Cushing Canadian Congestion
A Review of Logistics Options

Martin Tallett

EnSys Energy

1775 Massachusetts Avenue, Lexington, MA 02420, USA

(781) 274 8454

www.ensysenergy.com

Energy Forum

New York, November 22nd, 2011

ENSYS ENERGY

Overview

- EnSys background
- Today's congestion
- Keystone XL
- Projects & Options
  - Refining
  - Pipeline projects
  - Non-pipeline potential
    - Rail, barge/tanker, full upgrading
- Summary comments

EnSys Overview

- **Strategic issues in U.S. and global refining**
- **Focus on national and international developments**
- **Underlying basis is extensive refining experience and modeling**

ENSYS ENERGY

EnSys KXL Analyses (for DOE/DOS)

- **2010 Keystone XL Assessment:**
  - **Evaluated alternative pipeline outlooks through 2030**
  - **Combinations of: KXL, No KXL, No Expansion, Hi/Low Asia**
  - **Against 2 US petroleum demand outlooks**
    - **4 mbd difference by 2030**

- **2011 Keystone XL Assessment Update:**
  - **Revisited No Pipeline Expansion scenarios**
  - **Assessed potential for alternative transport modes to move US and Canadian crude oils to markets**

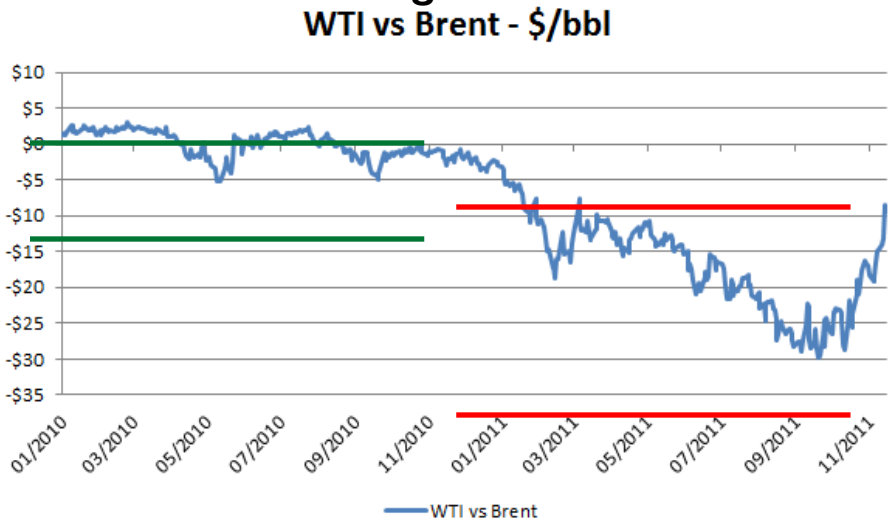
- **Studies available at www.ensysenergy.com**

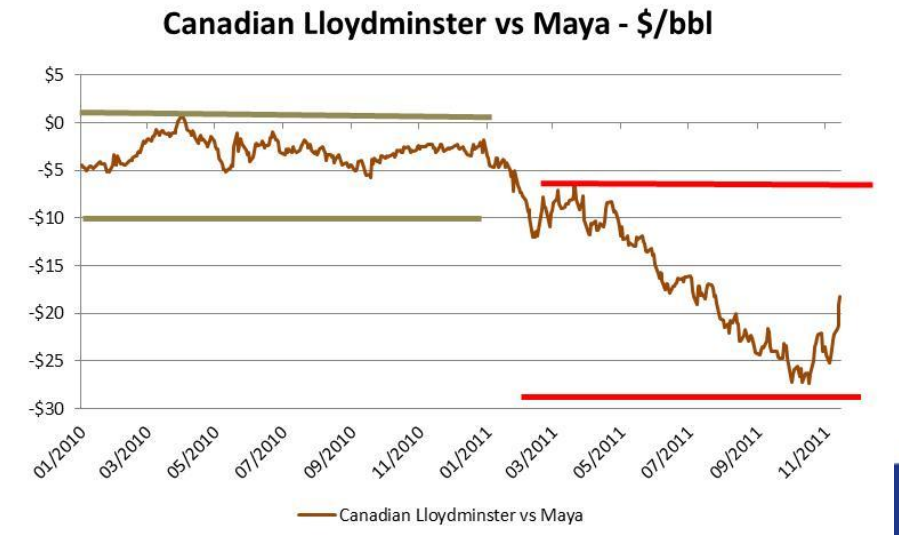
ENSYS ENERGY

Today: Canadian + Cushing = Congestion

- **In 2011 Cushing congestion has become "structural"**
  - **Line capacity into Cushing well exceeds capacity out**
    - No line south out of Cushing to GC
  - **Midcontinent, Bakken, WCSB etc. supply growth exacerbating broad inland imbalance**
    - Moving target
  - **Result is major crude discounts:**
    - WC heavies
    - WTI
    - And anything that is priced off WTI

