

Marketability of Oil Sands Products in Asian Countries

Presentation to HUTF

June 20, 2007

Duke du Plessis, Alberta Energy Research Institute (AERI)

Nancy Wu, Alberta Employment, Immigration and Industry

Background

- Prepared by Institute of Energy Economics Japan (IEEJ)
- Commissioned by AEI and Alberta Energy
- Consulted with Alberta industry experts
- Explores at a macro level the potential markets for Canadian oil sands (synthetic and bitumen blends) and oil sand-derived products (gasoline and diesel oil) in Asian countries.
- Purpose:
 - Understand the opportunities and risks in the marketing of oil sands products in Asia
 - Understand the drivers such as price and quality of oil sand that affect the introduction of oil sands in the Asian countries.
 - Understand the strengths and limitations of IEEJ's models

Outline

- Asian Petroleum Industry Demand Outlook
- Petroleum Refining and Trade Estimation Model (LP Model)
- Marketability of SCO, Synsynbit, Synbit and Dilbit in Asian Countries
- Marketability of Diesel and Gasoline Derived from Oil Sand
- Price Sensitivity Analysis
- Conclusions

Asia Petroleum Demand Summary (2015)

Use World Energy Demand-Supply Model

Macro econometric model based on data from UN, IEA and USDOE Annual Energy Outlook (2006)

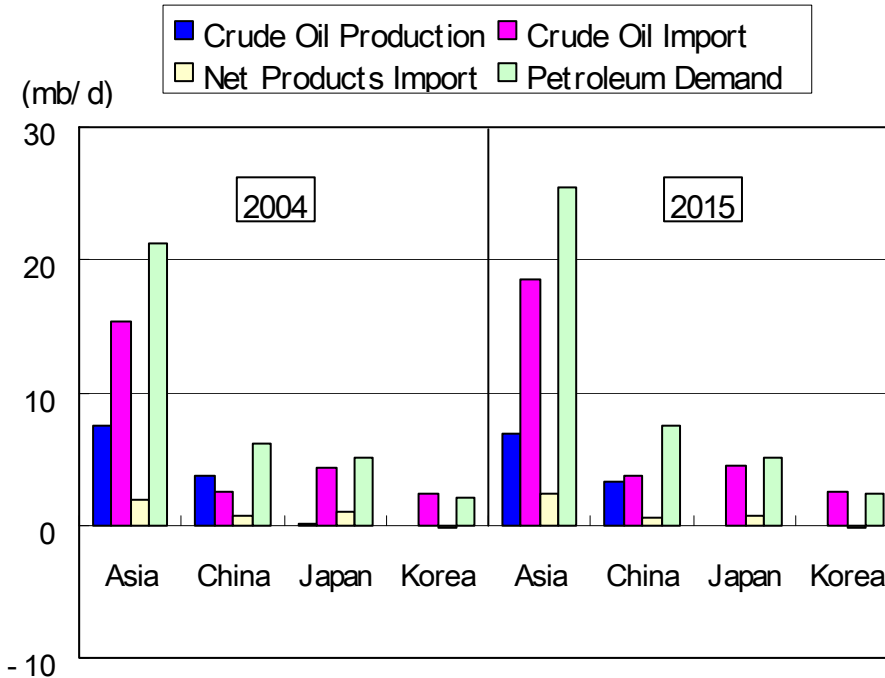
Estimates world demand for oil and petroleum products for each of 30 countries

2003

mb/ d	Crude Oil		Products Net Import	Petroleum Demand
	Production	Import		
Asia	7.1	13.3	1.5	20.8
China	3.4	1.5	0.4	5.1
Japan	0.0	4.0	0.8	5.6
Korea	0.0	2.7	-0.3	2.3

