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2014 DRAFT INTEGRATED ENERGY POLICY REPORT UPDATE

CALIFORNIA
ENERGY COMMISSION

Edmund G. Brown Jr., Governor

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CHAPTER 7:
Changing Trends in California's Sources of Crude Oil

California's crude oil sources appear to be shifting from foreign, Alaskan, and instate supplies to new sources in the Midwest and Canada, spurred by a dramatic increase of domestic oil production enabled by more widespread use of hydraulic fracturing and other extraction advances. Shipments of these new resources by rail or by barge are increasing and could represent up to 23 percent of California's crude oil within a few years, depending on the economics of the extraction, transport, and development and approval of receiving/storage terminals in California. Greater use of transport of oil by rail is also a trend nationally, and industry is investing in increased infrastructure to support transport by rail. The federal government has primary oversight of rail safety with roles also played by state and local agencies.

To better understand this changing landscape in the supply of crude oil and how it is regulated, the Energy Commission hosted an Integrated Energy Policy Report (IEPR) workshop in Berkeley on June 25, 2014. The workshop focused on the changing trends in California's sources of crude oil with emphasis on the growth of crude oil delivered by rail (CBR) and the effects of these trends on the transportation energy market and existing government policies. The discussions also focused on existing and possible new roles of federal, state, and local government to address market changes.

Chair Robert Weisenmiller and Commissioners Janea Scott and Karen Douglas presided over the meeting along with California Public Utilities Commissioner (CPUC) President Michael Peevey and Cliff Rechtschaffen and Ken Alex from the Governor's Office. The workshop featured presentations on near-term trends and long-term policy goals, crude oil distribution logistics, government responsibilities within that distribution process, government responsibilities regarding safety requirements and oversight for CBR, environmental and oil industry perspectives, and the relationship of crude oil trends to environmental and energy policies.

This workshop brought together, for the first time, a broad set of stakeholders involved in changing trends in the sources of California's crude oil and represented one step in the state's efforts to proactively address it. Cliff Rechtschaffen from the Governor's Office briefly spoke about the Governor's Office Interagency Rail Safety Working Group formed in January 2014, explaining, "California is on the cusp of dramatic changes in the sources of our oil and increasing transportation. We wanted to be ahead of the problem. …We wanted to be proactive and deal with the risks as they are in a sensible and thoughtful way."[223] The

223 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 187.

Governor's Office Interagency Rail Safety Working Group published *Oil by Rail Safety in California: Preliminary Findings and Recommendations*[224] in June 2014, highlighting actions state agencies and the federal government should consider in light of project increases of CBR. Recommendations included a call to increase the number of CPUC Rail Inspectors to improve emergency preparedness and response programs, to request more information from railroads regarding shipments and routes, to request that the U.S. Department of Transportation expedite the phasing out of older DOT-111 tank cars, and to take action to ensure railroads complete agreed upon voluntary safety improvements.

State Assembly Member Nancy Skinner thanked the Energy Commission for hosting the workshop in one of the primary affected corridors and highlighted some of the bills currently moving through the legislature that pertain to CBR. She also noted that the recently adopted state budget included funding for seven additional safety inspectors at the CPUC and 38 new positions for prevention, emergency response, cleanup, and enforcement at the Office of Spill Prevention and Response (OSPR).

This chapter highlights changes to the trends in crude oil sources for California refineries, in particular the more recent increases in rail car deliveries that have developed in response to discounted oil sources in Canada and domestic shale oil production regions of North Dakota, Colorado, and Texas. Federal and state activities associated with improving the safety of transporting flammable liquids via rail cars is also explained, along with the status of recent regulatory activity for rail operations and tank car construction standards.

Agency Roles and Responsibility

One purpose of the June 25, 2014, workshop was to help clarify roles various agencies play. There are several entities that oversee railroad safety and rail tank car standards.

Federal Government

The Pipeline and Hazardous Materials Safety Administration within the U.S. Department of Transportation is responsible for developing regulations to help ensure and improve the safe transportation of hazardous materials. In addition, this agency is also responsible for responding to any safety-related recommendations issued by the National Transportation Safety Board in the wake of a major accident investigation. The Federal Railroad Administration employs inspectors who enforce rail safety regulations.

State of California

The federal government has primary authority over railroad safety. In California, the Rail Safety Division within the CPUC works in conjunction with federal inspectors to help

224 The full report can be found at http://www.caloes.ca.gov/HazardousMaterials/Documents/Oil%20By%20Rail%20Safety%20in%20California.pdf.

ensure the safe operations of rail movement for goods and people. Table 12 provides more detail on specific state agency roles and responsibilities.

Local Governments

California local governments normally have lead responsibility under the California Environmental Quality Act regulations for the review of environmental impacts that new construction of crude oil storage and delivery terminals might have in the jurisdictions. In addition, local agencies, such as the Certified Unified Program Agencies (CUPAs), play critical roles in emergency preparedness and response, alongside local first responders.

Class 1 Railroads

There are two Class 1 railroads operating in California: Burlington Northern Santa Fe and Union Pacific. These companies have invested in their infrastructure and modified operating procedures to decrease the number of derailments and minimize the consequences of a hazardous release of flammable liquids.[225]

Canada

The Transportation Safety Board of Canada is responsible for developing regulations to improve the safe operations of rail activity in Canada. Transport Canada employs Railroad Safety Inspectors who enforce these regulations. In July 2013, Canada witnessed the most notable CBR accident in recent history as 63 tank cars of crude oil exploded, killing 47 people in Lac Mégantic, Quebec.[226]

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225 Each of these companies provided an overview of their operations, including details of improvements and operational changes for their systems during the California Energy Commission's public workshop on June 25, 2014. The BNSF presentation can be found at http://www.energy.ca.gov/2014_energypolicy/documents/2014-06-25_workshop/presentations/06_DiCamillo_CBR_Safety_Presentation_June_24.pdf and the UP presentation at http://www.energy.ca.gov/2014_energypolicy/documents/2014-06-25_workshop/presentations/Stark_Union_Pacific_Railroad_IEPR_Workshop_v1.pdf.

226 Congressional Research Service, "U.S. Rail Transportation of Crude Oil: Background and Issues for Congress," May 5, 2014, http://www.fas.org/sgp/crs/misc/R43390.pdf.

Table 12: Crude Oil Movement—California State Agency Primary Roles and Responsibilities

State Agency	Information Collection	Planning	Inspection	Enforcement	Emergency Response
Governor's Office of Emergency Services	Counties traversed within California by CBR shipments of Bakken crude oil greater than 1 million gallons	Review plans & training on emergency preparedness– hazmat team gap analysis work			Incident command on regional or statewide level, provide mutual aid support (if necessary) in response to an incident
Office of Spill Prevention & Response		Oversight and approval of spill response plans, local government training, and contingency planning development	Investigate all spills and releases	Surprise inspections, unannounced drills, verification of proof of financial responsibility by crude oil shippers	Oil spill prevention & response, coastal waters and inland areas– restoration of habitat and oiled wildlife care
California Public Utilities Commission	Crude oil projects and rail activity related to crude oil	Perform statewide and localized risk assessments and analysis	Inspect rail tracks, bridges, crossings, train control, and rail equipment– investigate all rail-related accidents	Enforce federal and state rail safety requirements	
California State Lands Commission	Marine vessel receipts and loading of crude oil & other petroleum products by terminal - monthly	Oversight of marine oil terminal modifications and new projects	Annual and spot inspections of marine oil terminals	Enforce Marine Oil Terminal Engineering & Maintenance Standards (MOTEMS)	
Office of State Fire Marshal - Office of Pipeline Safety	Location of hazardous liquids pipelines	Emergency response planning and training for hazardous materials spills	Inspect and pressure test hazardous liquids pipelines	Intrastate hazardous liquids pipeline standards and operations	Contacted by OES for each hazardous liquids pipeline leak and train derailment, respond to site if necessary
California Energy Commission	CBR shipments from BNSF & UP, volume & source state/province– monthly				
California Air Resources Board	Crude oil types used by each refinery– annual				

