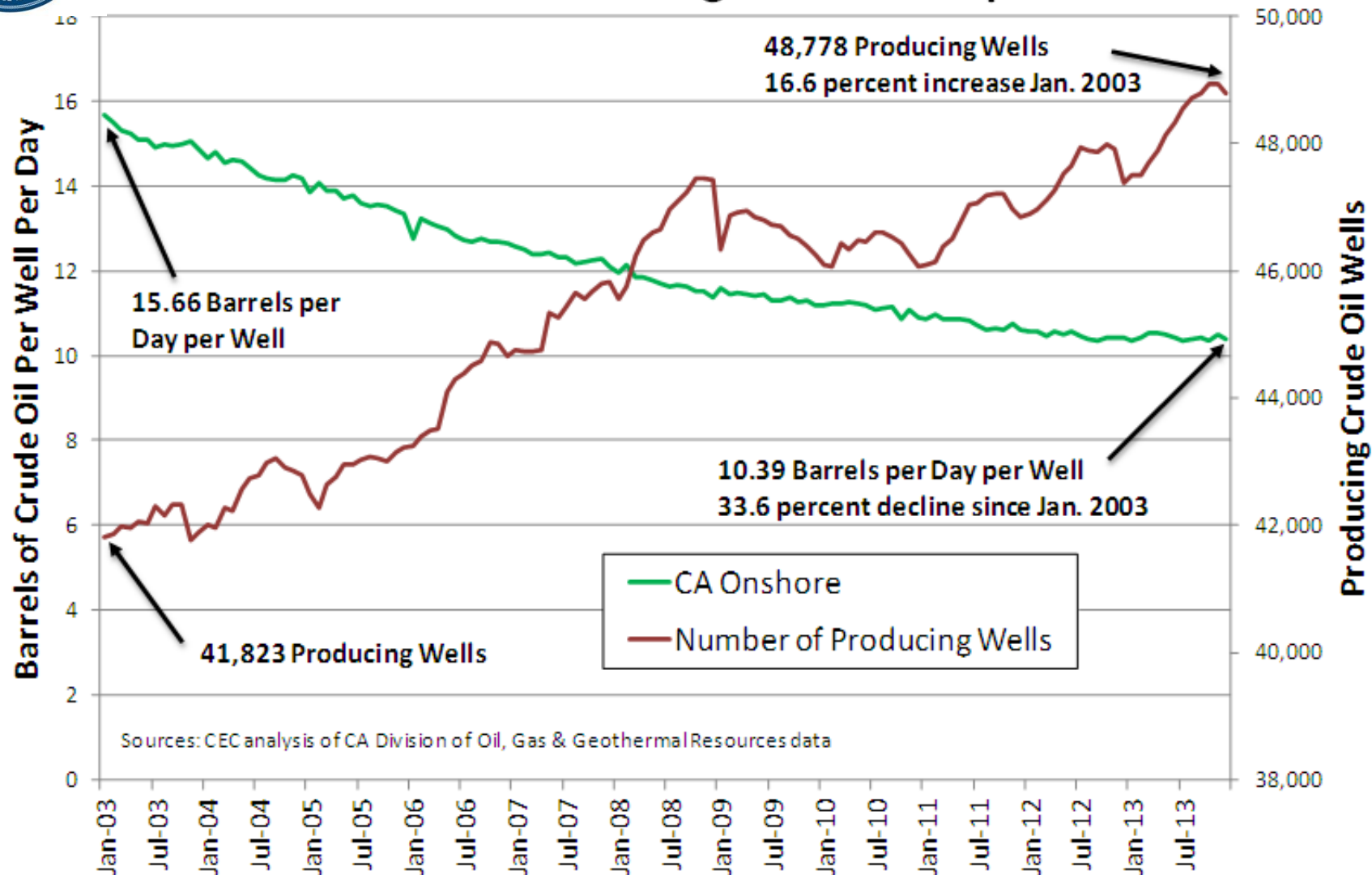
California Crude Oil Production Source By Geographic Region





