



The Effect of Crude by Rail on Refining and Logistics

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I hear the train a comin'...



Source: Getty Images

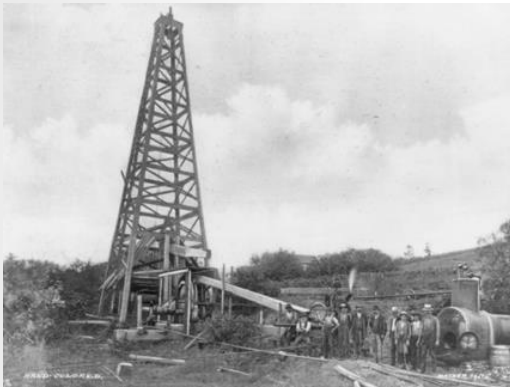
Crude by rail goes back to the earliest days of the refining business



Source: ExplorePAHistory.com

Photo Credit: The Robert N. Dennis Collection of Stereoscopic Views (NYPG91-F314 o97z) Courtesy of the New York Public Library

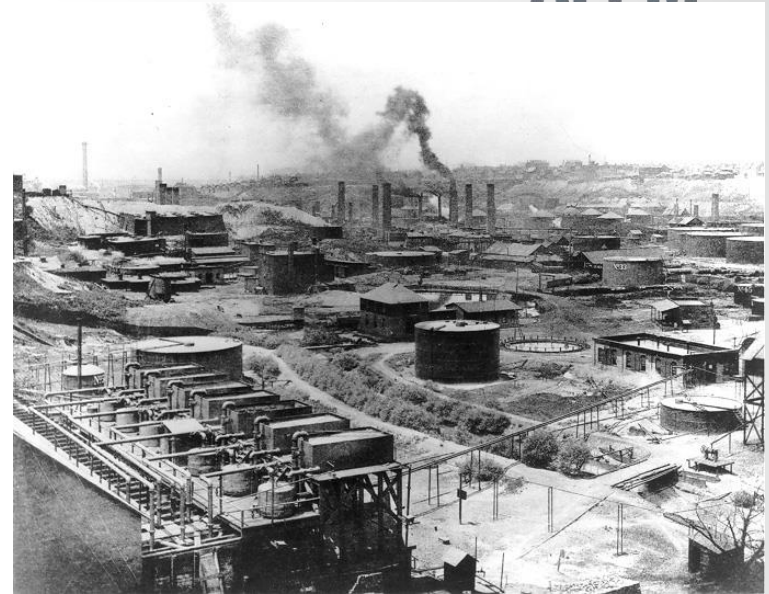
Everyone in the supply chain is interested in this growing space