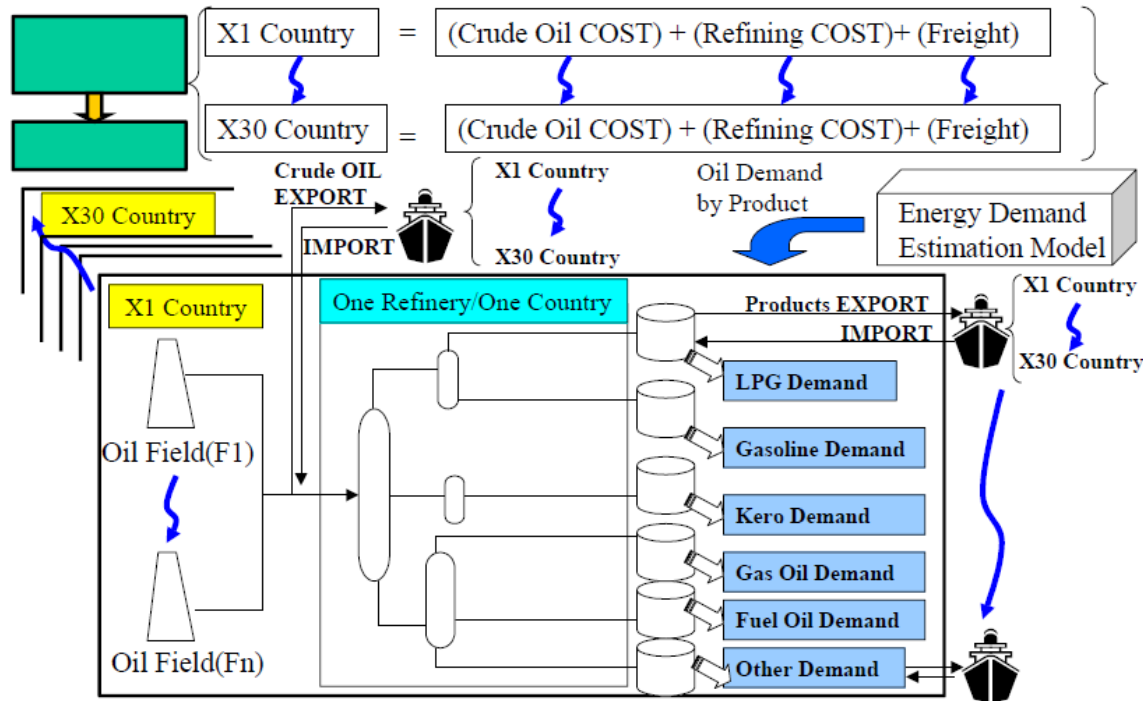
2015

mb/ d	Crude Oil		Products Net Import	Petroleum Demand
	Production	Import		
Asia	7.4	21.5	2.5	29.2
China	3.6	4.5	0.7	9.0
Japan	0.0	4.5	0.9	5.3
Korea	0.0	2.6	-0.10	2.6



- Petroleum demand in Asia will increase by 40% to 29.2 million B/D in 2015. This increase will be covered either by increasing crude oil import and processing at regional refineries or by importing petroleum products.
- Crude oil import will increase by 8.2 million B/D to 21.5 million B/D and net products import will increase by 1.0 million B/D to 2.5 million B/D.
- Even with the near doubling of the refining capacity from 5.5 million B/D in 2003 to 9.3 million B/D in 2015, China cannot catch up with the increase in the petroleum demand. China's net products import increases by 0.30 million B/D to 0.7 million B/D.

Conceptual Diagram of Petroleum Refining and Trade Estimation LP Model



- The model divides the world into 30 regions or countries and estimates petroleum demand respectively
- Whether the oil refinery in each area imports crude oil and refines them into products, or imports products from other regions to cover the demand is determined by solving the LP model
- The LP solution minimizes the sum of the crude oil cost, refining cost, and transportation cost for crude oil and refined products for the world as a whole, which in turn determines the trade flow of crude oil and the refined products
- “Reference Scenario” doesn’t take into consideration oil sand export to Asian oil market