California Crude Oil Production

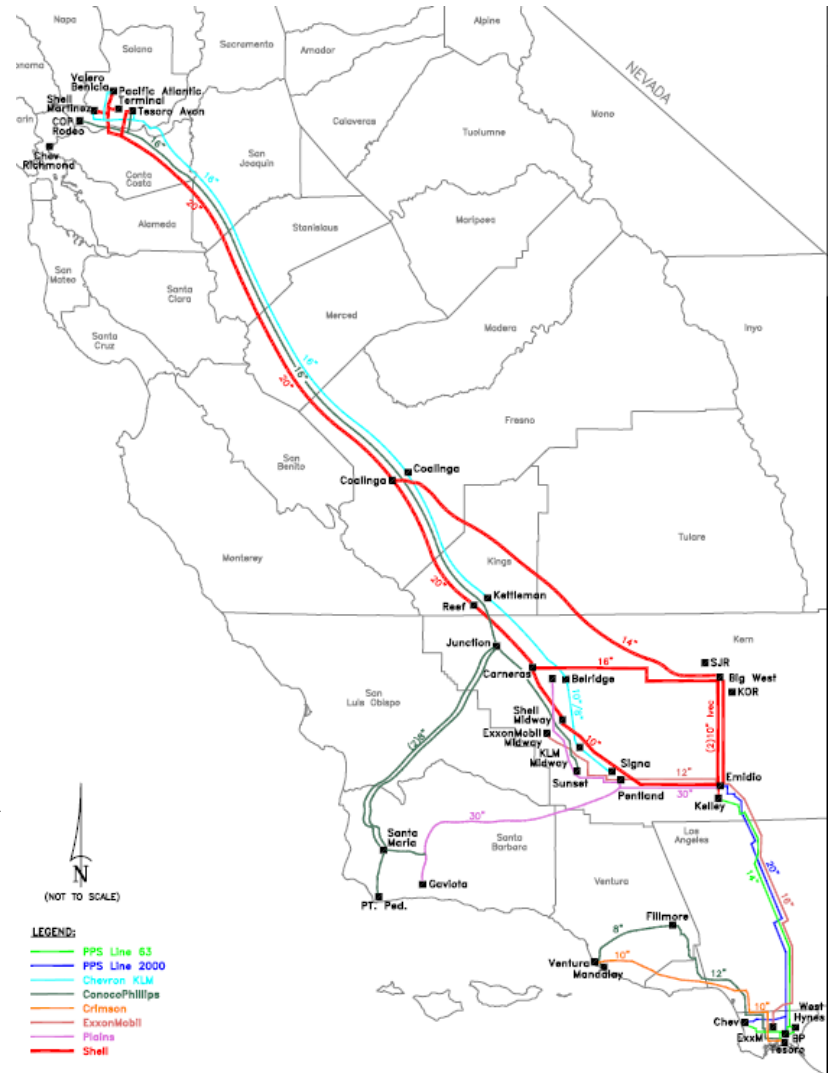
Onshore - Producing Wells & Output





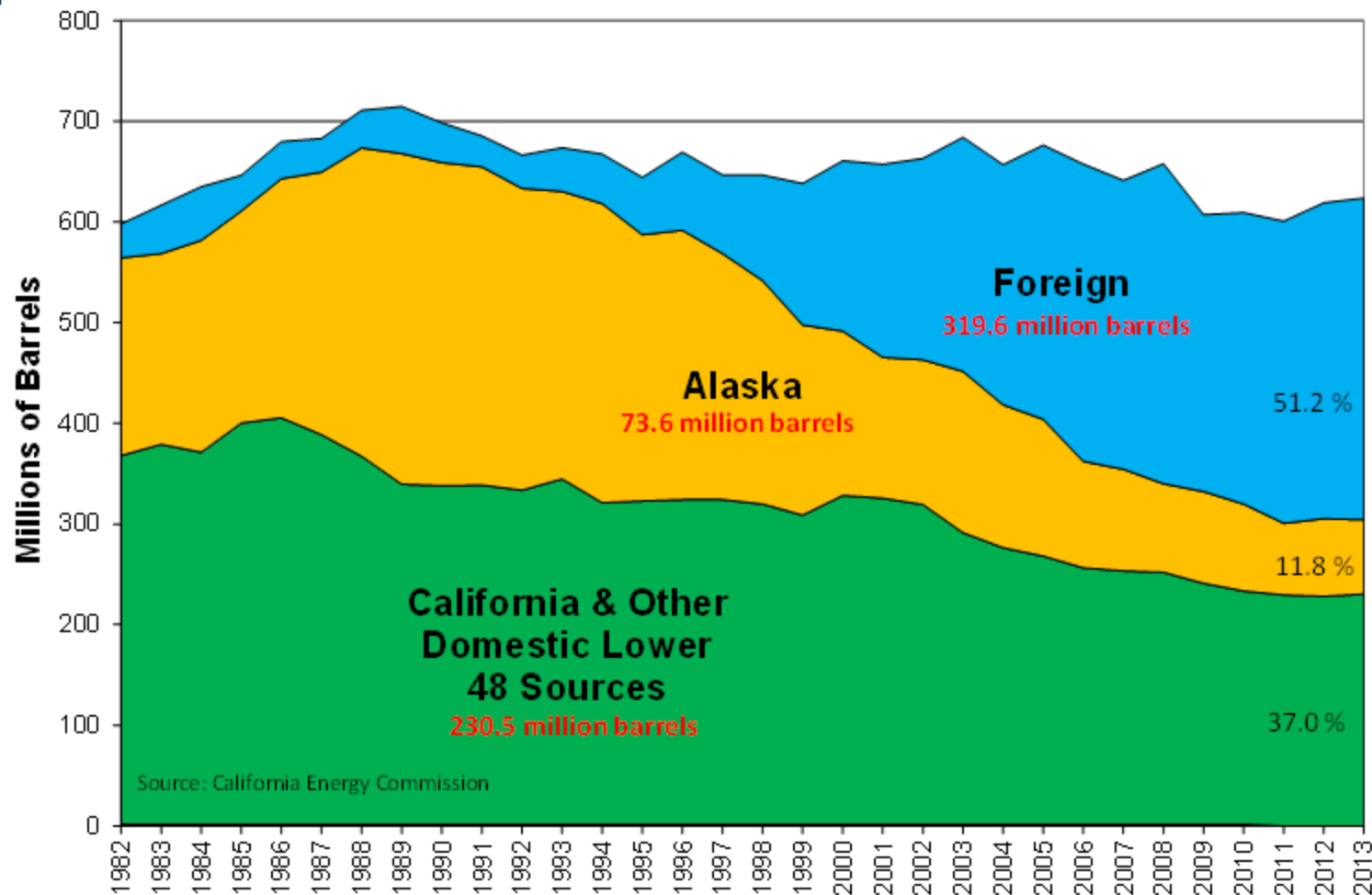
Crude Oil Sources – Northern Calif. Refineries

- Northern California refineries processed 754.8 thousand barrels per day of crude oil during 2014
 - 261.6 TBD pipeline shipments
 - 35 percent of crude oil received
- Northern California refineries processed 45.5 percent of total crude oil
- Increased crude-by-rail likely to back out marine receipts of similar quality
- Rail capability increases flexibility to enhance supply options & reduces risk of crude oil receipt curtailment





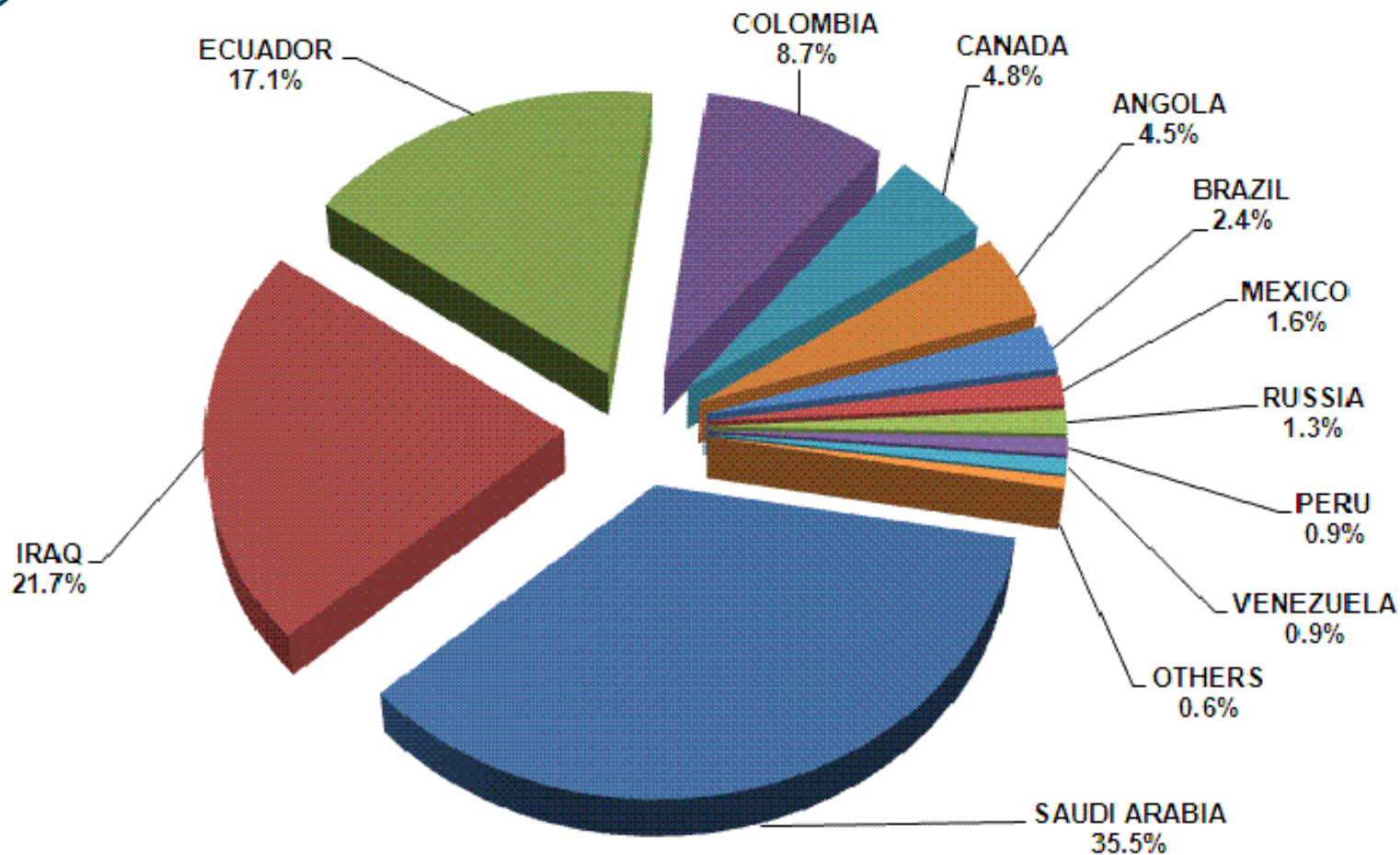
California Refineries – Crude Oil Sources



Declining CA & Alaska sources replaced by additional foreign imports.



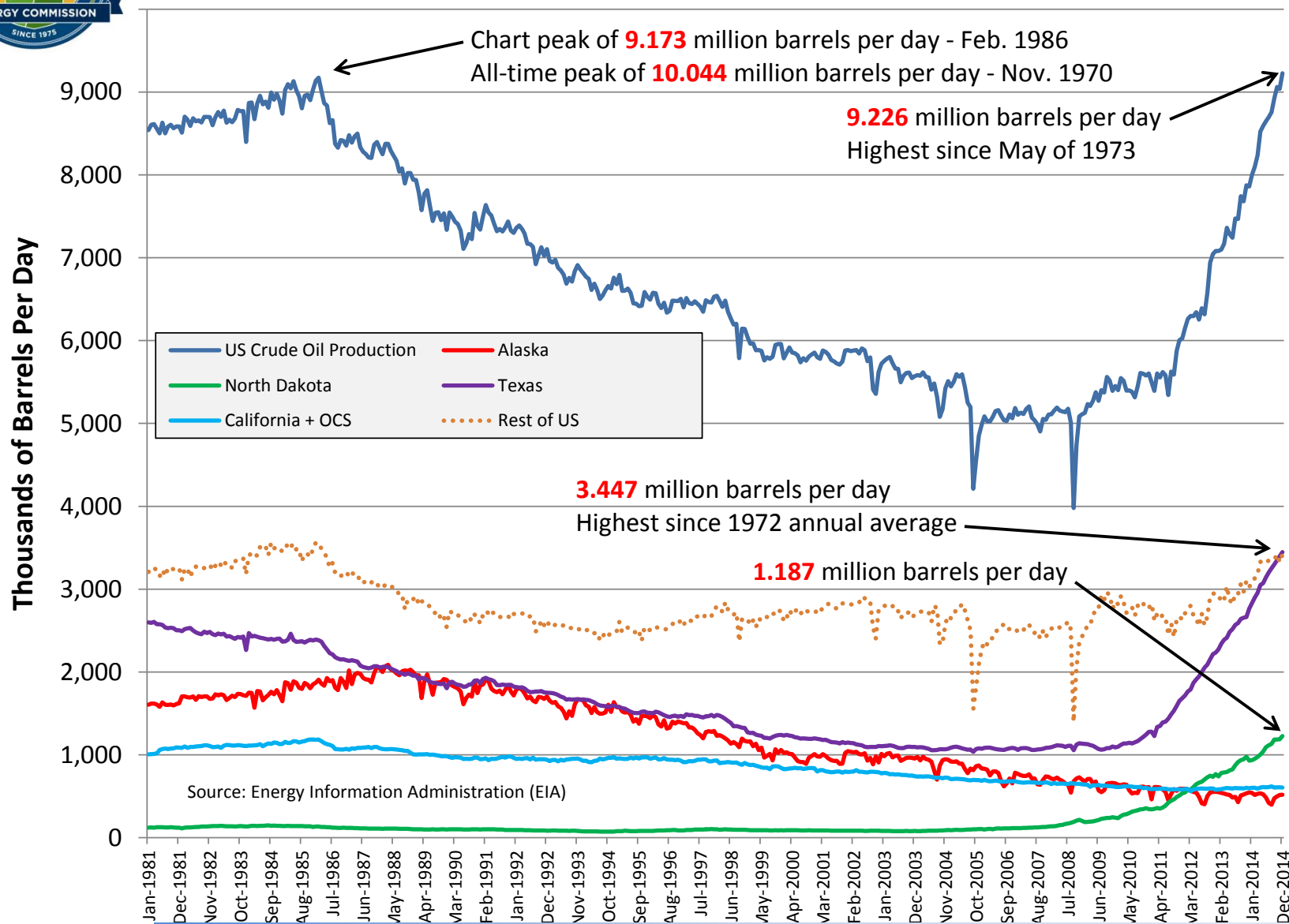
Foreign Sources of Crude Oil Imports to California 2014



