

BIOGRAPHY

S. J. (Steve) Kelly

Purvin & Gertz, Inc.

Steve assumed the role of Calgary office manager for Purvin & Gertz in January 2006, and is a Senior Vice-President of the firm. Since joining Purvin & Gertz in 1996, Steve has been involved in the analysis of regional and global crude oil and petroleum markets. He has assisted numerous crude oil producers in the development of marketing strategies, including projects for a variety of conventional light, heavy and synthetic crude oils. Steve has completed feasibility studies, development projects and independent analysis for a wide range of Purvin & Gertz clients. While on a temporary work assignment in London, he managed the firm's European market analysis activities. Steve returned to Canada in August 2005.

Steve joined Purvin & Gertz from Shell Canada Limited, where he worked in a variety of manufacturing, operations and optimization roles.

Steve holds B.Eng. and M.Eng. degrees in Chemical Engineering from McMaster University, and an M.B.A from the University of Calgary. He is a registered Professional Engineer in Alberta.

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ABSTRACT

The Oil Sands Stage – Intermission or Rehearsal?

Steve Kelly

Purvin & Gertz, Inc.

The development of new oil sands projects slowed significantly in the 2009 economic climate. This has reduced the outlook for oil sands production and upgrading. Is this a pause before new development occurs? Or is this an opportunity for change?

The enormous bitumen resources of Canada's oil sands are conveniently located next to the largest oil market in the world. But the U.S. market seems to prefer not to use so-called "dirty oil". What must the oil sands industry do to meet this new challenge?

The paper will show how the outlook for oil sands production has changed, both for bitumen and for synthetic crude oil. It will discuss plans and future needs for petroleum products and refining, as related to oil sands.

The paper will discuss some of the challenges facing the oil sands industry. Issues include the qualities of synthetic crudes and bitumen blends, project costs, natural gas use and environmental considerations.

The paper will present some opportunities for change. These include technologies for new products, new markets and pipelines, and environmental improvements.

The Oil Sands Stage – Intermission or Rehearsal?



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The Oil Sands Stage – Intermission or Rehearsal?

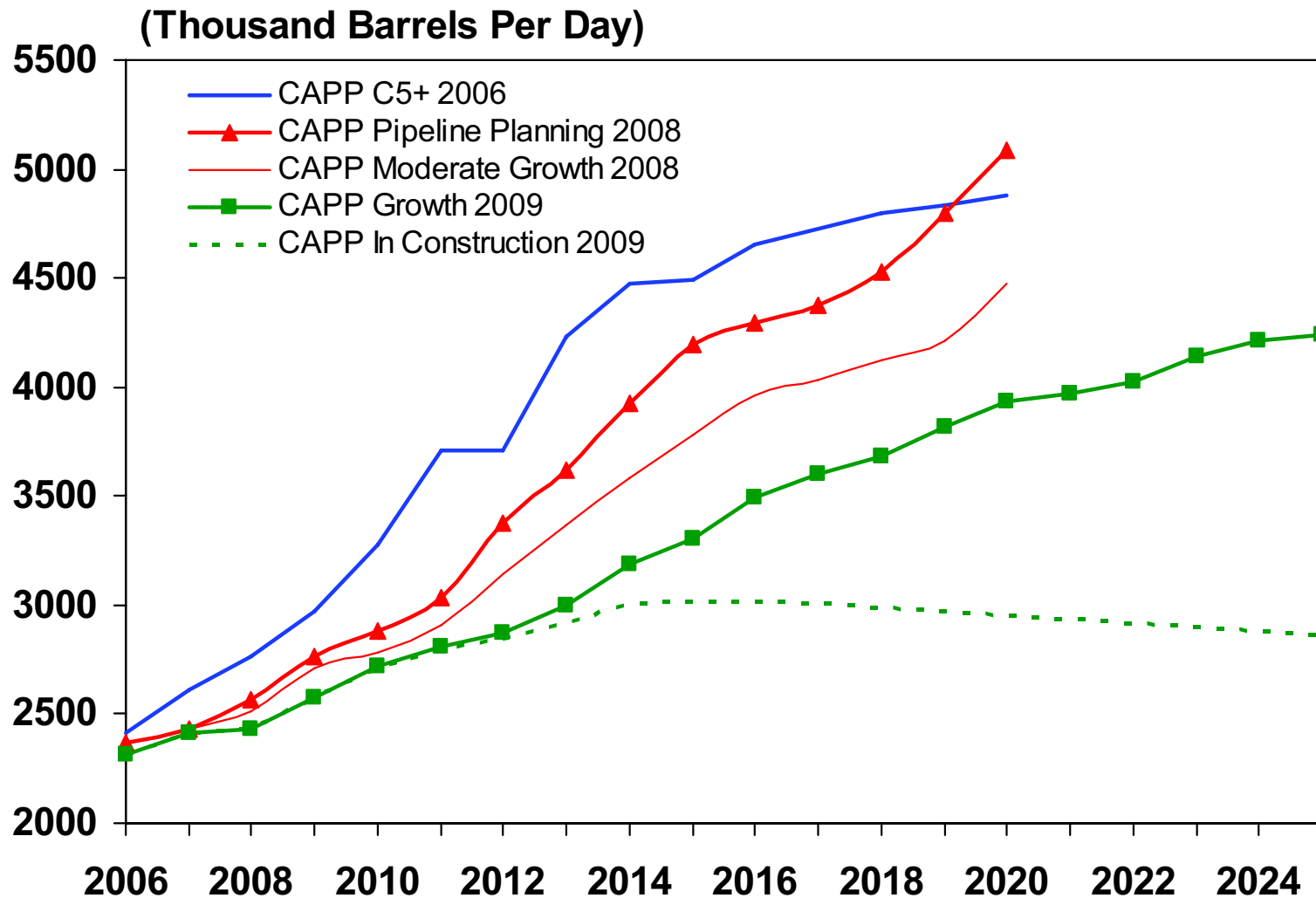
Presentation Outline

- **Oil Sands Supply Outlook**
- **Petroleum Market Trends**
- **Oil Sands Product Opportunities**
- **Costs and Value Drivers**
- **Greenhouse Gas Considerations**

Purvin & Gertz and Oil Sands

- **International Energy Consultancy**
 - Private and Independent
- **Firm established in 1947**
 - Headquartered in Houston
 - Maintained office in Calgary since 1973
- **35 years in oil sands (Canada and Venezuela)**
- **Maintain short-term and long-term forecasts**
 - Supply / Demand
 - Pricing
- **Refining and upgrading**
 - Technologies, Costs / Economics
- **Independent Engineer for banks/investors**
 - Initial project reviews and project reports
 - Project monitoring and certification of progress

Western Canada Crude Supply: CAPP Forecast Comparison



- Oil sands forecasts have driven down Canadian crude supply forecasts in recent years
- CAPP “In Construction” case would only complete existing construction projects

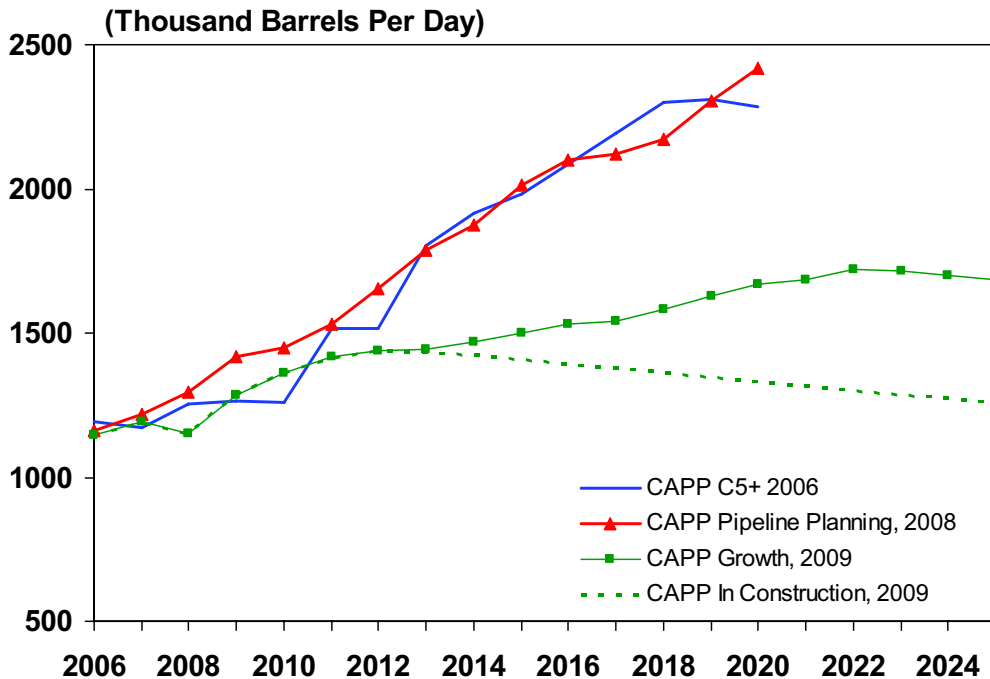
The downturn has dramatically changed the outlook for Alberta oil sands projects

- **Low projected upgrader returns has shifted focus to developing heavy crude**
 - Upgrader deferrals
- **Mine / SAGD project delays could slow bitumen growth**
- **Projected balance for heavy crude supports need for continued development**
 - Increased coker capacity
 - Declining traditional sources of heavy crude
- **Not all projects are cancelled or deferred; for example:**
 - Imperial / Exxon, Kearl Devon, Jackfish II

Suncor Voyageur	Firebag In-situ delayed Upgrader delayed
Shell AOSP Phase II	Mine/upgrader expansion on hold
Shell - Peace River	In-Situ Permit Application withdrawn
Fort Hills	Mine decision delayed Upgrader indefinitely shelved Merger with Suncor
Long Lake Phase II	In-Situ/upgrader decision delayed
Total Joslyn Creek	Mine delayed Upgrader on-hold
Total Northern Lights	Mine/upgrader Permit Application withdrawn
StatoilHydro	Upgrader cancelled
North West Upgrading	On-hold, pending financing
BA Energy	In administration, upgrader shelved