Source: California Energy Commission

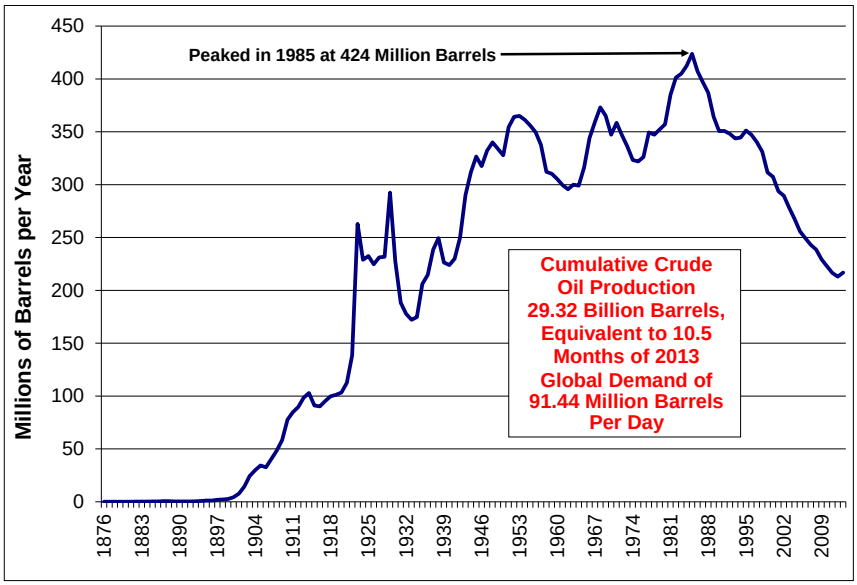
Safety-related activities associated with rail transport of flammable liquids have included new practices and proposed regulations designed to reduce the probability of derailments and reduce the possibility of any explosion and fire if such a derailment were to occur for a train transporting crude oil or other flammable liquids. These international, federal, and

individual state activities have intensified following the tragic loss of life associated with the crude train derailment in Lac Mégantic, Quebec.[227]

Changing Trends in California's Crude Oil Production

The decline of California crude oil production has persisted since 1985, when production peaked at 424 million barrels per year. Most of California's crude oil producing fields are mature, such as those in Kern County, and have been producing oil for more than 100 years. Over time, the drilling and extraction of crude oil result in diminishing output from wells. As Figure 30 illustrates, the production of California crude oil has peaked and has been declining for the majority of the years since 1985 through 2013. For the first time since a brief uptick during 1994 and 1995, oil production in California showed a modest increase during 2013. However, the consequence of the long-term declining trend has been a growing shift to alternative sources of crude oil from foreign sources.

Figure 30: California Oil Production (1876 to 2013)



Source: California Division of Oil, Gas, and Geothermal Resources (DOGGR) and the California Energy Commission

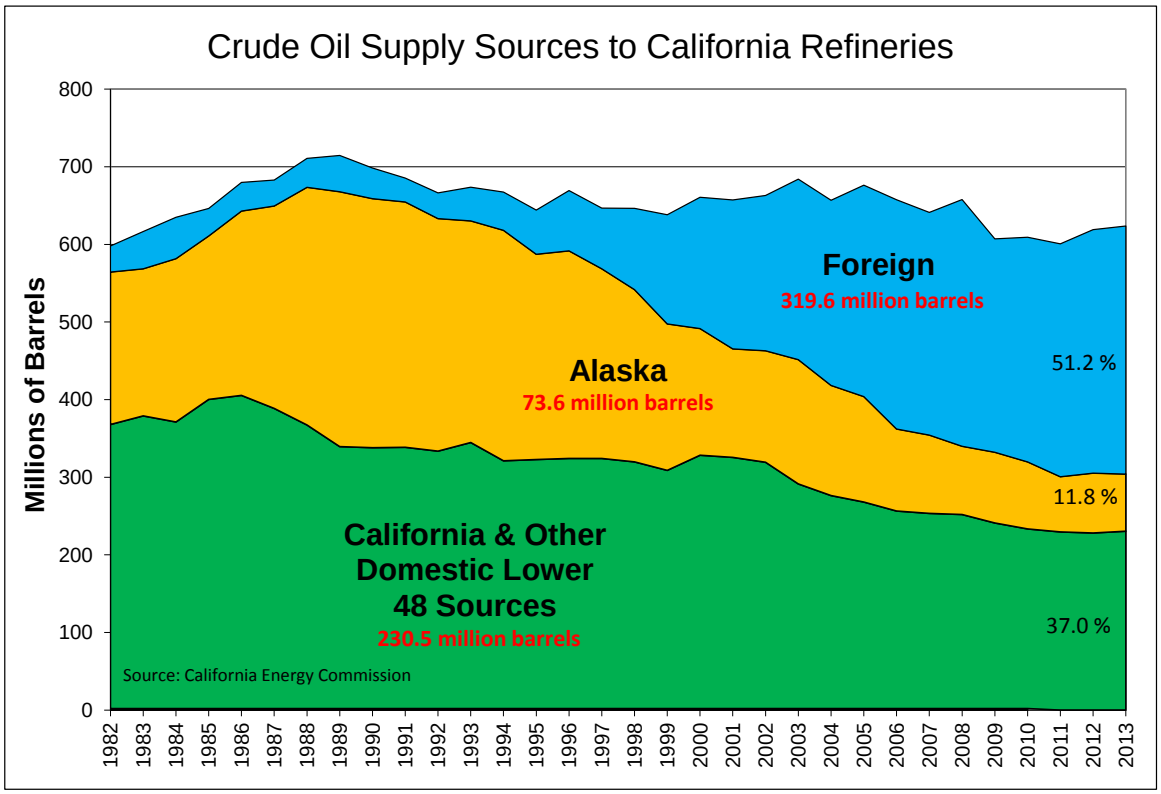
Sources of Crude Oil for California Refiners

Crude oil used by California refineries is imported from foreign and domestic sources. This crude oil is delivered to California primarily via marine vessels, in-state pipelines, and more recently via rail tank cars. There are no crude oil pipelines that deliver crude oil to California refineries from outside the state. Figure 31 illustrates how sources of crude oil to

227 *Railway Investigation Report R13D0054*, Transportation Safety Board of Canada, August 2014, http://www.tsb.gc.ca/eng/rapports-reports/rail/2013/R13D0054/R13D0054.pdf.

California refineries have shifted to become more dependent on foreign sources as supplies from Alaska and California have declined.[228] During 2013, California refiners received a total of 623.7 million barrels of crude oil for an average of 1.7 million barrels per day. About 51 percent came from foreign sources, 37 percent came from California and other domestic lower-48 state sources, and about 12 percent was from Alaska.

Figure 31: California Oil Sources (1982 to 2013)



Source: DOGGR and the California Energy Commission

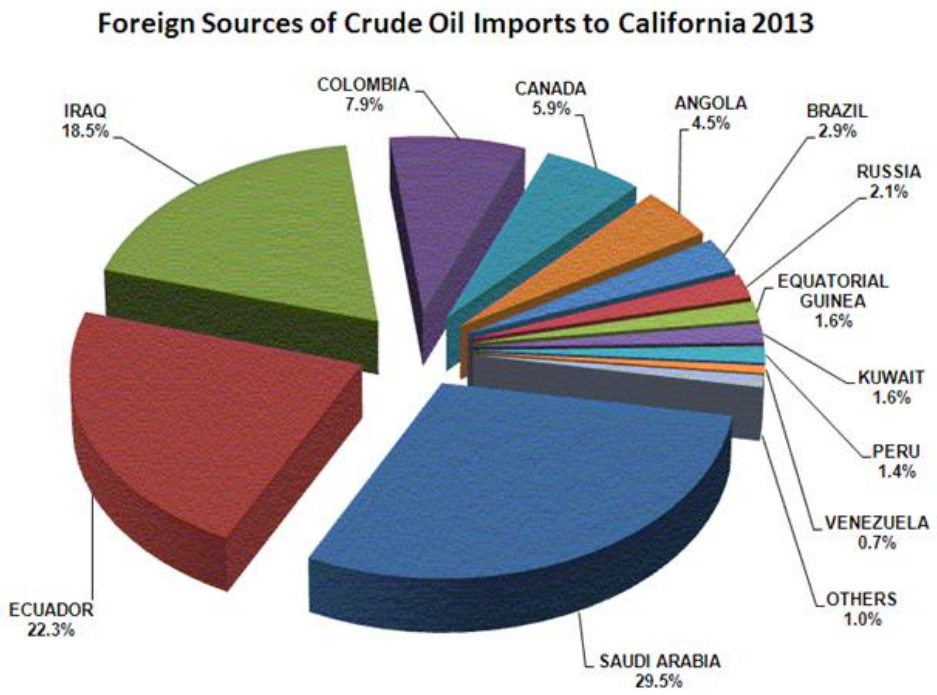
All of the crude oil from Alaska was delivered via marine tanker, as was the vast majority of foreign crude oil. A smaller portion (0.7 percent) of the domestic (California plus lower-48 state) crude oil was imported by marine vessel.

Crude oil imports from foreign sources are obtained from diverse countries. During 2013, Saudi Arabia was the largest source of foreign crude oil imports with 29.5 percent of total,

228 California Energy Commission. This chart and detailed monthly data can be found at http://energyalmanac.ca.gov/petroleum/statistics/crude_oil_receipts.html.

followed by Ecuador (22.3 percent) and Iraq (18.5 percent). Figure 32 depicts the top 12 source countries' share of foreign crude oil imports.[229]

Figure 32: Foreign Oil Sources (2013)



Source: Energy Information Administration, Company-Level Imports

U.S. Crude Oil Extraction Developments and Resulting Increased Output

Although crude oil production has been generally declining in California, production is increasing in the rest of the United States. Domestic crude oil production has dramatically rebounded in the United States due to the extensive use of horizontal drilling techniques and unconventional well stimulation treatments, like hydraulic fracturing.