Source: Energy Information Administration (EIA), Company-Level Imports.

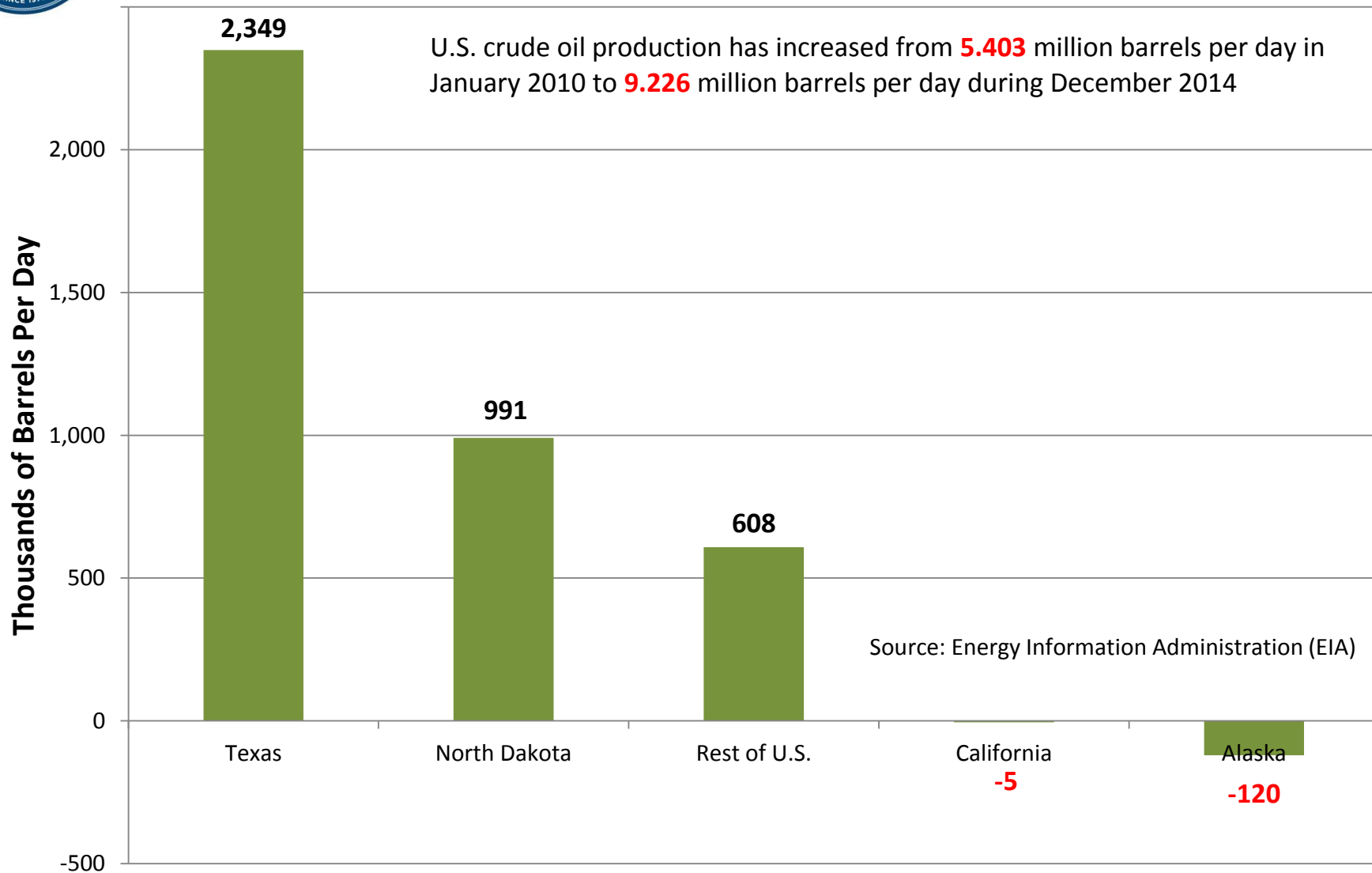


U.S. Crude Oil Production – Jan. '81-Dec. '14





Change in Crude Oil Production January 2010 vs. December 2014

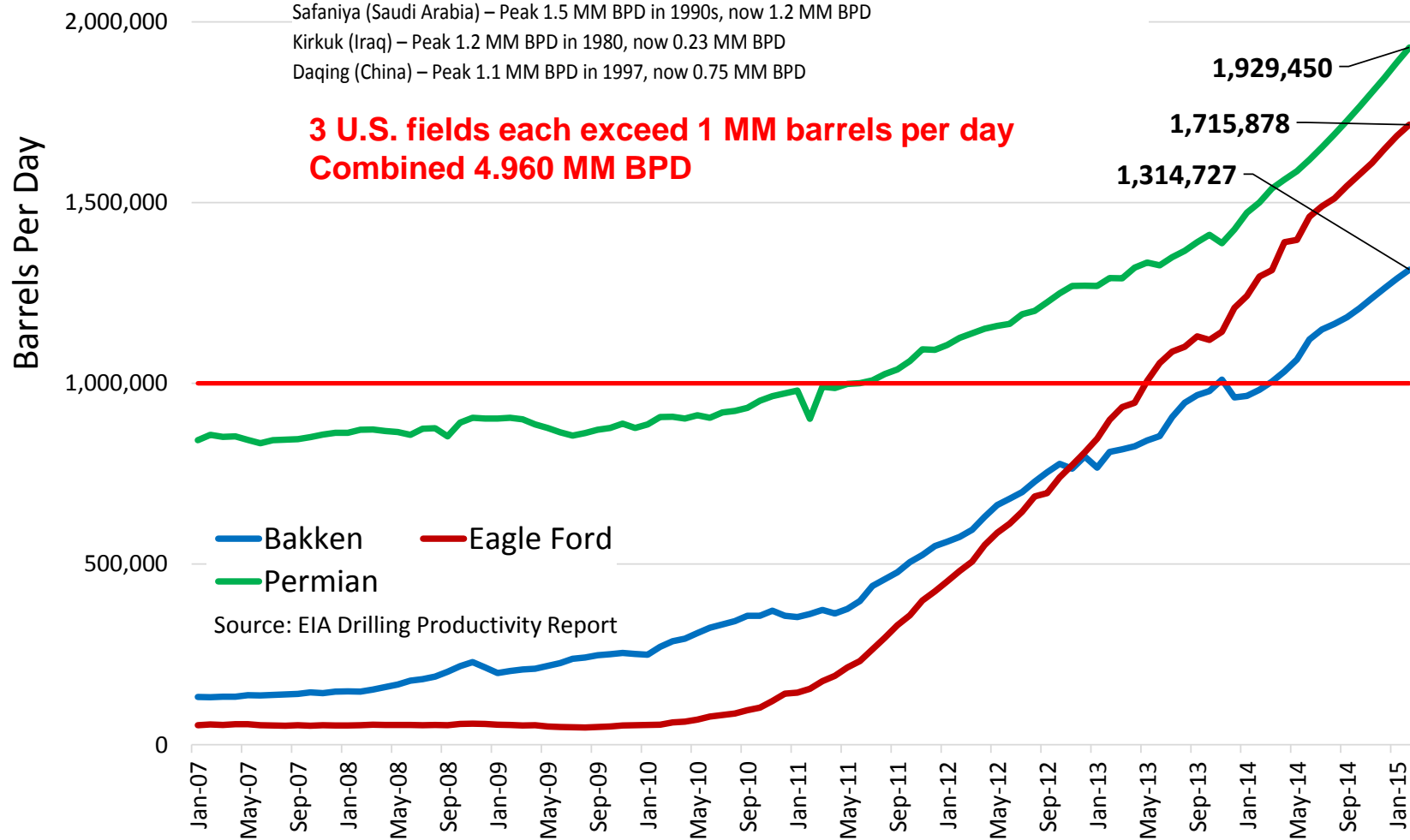




U.S. Tight Oil Production – Jan. '07-Feb. '15

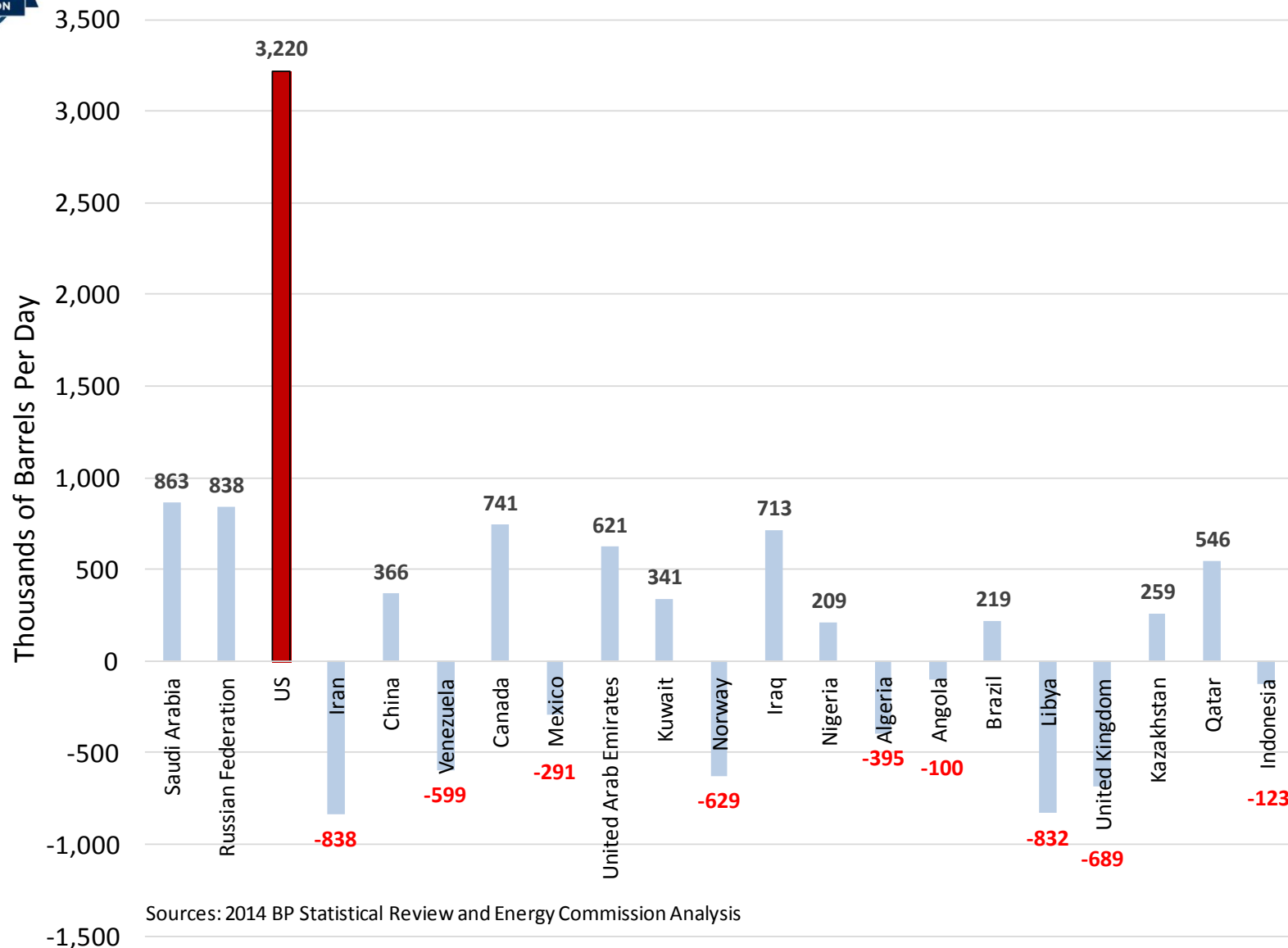
Ghawar (Saudi Arabia) – Peak 5.0 MM BPD in 2005, now 4.5 MM BPD
Samotlor (Russia) – Peak 3.0 MM BPD in 1980, now 0.84 MM BPD