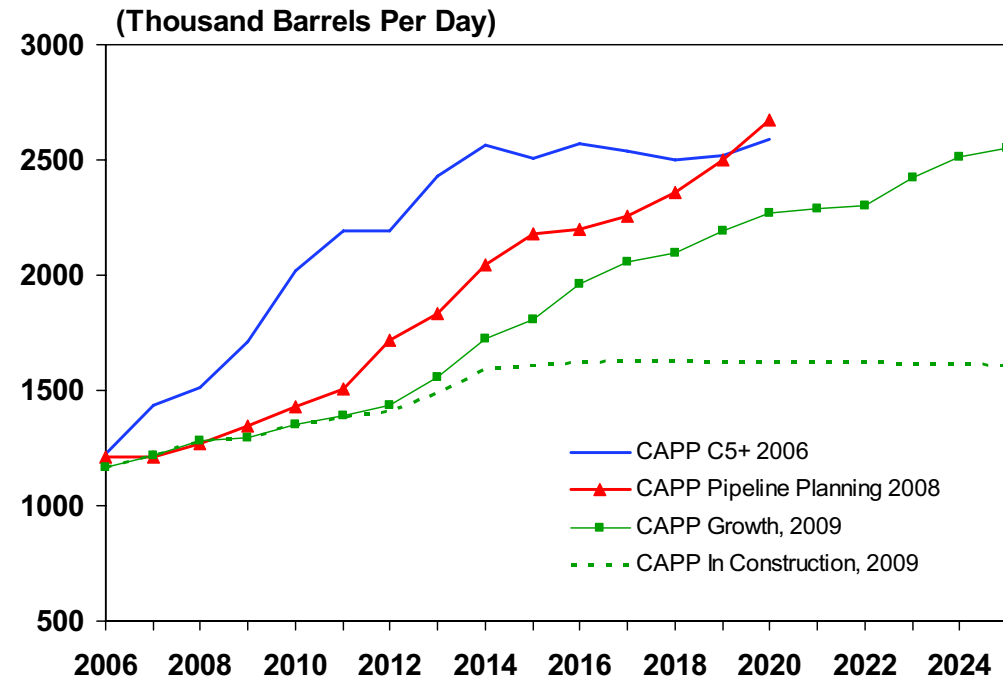
Western Canada Crude Supply: CAPP Forecast Comparison

Light Supply



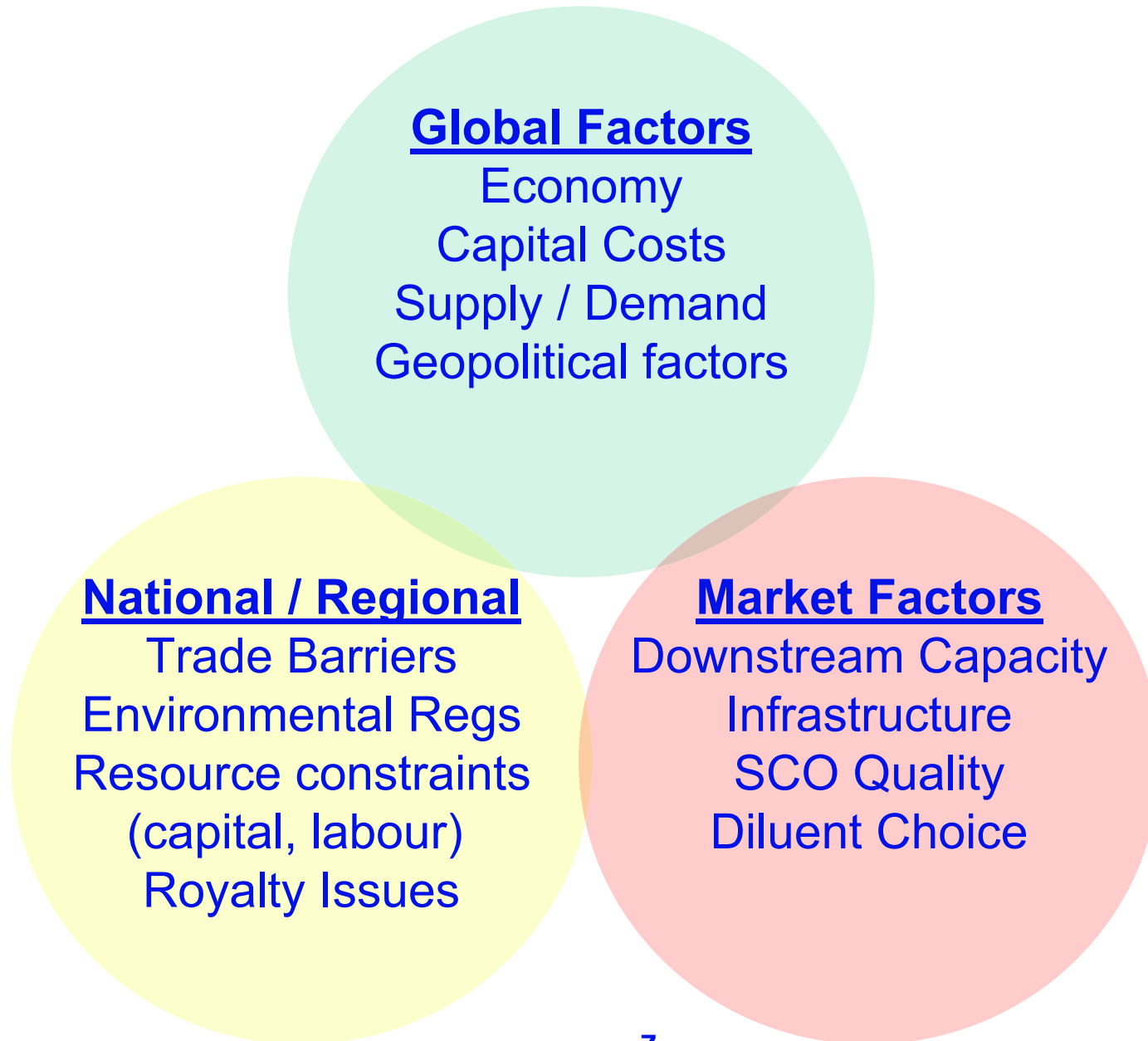
- Light crude includes upgraded synthetic crude
- CAPP did not reduce supply forecast for light crude until 2009

Heavy Supply

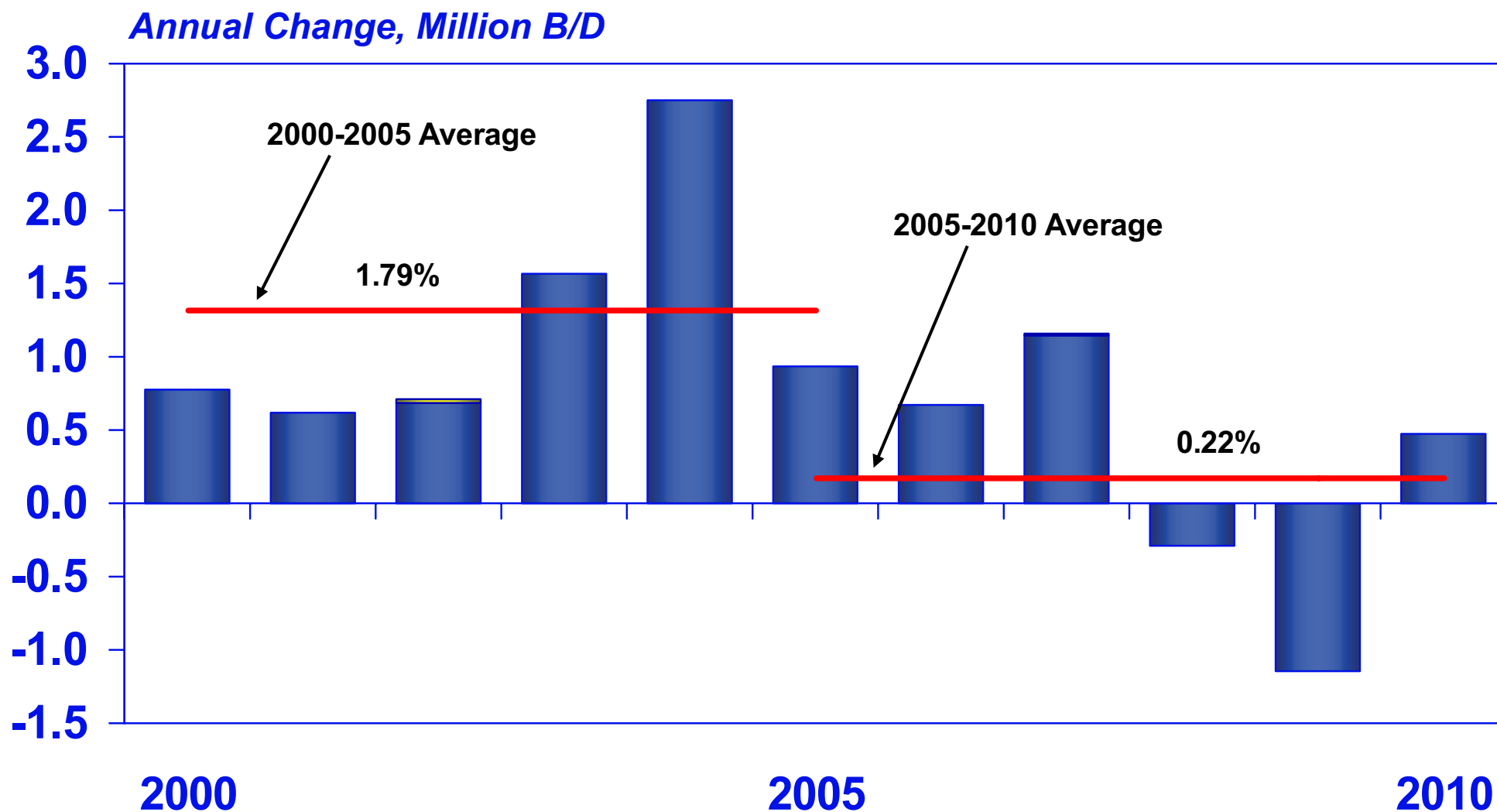


- Heavy crude supply forecasts have fallen less than light crude
- Bitumen production forecasts have fallen but so have upgrading forecasts