Oil Sands Crude Quality Assumptions

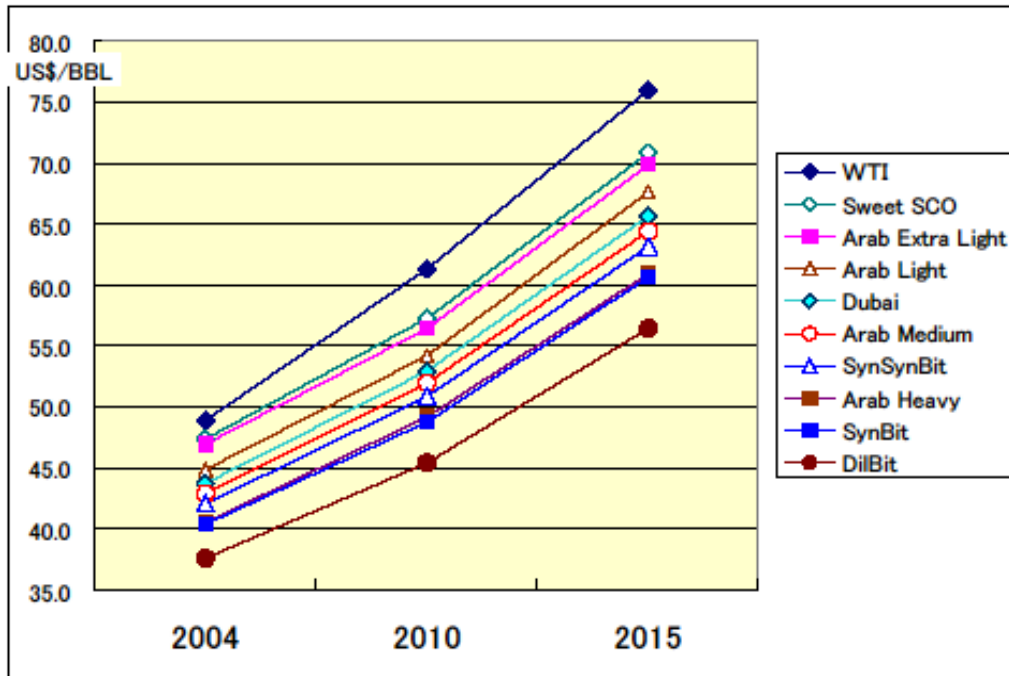
Blend Ratio Vol%	Athabasca Bitumen	Dilbit (Cold Lake Blend)	SynBit	SynSynBit	Sweet SCO	WTI	Arab Extra Light	Arab Light	Dubai
Bitumen	100	72	52	36	-				
SCO	-	-	48	64	100				
Condensate	-	28	-	-	-				
API	83	22.6	19.9	24.2	34.8	39.6	38.4	32.7	30.6
Sulfur	4.8	3.4	2.5	1.8	0.1	0.2	1.2	1.8	2.0
LPG Vol%	0.0	0.3	1.3	1.8	2.8	2.1	1.7	1.7	2.4
Naphta	1.5	23.9	9.3	11.9	17.7	27.5	23.2	17.9	24.8
Jet	1.7	12.0	6.7	8.3	12.0	21.0	10.7	9.6	9.8
Diesel	13.9	7.3	23.4	26.6	33.8	13.6	22.5	24.1	20.5
VGO	31.9	17.6	32.6	32.9	33.4	23.5	41.9	46.7	25.7
Resid	50.8	38.9	26.4	18.3	0.0	10.3			16.7

- SynSynBit is a blend of 64% SCO and 36% Bitumen, and blended to approximate the quality of Middle East light sour crudes
- SynBit is a blend of 48% SCO and 52% Bitumen
- Dilbit is a blend of 28% condensate and 72% Bitumen

Source : Oil Sands Products Analysis for Asian Markets, Purvin & Gertz, April 15, 2005

Canadian Energy Research Institute, 2000

Price Assumptions



	2004	2010	2015
WTI	49.0	61.3	75.9
Arab Extra Light	47.0	56.4	69.8
Arab Light	44.9	54.3	67.7
Arab Medium	43.0	52.0	64.5
Arab Heavy	40.6	49.1	61.0
DilBit	37.6	45.5	56.4
Sweet SCO	47.3	57.2	70.9
SynSynBit	42.1	50.9	63.1
SynBit	40.4	48.8	60.6
Dubai	43.7	52.9	65.6