Burgan (Kuwait) – Peak 2.4 MM BPD in 1972, now 1.7 MM BPD
Cantarell (Mexico) – Peak 2.1 MM BPD in 2003, now 0.41 MM BPD
Rumaila (Iraq) – Peak 1.6 MM BPD in 1980, now 1.3 MM BPD
Safaniya (Saudi Arabia) – Peak 1.5 MM BPD in 1990s, now 1.2 MM BPD
Kirkuk (Iraq) – Peak 1.2 MM BPD in 1980, now 0.23 MM BPD
Daqing (China) – Peak 1.1 MM BPD in 1997, now 0.75 MM BPD

**3 U.S. fields each exceed 1 MM barrels per day
Combined 4.960 MM BPD**





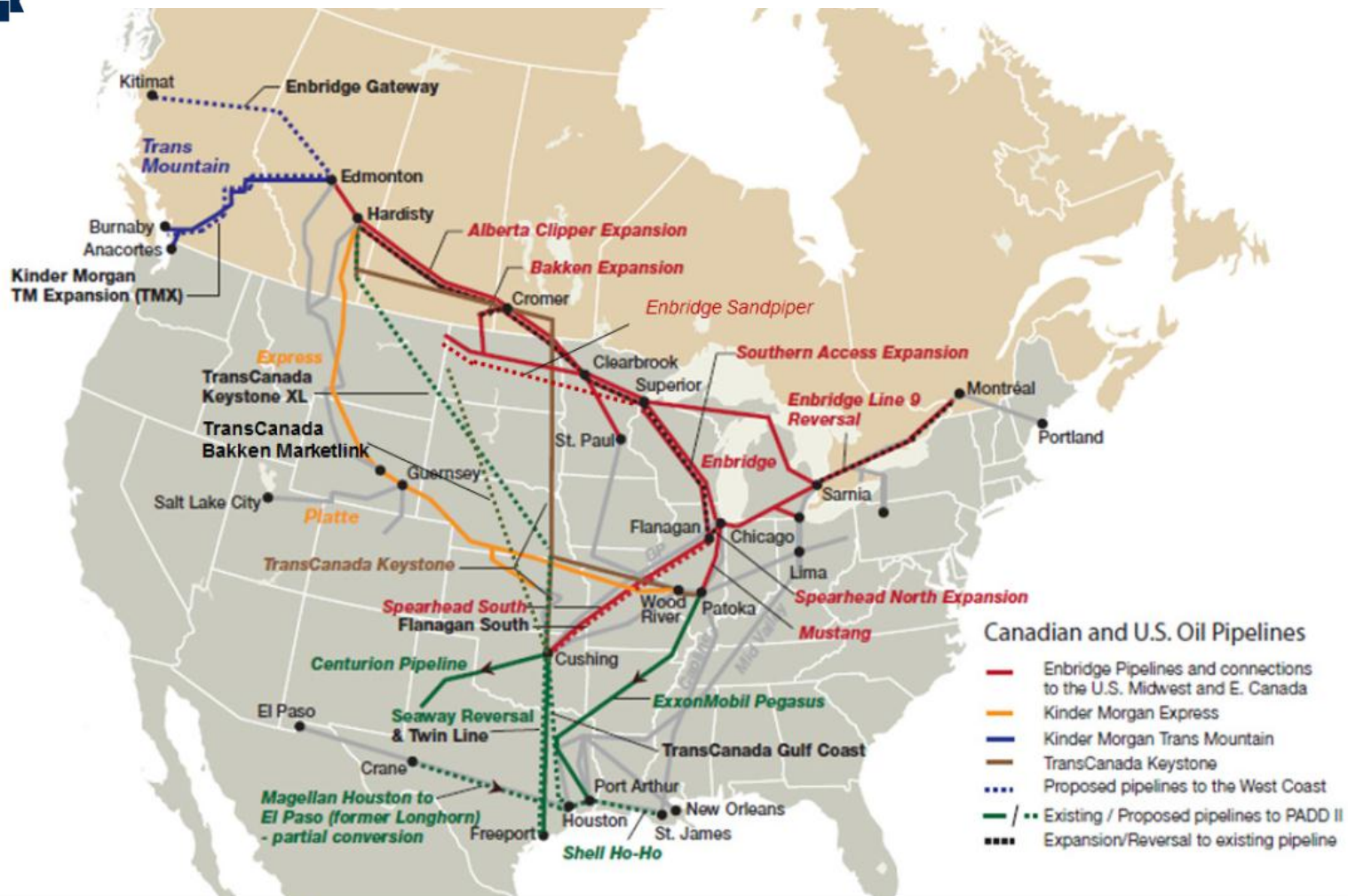
Global Crude Oil Production 2013 vs. 2008