Issues Facing the Canadian Oil Sands

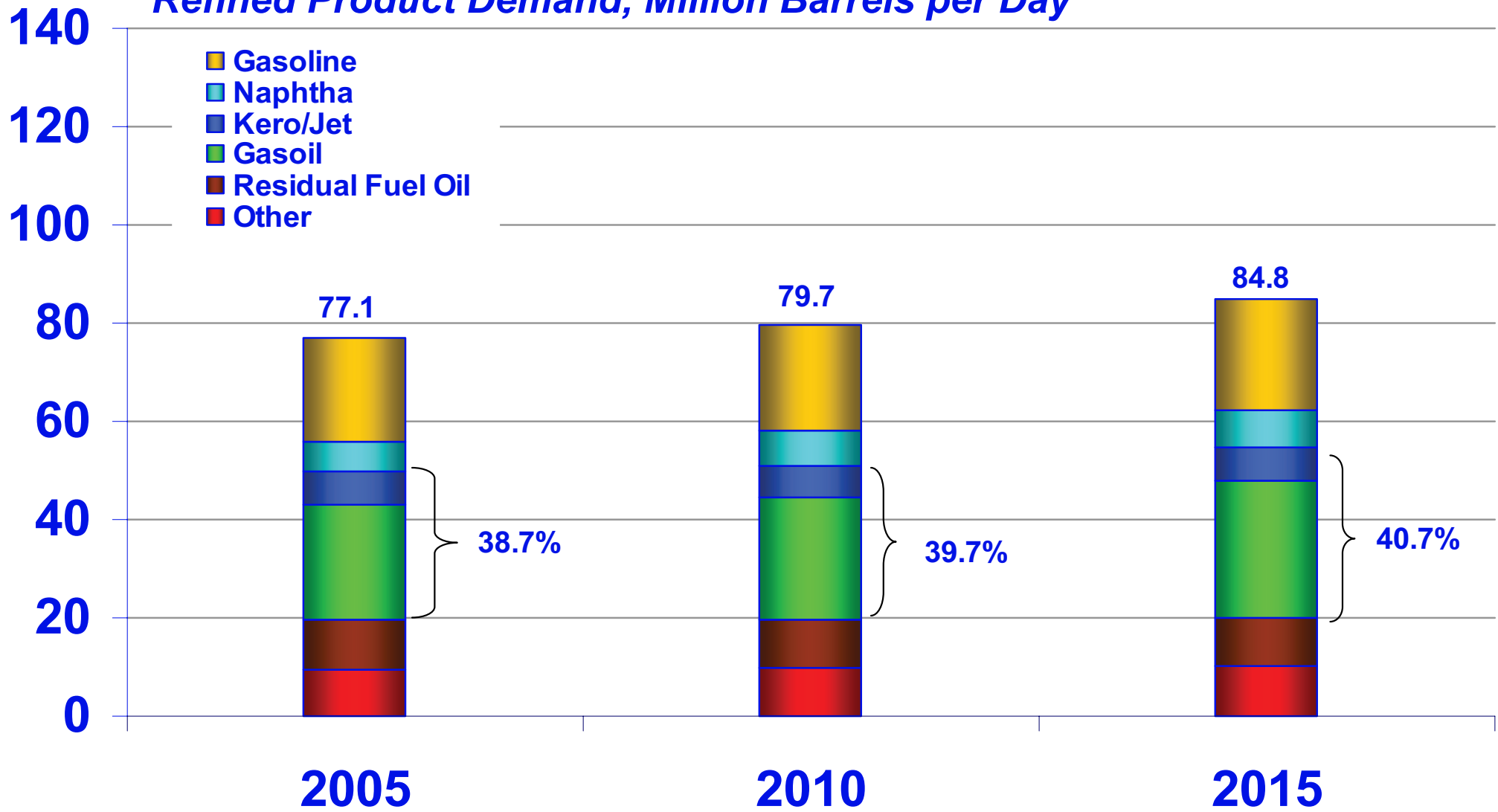


World refined product demand growth follows GDP



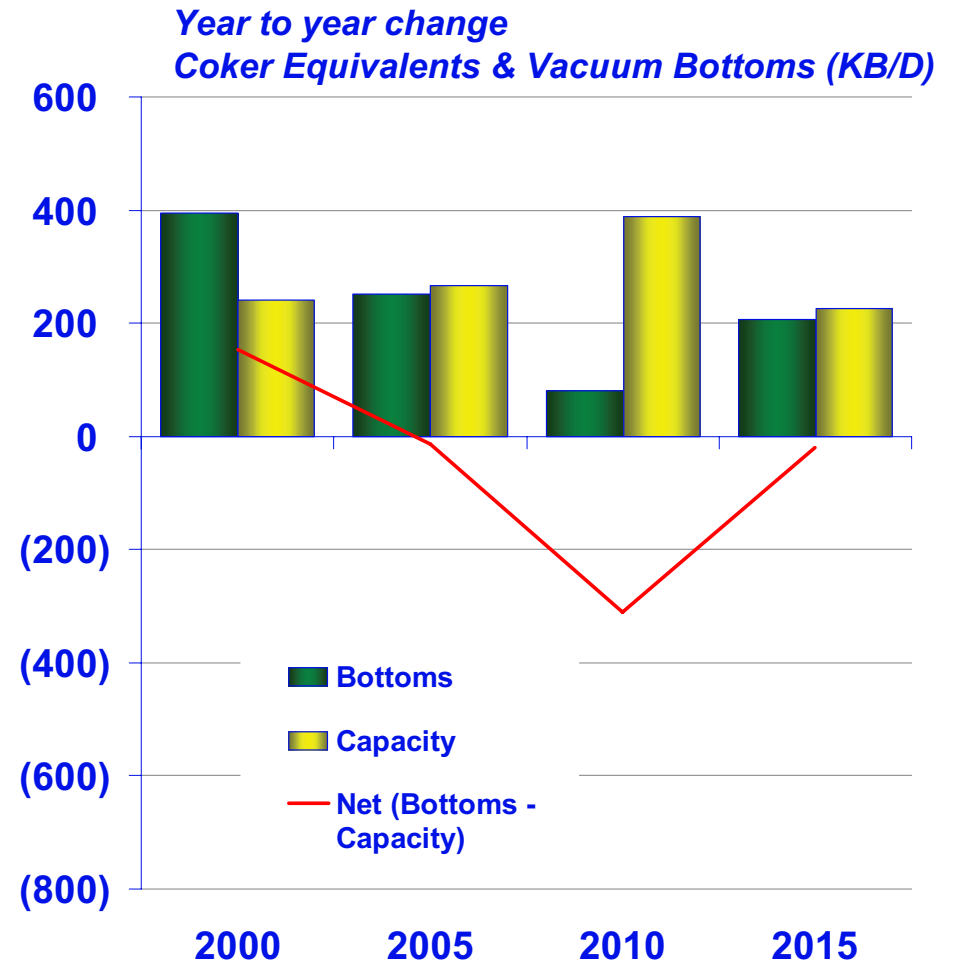
Global growth in refined product demand is largely in distillate transportation fuels

Refined Product Demand, Million Barrels per Day



Demand for heavy crude expected to increase with new conversion capacity

- **Increased conversion capacity a response to:**
 - Wide light / heavy spread
 - Corresponding high coker returns
- **However, heavy crude supply tightness projected in Atlantic basin**
 - Regional declines
 - Potential shortfalls filled with light sour / fuel oil
- **Opportunity for Canadian producers**



Refined product specification changes

- **Ongoing regulatory improvements**
- **Low sulphur gasoline & diesel**
 - More for heating oil, off-road diesel etc.
- **Benzene in gasoline**
- **Biofuels impact (ethanol & bio-diesel)**
- **Sulphur in resid fuel oil**
 - Local restrictions
 - Marine bunker (may have to switch to diesel, impacting resid supply)

Important regulatory changes are happening which impact long-term demand....

➤ **US: Energy Independence and Security Act**

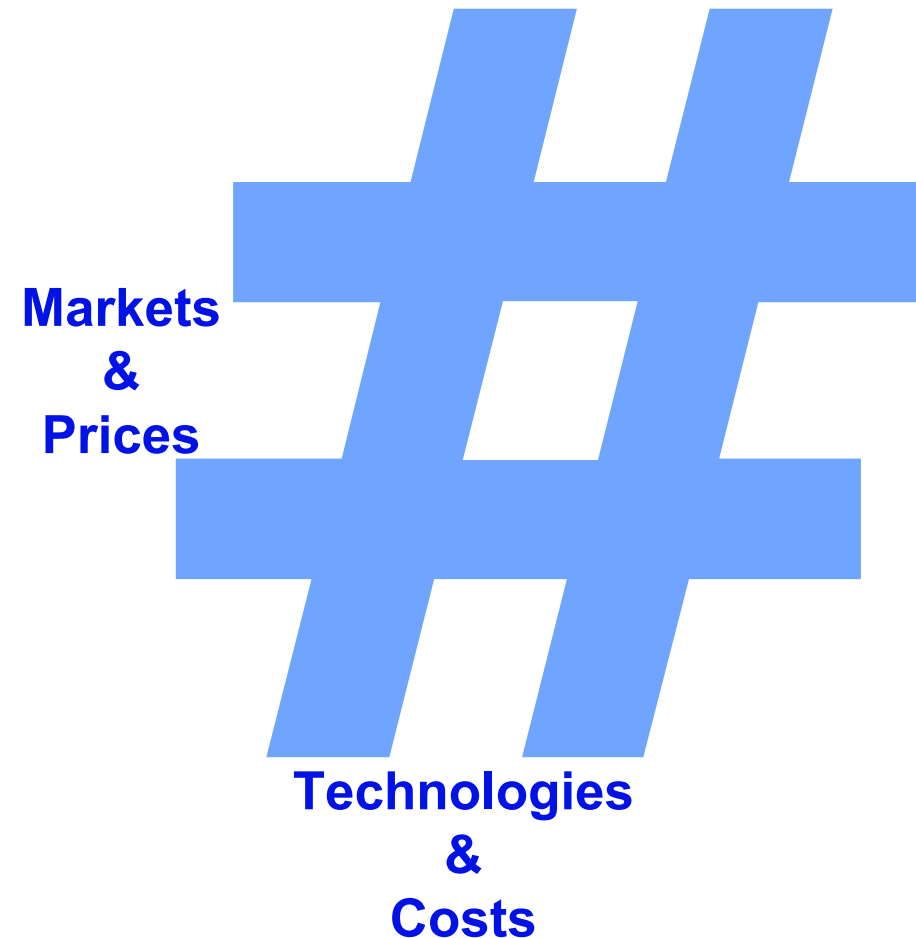
- Sharp increase in new vehicle efficiency standards
 - ✓ Passenger car fleet changes
 - ✓ Light-duty truck fleet changes
- Substantial increase in the use of biofuels
 - ✓ Corn ethanol to 15 billion gallons by 2015
 - ✓ Total renewables target of 36 BGY by 2022, but authority to lower advanced fuels requirements