Source: HMCCurrentEvents.com



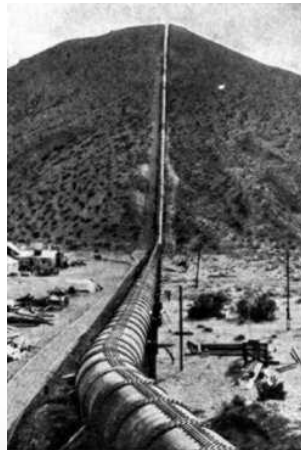
Source: Getty Images



Source: Wikimedia



Source: New York State Archives



Source: micheloud.com



Source: The Chevron Retirees Association

Problems have to be solved



Lark Train Wreck, October 2, 1915
Source: San Luis Obispo Tribune News

The crude needs to flow to reduce dependence on imports



Riveted iron horizontal tanks

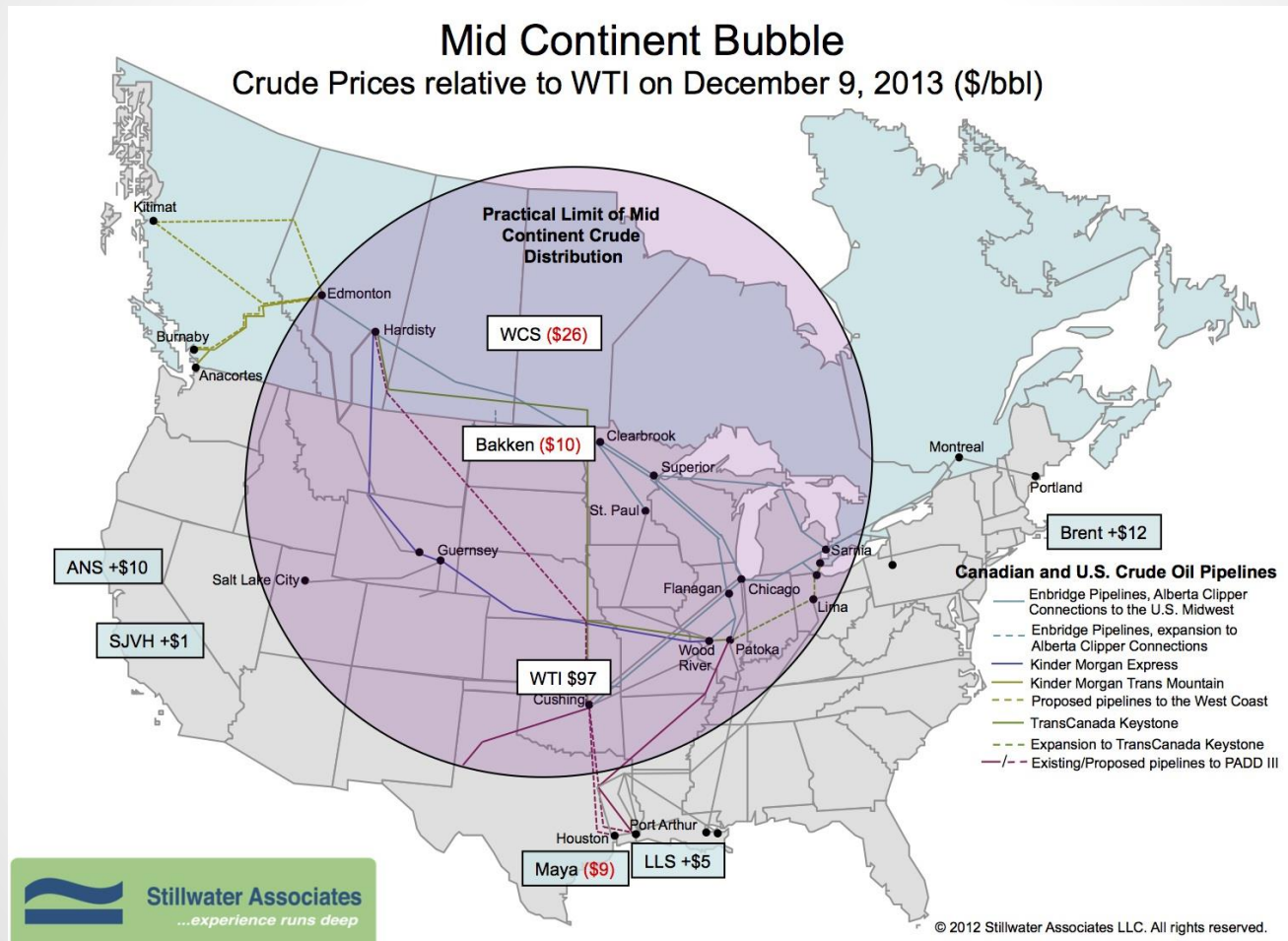
Source: American Oil and Gas Historical Society

All the players need to work together to fix the problems



Source: Campsilos.com, Silos and Smokestacks National Heritage Area

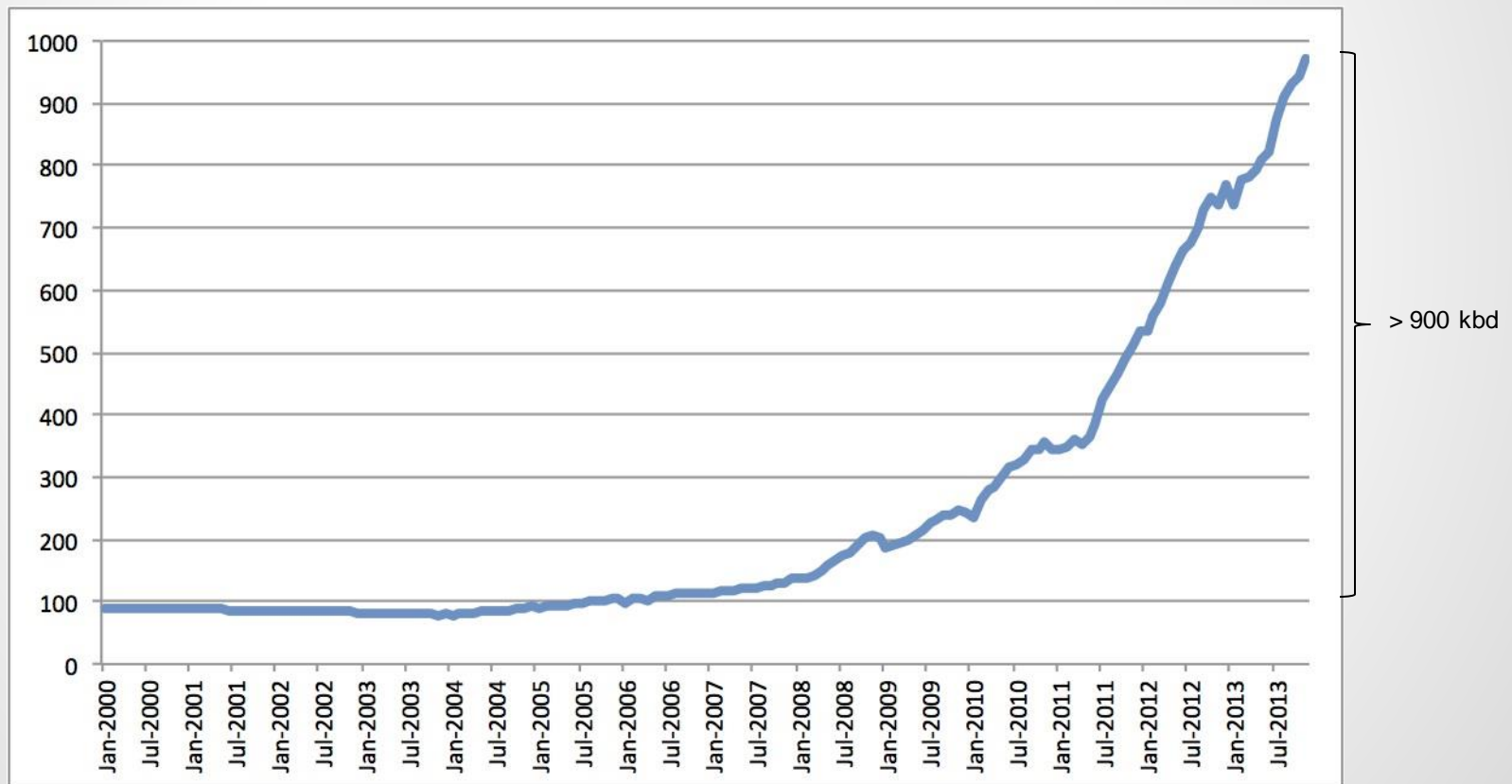
Crude by Rail from the producer prospective