Source: Bloomberg

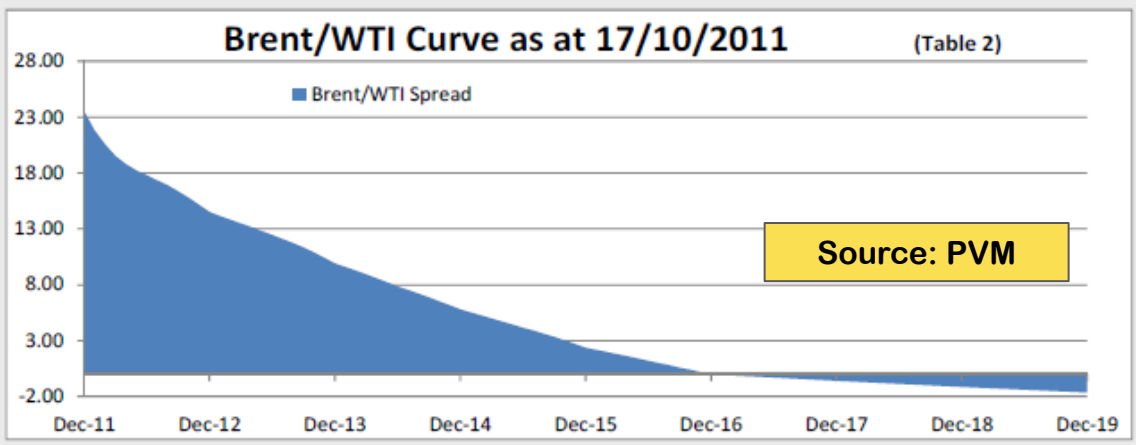




ENSYS ENERGY

Today: Canadian + Cushing = Congestion

- **Brent/WTI spread arguably a function of**
  - **Perceived time to revert toward parity**
  - **x Storage costs**
    - **~4½ years ***
    - **~$0.50/bbl per month**
    - **= ~ $25/bbl**
  - **Cost of (inefficient) transport to GC**

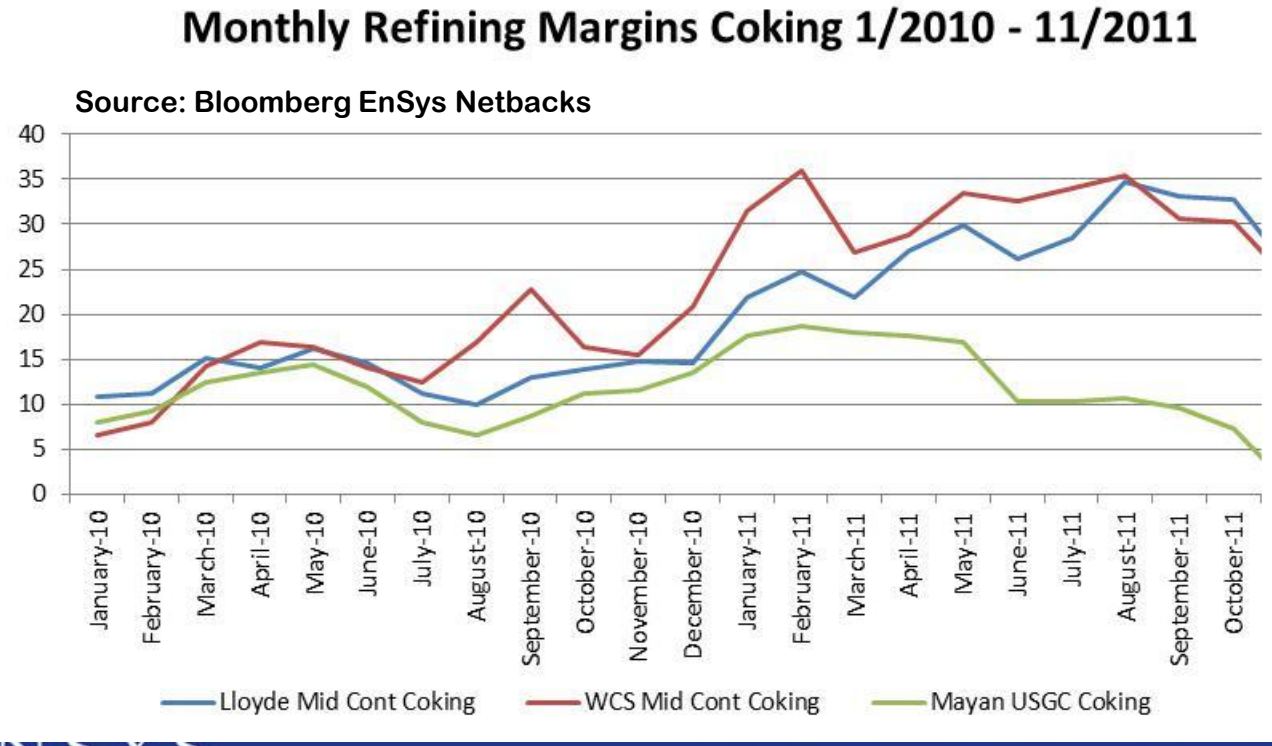


Transportation	Price range
Catoosa (Truck+Barge)	$12 - $15
Rail manifest (indirect)	$8 - $10
Rail unit train (indirect)	$6 - $ $8
Pipeline	$2 - $4
Seaway tariff (north)	$1.10 -$1.75