➤ **Europe: EU climate policy is primary driver**

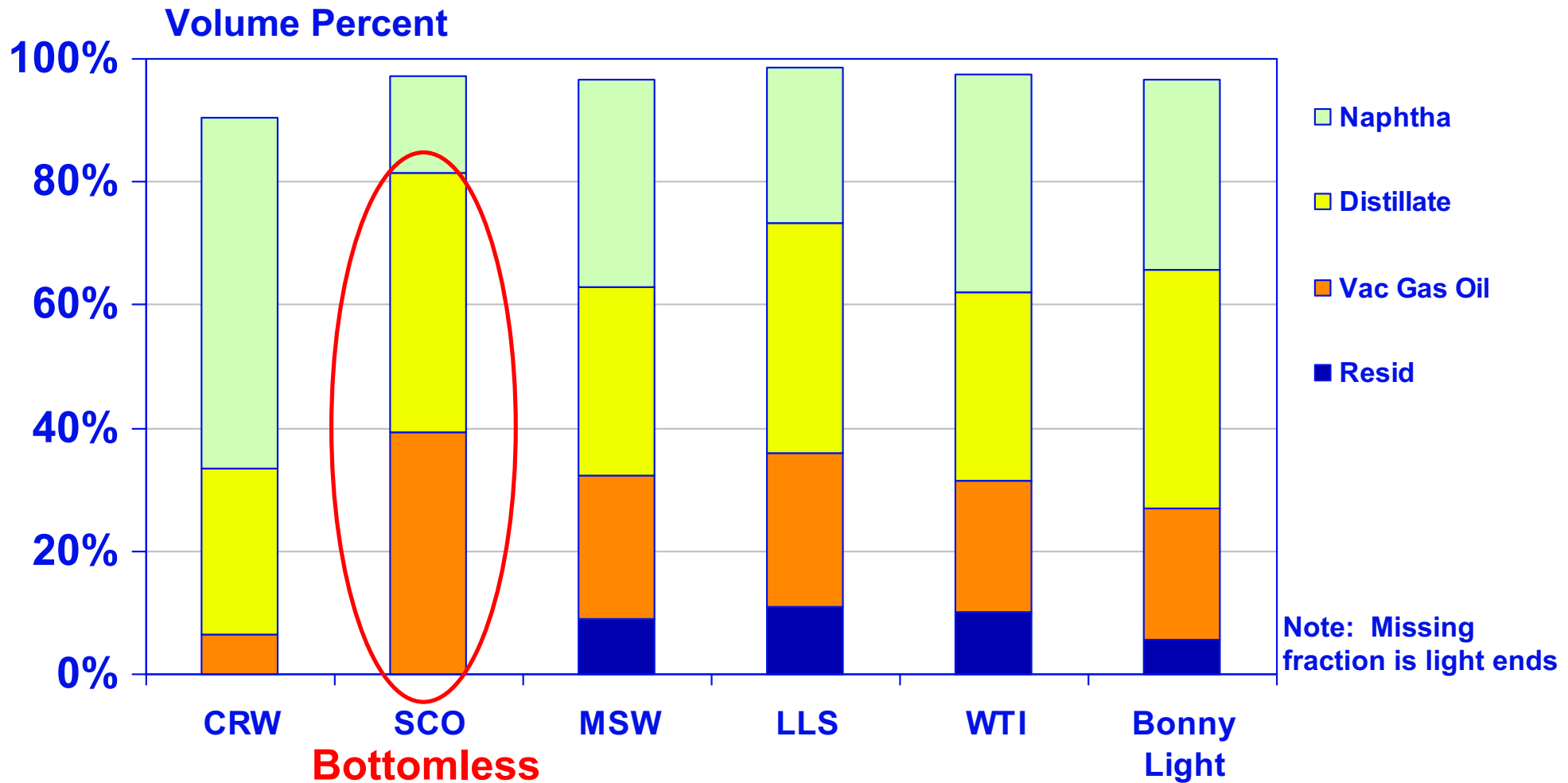
- Increased vehicle efficiency to lower carbon emissions
- Aggressive targets set for biofuels in gasoline and diesel, but targets have now been scaled back

The intersection of oil sands technologies & markets

- **Upgrading technologies determine product quality and yield as well as costs and environmental footprint**
- **Product quality impacts market and price**
- **Price, yield and cost are major economic drivers**



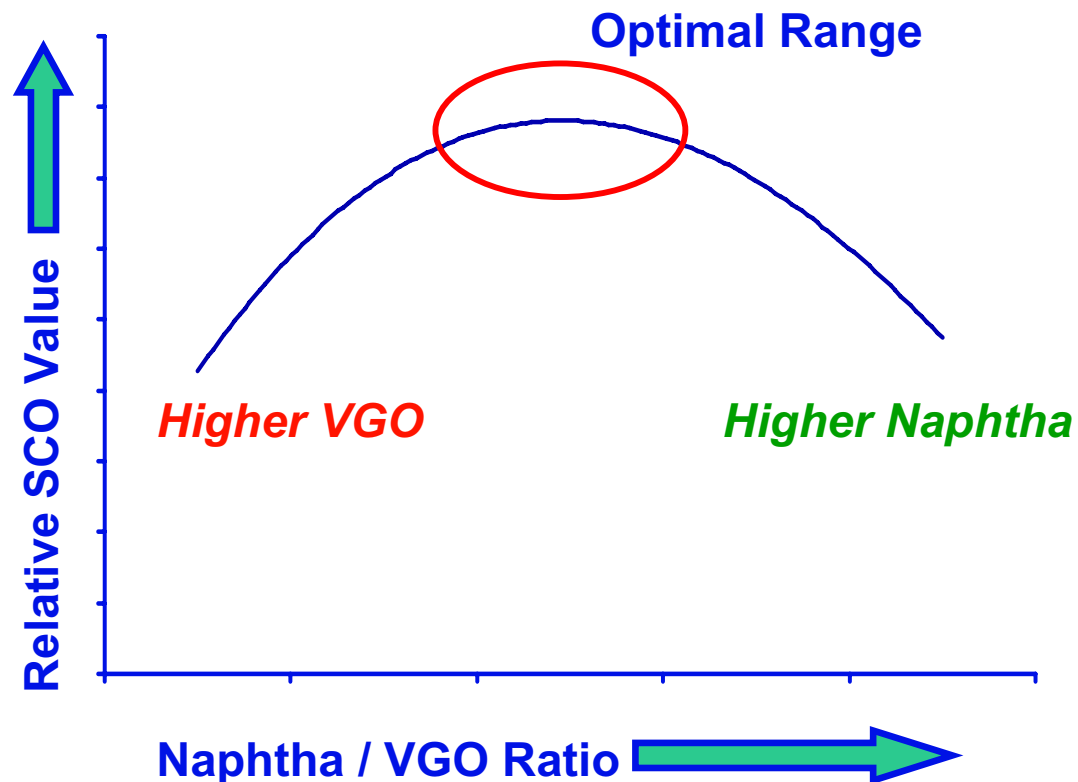
Distillation Comparison Light Sweet Crude



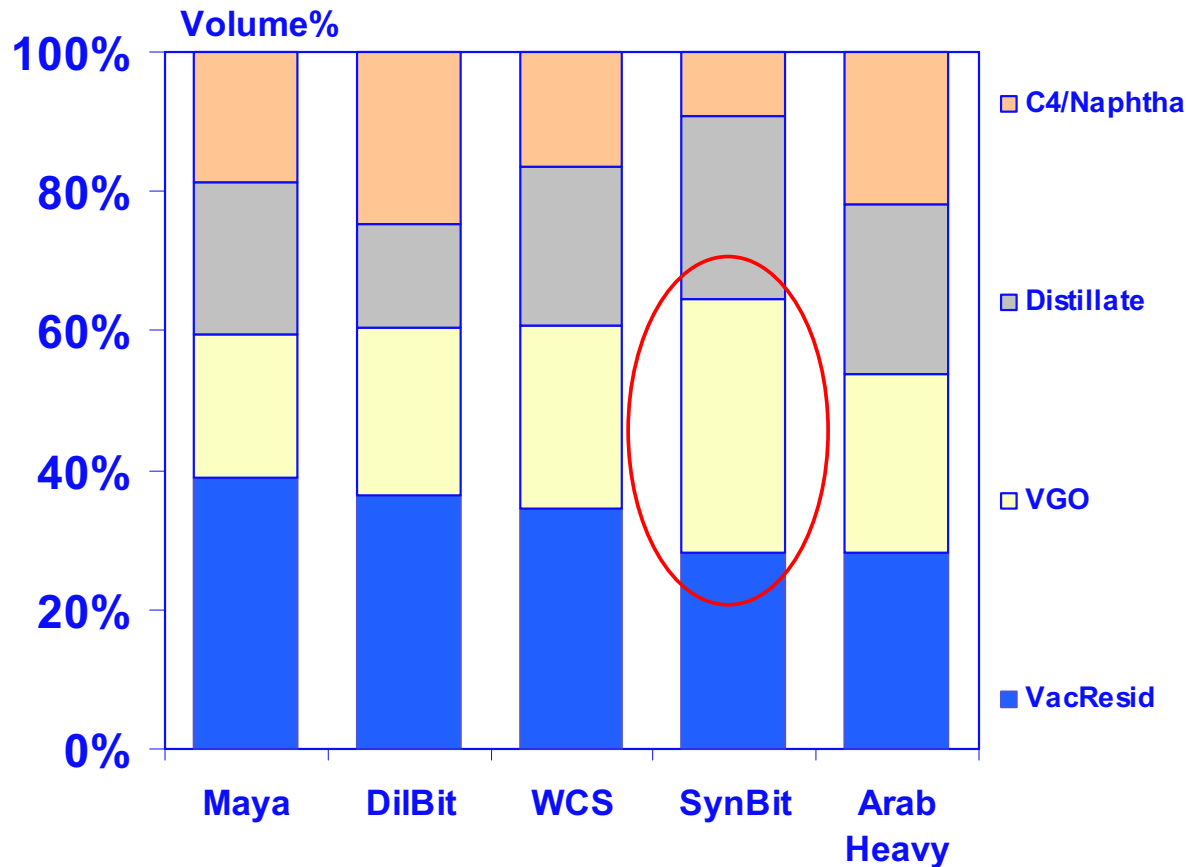
- Light sweet SCO not fully interchangeable with conventional crudes
- SCO not readily marketable to coking / asphalt refineries
- Distillate and VGO quality considerations

The ideal SCO for the market?