Increases in crude oil production

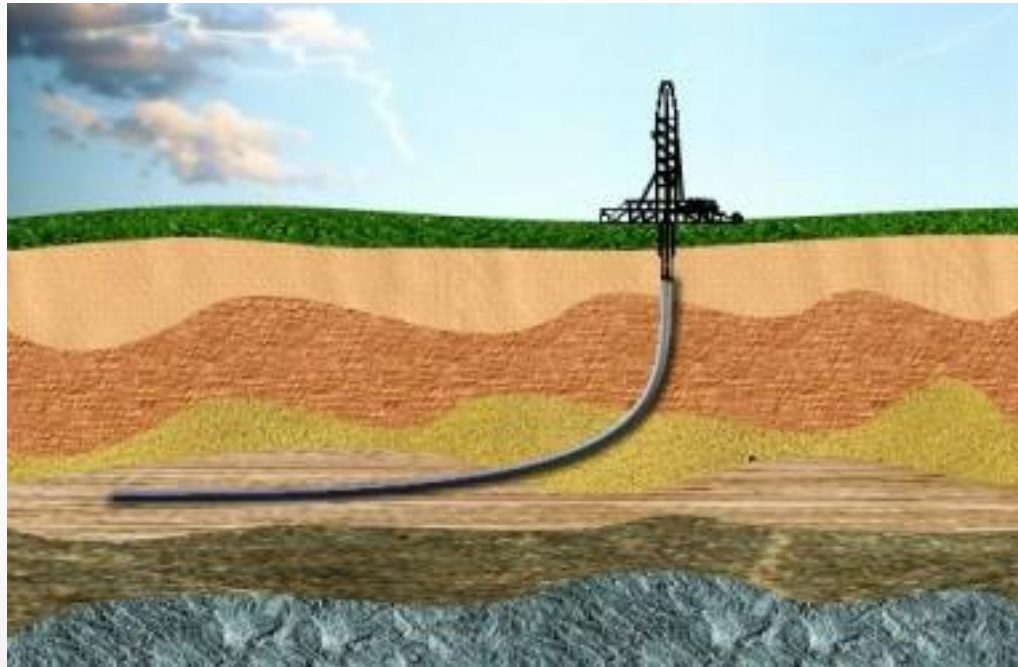


Starting in North Dakota



Source: EIA

Fracking opened up new production pursued aggressively by independents



Source: Amerex Corporation

Producers running way ahead of infrastructure



Trucks can't keep up



Source: Bloomberg.com

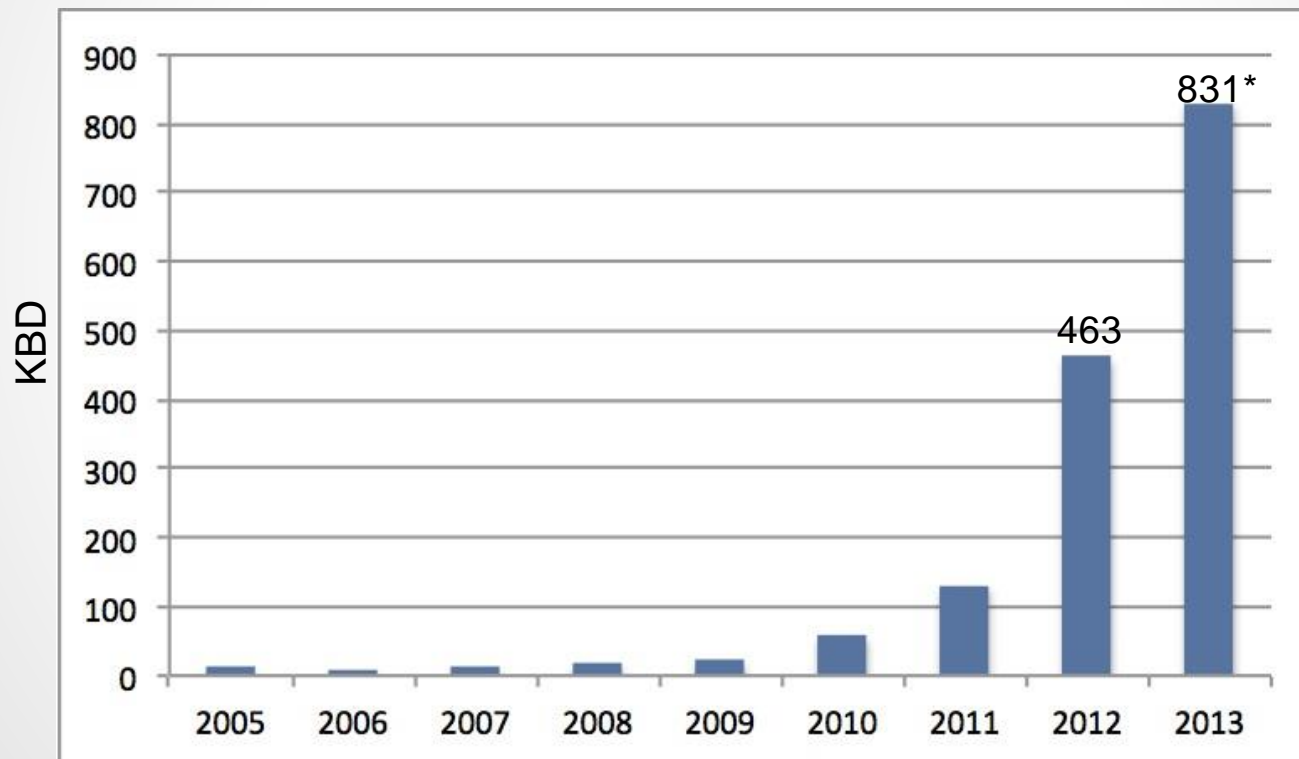
Pipelines will be the solution eventually



Only rail can keep up with the production increase



U.S. Crude Oil Movements via Class I Railroad (KBD)