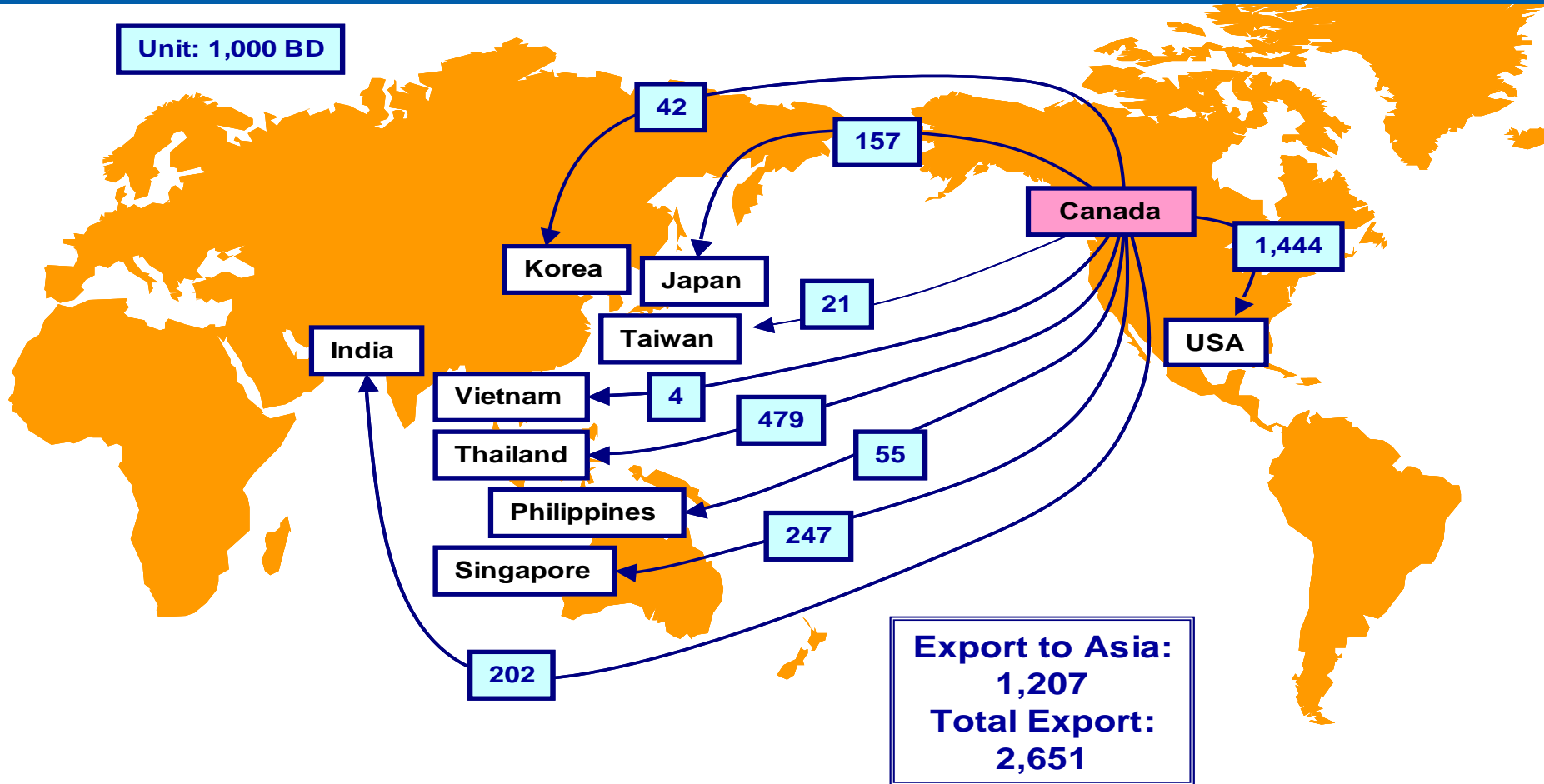
- Crude oil prices from Annual Energy Outlook 2006, USDOE
- Oil sands prices based on 2005 Purvin & Gertz Study “Oil Sands Product Analysis for Asian Markets”
- The SCO price for 2015 is assumed to be close to the Arab Extra Light price.
- The SynBit and SynSynBit prices are assumed to retain the same price gaps by percentage with the Dubai and Arab Extra Light prices.
- The DilBit price is assumed to follow the Dubai price trend.

Projected Oil Sand Exports for Sweet SCO (2015)