- SCO value is dependent on the ratio of cut fractions
- High VGO quantities tend to be discounted due to processing limits
- High naphtha quantities result in lower refining product yields – potentially lowering value
- Optimal SCO is refinery specific



Distillation Comparison Bitumen Blends

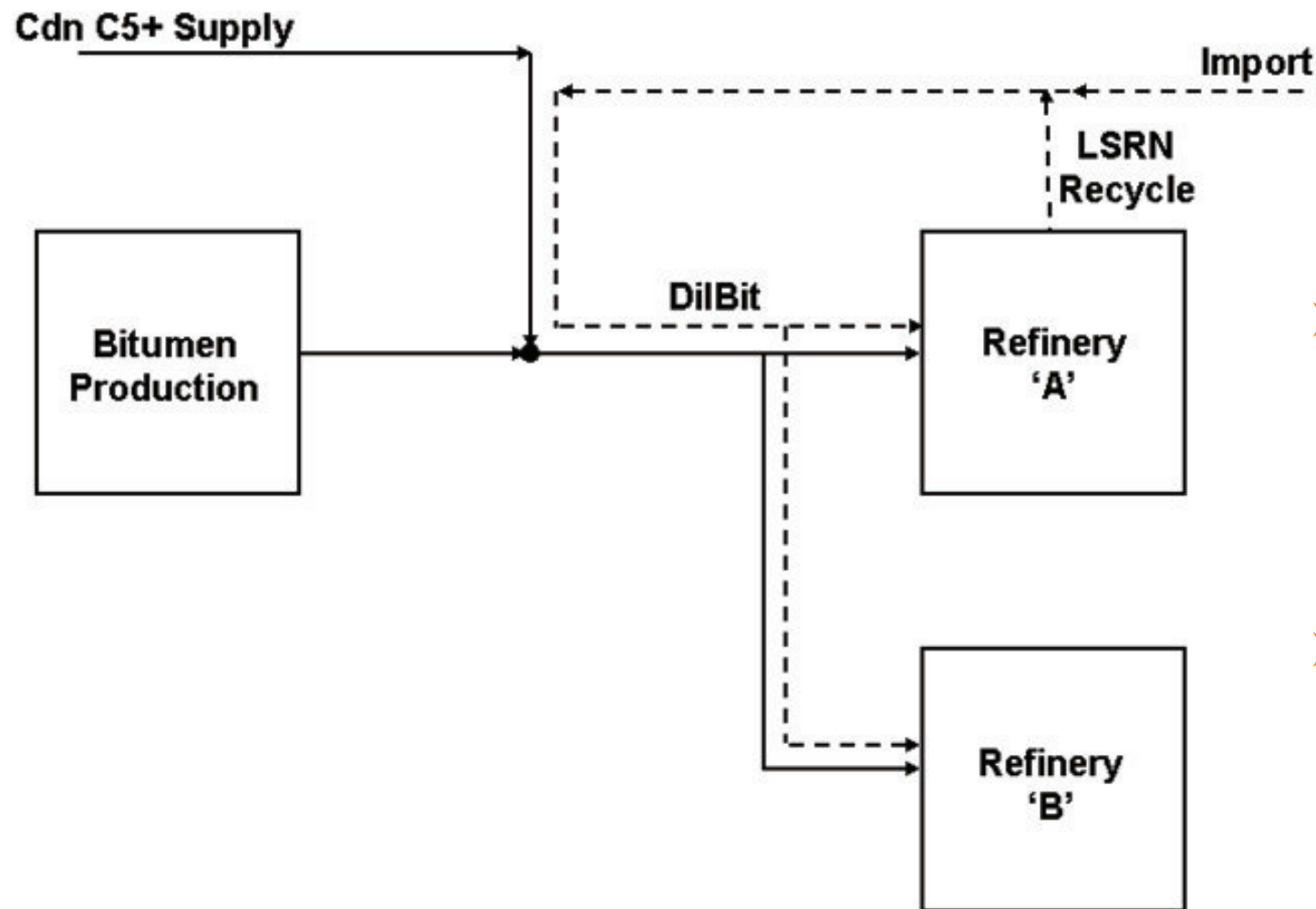


- DilBit quality close to Maya, but with more naphtha & less distillate
- SynBit quality close to Arab Heavy but with much more VGO & less naphtha
- Western Canadian Select (WCS) is a blend with DilBit, SynBit and conventional heavy crude
- Athabasca and Peace River blends have high acid content

Canadian diluent options

- **Import Condensate**
 - USGC or West Coast
- **Naphtha recycle via Southern Lights P/L**
 - Chicago to Edmonton in late 2010
 - Light Straight Run Naphtha (LSRN)
- **SCO for SynBit**
 - SCO value as a bitumen diluent not likely to be fully recognized until refiners can trust segregation and composition
- **NGL diluents (such as butane and/or LPG mixes)...**
 - USGC NGL values generally at Edmonton plus transportation
- **HotBit**
 - No diluent - rail from Alberta with possible backhaul of condensate
- **Avoid diluent with low conversion upgrading**

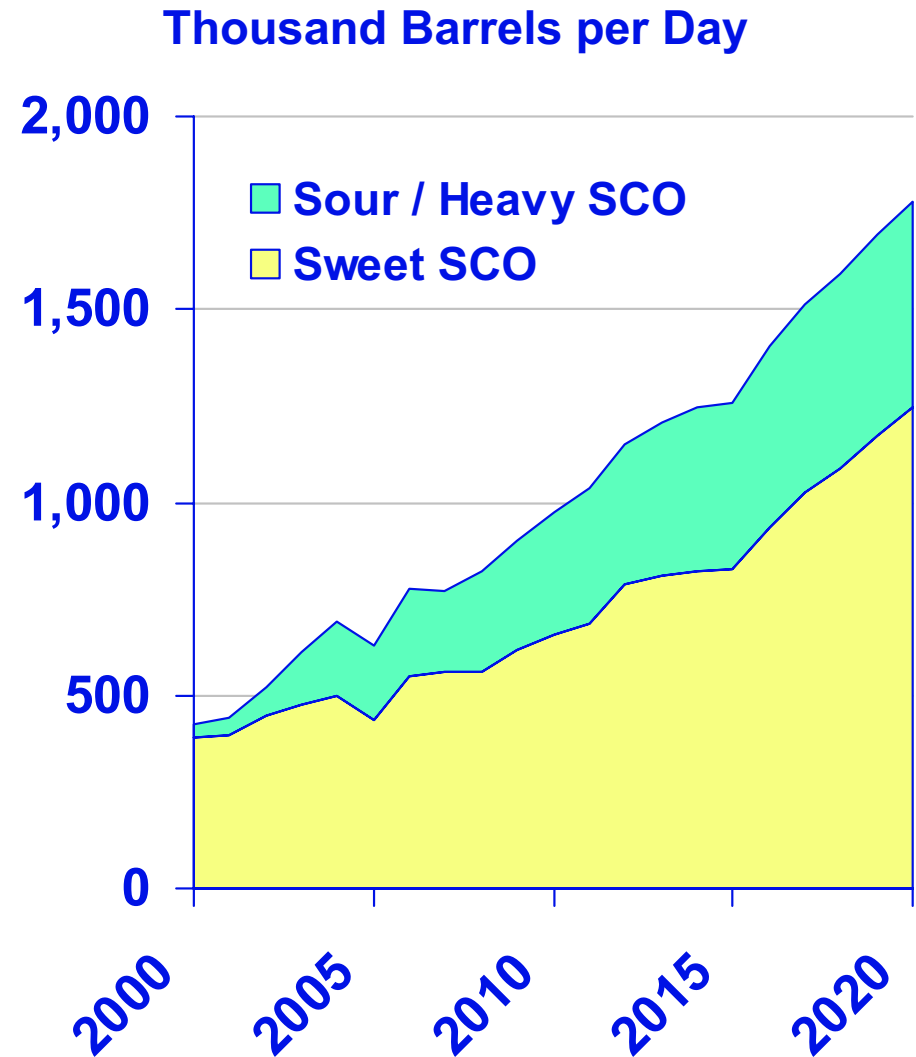
Impact of diluent quality on refiners



- **Condensate imports & LSRN recycle to be pooled on Southern Lights pipeline**
- **May be pooled with Canadian C5+ supply**
 - Diluent quality could change
- **Impact on refinery A and B is different**
 - Refinery A offloads LSRN to Refinery B

Sour, heavy SCO expected to increase

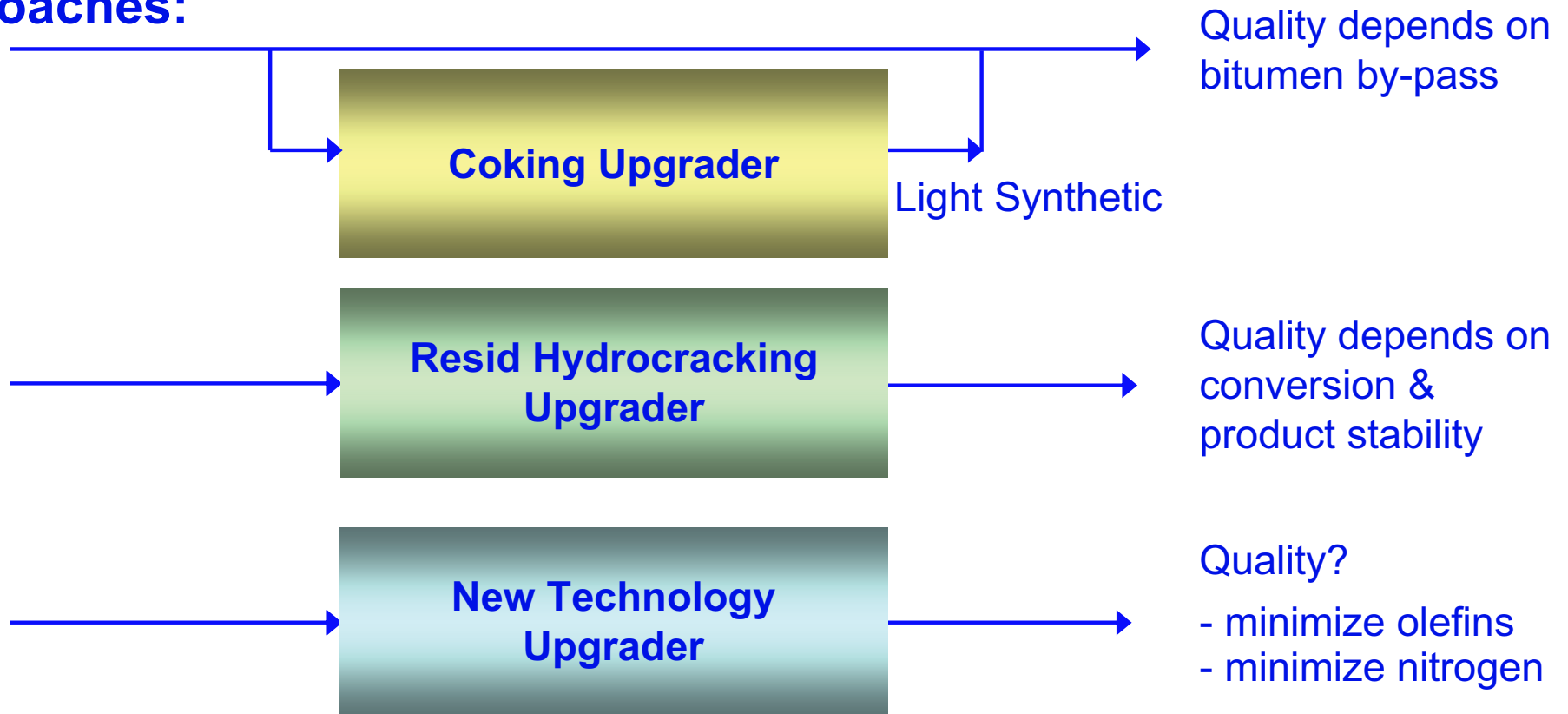
- **Lower capital requirements for the upgrader**
 - Refiner assumes the “load” of hydrotreating product to meet specs
 - Refinery cokers need vac. resid
- **Potentially unique processing / transport issues**
 - Olefins, nitrogen, sulfur, gravity
 - Issues with traditional processing, including crude unit
 - Pipeline limitations