Hydraulic fracturing or "fracking" is a technique used by the petroleum industry to obtain crude oil and natural gas from geological formations that require additional effort to increase the volume of petroleum that can be removed from an existing field. These "tight oil and gas" formations require the rock to be fractured to enable the crude oil and natural

229 California Energy Commission. This chart and individual country totals are at http://energyalmanac.ca.gov/petroleum/statistics/2013_foreign_crude_sources.html.

gas to flow though the fissures to well bores and on to the surface. Hydraulic fracturing is not a new procedure and is estimated to have been used in more than 1 million wells worldwide. At the June 25, 2014, IEPR workshop, Steven Bohlen from DOGGR explained how hydraulic fracturing, or fracking, in California differs from techniques used in the Marcellus Shale or other places. He noted that a substantial portion of California's wells "do require some kind of well stimulation in order to enhance recovery," but that the water used for well stimulations in California is much more restricted than in other parts of the country, by virtue of the vertical style of wells used here.[230] Mr. Bohlen also spoke about Senate Bill 4 (Pavley, Chapter 313, Statutes of 2013)—which requires oil and gas companies to apply for permits to conduct hydraulic fracturing in-state, publicly disclose the chemicals used, and monitor ground water and air quality—noting that draft regulations had been released by DOGGR for public comment.

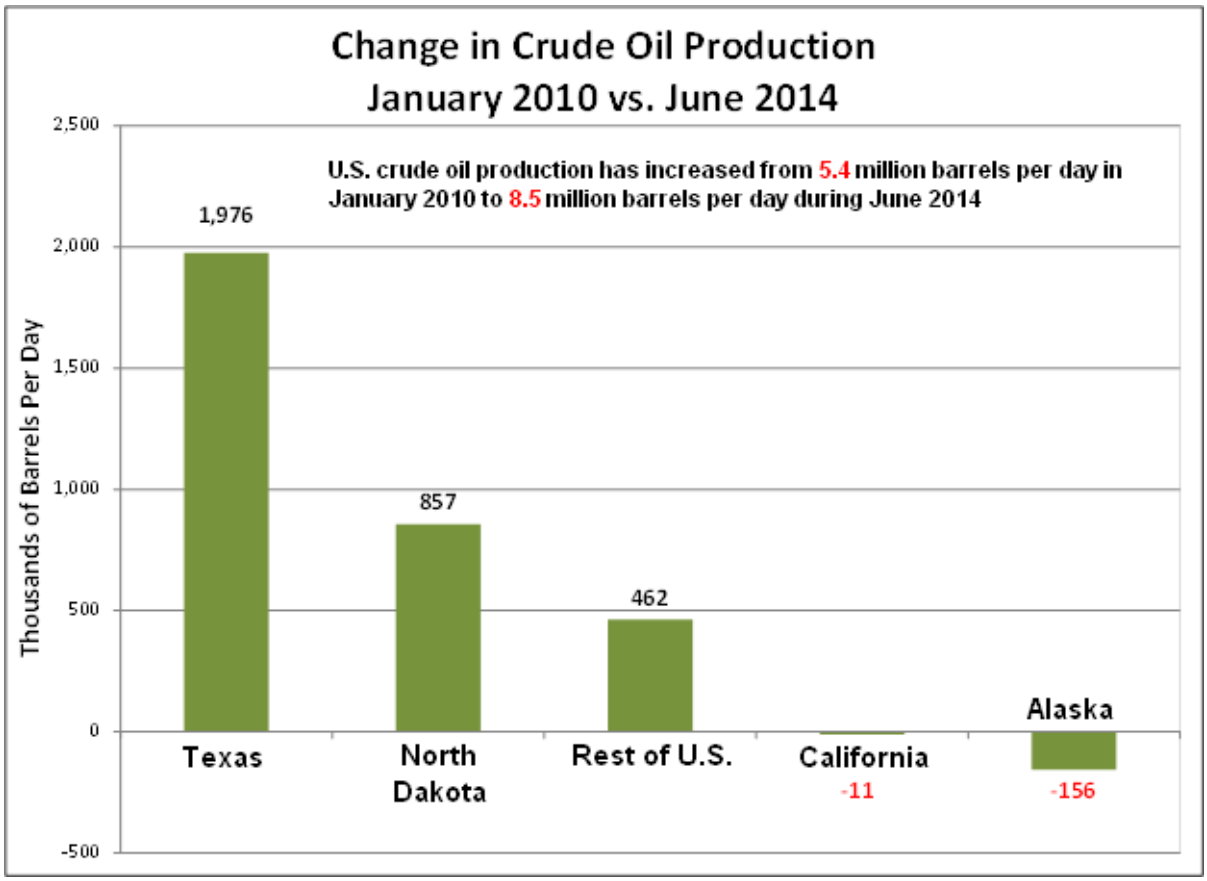
Continued improvement in technology, operating procedures, and understanding of subsurface petroleum deposit structures has allowed companies to deploy fracking in conjunction with horizontal drilling. This type of activity has been used with great success in tight oil formations in North Dakota (Bakken) and southern Texas (Eagle Ford). Production of oil in the United States stood at 8.53 million barrels per day during June 2014, the highest level of output since July 1986. It is forecasted that production could continue increasing and eventually exceed the all-time record output of 10.04 million barrels per day achieved during November 1970.[231]

The surge in domestic crude oil production is centered on the shale oil regions of the United States, such as the Eagle Ford formation in Texas and Bakken formation in North Dakota. Figure 33 shows how much oil production in those respective states has increased since January 2010 compared to California and Alaska.

230 June 25, 2014, Integrated Energy Policy Report workshop transcript, pp. 65-66.

231 According to the Energy Information Administration's latest *Annual Energy Outlook* publication, crude oil production in the United States could reach 11.41 million barrels per day by 2020 under the "High Oil and Gas Resource" scenario. *Annual Energy Outlook 2014 with Projections to 2040*, Energy Information Administration, April 2014, Table D8, page D-16, http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf.

Figure 33: Crude Oil Production Change



Source: Energy Information Administration

While crude oil production in California has been generally declining, several presenters at the June 25, 2014, workshop spoke about the potential development of the Monterey Shale. In response to a question from Cliff Rechtschaffen regarding how to gauge the potential of the Monterey Shale play, Michael Schaal from the Energy Information Administration suggested that "…research would unlock the potential…and…additional technological innovation would have to occur before it could be considered a commercial success."[232]