ENSYS ENERGY

Today: Canadian + Cushing = Congestion

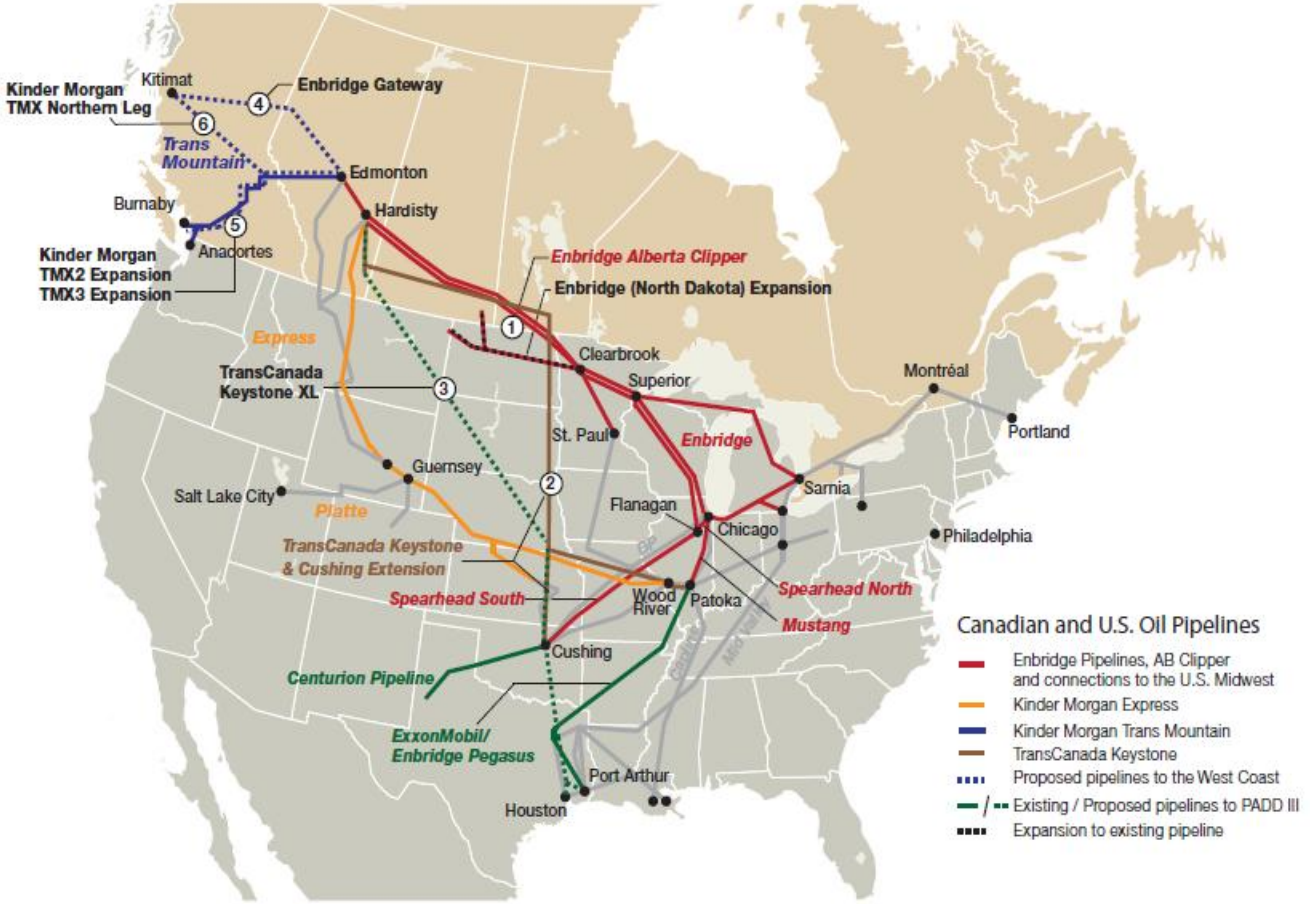
- **US / Western Canada producers losing out**
- **Foreign producers arguably benefiting**
- **Midcontinent refiners benefiting**



ENSYS ENERGY

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

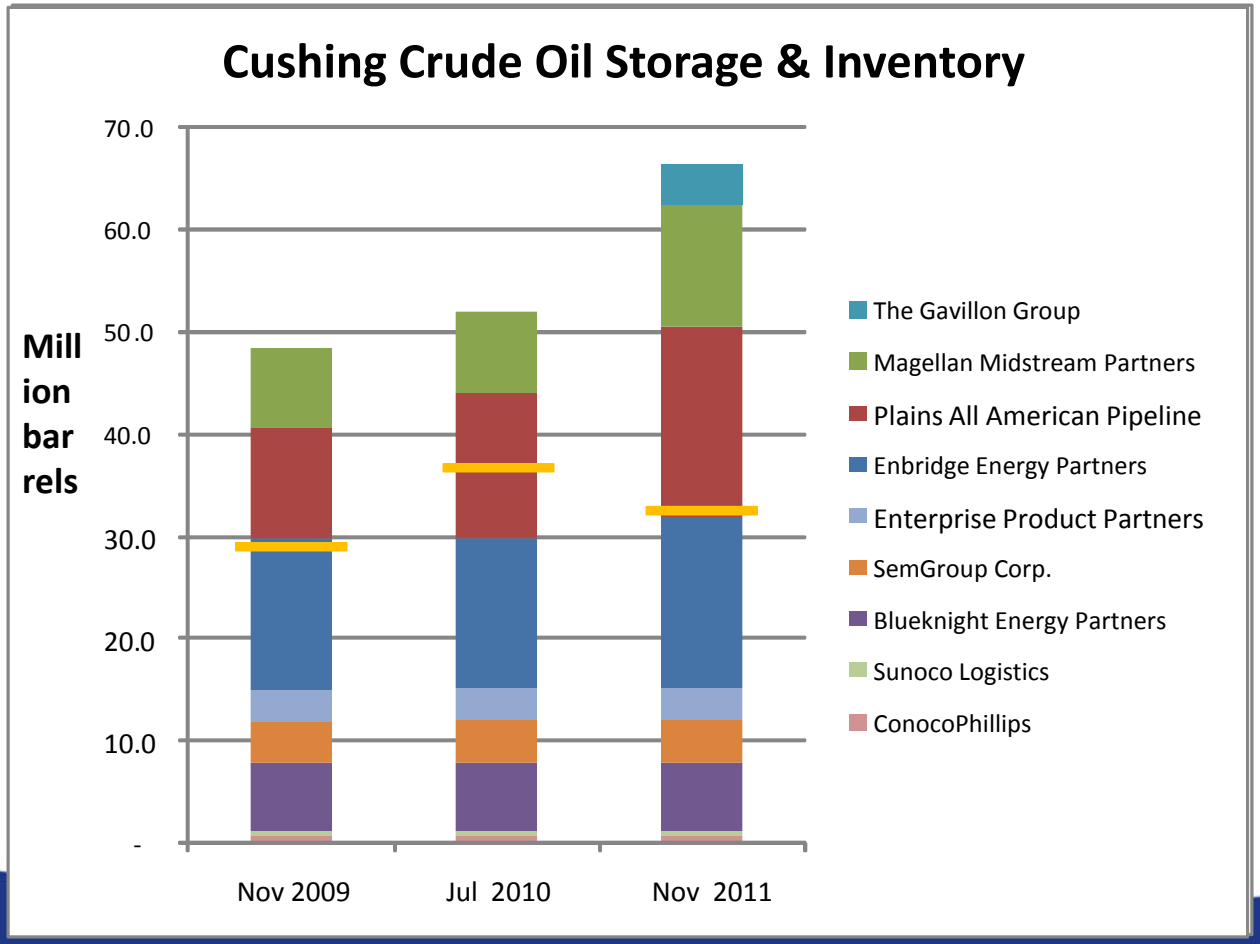
- System is designed for taking WCSB in to PADD2 and Ecan and US Gulf of Mexico and foreign crudes in to PADDs 2 and 3