Synthetic medium sour crude production

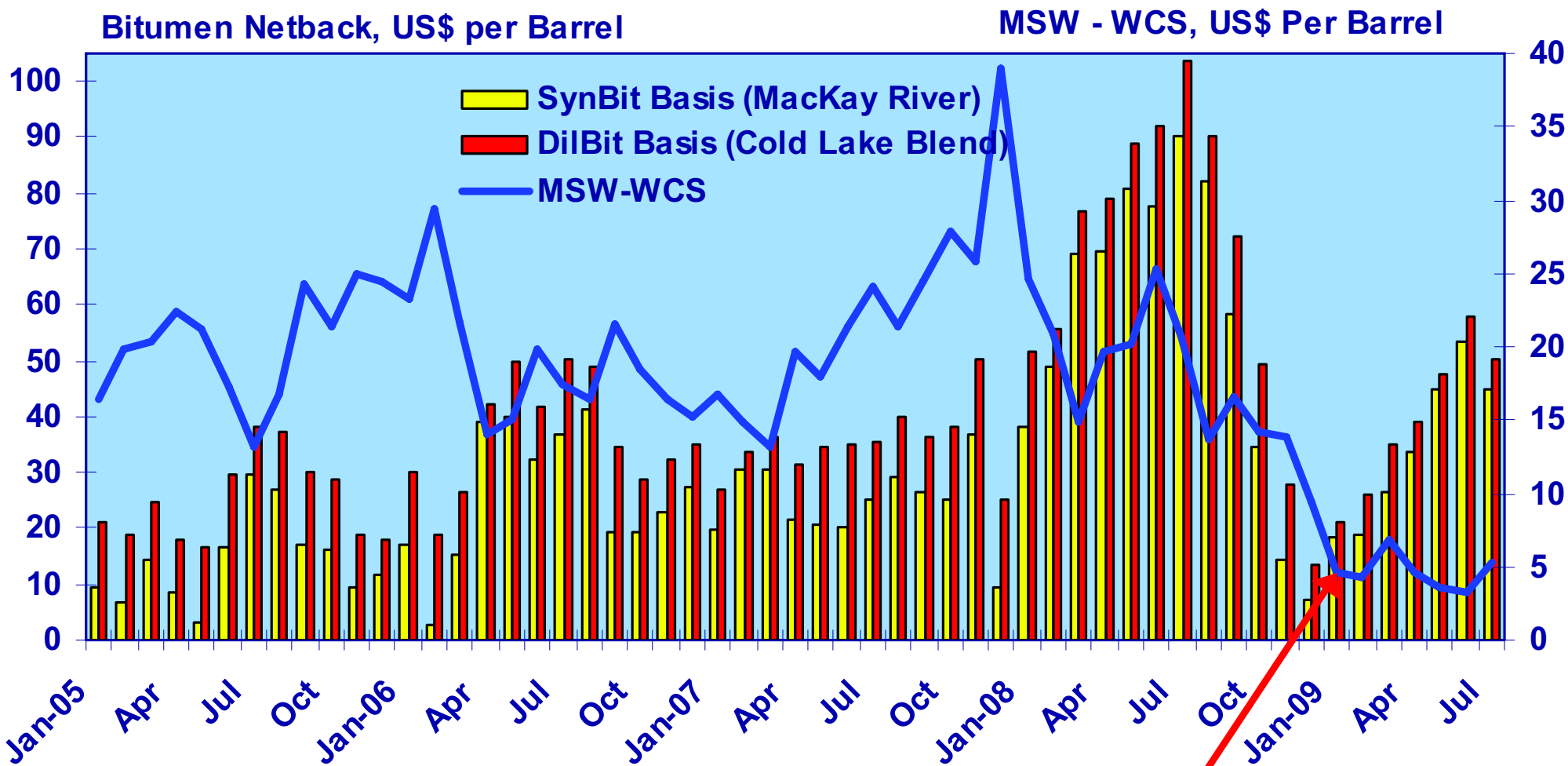


Approaches:



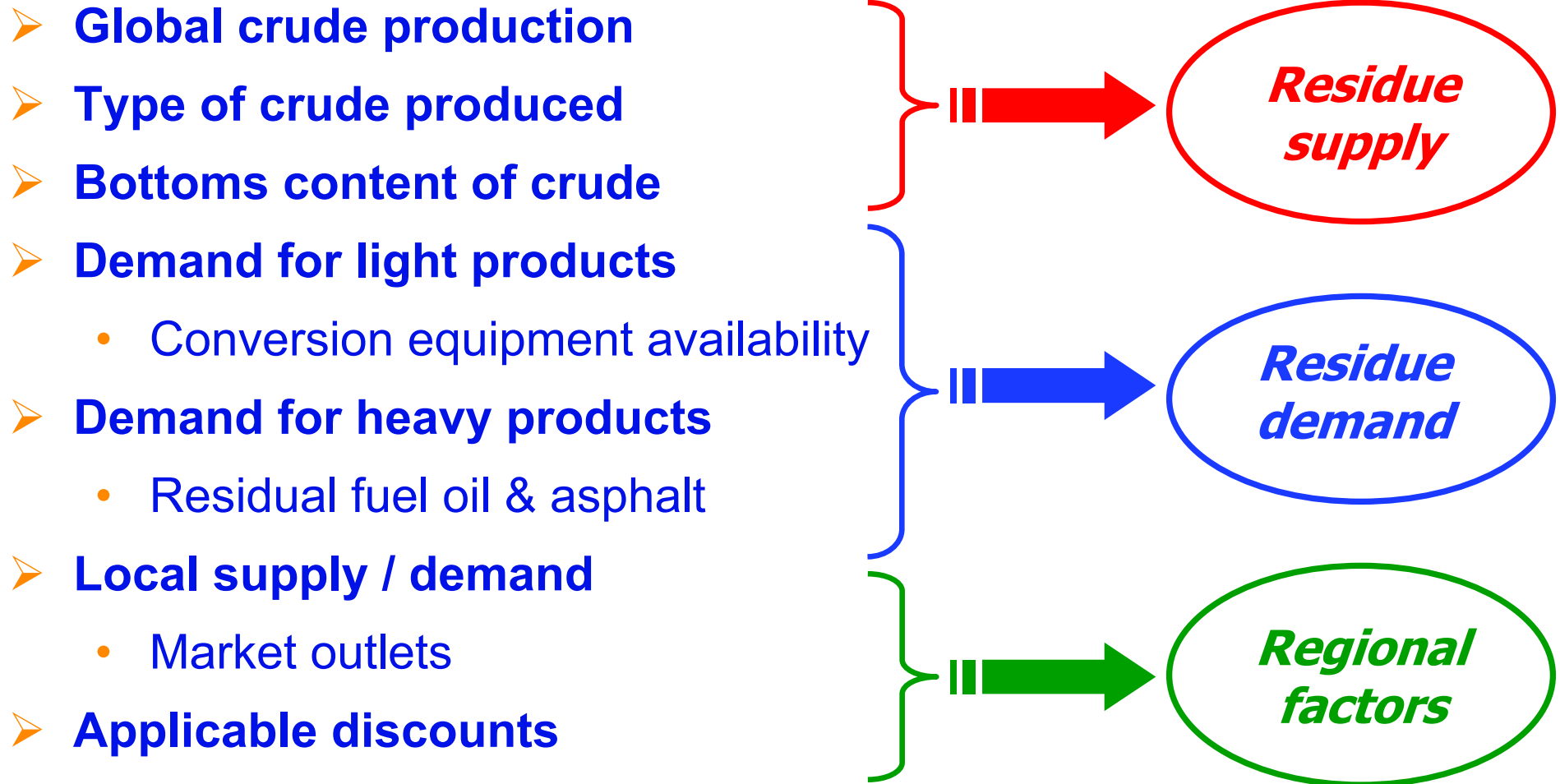
Opportunity???
Capex? Opex? Yield?

Bitumen netback prices down sharply from 2008 peak, but have recovered in recent months

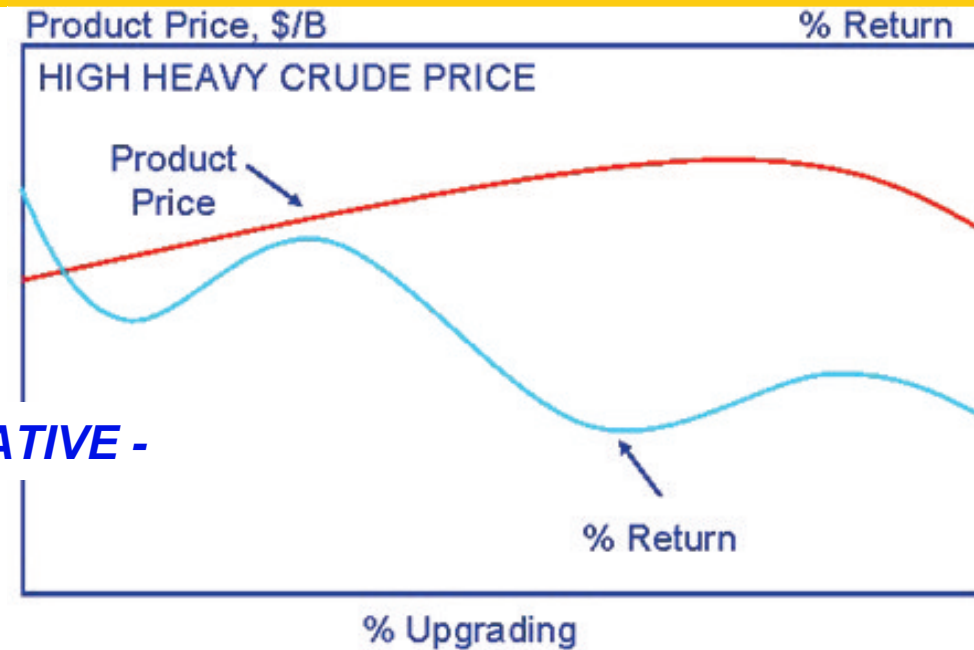
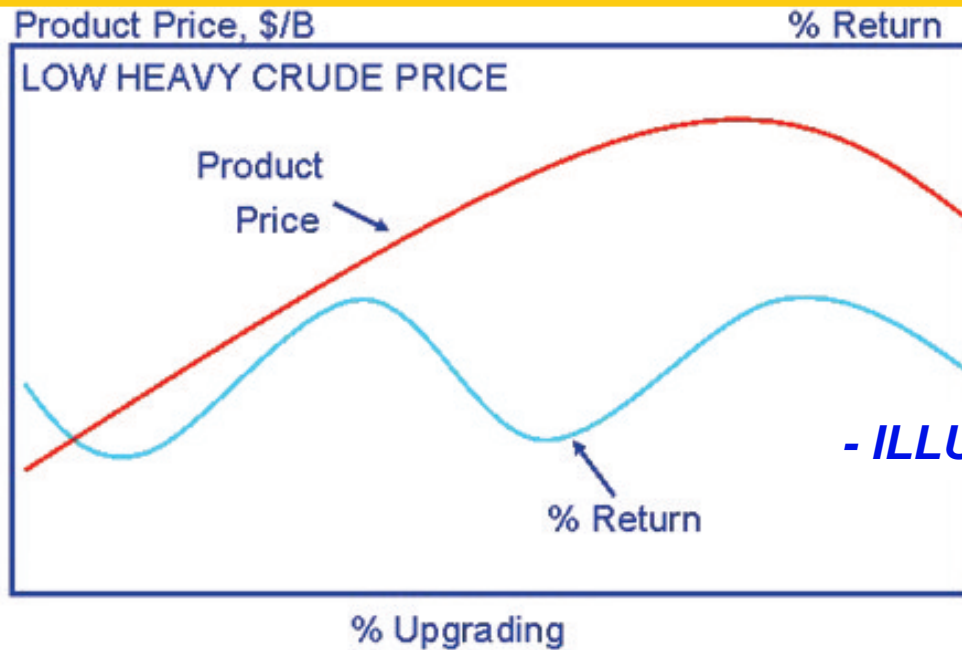