Sources: 2014 BP Statistical Review and Energy Commission Analysis



Crude Oil Pipeline Projects



Source: CAPP, Raymond James Ltd.

No crude oil pipelines into California...one project being examined.



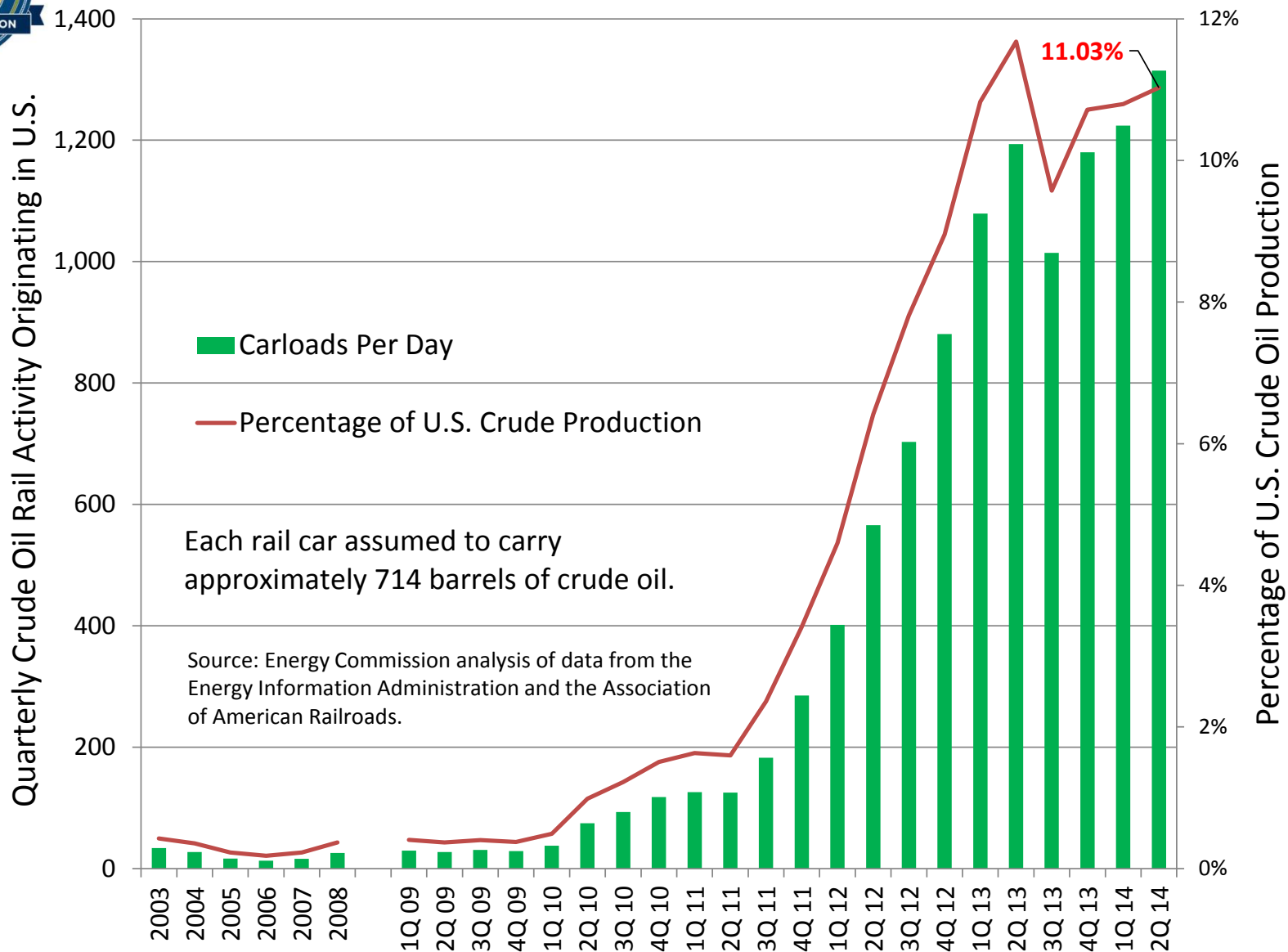
Crude Oil – Export Restrictions

- Domestically-produced crude oil exports to foreign destinations are allowed under specific "license exceptions" identified under federal statute. Those primary exceptions include:
 - Alaska crude oil shipped on the Trans-Alaska Pipeline System (TAPS) and exported via a Jones Act vessel directly from Valdez Harbor
 - California heavy crude oil production with API gravity of 20.0 degrees or lower, limit of no more than 25,000 barrels per day
 - First export license for California heavy crude oil was granted on December 9, 1991 – no heavy crude oil exports for several years
 - Exports of domestic crude oil to Canada for processing by Canadian refineries
 - Exports in connection with refining or exchange of Strategic Petroleum Reserve crude oil
- Companies can also apply to the federal Bureau of Industry and Security (BIS) for an export license that basically requires Presidential approval

Recent export licenses for “processed” condensate approved.