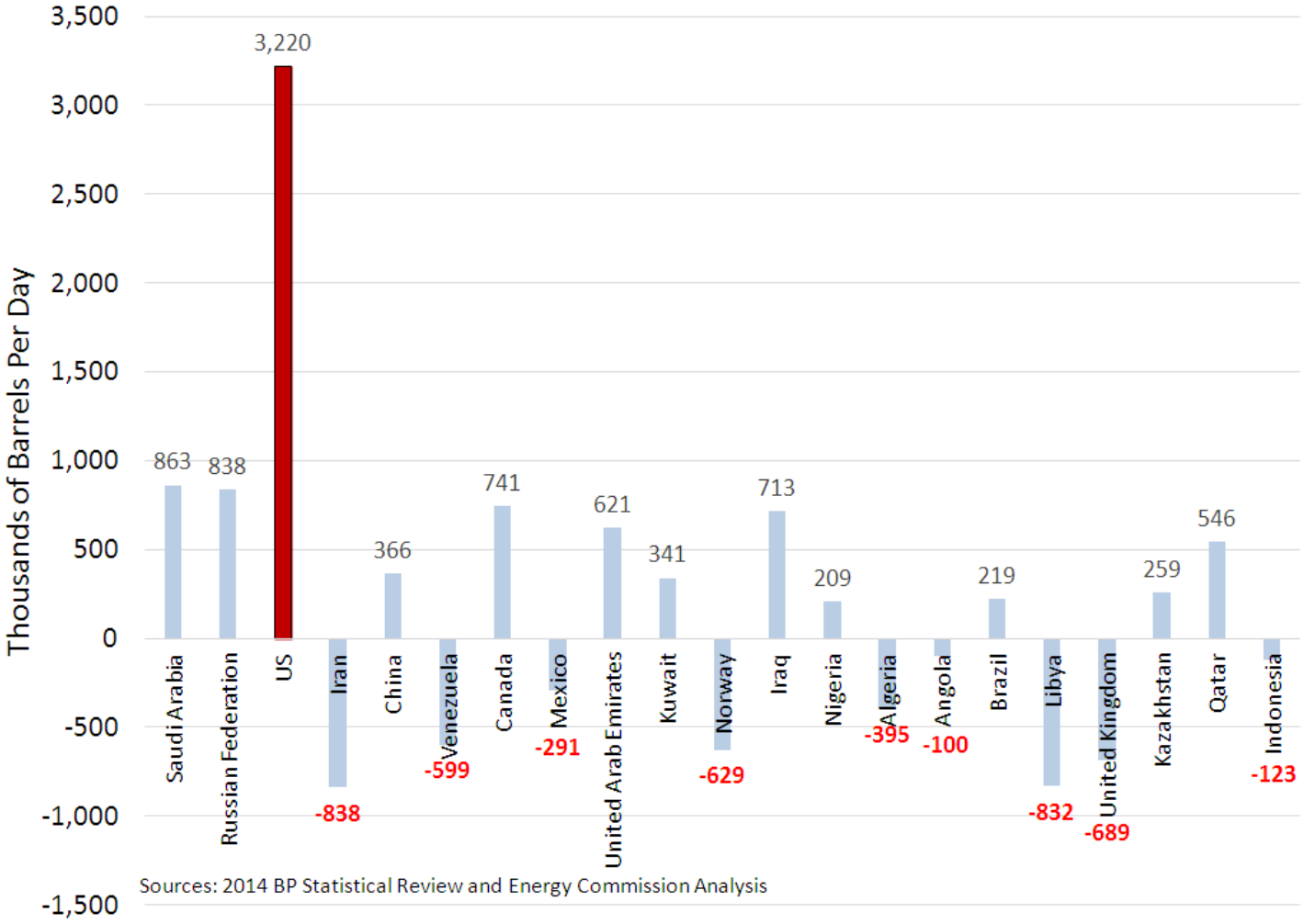
Global Crude Oil Production Decline

Although the decline in crude oil production has reversed in the United States over the last several years, the trend in several other oil-producing countries is the opposite. During 2008, there were 21 countries that produced at least 1 million barrels per day of crude oil with the

232 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 69.

United States ranking third.[233] By 2013, nearly half (nine) of those countries experienced a decline in oil production as shown in Figure 34. The aggregate change for these 21 countries amounted to an increase of 4.44 million barrels per day. However, if the United States' contribution is removed, the increase between 2008 and 2013 drops to 1.22 million barrels per day.

Figure 34: Crude Oil Production Change 2013 vs. 2008



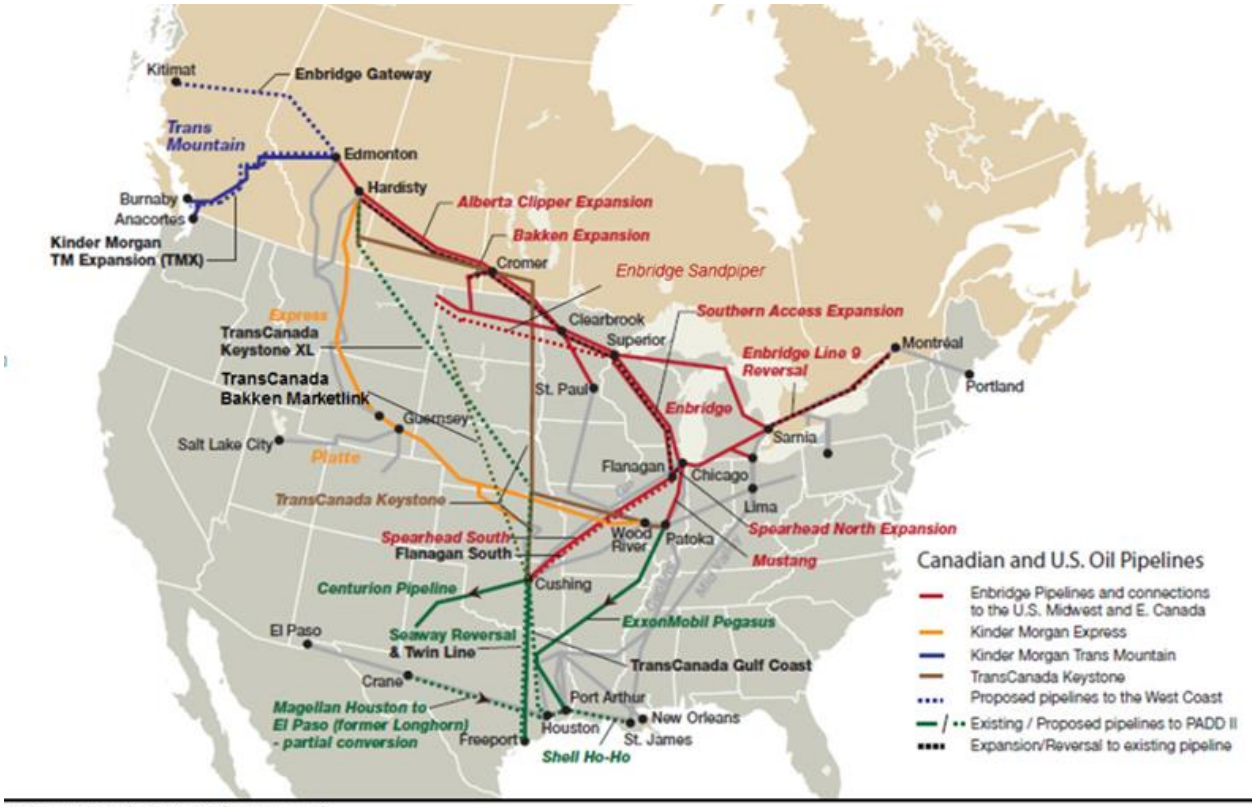
Source: 2014 BP Statistical Review and Energy Commission analysis

233 *BP Statistical Review of World Energy*, BP, June 2014, p. 8, http://www.bp.com/content/dam/bp/pdf/Energy-economics/statistical-review-2014/BP-statistical-review-of-world-energy-2014-full-report.pdf.

Crude Oil Distribution Trends Toward Rail Transportation

The dramatic increase of crude oil production has outpaced the ability of the crude oil pipeline gathering and distribution infrastructure to keep pace. Consequently, producers have sufficiently discounted their oil prices to make the more expensive means of rail transportation an economically viable option for refiners outside of these shale oil regions. As Figure 35 shows, there are no crude oil pipelines providing oil to California from outside the state. California refiners have not had a need to import domestic crude oil from other states via pipeline due to local sources of oil production and access to waterborne deliveries from Alaska and foreign sources.

Figure 35: Crude Oil Pipeline Infrastructure



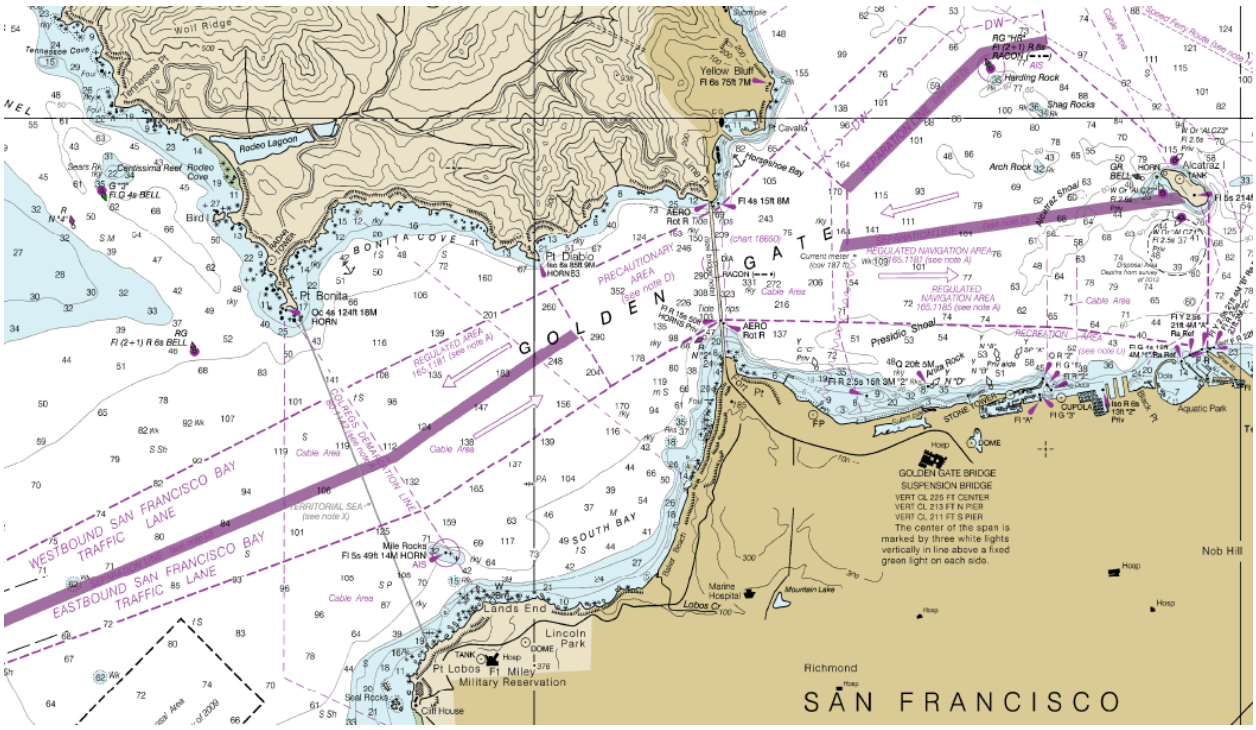
Source: CAPP, Raymond James Ltd.