ENSYS ENERGY

Cushing:
Storage Companies are Racing to Add Capacity

- **Inventories:**
  - **Rose ~0.4 mb per month since 2009**
  - **Have recently dropped back**
- **Increasing total capacity**



ENSYS ENERGY

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

- **Cushing "I/O" imbalance**
  - **Today severe**

Cushing Pipeline Capacity	**mbd**		**mbd**
In:		**Out:**	
From north/east	0.340	To north/east	0.740
From west	0.950	To west	0.255
From south (Seaway)	0.350	To south	0
Total	**1.640**	**>>**	**0.995**

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

- **Cushing "I/O" imbalance**
  - **Seaway reversal partially alleviates**

Cushing Pipeline Capacity	**mbd**		**mbd**
In:		**Out:**	
From north/east	0.340	To north/east	0.740
From west	0.950	To west	0.255
From south **(-Seaway)**	0	To south **(+Seaway)**	0.15-0.40
Total	**1.29**	**≈**	**1.15-1.45**

ENSYS ENERGY

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

- **Cushing "I/O" imbalance**
  - **Adding Wrangler – Flanagan**

Cushing Pipeline Capacity	**mbd**		**mbd**
In:		**Out:**	
From north/east **(+ Flanagan)**	0.690	To north/east	0.740
From west	0.950	To west	0.255
From south **(-Seaway)**	0	To south **(+ Seaway & Wrangler)**	0.55-1.2
Total	**1.64**	**<**	**1.55-2.25**

ENSYS ENERGY

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

- **Midwest refining projects will help relieve the pressure on WCSB heavy crudes**
  - **But add to that for Lower 48 light sweet**
  - **And production of both keeps growing**

	Impact mbd	Start up
Midwest/Midcont WCSB heavy projects:		
WRB Refining Wood River Illinois	0.130	2011/12
WRB Refining Borger Texas	0.110	2011/12
Marathon Detroit Michigan	0.080	2H 2012
BP Whiting Indiana	0.260	2013
Total	**0.580**	
MidContinent Debottlenecking	0.100	2011/12

ENSYS ENERGY

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

- **Major pipeline projects are needed**

Projects to US Gulf Coast	Capacity mbd	Start up
Magellan Longhorn Reversal	0.135/0.225	2013
Seaway Reversal	0.15/0.40	2012/2013
Flanagan / Wrangler Pipeline (Enbridge, Enterprise Product Partners)	Flanagan 0.300 Wrangler 0.800	2Q 2013
Transcanada Keystone XL	0.700	2014??
Transcanada Keystone XL expansion	0.130	2015??
Total to GC	**up to 2.2**	

ENSYS ENERGY

Fundamental Issue :
Pipeline Capacity In Exceeds Capacity Out

- **Major pipeline projects are needed**

Projects to British Columbia Coast	Capacity mbd	To BC / Asia	Start up
Kinder Morgan Trans Mountain expansion (1)	up to 0.400	Yes	2015?
Kinder Morgan Trans Mountain Northern Leg	0.400	Yes	uncertain
Enbridge Northern Gateway (2)	0.525	Yes	2017?
Enbridge Northern Gateway expansion	0.275	Yes	Uncertain
Total	**up to 1.6**		

(1) Open seasons under way 4Q 2011 to gauge level of interest

(2) Application before NEB. Recent open season led to full 0.525 mbpd commitment

ENSYS ENERGY

Keystone Mainline & XL Projects
Add 1.3 mbd expandable to 1.5 mbd

- **Keystone Mainline (2010, 2011)**
  - Initial 435,000 bpd
  - Expanded to 591,000 bpd & to Cushing
- **Keystone XL (2014??)**
  - 1 permit; 2 construction projects
  - new lines from WCSB to Steele City and from Cushing to USGC
    - Start up 2013 subject to permits
    - 700,000 bpd expandable to 833,000 bpd
    - Committed min 380,000 bpd WCSB to USGC, additional interest
  - KXL Bakken Marketlink
    - Intake of Bakken crudes at Baker, Montana
  - KXL Cushing Marketlink
    - Offtake of WCSB and intake of MidContinent crudes at Cushing

ENSYS ENERGY

KXL Focal Point of Political Debate

- **Supporters:**
  - Energy security
  - Jobs
  - Industry supply/refining logic
- **Opponents:**
  - Oil sands “bad” GHG footprint
  - Damage to boreal forest
  - Risk to water supplies Ogallala
  - Counter to clean energy goals
- **Status:**
  - DOS / Nebraska re-routing delay
- **Environmentalists:**
  - Next stop Northern Gateway