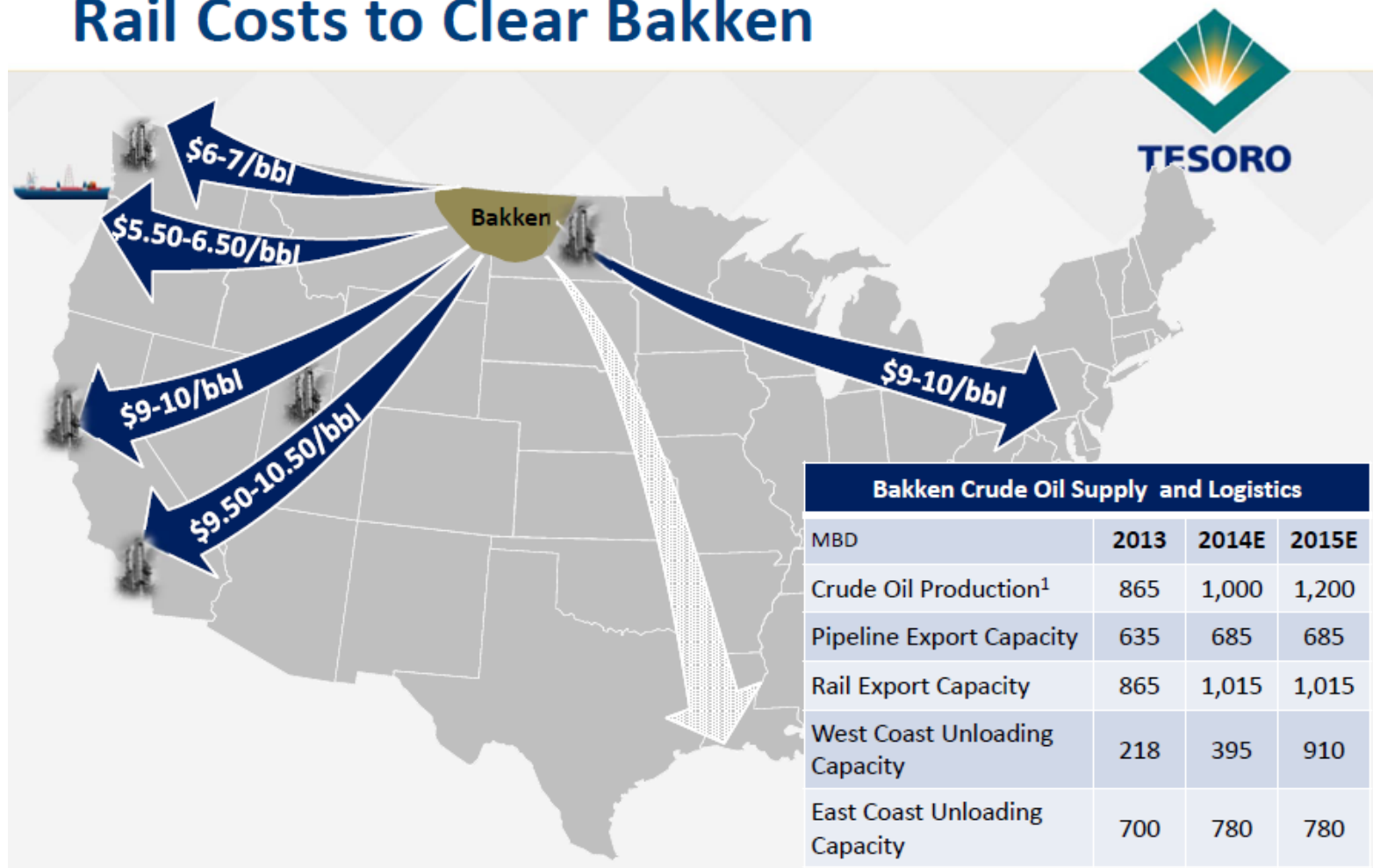
U.S. Crude-by-Rail Movements





Crude Oil Discounts Enable Rail Shipment

Rail Costs to Clear Bakken

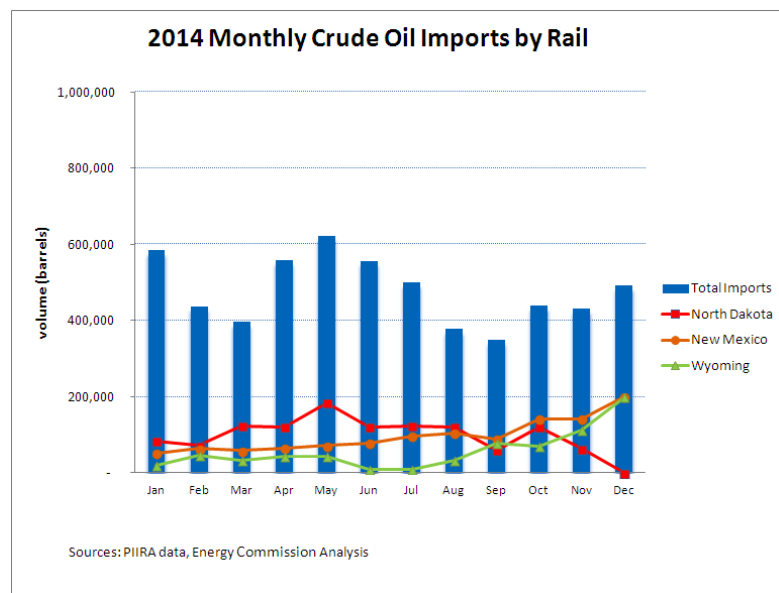


Source: Simmons Energy Conference, Tesoro, February 27, 2014



California Crude-by-Rail Imports

- 2013 CBR imports – 6.3 MM Barrels
- 2014 CBR imports – 5.7 MM Barrels
 - Average of 15,720 barrels/day
 - Approximately 8,700 rail tank cars
 - Average of 660 barrels/rail tank car



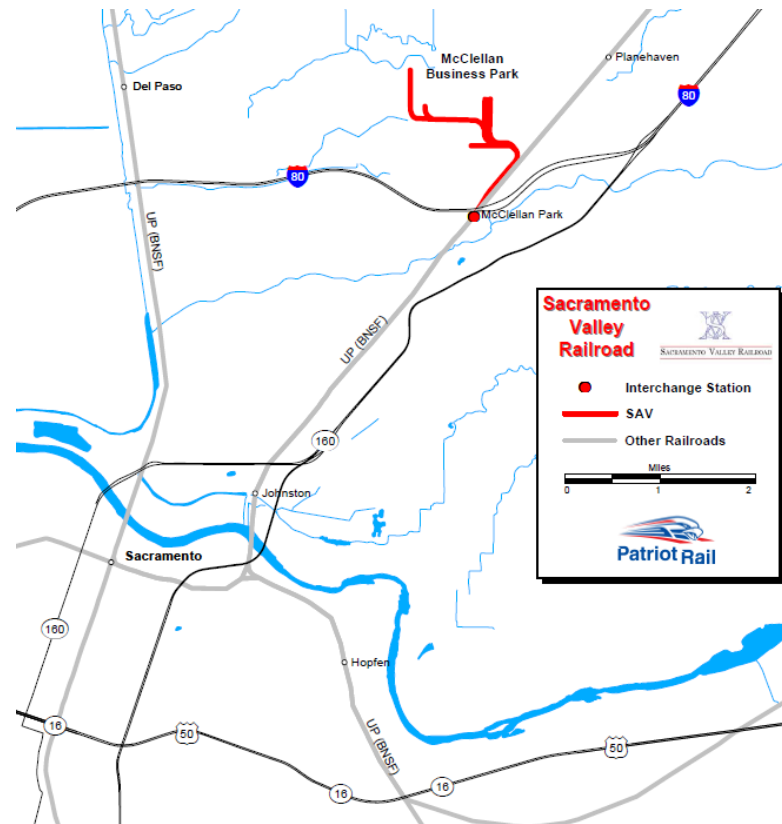
2014 Crude-By-Rail Imports (January - December)		
California Energy Commission Country or State of Origin for Railcars	2014 Total Barrels	2014 Percentage
California Totals		
Canada	1,520,288	26.50%
Colorado	147,488	2.57%
New Mexico	1,159,712	20.21%
North Dakota	1,191,758	20.77%
Utah	933,632	16.27%
Wyoming	694,101	12.10%
Other States	90,699	1.58%
Subtotals	5,737,678	100.00%
Northern California		
Canada	0	0.00%
Colorado	74,937	5.83%
New Mexico	15,268	1.19%
North Dakota	1,191,758	92.75%
Utah	0	0.00%
Wyoming	0	0.00%
Other States	2,891	0.23%
Subtotals	1,284,854	100.00%
Bakersfield & Southern California		
Canada	1,520,288	34.14%
Colorado	72,552	1.63%
New Mexico	1,144,444	25.70%
North Dakota	0	0.00%
Utah	933,632	20.97%
Wyoming	694,101	15.59%
Other States	87,807	1.97%
Subtotals	4,452,824	100.00%

Other States include Illinois, Louisiana, Missouri, Nebraska, Arkansas.



Northern California – CBR Activity

- One location currently receiving CBR deliveries
 - Kinder Morgan – Richmond Rail Facility
 - Facility is permitted to receive an average maximum of 16,000 barrels per day of crude oil via rail tank car
 - Crude oil transferred to trucks
- Kinder Morgan facility can receive crude oil unit trains
- SAV Patriot in McClellan had permit rescinded and operations ceased in early November 2014