Marine terminals allow California refiners the flexibility to import crude oil from a variety of locations that meet their quality needs. However, the emergence of discounted crude oil prices and development of rail loading capability in shale oil states have provided an opportunity for refiners to take advantage of these discounted domestic crude oil sources. Refiners inside and outside the state are pursuing crude-by-rail (CBR) receiving terminal projects not because they are running out of crude oil supplies from existing sources; rather they are trying to obtain discounted crude oil to reduce their operating costs and improve profitability.

California Crude Oil Routes for Marine Tankers

Crude oil deliveries via marine vessel from South American countries usually follow a southern coastal route through designated shipping lanes before being escorted to individual refinery marine berths in the ports of Long Beach, Los Angeles, and the San Francisco Bay Area. Canadian crude oil deliveries via marine vessel follow in coastal shipping lanes from the north, while marine vessels delivering crude oil from the Middle East and Russia traverse the Pacific Ocean. The figure below provides an example of these designated marine vessel routes for the approach to San Francisco Bay.

Figure 36: San Francisco Bay Entrance—Marine Tanker Lanes



Source: National Oceanic and Atmospheric Administration – San Francisco Bay entrance chart number 18649

Crude oil deliveries via marine vessels can also include the discharge of a partial cargo at one refinery in one portion of the state before moving to another refinery marine terminal to discharge the remainder of the crude oil cargo. In such instances, these marine vessels follow designated coastal shipping lanes running north to south before being escorted to refinery marine terminals.

The morning session of the June 25, 2014, workshop outlined marine oil terminals and the crude oil pipeline network. Lisa Kovary from the California State Lands Commission's Marine Facilities Division spoke about maritime disasters aboard the Sansinena at the Los Angeles Harbor and the Betelgeuse in Ireland and about the lessons learned as a result of these disasters. "…The International Maritime community made changes in the way that crude oil is transported by water. A couple of these changes were to require closed loading and discharging operations and for the use of inert gas to replace ambient air, therefore

keeping oxygen away from flammable vapors. … More recently the oil industry has been developing safety management systems for marine oil terminals through the Oil Companies International Marine Forum …including a baseline criteria auditing process." She encouraged those in the rail industry to "take some of these lessons learned from the maritime industry and look towards safety management systems and prevention first."[234]

Crude Oil Export Restrictions

In addition to the rapid increase of crude oil production temporarily outpacing the ability of oil pipeline transportation capacity, there are federal restrictions in place that severely limit the quantity of domestic crude oil that can be exported from the United States. Domestically produced crude oil exports to foreign destinations are allowed under specific "license exceptions" identified under federal statute.[235] These restrictions on exports essentially mean that crude oil that is produced in the United States has to be used in the United States. No heavy crude oil is exported from California nor has any been exported for several years.

Shift to Crude-By-Rail Increases and Expands to West Coast

CBR is a somewhat recent phenomenon. Figure 37 shows the rapid increase over the last three years as logistical providers have ramped up the capability to load crude oil into rail cars at production locations in Canada, North Dakota, Texas, Colorado, and New Mexico. These projects have been recently completed to take advantage of crude oil price discounts for Canadian and domestic crude oil, for which rapid increase in output has overwhelmed the capacity of crude oil pipelines to transport to refineries. As a consequence, crude oil prices at these new tight oil (or shale oil) producing regions (such as Bakken in North Dakota) have been sufficiently discounted by producers to enable the costlier rail transportation economics to work for refining customers on the West, East, and Gulf coasts of the United States. The American Association of Railroads said 874,000 barrels per day (BPD)—about 10.8 percent of U.S. output of 8.09 million BPD—moved by rail during the first quarter of 2014.

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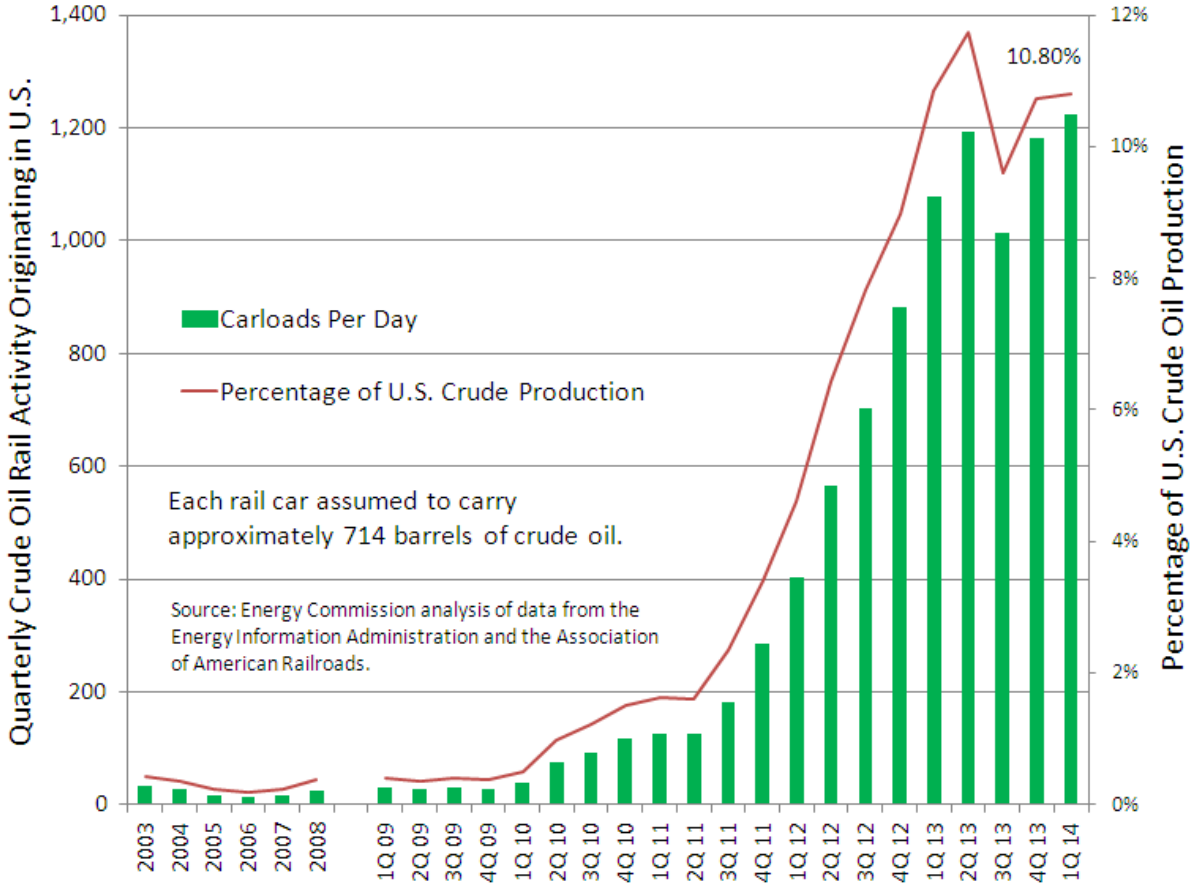
234 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 154.

235 *U.S. Crude Oil Export Policy: Background and Considerations*, Congressional Research Service, March 26, 2014, http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=dfe108c9-cef6-43d0-9f01-dc16e6ded6b4.