Narrow light/heavy differential

Factors influencing the light / heavy differential



Will higher product price add value?



- ILLUSTRATIVE -

Then

- Wide
- Conversion
- Hydrotreating
- Distillate qualities

Light – Heavy

Objectives

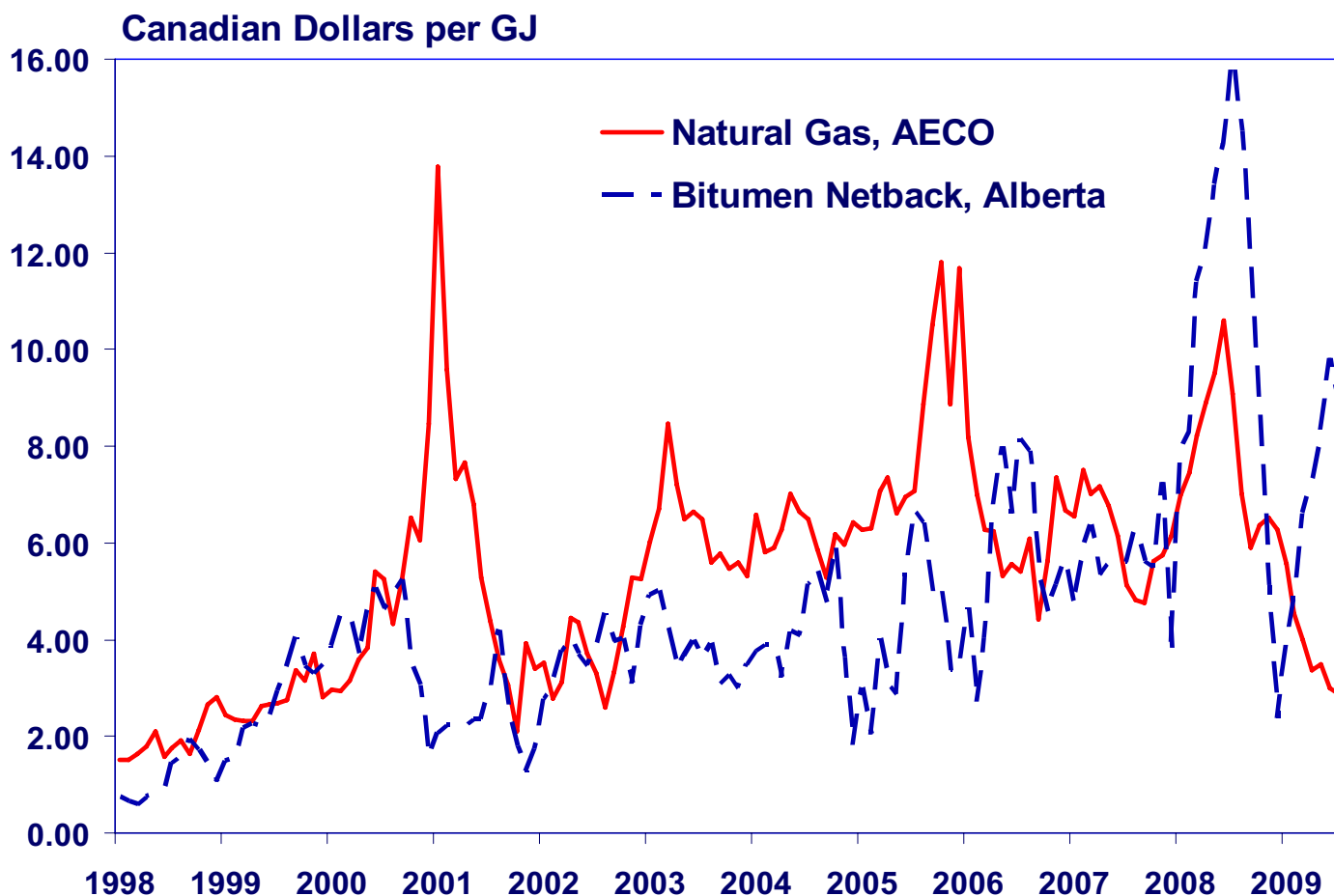
Issues

Now

- Tight
- Pipeline Specs
- Minimum capital
- Keep vac resid
- Olefins

Gas consumption rising but price is low

Bitumen versus Gas Price



- Concerns re. growing gas use for oil sands vs. other clean fuel users
- Gas price for fuel exceeded bitumen price most of the time from 2003 to 2007
 - Now less expensive & forecast to continue
 - Low price will not deter gas use
- Petroleum coke is stockpiled and virtually free, but high cost for combustion equipment & desulphurization

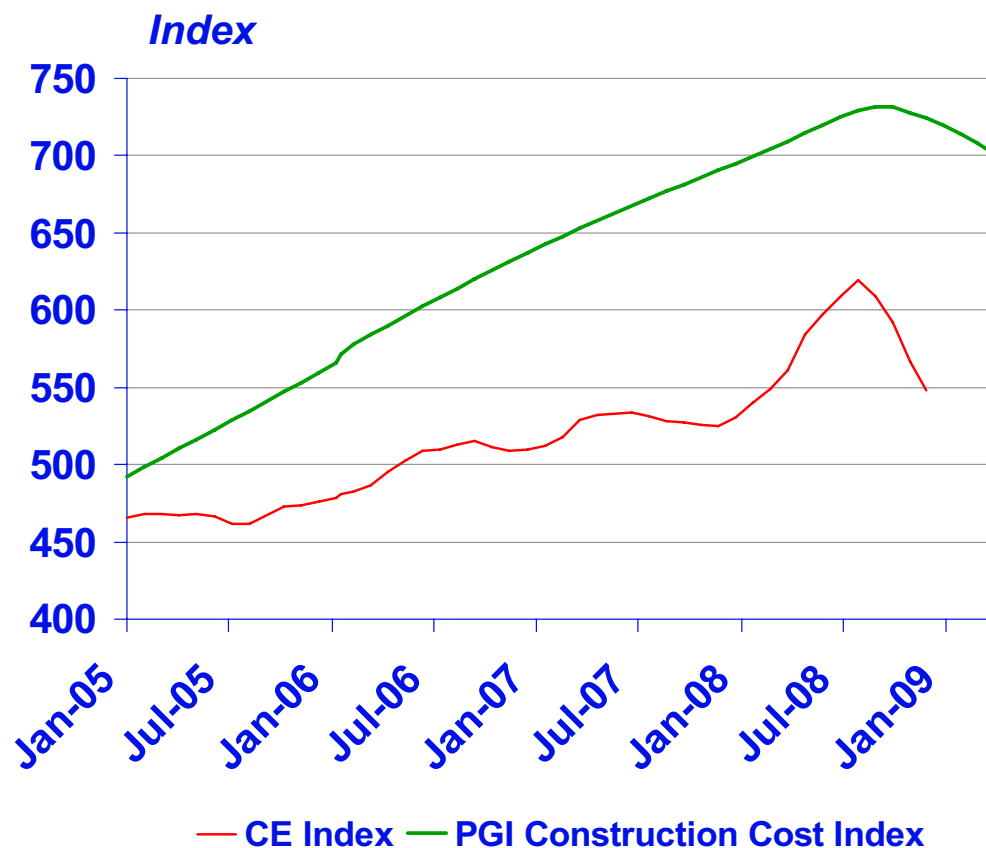
Capital cost indices are declining...

➤ Rapid increases in capital cost appear to have abated

- Material cost declines
- Higher labour productivity
- Lower margins for contractors and vendors
- Indices based on actual costs

➤ “Real” data points for large projects are tricky until projects are built

➤ Additional capital requirements in future for GHG initiatives



Greenhouse gas / regulatory issues

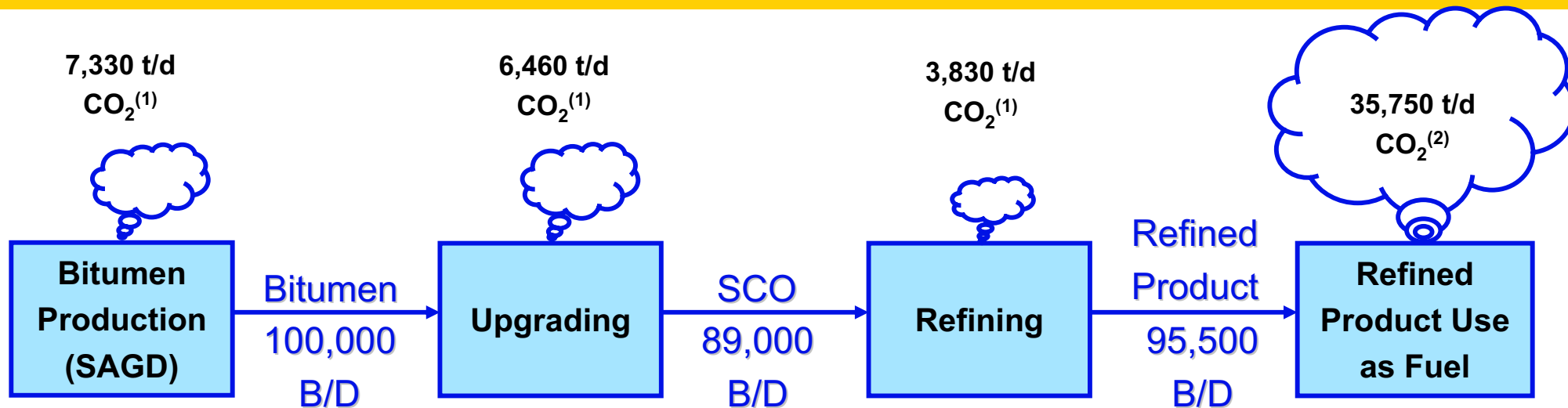
➤ Canadian Plans

- Federal/Provincial tensions
 - ✓ Alberta has long term reduction targets, initially intensity based
 - ✓ Federal government plans long term (2050) limits
- Carbon Capture and Storage (CCS) is favoured
 - ✓ Alberta has geological potential
 - ✓ High cost infrastructure
 - ✓ May encourage gasification, despite water supply concerns
- Market mechanisms with costs are uncertain
- Commitment/ability to harmonization with US?