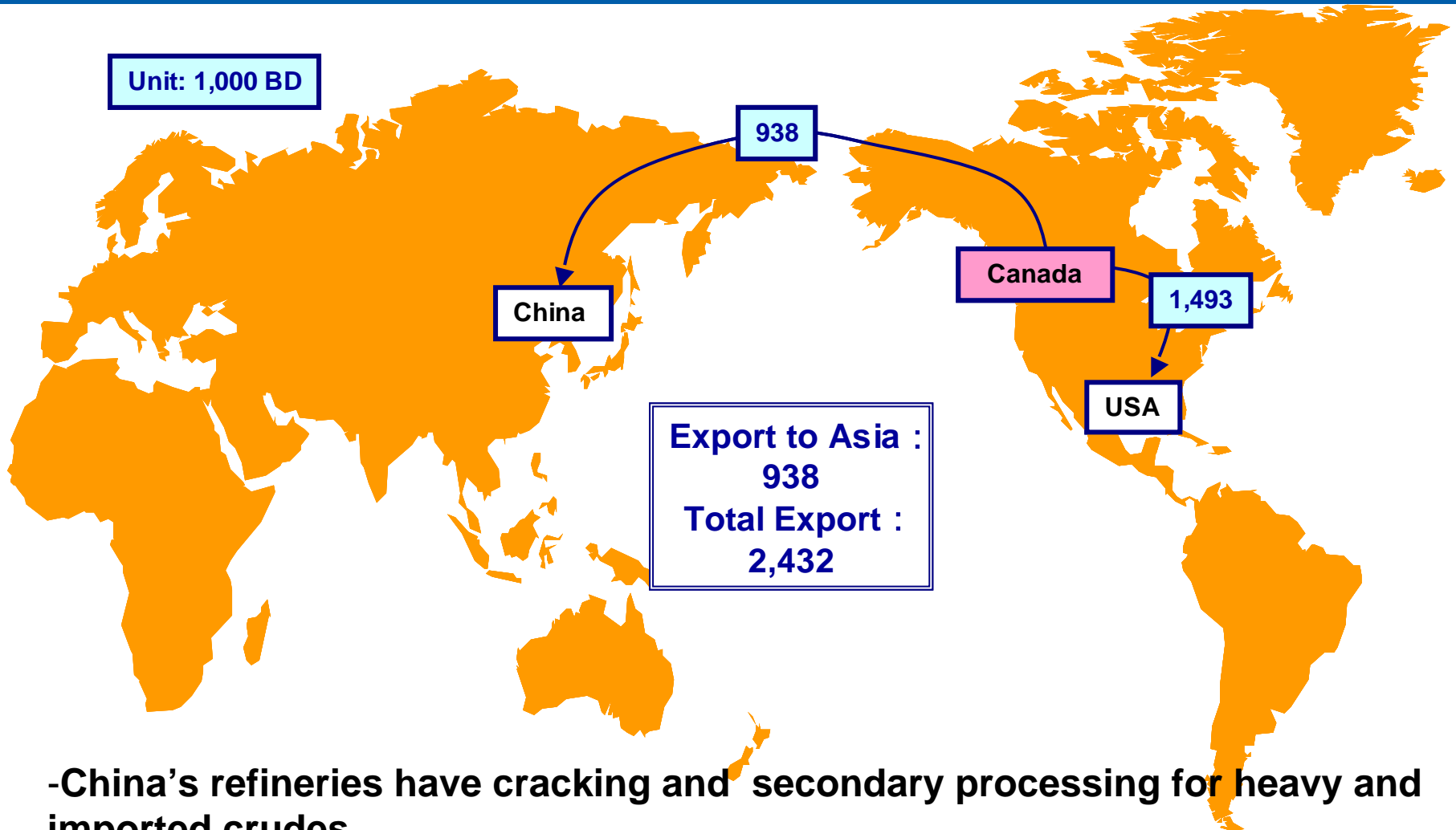
- When exporting in the form of SCO, Canadian oil sand exported to the USA is 1.381 mb/d, and Asia 0.958 mb/d

Projected Oil Sand Exports for SynSynBit (2015)



- SynSynBit exports and the number of countries importing SynSynBit is larger than for Sweet SCO
- SynSynBit export has the largest exporting volume, diversity of markets.
- Asia refineries are able to accept SynSynBit without any major modifications

Projected Oil Sand Exports for SynBit (2015)