Figure 37: Crude Oil Transportation by Rail Tank Car

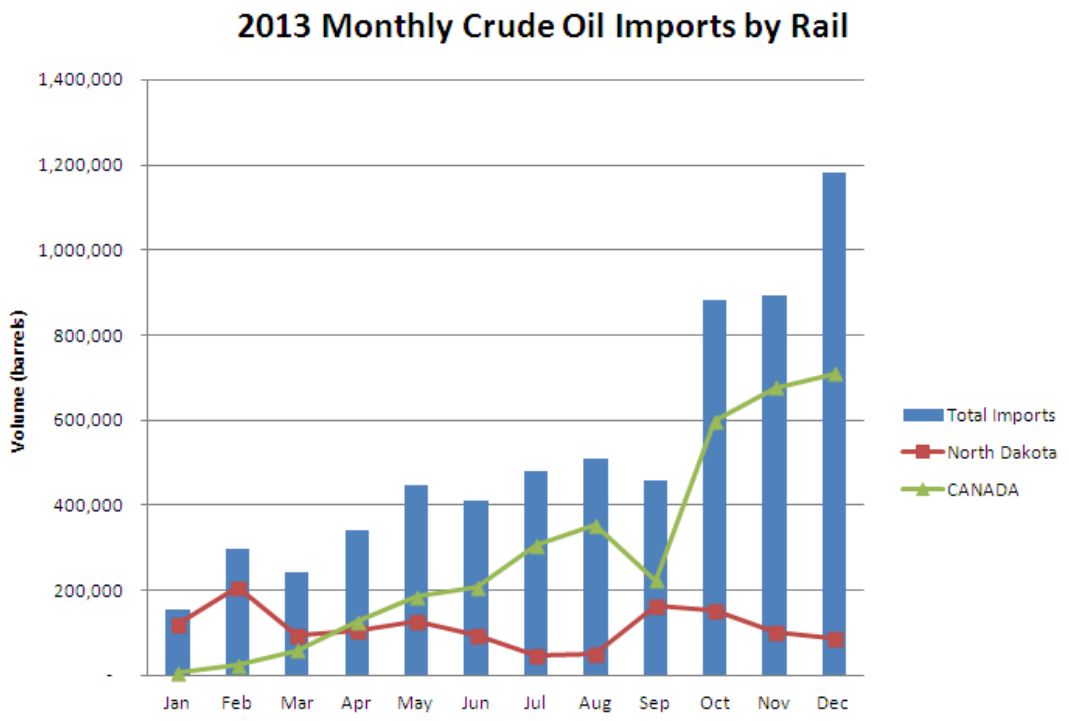


Source: Energy Commission analysis of data from the Energy Information Administration and the Association of American Railroads

Crude-by-Rail in California

California refiners received 1.1 million barrels of crude oil via rail during 2012. During 2013, California refiners received 6.3 million barrels, a nearly sixfold increase within one year. Figure 38 shows how quickly the monthly CBR deliveries increased throughout 2013.

Figure 38: California CBR Receipts



Source: Petroleum Industry Information Reporting Act data, Energy Commission analysis

The 2013 deliveries of crude-by-rail to California originated from Canada and 10 other states. Canada was the largest source of CBR cargoes, accounting for slightly more than 55 percent of statewide totals, followed by North Dakota at 21.4 percent and Colorado at 7.9 percent. CBR deliveries for the first seven months of 2014 have totaled 3.65 million barrels, roughly 53.8 percent greater than the same period during 2013 (2.37 million barrels). Canada's share has dropped to 41.7 percent of total, followed by North Dakota at 22.6 percent (similar to 2013 share) and New Mexico at 13.3 percent. Table 13 depicts the totals from the other states and the regional breakdown within California of these CBR deliveries for 2013 through July 2014.

Table 13: California CBR Sources and Destinations (2013–July 2014)

California Crude-By-Rail Imports for 2013–July 2014				
Country or State of Origin for Railcars	**2013 Totals**	**2013 Percentage**	**2014 Totals**	**2014 Percentage**
California Totals				
Canada	3,472,050	55.15%	1,520,288	41.69%
Colorado	500,706	7.95%	125,755	3.45%
New Mexico	411,725	6.54%	485,482	13.31%
North Dakota	1,348,681	21.42%	825,557	22.64%
Utah	59,004	0.94%	411,933	11.30%
Wyoming	441,398	7.01%	203,833	5.59%
Other States*	62,621	0.99%	76,417	2.10%
Subtotals	**6,296,185**	**100%**	**3,646,265**	**100%**
Northern California				
Canada				
Colorado	157,836	12.54%	68,622	7.52%
New Mexico			15,268	1.67%
North Dakota	1,075,861	85.45%	825,557	90.50%
Utah				
Wyoming				
Other States*	25,366	2.01%	2,764	0.30%
Subtotals	**1,259,063**	**100%**	**912,211**	**100%**
Bakersfield & Southern California				
Canada	3,472,050	68.93%	1,520,288	55.54%
Colorado	342,870	6.81%	57,133	2.09%
New Mexico	411,725	8.17%	470,214	17.18%
North Dakota	272,820	5.42%		
Utah	59,004	1.17%	411,933	15.05%
Wyoming	441,398	8.76%	203,833	7.45%
Other States*	37,255	0.74%	73,653	2.69%
Subtotals	**5,037,122**	**100%**	**2,737,054**	**100%**

*Other states include Illinois, Louisiana, Missouri, and Nebraska

Source: California Energy Commission

Rail deliveries of crude oil to California refiners represent the smallest source, about 1 percent of the 625 million barrels of crude oil received during 2013. Foreign crude via marine tankers accounted for 316.1 million barrels (50.6 percent), followed by 228.9 million barrels (36.6 percent) from California crude oil received via pipeline and 73.6 million barrels (11.8 percent) from Alaska via marine tankers.

CBR deliveries for the first seven months of 2014 (see Table 14) have totaled 3.65 million barrels, about 53.8 percent greater than the same period during 2013 (2.37 million barrels). Canada's share has dropped to 41.7 percent of total, followed by North Dakota at 22.6 percent (similar to 2013 share) and New Mexico at 13.3 percent.

Going forward, the outlook is for a continued increase into the latter portion of 2014 that will continue into 2015. Assuming the Plains All American CBR receiving facility begins operations as scheduled and operates at or near capacity, California CBR deliveries could reach at least 4 percent of total crude oil supply—roughly four times greater than the average for 2013. Further, if Alon (who recently received permits for its Bakersfield project) begins construction by early 2015, CBR imports could jump to just more than 10 percent of total crude oil supply by end of 2015.[236]

Delivery Logistics for CBR in California

CBR projects are designed to receive shipments of roughly 100 rail tanker cars at a time, referred to as "unit trains." Unlike the more expensive manifest rail car transportation means used by a couple of California refiners, unit train shipments are granted top priority for rail line access and normally do not stop until reaching the CBR receiving facility destination. CBR rail deliveries in California are a combination of unit trains and manifest cars intermingled with other types of rail cars in mixed freight train deliveries. Rail tank cars carrying crude oil are then dropped off at different rail yards (such as Bakersfield) where they are grouped together for transport to the final refinery destination. In other instances, the rail cars are delivered to locations that unload the crude oil into storage tanks connected to a refinery. Some CBR tank cars directly transfer crude oil from rail tank cars to tanker trucks that are then driven to a refinery.

CBR imports are transferred to tanker trucks at two locations in California. The Kinder Morgan rail yard facility in Richmond (Contra Costa County, Northern California) receives between one and two unit trains of crude oil per month. That crude oil is then transferred directly from the rail tank cars to tanker trucks through a process referred to as "transloading." About three to four tanker trucks are required to transfer the crude oil from a single rail tank car. The other rail terminal that is used to transload crude oil is located in Sacramento and operated by the SAV Patriot Rail Company.

CBR Safety Concerns

At the June 25, 2014, IEPR workshop, the afternoon presentations covered recent derailments of hazardous materials and current and proposed standards. Ernie Simotek from the U.S. Department of Transportation Federal Railroad Administration noted that in response to the catastrophic derailment of a runaway train in Lac-Mégantic, Quebec, his agency had come out with Emergency Order 28. The Order "requires…railroads

236 For additional information on California CBR projects, see Appendix F.

to…develop a security plan for leaving unattended trains, develop a process for securing trains outside of yards and terminals, review and update existing procedures, and implement operating rules requiring the discussion of the securement of any train or vehicle."[237]

After discussion surrounding the potential safety issues with existing rail tank cars in the event of a derailment, Commissioner Scott asked what time frame the presenters would propose for the phasing out of legacy DOT-111 tank cars. Liisa Lawson Stark from Union Pacific answered that "…as part of the rail industry we have already called on the federal government to make those changes and recommendations, keeping in mind that those legacy tank cars meet all federal standards for transportation. We would like to see that…happen…as soon as possible and we've encouraged the federal government to do so."[238] Public feedback received both at the workshop and via written comments reflected concern over legacy tank car safety, with several commenters recommending a phase-out or immediate ban of DOT-111 tank cars.

Similarly, the state Interagency Rail Safety Working Group recommended that the federal government expedite phase-out of these older, riskier tank cars. This request, among many related, was conveyed to the federal government by California Public Utilities Commission President Michael Peevey in his letter to U.S. Department of Transportation Secretary Anthony Foxx in July 2014.