➤ US Plans

- Carbon life-cycle regulations (Market Issue)
 - ✓ US Energy Bill / Government fleet limitations
 - ✓ California Proposal (Low Carbon Fuel Standard)
- Limits use of fuels derived from non-conventional sources with a carbon life-cycle greater than that of conventional oil

Greenhouse gas emissions along value chain



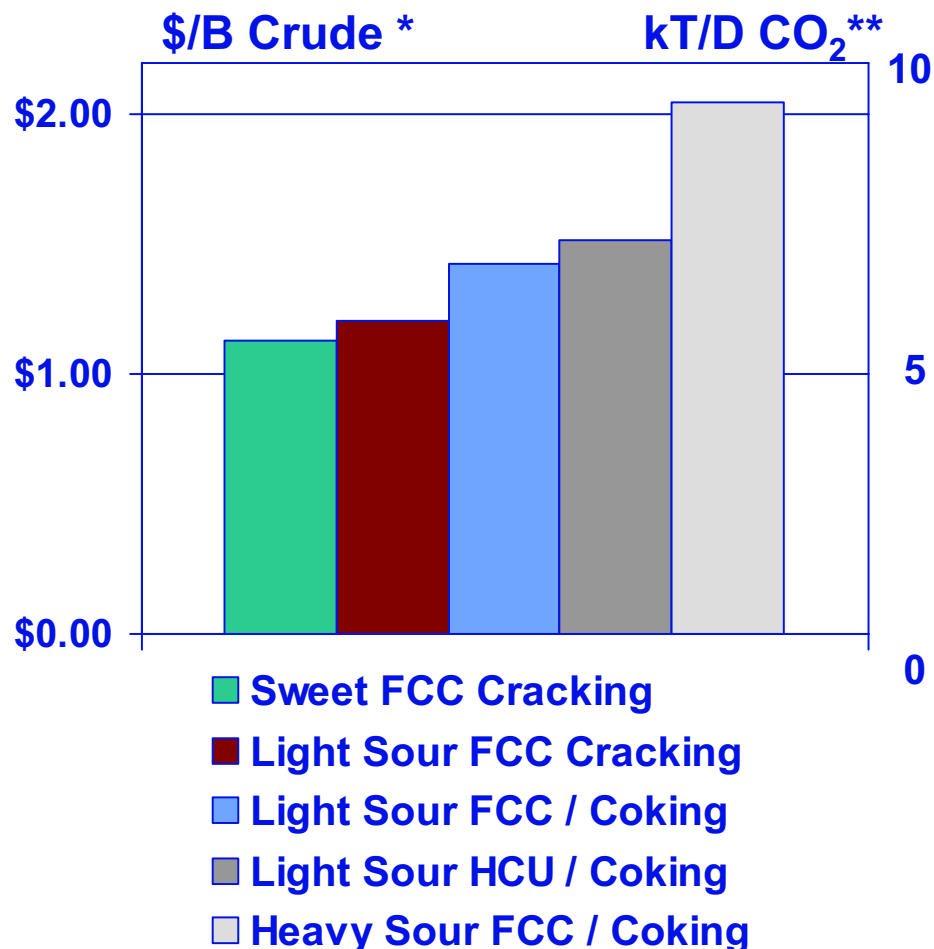
Notes: (1) CO₂ emissions estimated from fuel gas and power use

(2) Refined products assumed = 65% gasoline, 32% diesel, 3% LPG

- CO₂ from refined product use is more than double CO₂ from processing energy
 - Higher efficiency product use would reduce fuel demand and need for bitumen, but oil sands supply “push” could displace other crude oil sources
- CO₂ from processing depends on efficiency and fuel type
 - Heavier fuels like coke or heavy oil would increase CO₂ emissions
 - Nuclear fuel (where appropriate) would avoid CO₂
 - EOR use or sequestration from large point sources may be needed
- Impact of GHG regulations / penalties uncertain

CO₂ emissions vary by refinery configuration

Refinery CO₂ Emissions

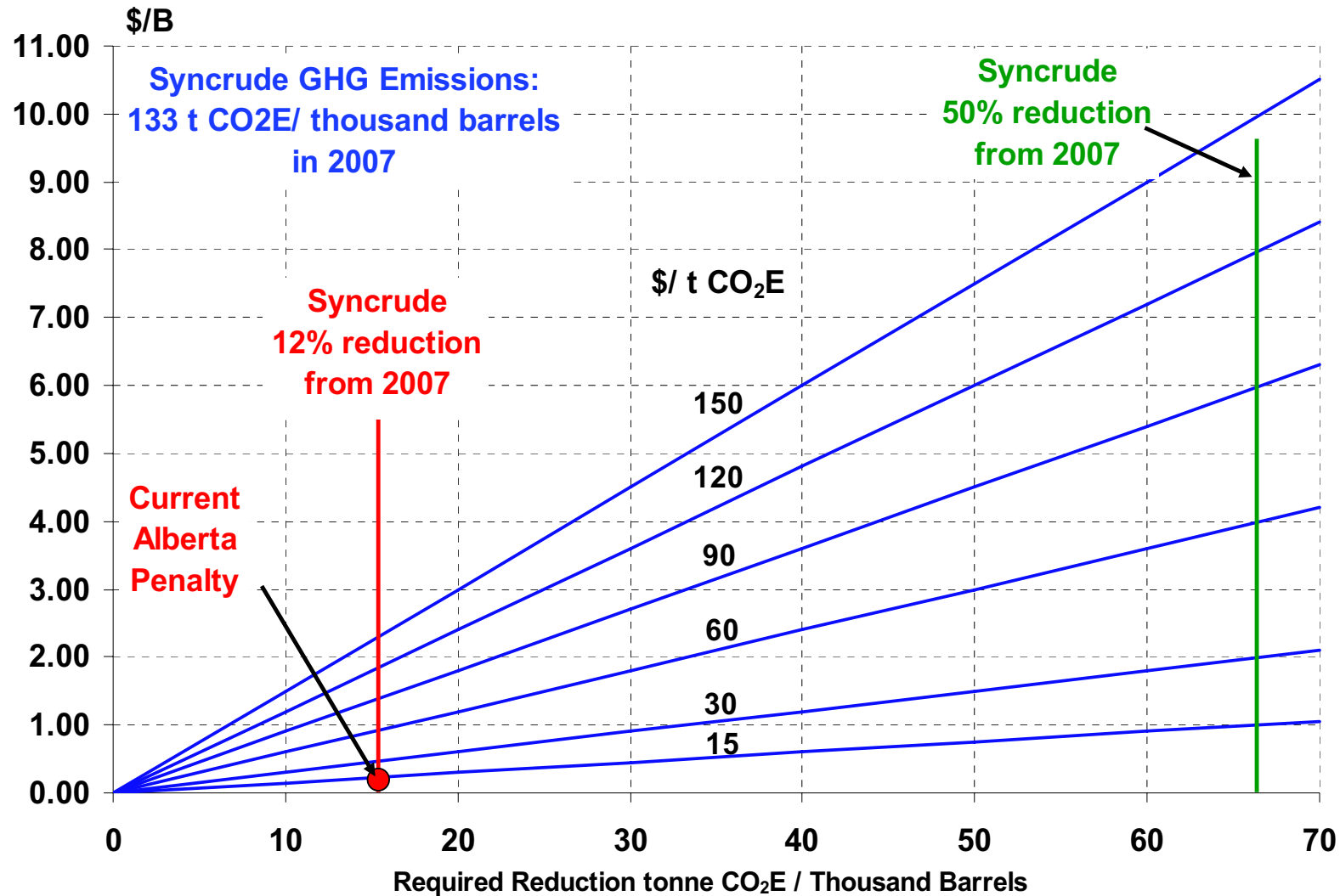


* \$35.2/T CO₂ - European Climate Exchange, Phase II, 2008 Average Price

** 100 kb/d crude, includes power generation

- Emissions originate from a number of sources
 - Fuel consumption
 - Carbon burn on FCC unit
 - Hydrogen plant vents
- Emissions tend to increase with complexity
- Full emissions cost (no allowances) a significant “operating cost” addition
- Emissions shown on a “downstream” basis
 - Most recent U.S. bill (HR 2454) includes the refinery emissions as well as emissions from the fuel sold (“upstream” basis)

Cost of non compliance for GHG reduction



- GHG reduction costs uncertain
- Current GHG costs low
- Potentially high cost

GHG emission mitigation options for upgrading in Alberta

- **Carbon Capture & Storage (CCS)**
 - including Enhanced Oil Recovery (EOR)
- **Cogeneration with gas or syngas**
 - receive credits against coal fired power generation
- **Coke stockpiling (carbon storage)**
 - delayed coking advantage over fluid coking
- **Use natural gas, not coke, as fuel**
 - unless CCS employed
- **Increased efficiency**
 - lower intensity
- **Low conversion processing & less hydrogen use**
 - lower intensity
 - more upgrading & emissions would occur at downstream refineries in Canada and elsewhere
- **Alternate markets for bitumen (blends)**
- **New technology**

Concluding Remarks

- **Western Canada development outlook favours bitumen production over conventional upgrading**
- **Future growth in petroleum products is distillate**
- **Light / Heavy crude spread to remain narrow as conversion capacity comes on stream**
 - Favours new upgrading concepts and technologies
 - Capital cost reductions open opportunities
- **Severity of environmental regulations still unclear**
 - Will call for creative solutions with effective technologies

Will the players be ready when the curtain rises?

About this Presentation

Production and marketability of Oil Sands bitumen blends and synthetic crude oil, crude price differentials, economics of upgrading and diluent issues are analyzed in Purvin & Gertz' ongoing multi-client service, ***Crude Oil & Oil Sands Market Outlook***.

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