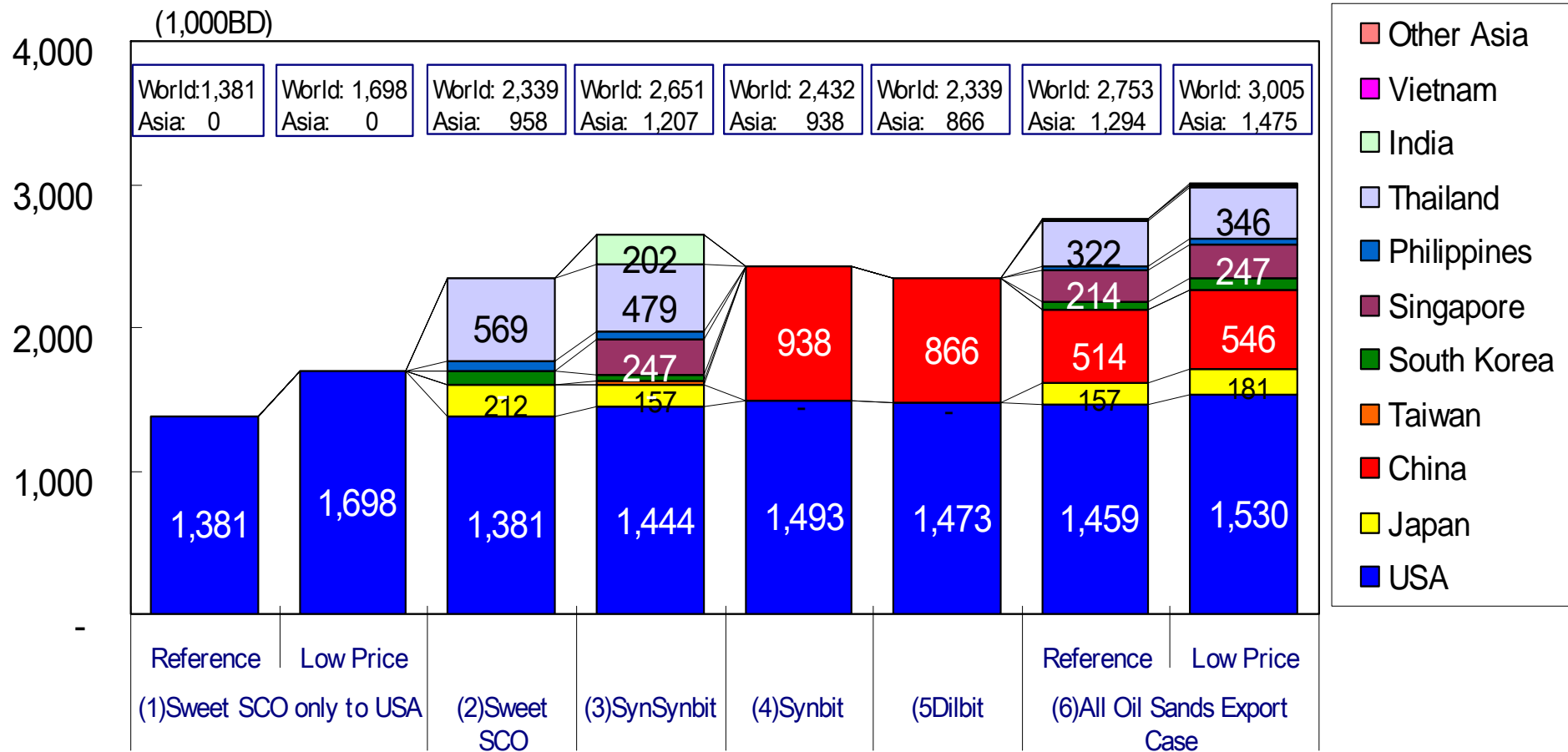
- China's refineries have cracking and secondary processing for heavy and imported crudes
- Low market diversity may lead to uncertain demand patterns.

Projected Oil Sand Exports for DilBit (2015)