Public comments also expressed concern over the integrity of tracks being used for CBR through populated areas. Commenters pointed out that running CBR trains on damaged tracks can be dangerous. At the workshop, David Wickersham from Union Pacific underscored the potential safety improvements that could be brought about through greater use of concrete railroad ties. While he acknowledged the big upfront capital investment that would be needed, he explained that "…if you have a really strong track structure you can eliminate mechanical derailments. …if a train engineer is not handling his train right, concrete ties will prevent that car from derailing at that moment."[239]

Since the IEPR workshop, the California Public Utilities Commission and the California Governor's Office of Emergency Response submitted comments to the U.S. Pipeline and Hazardous Materials Safety Administration regarding the proposed federal regulations for transportation of hazardous materials by rail.[240] The comments highlight the importance of

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237 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 175.

238 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 134.

239 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 138.

240 Docket No. PHMSA-2012-0082 (HM-251), Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains, Comments of California State Agencies, September 30, 2014.

finalizing these national regulations with sufficient detail and clarity to protect communities and natural resources along rail lines. In the comment letter, state agencies recommend adopting proposed regulations for:

- Classification of mined gas and liquids to enhance safety before shipping and ensure proper classification.
- Rail routing, clarifying that state railroad safety and emergency response personnel should have ready access to analyses.
- A notification system for CBR shipments and ensuring the data can provide accurate projections of *future* shipments.
- Speed restrictions and enhanced breaking requirements, including electronically controlled pneumatic brakes.
- Phasing out DOT-111 tank cars according to the proposed schedule or sooner.

New Risks Require Additional Funding

The risks posed by transportation of CBR are new and unique, as outlined above. With transportation of CBR expected to increase 23 percent in the next couple of years, adequate preparation for CBR and other incidents involving hazardous materials will require additional funding for local emergency responders. Despite recent actions taken by the federal government, CBR still poses fundamental risks at the local level that have yet to be addressed. In California, the Governor's Office of Emergency Services identified that numerous local emergency response agencies that lack resources to respond to a CBR incident. The state should take steps to ensure local emergency responders have the equipment, training and support they need to take on additional responsibility for CBR incidents and reduce risks for communities along rail lines for years to come.

CBR Data Gaps

Timely data on CBR activities are necessary to address safety concerns; provide thorough, accurate information to local emergency responders; and enable the state to plan for future incidents. To date, some progress has been made on notification of shipments, pursuant to the federal Emergency Order, but several data gaps in other areas remain:

- Information on the source of imported crude by month, year and country/state (provided up-front in a timely manner)
- Profile/composition of the crude
- Routes of entry to California (rail, barge, pipeline) and in what quantities
- Types and quantities of crude (and refined product) exported and final destination
- Transfer points from trains and other modes of transportation
- Information on refinery replacements, expansions, or equipment changes

California and West Coast CBR Potential for Increased Imports

CBR imports to California are expected to increase over the next couple of years. The California Energy Commission is tracking five CBR projects that are either under construction or undergoing permit review. If the four projects seeking permits obtain all the necessary approvals and begin operating at full capacity, the contribution of CBR for California refiners could significantly increase from 1 percent in 2013. Assuming that California refiners process the same quantity of crude oil during 2016 that they did during 2013 (625 million barrels or about 1.71 million barrels per day), the 376,000 barrels per day for maximum throughput of the five California CBR projects would amount to 22 percent of the crude oil processed during 2016. Please see Appendix F for more information on California CBR projects.

Changing Crude Oil Quality- Potential Refinery Impacts

Given the similar properties to crude oil imported by marine vessel, CBR oil could be used by California refineries without construction of new processing equipment. If all CBR project proposals in California receive permits and become operational at the rated capacities, the combined volume of CBR will be about 22 percent of total crude oil receipts by 2016.

Refiners may have to make some adjustments to their operating procedures to accommodate the higher paraffinic (wax) and hydrogen sulfide nature of Bakken crude oil. The higher paraffinic content can cause increased development of waxy coatings in storage tanks and combining Bakken with other typical crude oil can result in the development of more solids and sludges. Both issues require operational changes and increased attention to coating and sludge removal. Changes in atmospheric distillation tower operations are also needed to avoid the development of chloride salts, which could increase the risk of corrosion if left untreated.

At the June 25, 2014, workshop, San Luis Obispo County Supervisor Caren Ray spoke about her concerns with increased CBR as a local official, saying, "I am the one who is perceived as responsible here, and yet I have very little decision-making authority. …we have no regulatory authority to restrict what's coming into our county."[241] Providing another local perspective, Diane Bailey from the Natural Resources Defense Council spoke about the concerns her organization is hearing from the communities they work with. "As far as we know, every refinery in the Bay Area right now is proposing a new project, and we have some additional oil terminals on top of that, and these seem to overlap almost perfectly with areas already identified by our air district as health vulnerable and vulnerable to air pollution, so we have some very serious environmental justice considerations with these new terminals that I think bear extra consideration."[242]

It is possible that not all proposed projects will receive financing and be constructed. Those that eventually do become operational will receive CBR deliveries that will most likely displace imports of Alaska crude oil (about 201,721 barrels per day in 2013), followed by

241 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 245-246.

242 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 264.

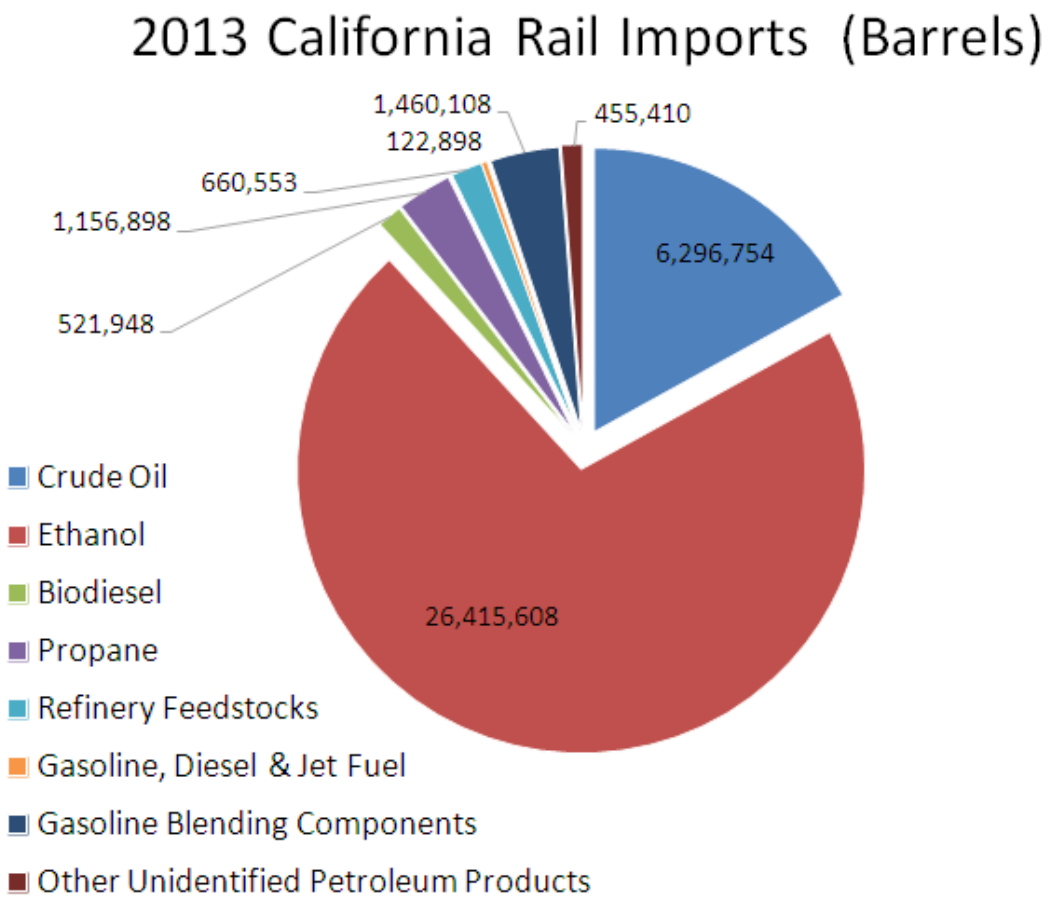
imports of foreign crude oil via marine tanker that are of similar quality to the properties of the CBR oil.

Oil refiners in Washington state began initiating CBR projects before California refiners due to lower rail transportation costs. Washington state refiners are also the biggest consumers of Alaska crude oil, which continues to decline in output, compelling refiners to seek alternative sources of crude oil to replace the declining Alaska source. The light crude oil from Bakken (North Dakota) is similar in quality to Alaska crude oil, reducing the need to make additional refinery modifications to accommodate the new source of domestic crude oil. There are several CBR facilities in Washington state that are operational, with more planned. Please see Appendix F for more information on individual projects.