Enbridge Mainline pipeline break, Summer 2010

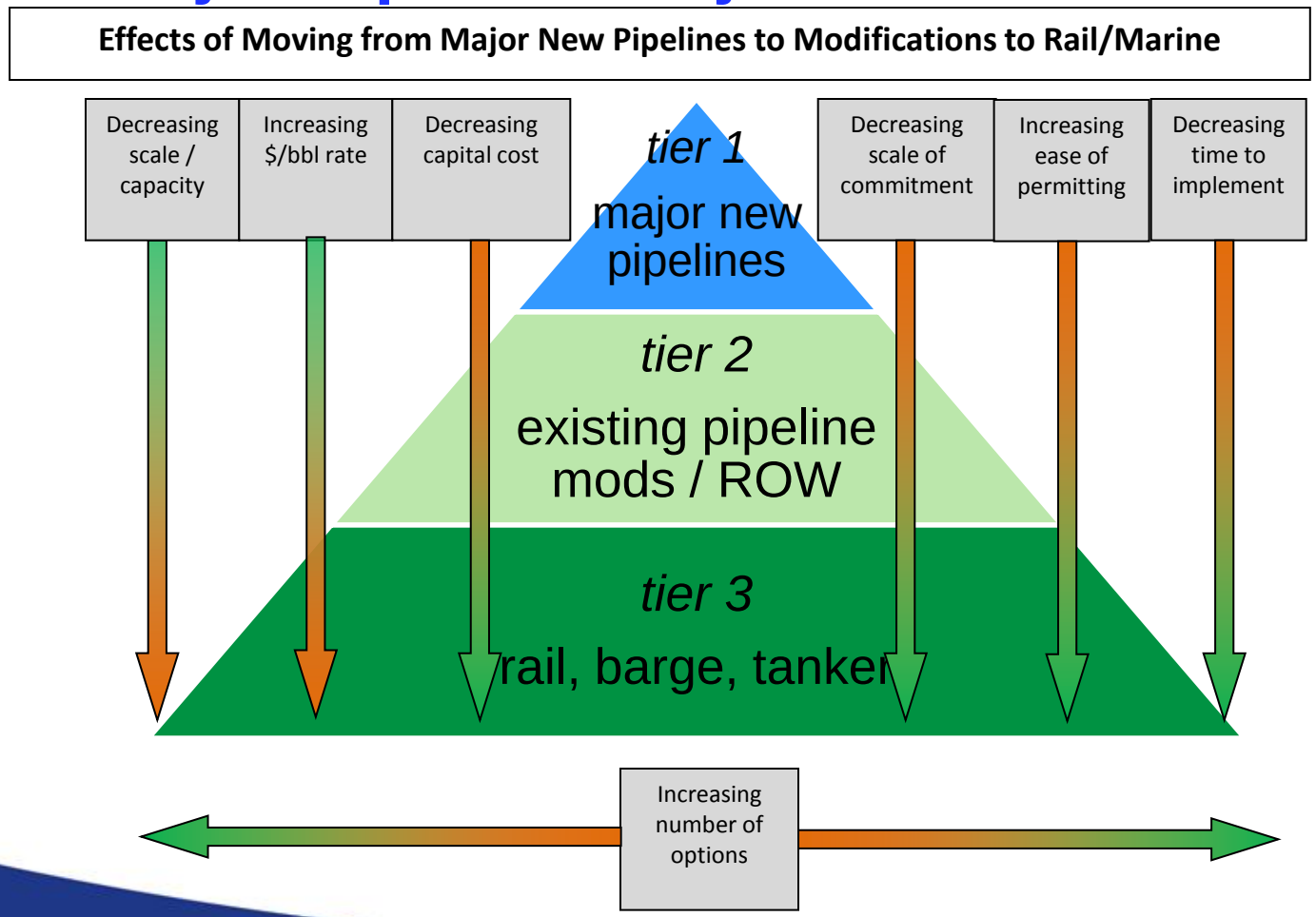
1) Great Lakes
2) Lake St. Clair and the St. Clair River
3) Indiana Dunes
4) Deep Fork Wildlife Managment Area
5) Native Prairies and the Threatened Topeka Shiner Minnow
6) Whooping Crane and Sandhill Crane Habitat
7) Ogallala Aquifer
8) Prairie Potholes and Migratory Birds
9) Shortgrass Prairie and Mountain Plover
10) Pronghorn Antelope Habitat

ENSYS ENERGY

Result is Pipeline Focus & Uncertainty

ENSYS ENERGY

What are the Options for Taking Lower 48 and WCSB Crudes to Market if Major Pipeline Projects Constrained?