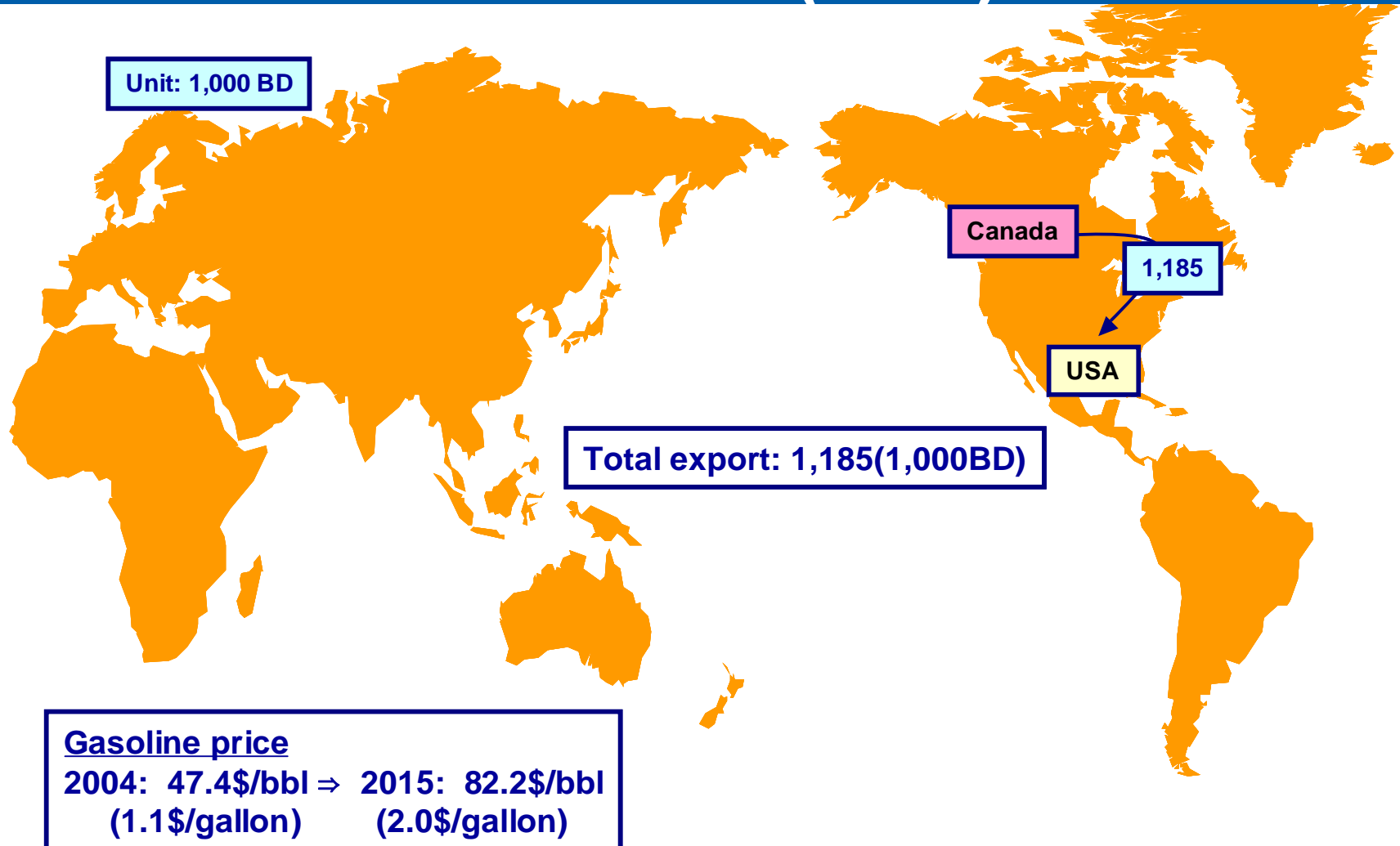
- Asian imports are limited to China.
- China can expand its cracking and reforming capacity to handle large volumes if DilBit

Comparison of Oil Sand Export Cases



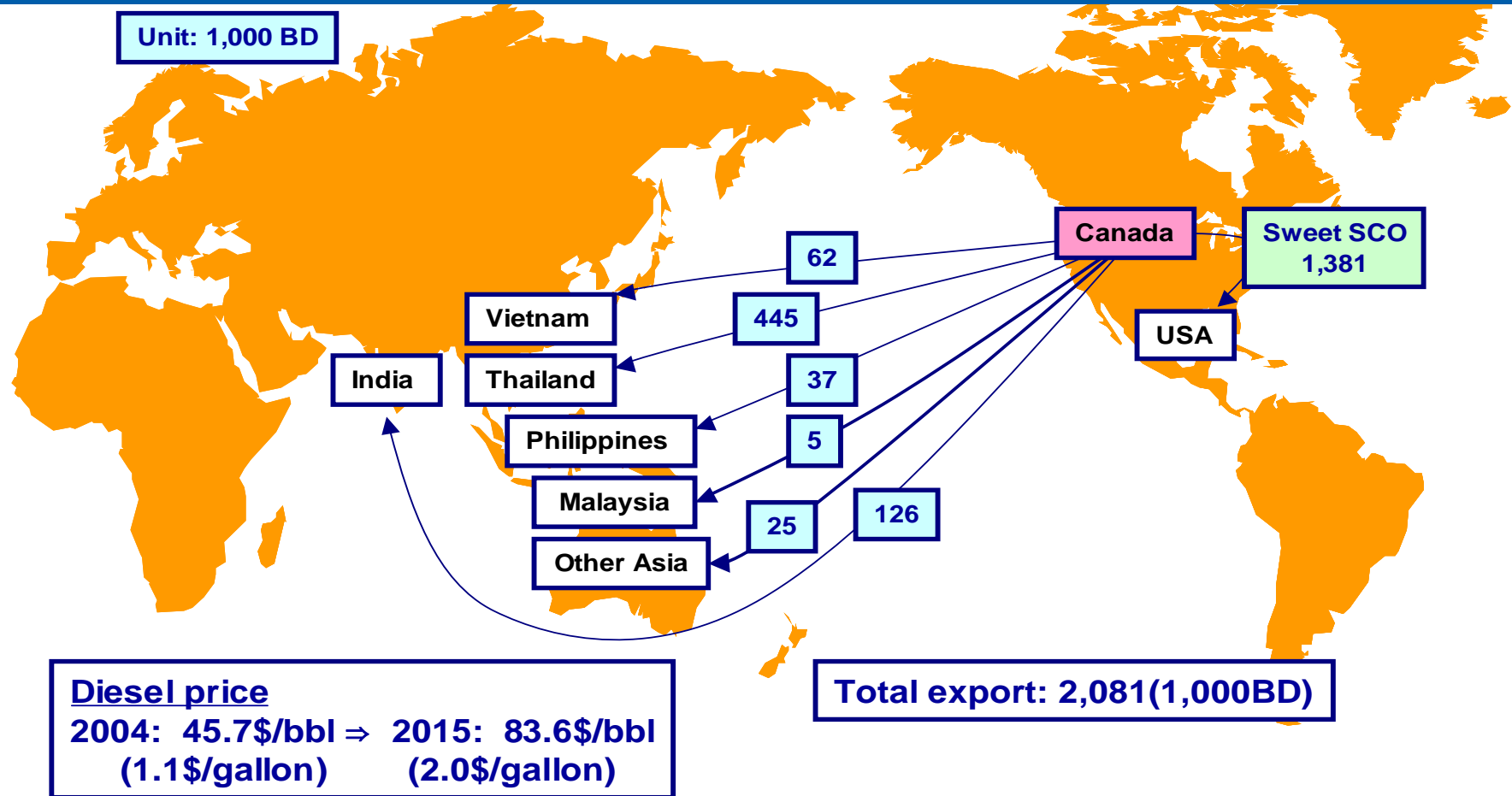
- All oil sands products have significant markets in Asia
- If a single product is exported, SynSynbit has the largest export volume and market diversity (US and Asia)
- Exporting all 4 types results in the largest volume of total exports to the U.S. and Asia and maximizes market diversity