1 rail carload = 30,000 gallons = 714 barrels

Source: AAR

* Estimate based on first three quarters annualized

Crude by rail from the railroad and shipper perspective



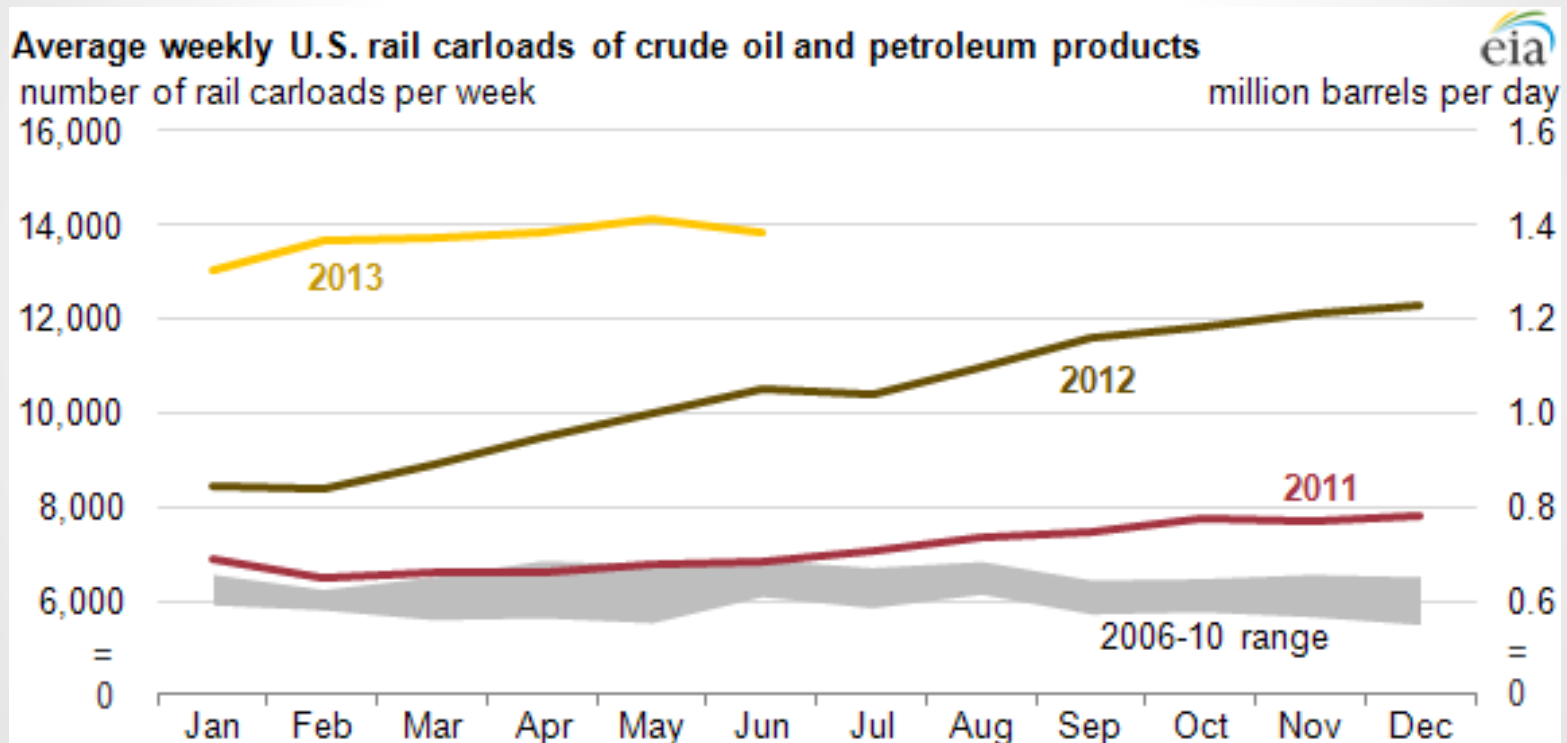
Source: AAR

The railroads are investing in CBR



Source: Photo Illustration by Justin Metz for Bloomberg.com, Alamy (2), Getty (1)

The railroads have plenty of capacity for CBR



Source: U.S. Energy Information Administration, based on Association of American Railroads.

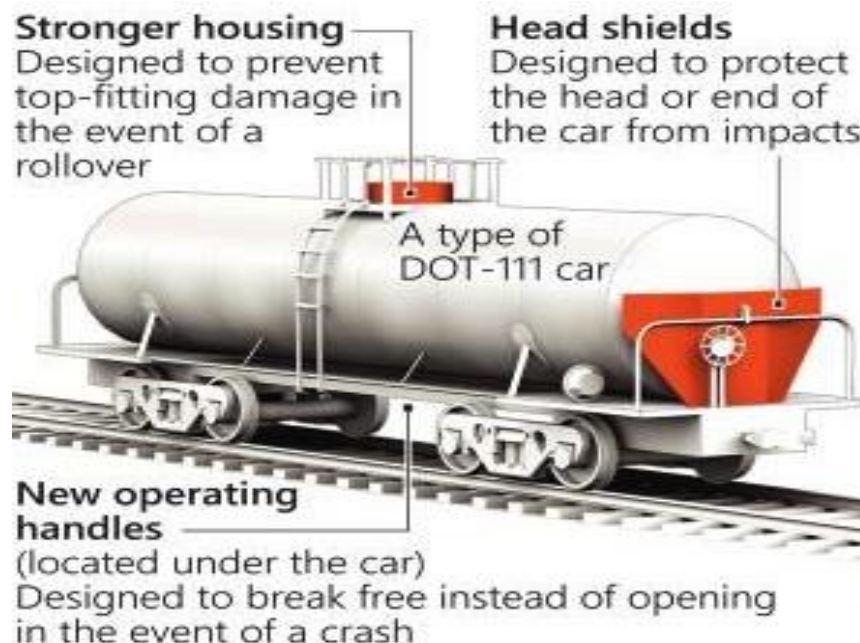
Note: Petroleum product rail shipments do not include ethanol. Conversion of rail carloads per week into million barrels per day includes assumption of 700 barrels per rail carload.