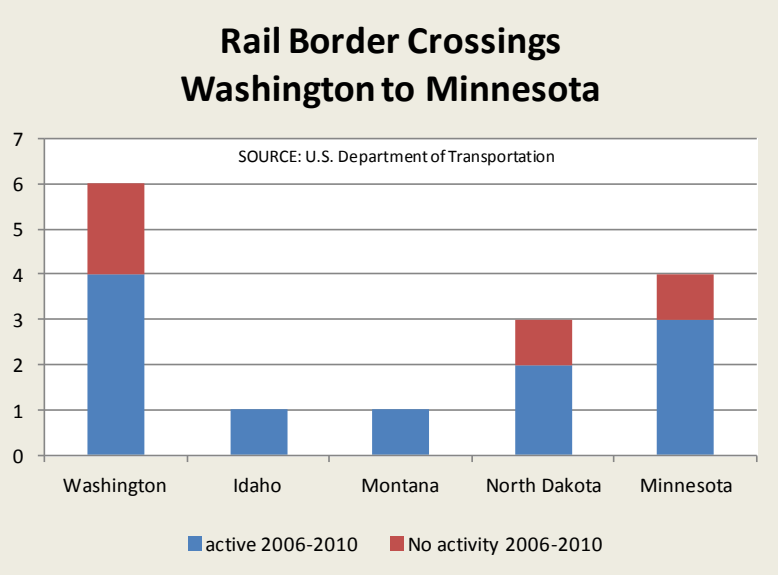
Rail: Different Economics vs Pipeline

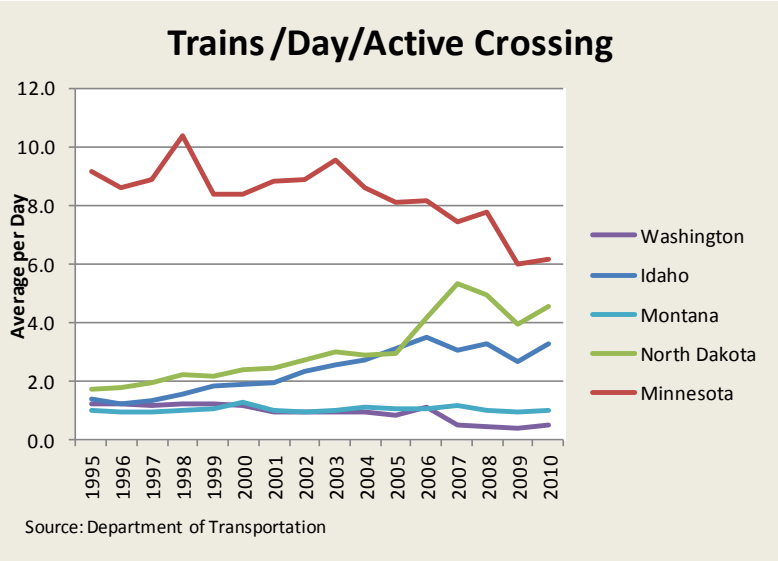
- $/bbl rate higher but
  - Unit trains bring better economics
  - Far lower capital cost / scalable
  - Shorter time to develop (12-18 months)
  - Easier permitting
  - Quicker transit to market
    - Hardisty to GC 8-10 days versus 40 +/- for pipeline
  - Greater flexibility / market destinations
  - Shorter contract terms (0-5 years)
- Alberta bitumen
  - Option to move as DilBit or undiluted in heated rail cars
  - Economics comparable to pipeline per bbl bitumen moved
  - Economics can be better if diluent back-hauled

Rail: Available Capacity / Infrastructure

- **US and Canada rail systems**
  - **Infrastructure already built**
  - **Under-utilized post-recession**
  - **Petroleum <= 2 % of total rail movements**

- **US-Canada cross-border rail crossings**
  - **Oil imports by rail ~110,000 bpd ~70,000 bpd WA - MN**
  - **Significant expansion potential using existing crossings**

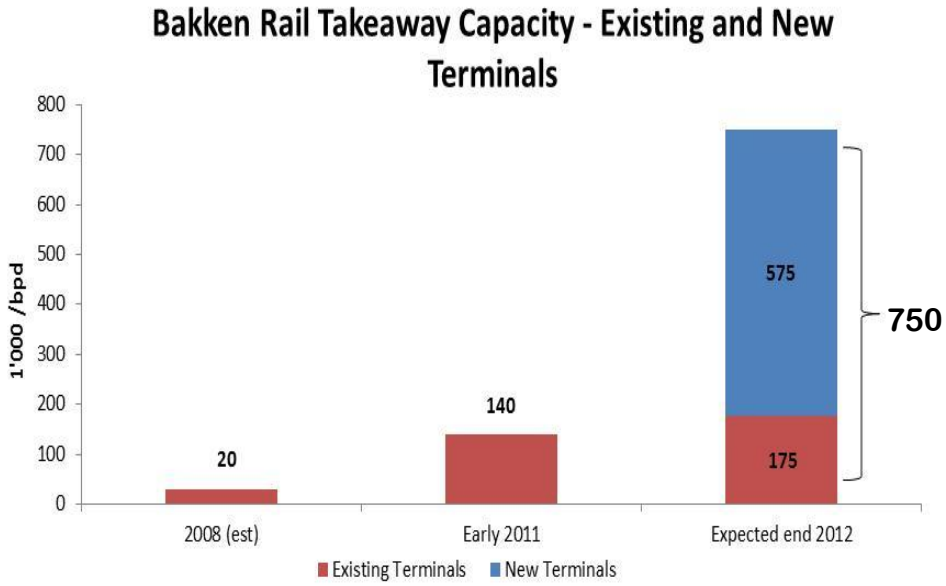




ENSYS ENERGY

Rail: Rapid US Expansion

- **Dramatic Bakken increase illustrates potential**
  - **Takeaway capacity expanding at 250,000+ bpd per annum**
  - **Large & small companies involved:**
    - **Hess, Kinder Morgan, BNSF, Enbridge, NuStar *et al***
- **Expanding destinations / receiving capacity:**
  - **GC: St. James, Port Arthur**
  - **WC: Tesoro, California**
  - **Cushing: Stroud, OK**
  - **EC: Global Albany NY to barge**