Projected Exports Of Gasoline from Oil Sands (2015)



- If gasoline from oil sands is exported, export quantity is 1.185 mb/d, only for the U.S.

Projected Exports of Diesel Oil from Oil Sand in 2015



- U.S. imports 1.381 million b/d of Sweet SCO, but not diesel
- A total of 0.7 million b/d of diesel oil is exported to Asia (excluding China)
- China may cover all its diesel consumption on its own in the reference case but if China's oil refining capacity expansion is delayed, China has to import 0.170 million b/d from Canada.

Price Sensitivity Analysis (2015)

Product	Price	Price \$/bbl	Asian Market Bbl/day
SCO	Reference	70.9	960
	High (WTI +\$10)	+15	602
	Low (Arab Med)	-6.5	1034
SynSynBit	Reference	63.1	1,207
	High (Arab Light)	+4.6	972
	Low (DilBit)	-6.7	1293
Diesel	Reference	83.6	700
	High	+10	562
	Low	-10	767

- Asian markets for SCO, SynSynBit and Diesel are quite robust to price fluctuations
- Number of destinations don't change

Conclusions

- Alberta can be a competitive supplier of oil sands products including refined products into US and Asian markets.
- There is a significant Asian market (about 1 million bbl/d) for all oil sands products in Asia.
- There are large export markets for diesel fuel from Alberta oil sands (700,000 barrels per day).
- Relatively low price sensitivity confirms the strong demand and competitiveness of oil sands products.
- Oil Sand exports to Asia will work to mitigate increase in the region's dependence on Middle East and contribute to enabling oil-consuming countries to diversity oil supplies.

Future Work

- More rigorous analysis of key importing regions
- Price setting refineries analysis to better reflect regional market price
- Instead of one refinery model for each country, examine regional market opportunities that may affect the import volumes for a particular country
- Build understanding among Alberta producers and Asian refineries of oil sands market opportunities
- Encourage Alberta producers' support to exploit Asian market opportunities
- Capitalize on the relationship developed with IEEJ

Contact

Dr. Duke du Plessis

Senior Advisor and Research Manager

Alberta Energy Research Institute

Duke.duplessis@gov.ab.ca

Ms. Nancy Wu

Director – Investment Attraction

Alberta Employment, Immigration and Industry

Nancy.wu@gov.ab.ca

Mr. Yuji Morita

Senior Coordinator

IEEJ

ymorita@edmc.ieej.or.jp

Website: <http://eneken.ieej.or.jp/en/data/pdf/390.pdf>