Railroad Safety is of the upmost importance

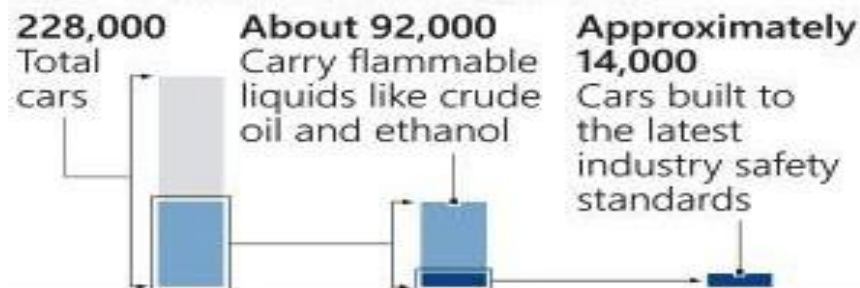


Source: AP Photo Matthew Brown

Investment in safety



DOT-111 CARS BY THE NUMBERS



CN will be charging more for older cars



Source: Getty Images

Leasing companies or shippers own the tank cars

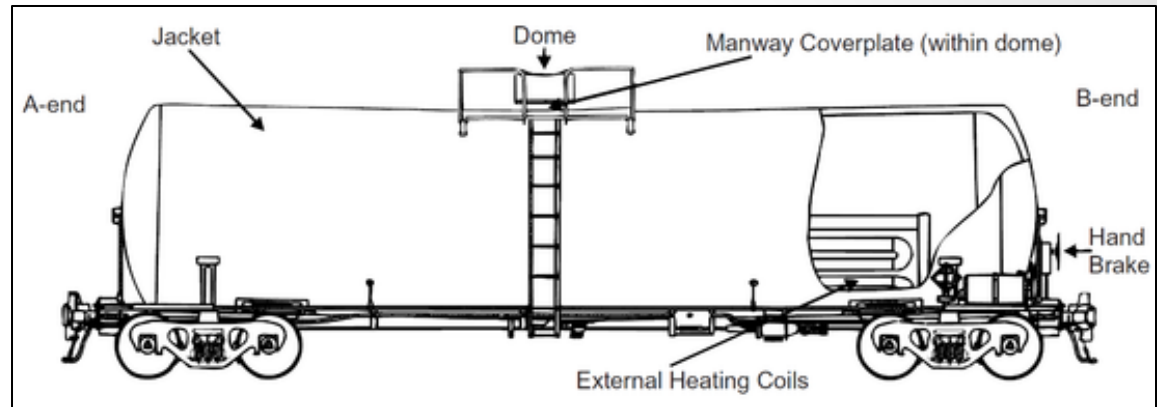


Source: Model Railroad Hobbyest

DOT-111 Railcars Carry Crude Oil



- There are 228,000 DOT-111 Railcars in service carrying hazardous and non-hazardous material.



Source: Congressional Research Service

- About 92,000 of these carry flammable liquids like crude oil and ethanol.
- Of these, 14,000 are built to the latest CPC-1232 industry standard.
- The CPC-1232 design standard for new DOT-111 tank cars includes enhanced safety features including reinforced outer shells and protective shields.

The cost to buy or lease a rail car has skyrocketed



Source: Getty Images

Rail car manufacturing capacity



Source: StateImpact Pennsylvania

Recent Accident Review

| Date | Location | Description |
|-------------------|-----------------------|---|
| February 13, 2014 | Vandergrift, PA | 120-car Norfolk Southern LPG and oil train derailment resulting in a 3,000 – 4,000 gallon spill |
| January 7, 2014 | New Brunswick, Ottawa | 122-car CN oil train derailment and fire resulting in the evacuation of 150 people |
| December 30, 2013 | Casselton, ND | 106-car BNSF oil train collided with a BNSF derailed grain train resulting in an explosion and a 400,000 gallon spill |
| November 8, 2013 | Pickens Co., AL | 90-car Genessee & Wyoming oil train derailment and explosion resulting in a 750,000 gallon spill |
| October 19, 2013 | Gainford, Alberta | 130-car CN LPG and oil train derailed and caught fire resulting in the evacuation of 100 people |
| July 6, 2013 | Lac Megantic, Quebec | 73-car Montreal, Maine & Atlantic oil train derailment and explosion resulting in the death of 50 people |