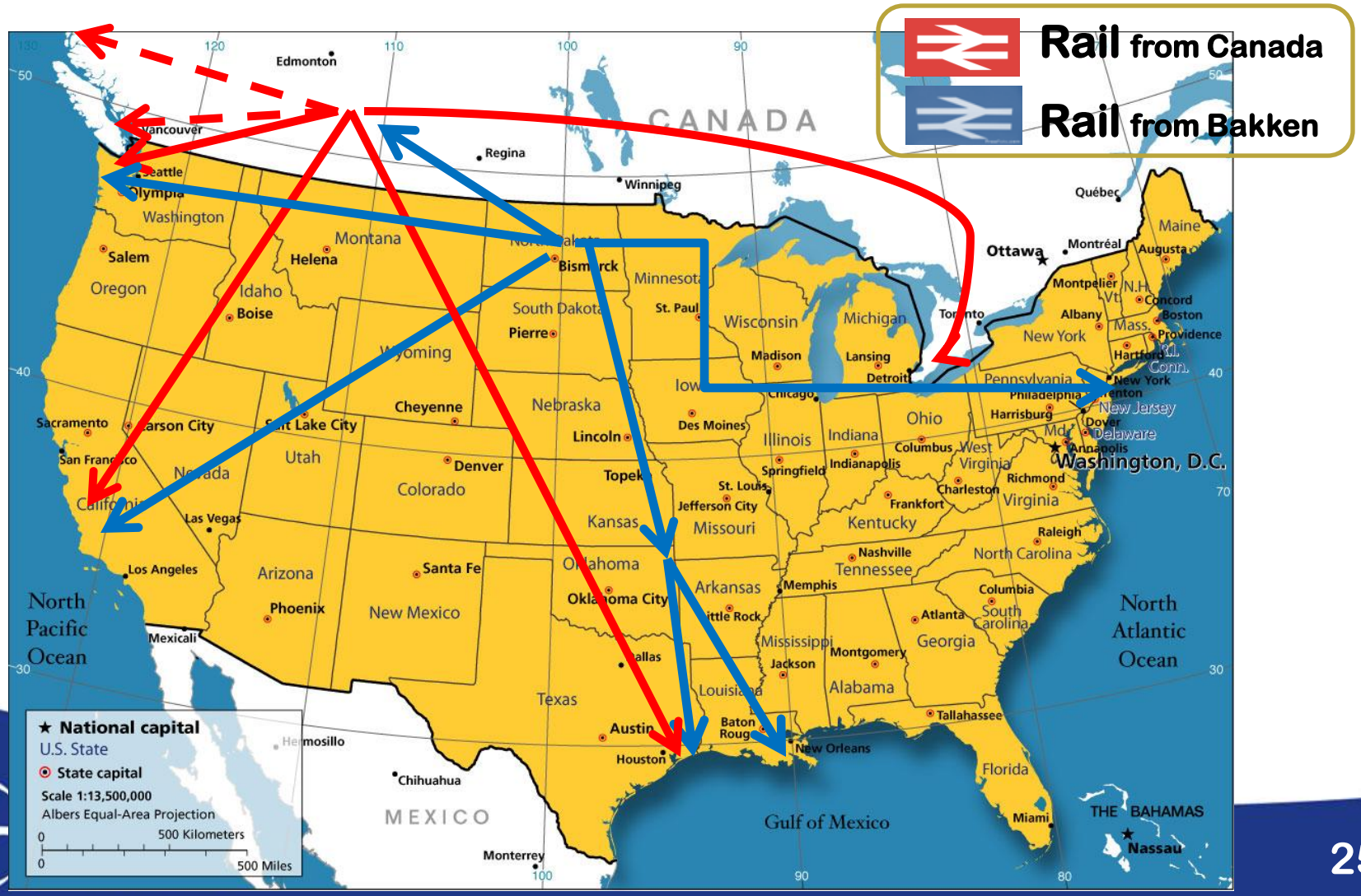
Source: North Dakota Pipeline Authority & Musket Corporation

Rail: History & Potential in Canada

- History of rail movements ~100,000 bpd
- CN Rail and Canadian Pacific now actively investing
- WCSB crude already being shipped to:
  - Gulf Coast
  - Washington
  - California
  - Ontario
- Potential to expand to BC Coast:
  - Vancouver
  - Kitimat
  - Port Rupert

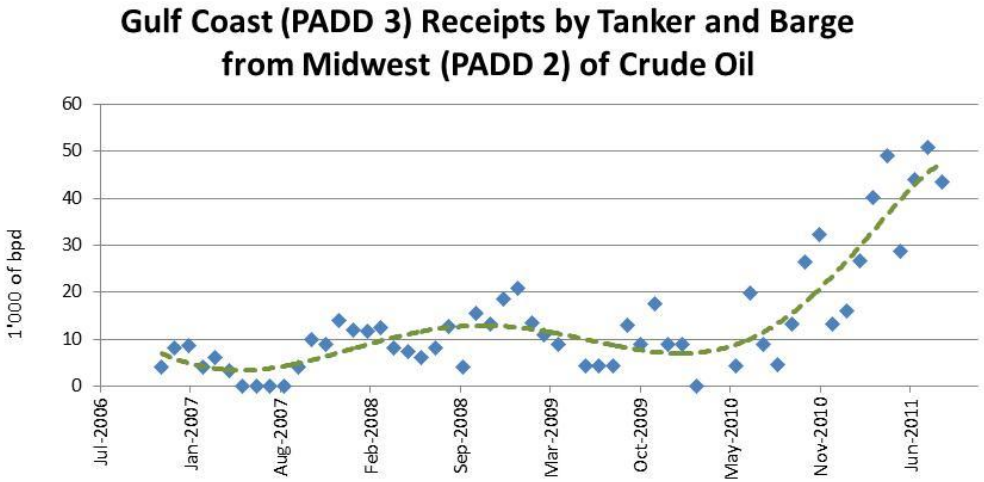
ENSYS ENERGY

Rail: Increasing Current Capacity & Potential



Barge & Tanker: Support Pipeline/Rail

- **Pipeline to barge PADD2 to PADD3**
  - Rising volumes
  - Wood River to USGC
  - Catoosa to USGC
  - Substantial potential given time to build barges, terminal mods



Source: U.S. Energy Information Administration

ENSYS ENERGY

Barge & Tanker: Support Pipeline/Rail

ENSYS ENERGY

In Summary

- **EnSys 2010 KXL Assessment concluded:**
  - **Commercial need now for KXL (or equivalent)**
  - **But KXL not essential**
    - **Under normal situation and over time**
    - **alternative pipelines could supply capacity similar to KXL**
    - **including substantial further capacity to USGC**
  - **Strong incentives to build pipeline capacity to BC – Asia markets**
  - **The competition is between US and Asia for WCSB crudes**
    - **with Middle East crudes the main (re)balancer**
  - **It is US demand reduction – not pipelines – that cuts total oil imports**
    - **Low Demand scenario looked at 4 mbd less US demand by 2030**

ENSYS ENERGY

In Summary

- **EnSys 2011 KXL Update concluded:**
  - **It may be possible to halt one or two major new projects**
    - **Keystone XL, Northern Gateway**
  - **But difficult to restrict pipeline mods, multiple options**
  - **If major pipelines were restricted, alternative transport modes can support Lower 48 and WCSB production and distribution**
  - **Rail increasingly presenting an alternative**
    - **US: potentially 1+ million bpd takeaway capacity**
    - **WCan: potentially 1-2 million bpd**
  - **Barge and tanker can play significant roles**
  - **Full oil sands upgrading to products in Canada also a player**
    - **Retaining the value in Alberta/Canada**

ENSYS ENERGY

In Summary

- **Looking forward:**
  - **Outlooks must take into account not only pipelines but also rail/barge/tanker**
    - **EIA do not report oil movements by rail**
  - **We are in a period of important developments**
    - **Longhorn, Seaway, Wrangler/Flanagan, KXL,**
    - **Trans Mountain, Northern Gateway**
  - **But it will take time to resolve the congestion**

Thank you !