California Rail Imports of Other Fuel-Related Products

Rail is also used to import renewable fuels (ethanol and biodiesel), liquefied petroleum gases (propane), gasoline blending components (such as alkylate and butane), and refined petroleum products. Ethanol deliveries to California via rail tanker cars amounted to 26.42 million barrels (1.11 billion gallons) during 2013 or about 72.37 thousand barrels per day. During that same year there were 0.52 million barrels (21.92 million gallons) of biodiesel delivered to California via rail tanker cars. Propane imports via rail cars amounted to 1.16 million barrels (48.59 million gallons), followed by 1.46 million barrels (61.32 million gallons) of gasoline-blending components, while rail imports of refined petroleum products (gasoline, diesel and jet fuel) were only 0.12 million barrels (5.16 million gallons) during 2013. Figure 39 depicts their relative contribution.

Figure 39: Other Fuel-Related Products Imported via Rail Into California



Source: California Energy Commission

California CBR Routes

Union Pacific and Burlington Northern Santa Fe are the only two railroad companies that transport rail tank cars into California, using portions of their tracks or tracks owned by other companies. Figure 40 depicts the rail route options for these companies. The exact routes used by these companies to move rail tank cars containing crude oil into California is not precisely known since the rail companies have multiple routes to take, especially for crude-by-rail imports from Canada, North Dakota, Colorado, New Mexico, and Wyoming. It is likely that shipments of crude oil from Canada, North Dakota, and Wyoming enter California through southern Oregon and northwestern Nevada, while the balance of crude oil imports from other states enters California through western Arizona and southwestern Nevada. Although information regarding the volume of crude oil delivered by rail cars to each specific destination is collected from the rail companies and refiners through the California Energy Commission confidential Petroleum Industry Information Reporting Act (PIIRA) monthly data collection activity, the routing of these shipments is not required to be reported to the Energy Commission.

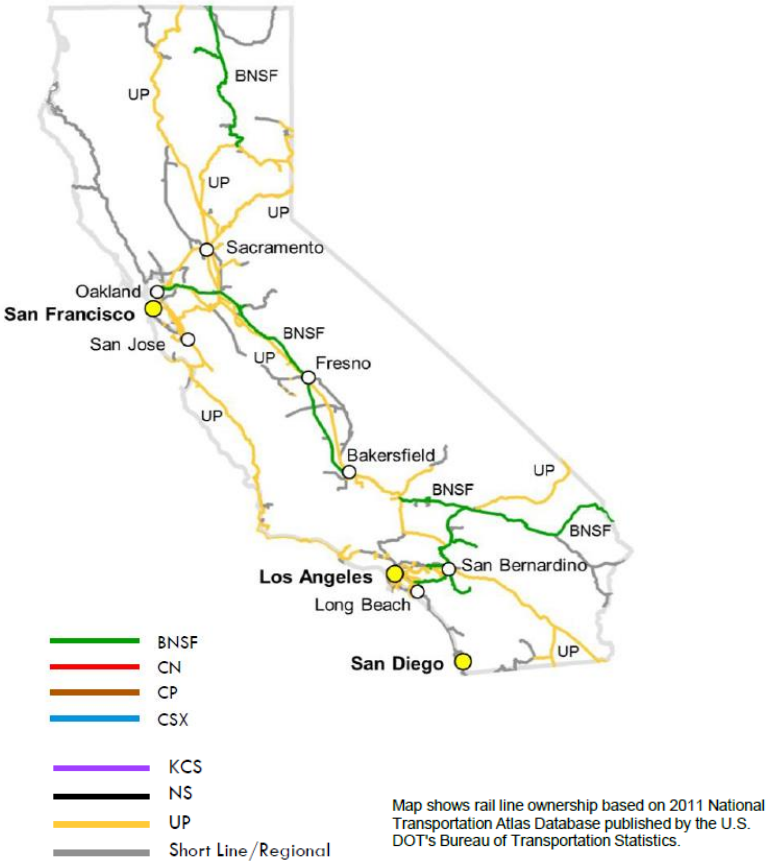
Safety of transporting flammable liquids by rail is a concern for regulators, rail operators, and community members along rail corridors. At the workshop, Gina Solomon, Deputy Secretary for Science and Health for the California Environmental Protection Agency, previewed an interactive map that is public as a tool to view local vulnerabilities related to rail risks and to view local response capabilities.[243] The mapping tool allows users to zoom down to street intersections to identify areas that have potentially higher levels of vulnerability. It was designed to help focus state and local efforts toward preventing incidents and enhancing and improving emergency response capabilities.[244] Many of the public comments received centered on concerns over CBR routing and contingency planning. Commenters requested additional studies be conducted on populations in the immediate vicinity of CBR railways, safer speed limits through populated areas, and additional data on CBR. These issues were also raised by the Interagency Rail Safety Working Group and the federal comment letter submitted by state agencies.

Please see Appendix G for a detailed timeline of safety-related CBR events since 2011.

243 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 195.

244 http://www.caloes.ca.gov/HazardousMaterials/Pages/Oil-By-Rail.aspx

Figure 40: Rail Routes Into and Within California



Source: U.S. Department of Transportation's Bureau of Transportation Statistics

Moving Forward

Representatives from the federal government presented at the June 25, 2014, IEPR workshop, including the Energy Information Administration, the U.S. Department of Transportation Federal Railroad Administration, and the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. They were joined by state and local government presenters from California Environmental Protection Agency, DOGGR, Office of Emergency Services, CPUC, California Air Resources Board, OSPR, California State Lands Commission, Office of the State Fire Marshal, Bay Area Air Quality Management District, West Sacramento Fire Department, and San Luis Obispo County. Workshop presenters also included representatives from rail operators, including Railway Supply Institute, Union Pacific, and Burlington Northern Santa Fe, as well as from stakeholders including the International Council on Clean Transportation, Communities for a Better Environment, Natural Resources Defense Council, and Western States Petroleum Association. This level of coordination among agencies and stakeholders is important going forward. As Cliff Rechtschaffen from the Governor's Office noted in his opening remarks,

"There haven't been very many forums where we've brought together all the stakeholders at federal, local, NGO, community, industry and so forth, so that's very valuable here."[245]

In her closing comments, Commissioner Scott noted that the workshop had helped clarify different agency roles and responsibilities and said she had "learned a lot about the data that we do have, the data that we don't have, the data that we do need to be able to do our jobs well." While the focus of much of the workshop was on the logistics of CBR and general trends in the state's sourcing of its crude oil, the overall message of needing to work toward reducing California's dependence on fossil fuels was also highlighted. During his presentation at the close of the workshop, Dr. Alan Lloyd with the International Council on Clean Transportation concluded "[P]ublic health, the air quality, (and) climate concerns demand the ultimate elimination of carbon in most combustion. …So while the transition will require time and investment, it is viable, necessary, and benefits are about ten times the investment. …California is well ahead of everybody else. And you can expect that leadership to continue."[246] And in his closing remarks, Ken Alex from the Governor's Office reminded those present that he "continue[s] to be concerned that California has a huge usage of oil that we have to come to grips with and cannot snap our fingers and simply be done with. So how we work our way out of that usage is essential. And it's also part of both our strategy and our obligation to deal with climate change."

Recommendations

- ***State agencies should continue to work together to implement the recommendations in the*** *Oil by Rail Safety in California: Preliminary Findings and Recommendations*. The state should be vigilant in protecting its ability to proactively address safety concerns.
- ***Monitor the status of federal rulemakings and proceedings to ensure they capture recommendations made by the state.*** Since the IEPR workshop, the California Public Utilities Commission and the California Governor's Office of Emergency Response submitted comments to the U.S. Pipeline and Hazardous Materials Safety Administration regarding the proposed federal regulations for transportation of hazardous materials by rail. The comments highlight the importance of finalizing these national regulations with sufficient detail and clarity to protect communities and natural resources along rail lines. As directed by the Governor's Office, the CPUC and OER should monitor progress on the federal regulations to ensure California's concerns are addressed.

245 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 16.

246 June 25, 2014, Integrated Energy Policy Report workshop transcript, p. 317-318.

- ***Provide additional funding for local emergency response agencies.*** As highlighted in this chapter, the risks posed by the transportation of crude oil by rail are unique. The Governor's Office of Emergency Services identified that numerous local emergency response agencies that lack resources to respond to a CBR incident. The Legislature should take steps to ensure local emergency responders have the resources, equipment, training and support they need to take on additional responsibility for CBR incidents and reduce risks for communities along rail lines for years to come.
- ***Acquire the data needed to fill identified information gaps***. Timely data on CBR activities are necessary to address safety concerns, provide useful information to local emergency responders and enable the state to plan for future incidents. To date, some progress has been made, but data gaps remain. State agencies should work together to collect, or request from other entities, the data needed to fill these gaps.