Source: Patriot Rail



Rail Routes Into and Within California

CBR Routing Information - California

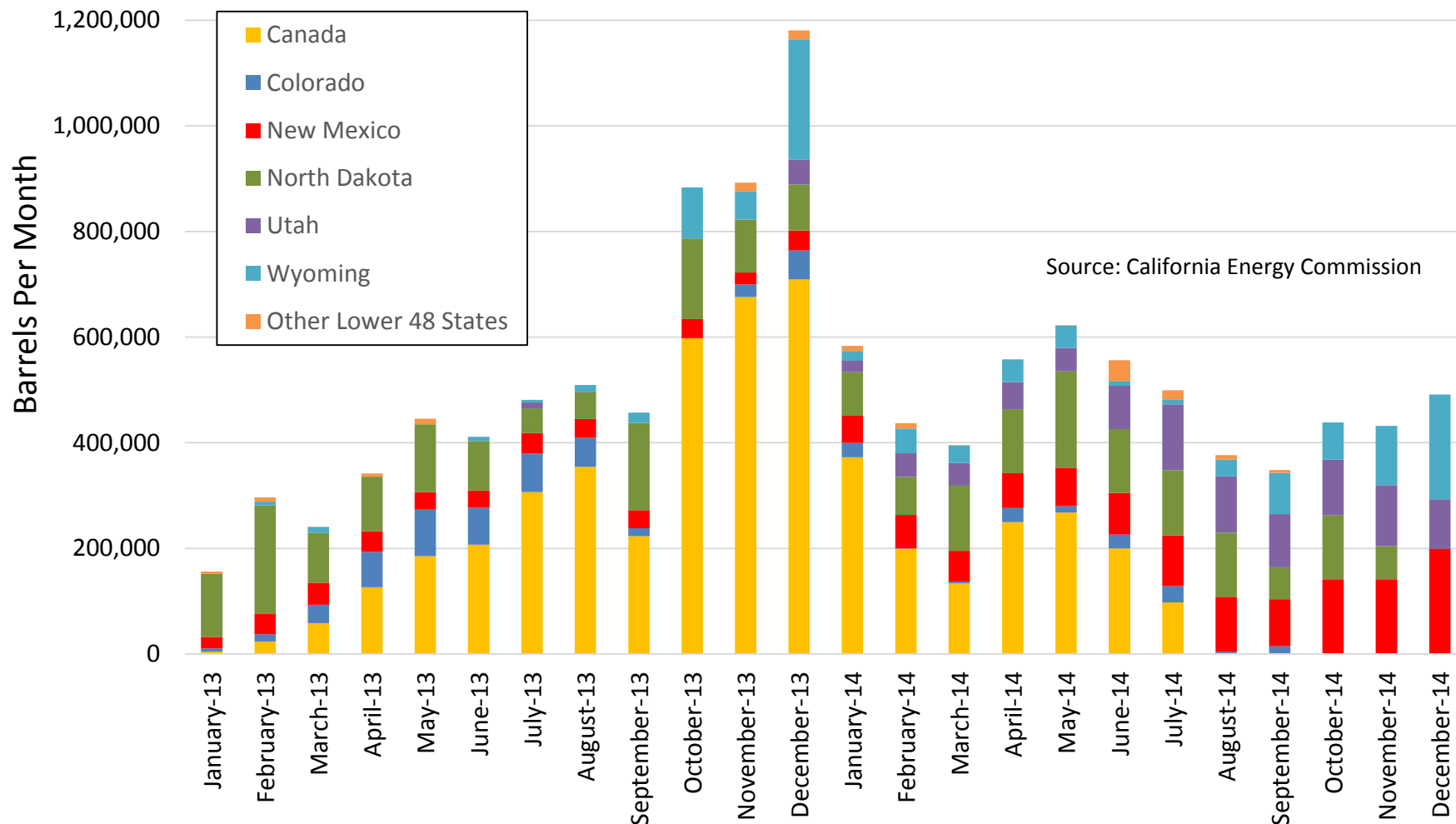
- Energy Commission does not track routes of CBR deliveries – only source states/provinces, destinations within California, and volumes
- Counties transited by trains carrying more than 1 MM gallons of Bakken crude oil are reported by Class 1 railroads to OES
- Crude oil from Canada, North Dakota and Wyoming will likely traverse the state from north to south
- Crude oil from Colorado, New Mexico and Texas will likely traverse the state from east to west





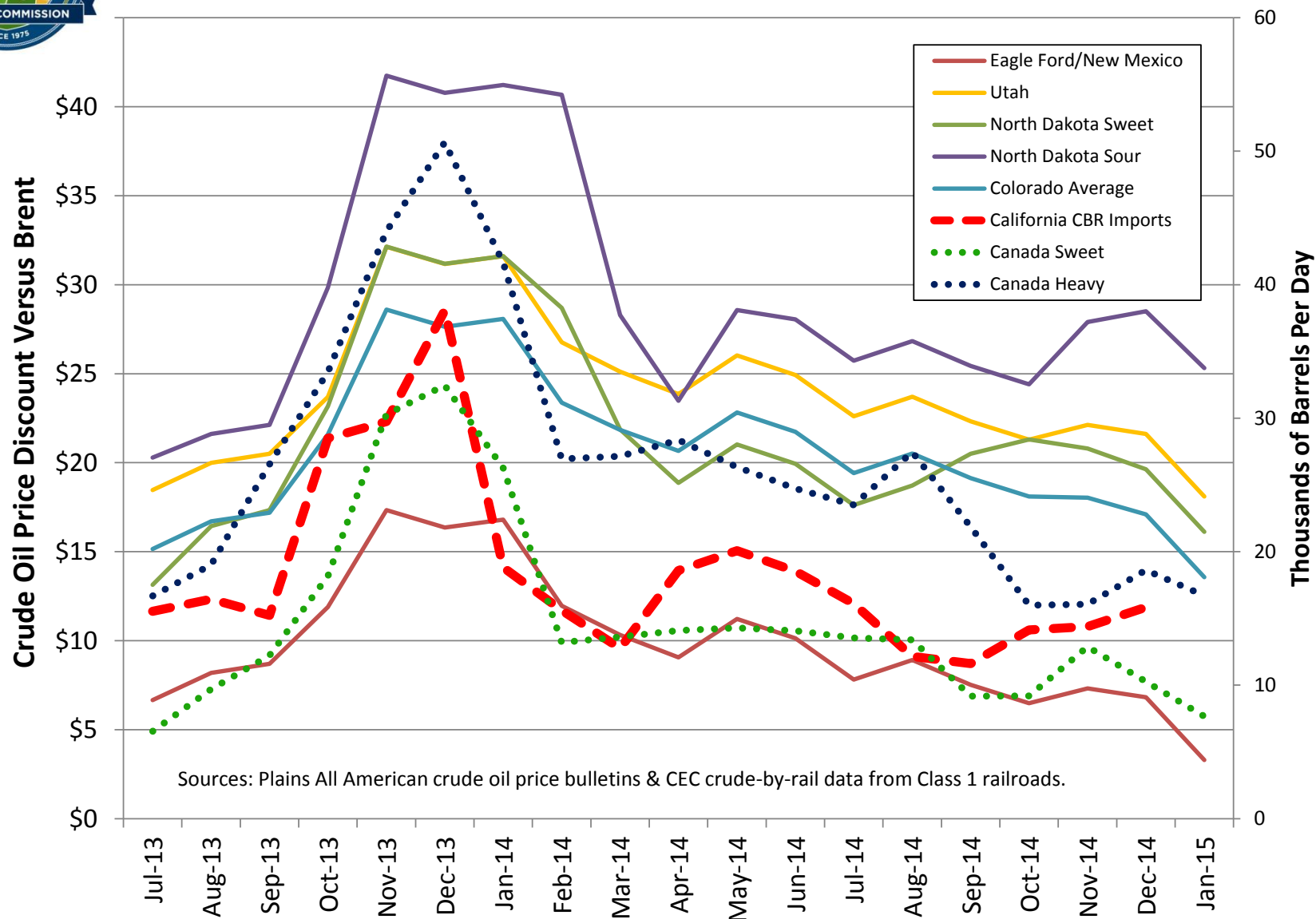
California Crude Oil Imports Via Rail Tank Cars

Why have CBR imports been declining?





CBR Imports Vary by Size of Oil Discount



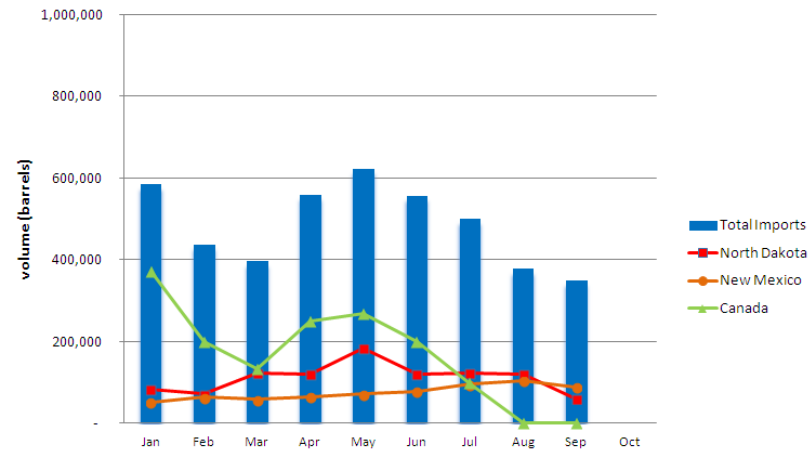
Sources: Plains All American crude oil price bulletins & CEC crude-by-rail data from Class 1 railroads.