Operating & regulatory changes



U. S. Department
of Transportation
**Federal Railroad
Administration
Office of Research
and Development**

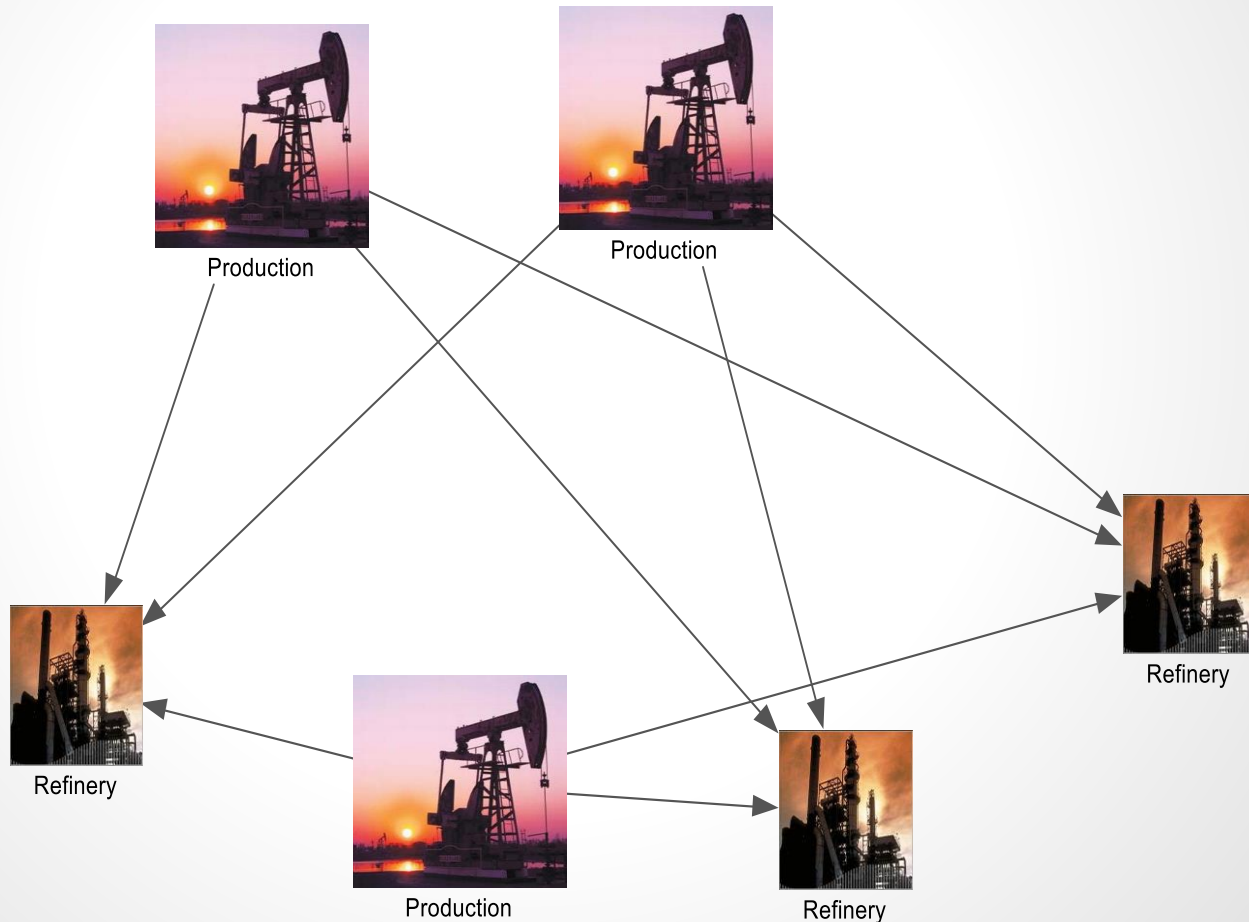


CBR from the refiner perspective

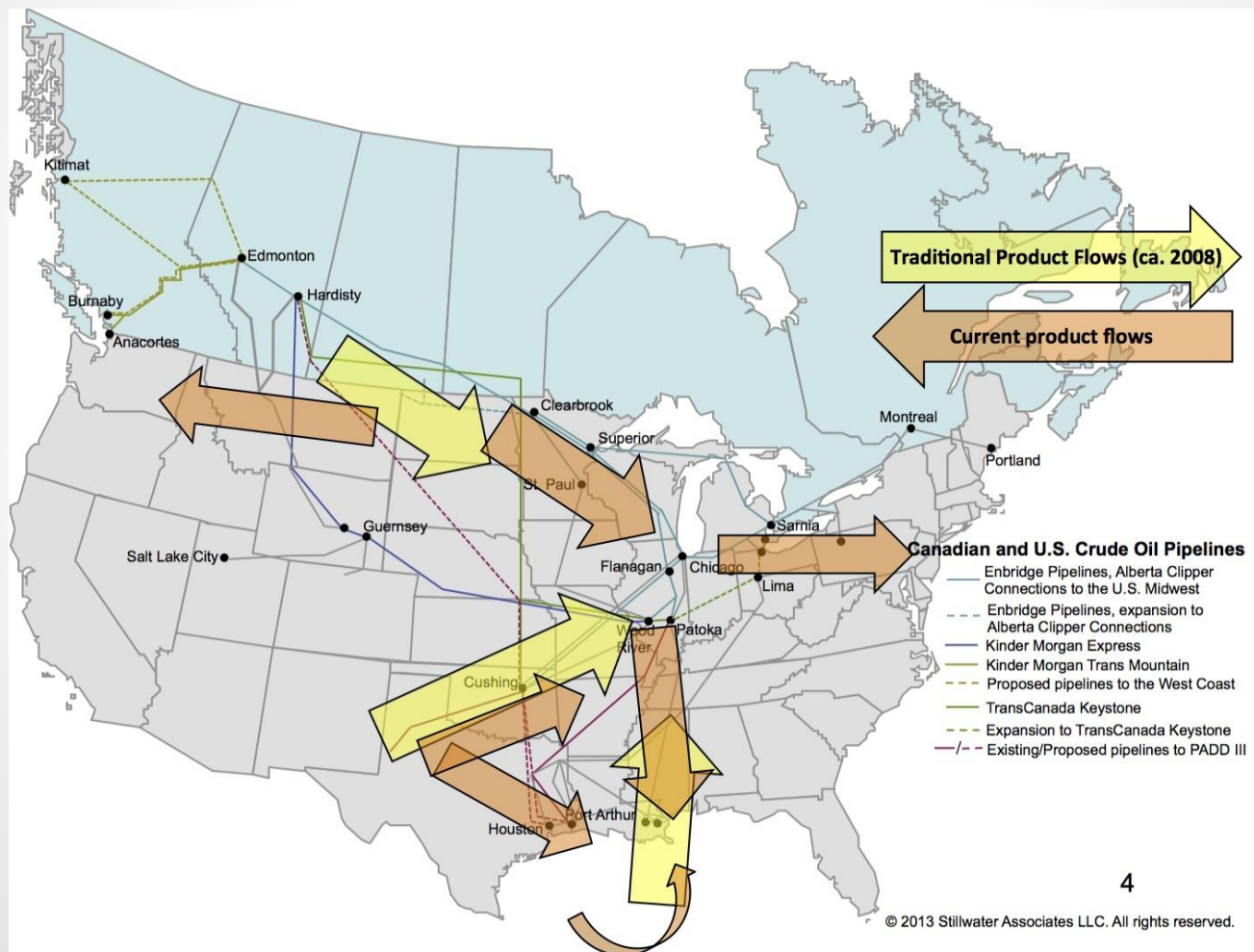


Source: Getty Images

Refiners like the optionality



Translate cheap Mid Continent crude to the coasts



Terminal construction



BP Cherry Point Refinery Rail Loop

Source: Larry McCarter for The Bellingham Herald

East (Philadelphia Energy Solutions)

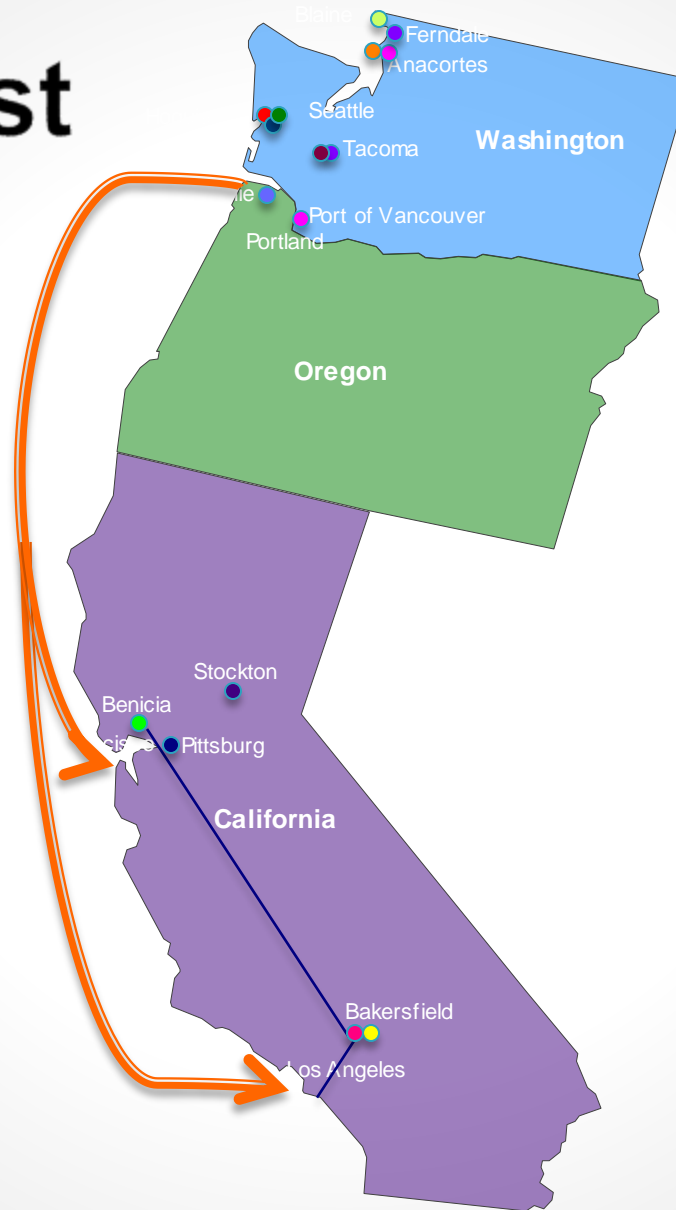


Source: David Swanson for The Philadelphia Inquirer

Gulf



West Coast



Where does it go from here?



Source: Getty Images

Safety issues have to be solved quickly



Continued growth

- Growth arrow – that flattens out a little

Will CBR continue to be a significant contributor to the supply chain?



- Question mark

Rail safety needs to be assured to keep the crude flowing



Source: Jason Cohn/Reuters

All the players need to work together to fix the problems



Source: Wikipedia

Strong Conclusion



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