Martin Tallett

EnSys Energy

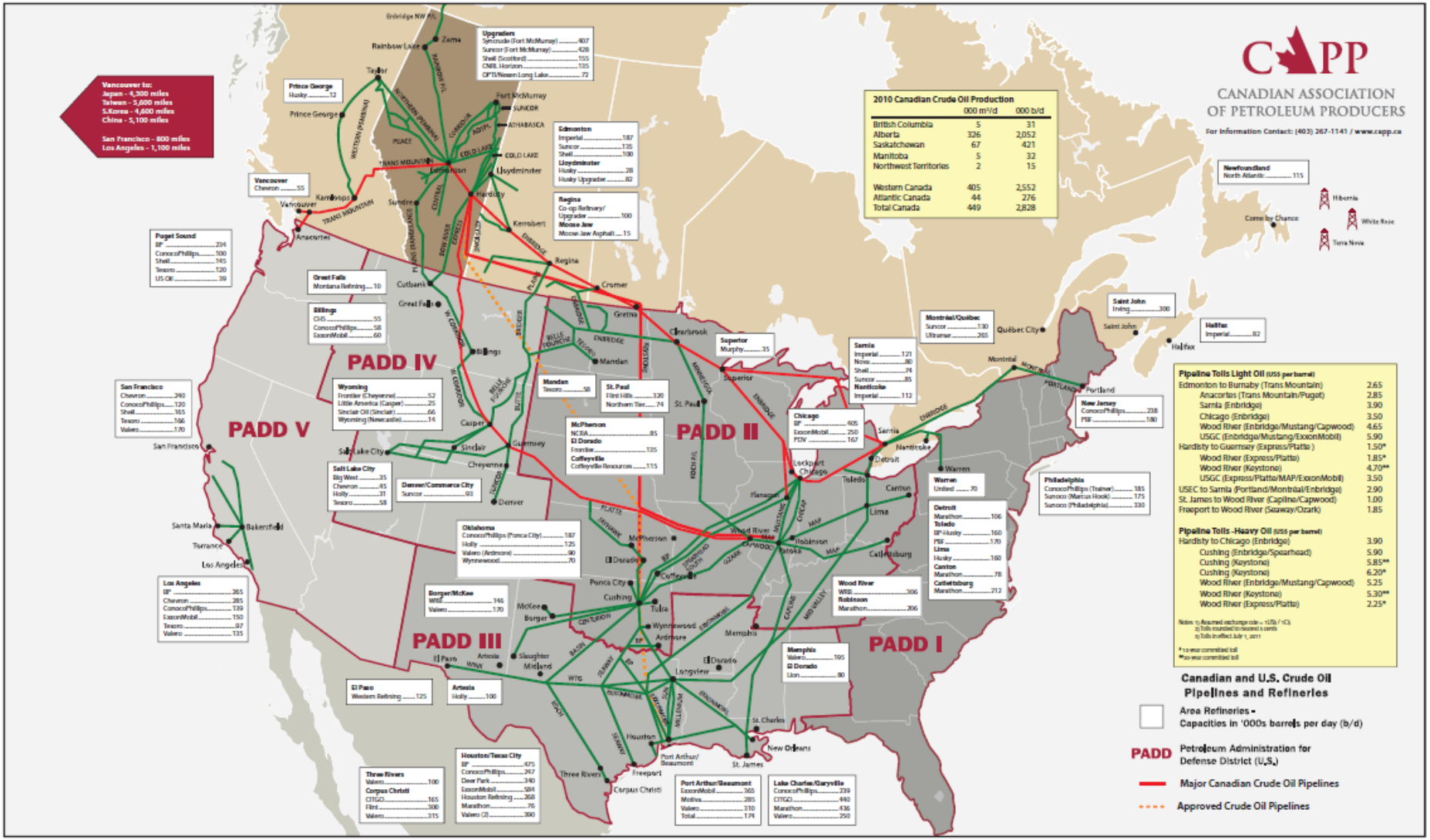
1775 Massachusetts Avenue, Lexington, MA 02420, USA

(781) 274 8454

www.ensysenergy.com

ENSYS ENERGY

Extras



ENSYS ENERGY

Bakken Rail Takeaway Capacity Current and Future Projects

Bakken Rail Takeaway Capacity - Current and future projects		
Facility/project	**Early 2011 b/d**	**Expected capacity by end 2012 b/d**
Various Sites in Minot, Dore, Donnybrook and Stampede (est)	30,000	30,000
EOG Rail, Stanley, ND [1]	65,000	65,000
Dakota Transport Solutions, New Town, ND	20,000	40,000
Musket - Dore	15,000	30,000
Musket - Dickinson	10,000	10,000
Subtotal - Existing Projects	**140,000**	**175,000**
Hess Rail, Tioga, ND [2]	in development	60,000
Rangeland COLT Hub, Epping, ND	Operational by January 1, 2012	80,000
Savage Services, Trenton, ND	Operational by 2nd Quarter of 2012	72,000
Watco & Kinder Morgan, Dore, ND	Operational by September 1, 2011	60,000
Enbridge Berthold		31,000
EDOG Logistics - Dickinson Railroad Shipping [3]	Operational by September 1, 2011	200,000
BakkenLink Belfield [4]		72,000
Subtotal - Future Projects		**575,000**
Total capacity	**140,000**	**750,000**
[1] Up to 90,000 b/d capacity		
[2] Up to 120,000 b/d capacity		
[3] The facility could handle more than 500,000 b/d between stage 2 to 5 of the project		
[4] This project hasn't been confirmed yet		
Source: North Dakota Pipeline Authority & Musket Corporation		

ENSYS ENERGY

Barge & Tanker

- **US river network opens up routing options**

Source: Kirby Corporation