California CBR Imports Expected to Grow

- Three CBR projects seeking permits
 - 2 Northern California
 - 1 in San Luis Obispo County
- One CBR project received permits
 - Alon USA - Bakersfield
- One CBR project operational
 - Plains All American – near Bakersfield
- CBR imports during 2015
 - Could approach 4 percent if Plains All American facility operates at capacity next year
- Could grow up to 22 percent by 2016, assuming:
 - Permits issued, customers signed up, financing approved, construction completed & facilities operated at capacity

2014 Monthly Crude Oil Imports by Rail



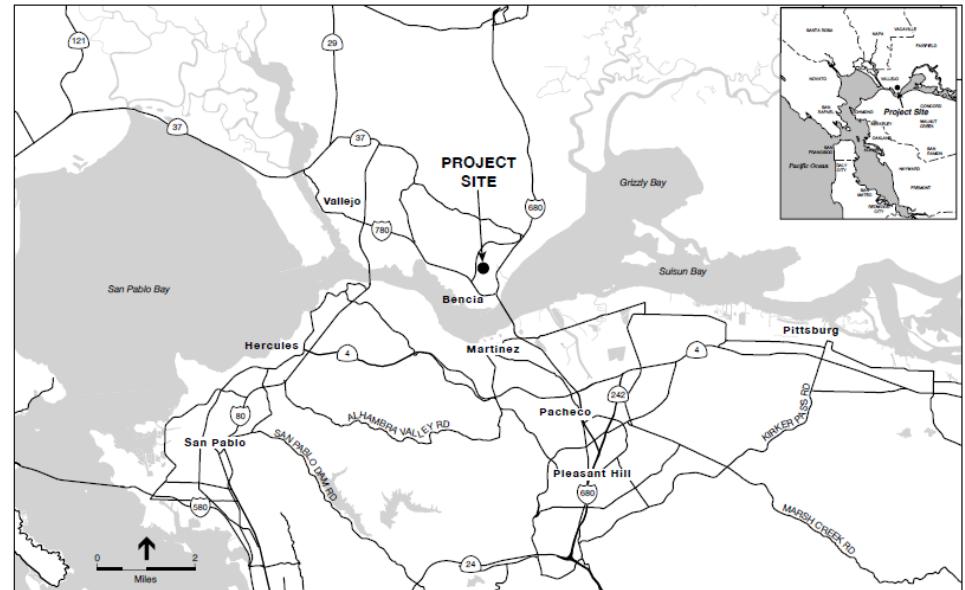
Sources: PIIIRA data, Energy Commission Analysis





Crude-by-Rail Projects – Northern California

- Valero – Benicia Crude Oil By Rail Project – **Permit Review**
 - Benicia refinery
 - Up to 70,000 BPD
 - Construction will take 6 months
 - Could be operational by 2015
 - Draft EIR released June 17, 2014
 - Comments closed Sept. 15
 - Lead agency – City of Benicia
 - http://www.ci.benicia.ca.us/index.asp?Type=B_BASIC&SEC={FDE9A332-542E-44C1-BBD0-A94C288675FD}



SOURCE: ESA

Benicia Valero CBR, 202115.01
Figure 3-1
Project Location



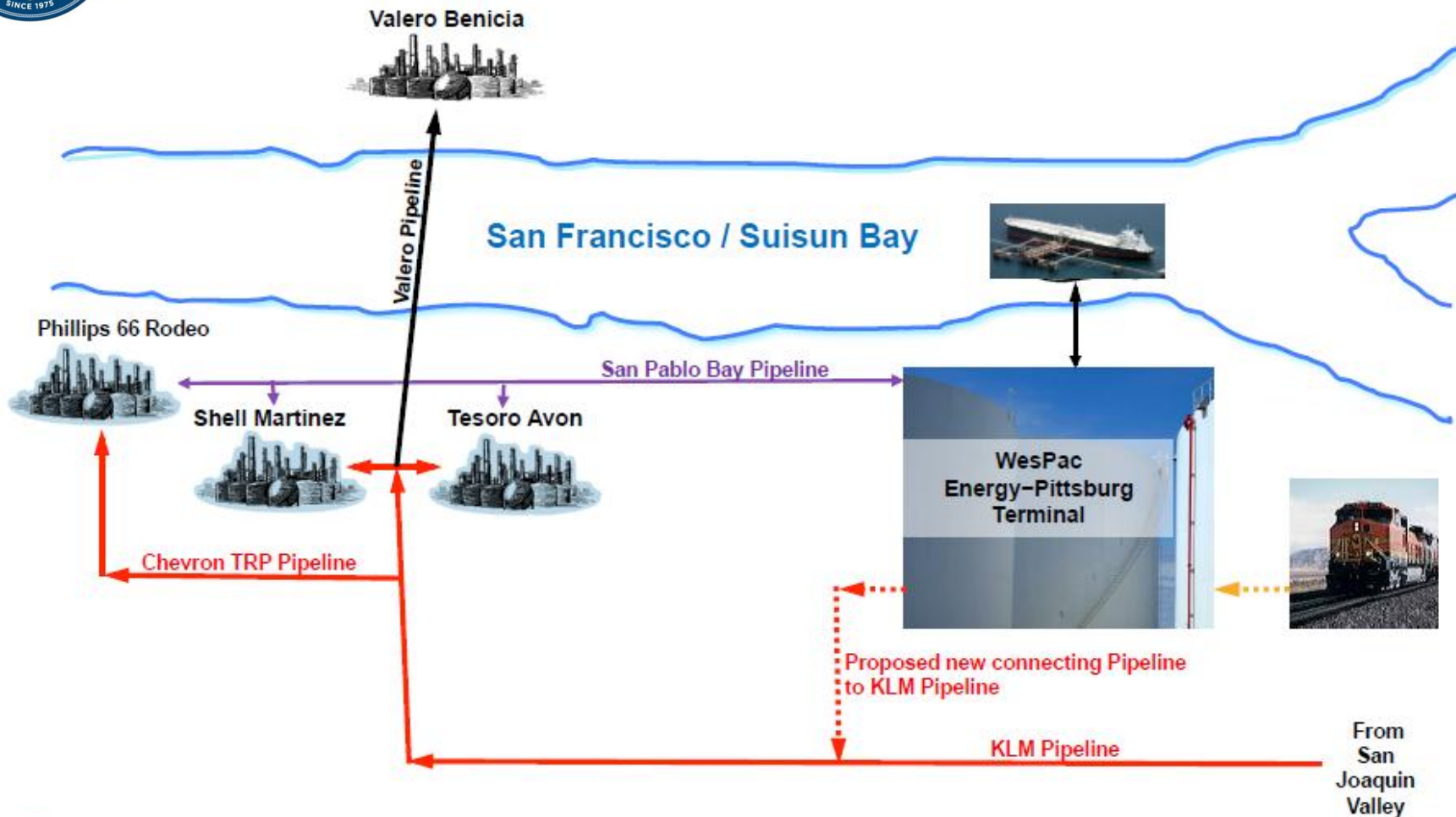
Crude-by-Rail Projects – Northern California

WesPac Energy Project – Pittsburg – **Permit Review**

- Rail receipt average capability of 50,000 barrels per day (BPD)
- Includes marine terminal for receipt and loading – average of 192,000 BPD
- Combined average receipt capability of 242,000 BPD
- Connection to KLM pipeline – access to Valero, Shell, Tesoro & Phillips 66 refineries
- Connection to idle San Pablo Bay Pipeline – access to Shell, Tesoro & Phillips 66 refineries
- Construction of the first phase for the rail facility and associated storage tanks could be completed within 12 to 15 months of receiving all permits
- Could be operational by 2016
- A recirculated draft environmental impact report (RDEIR) will be developed and a new comment period set for those applicable sections
- There is currently no scheduled release date for the RDEIR
- Lead agency – City of Pittsburg
- <http://www.ci.pittsburg.ca.us/index.aspx?page=700>



WesPac Project – Refinery Connections



WesPac Energy-Pittsburg LLC



Crude-by-Rail Projects – Bakersfield

Alon Crude Flexibility Project - **Approved**

- Alon – Bakersfield Refinery
- 2 unit trains per day
- 150,000 BPD offloading capacity
- Will be able to receive heavy crude oil
- Oil tankage connected to main crude oil trunk lines – transfer to other refineries
- Kern County Board of Supervisors approved permits for the project on September 9, 2014
- Construction will take 9 months, could be complete by 2015 assuming customers sign long-term agreements and financing is approved

Plains All American – Bakersfield Crude Terminal – **Operational**

- Up to 65,000 BPD
- Connection to additional crude oil line via new six-mile pipeline
- Initial delivery during November 2014



Source: KernGoldenEmpire.com



Questions?



C & H sugar refinery in Crockett, CA – April 1, 1958 - Charles W. Cushman Photograph Collection