Oil Sands Break-Even Challenges and Opportunities

CHOA Fall Business Conference

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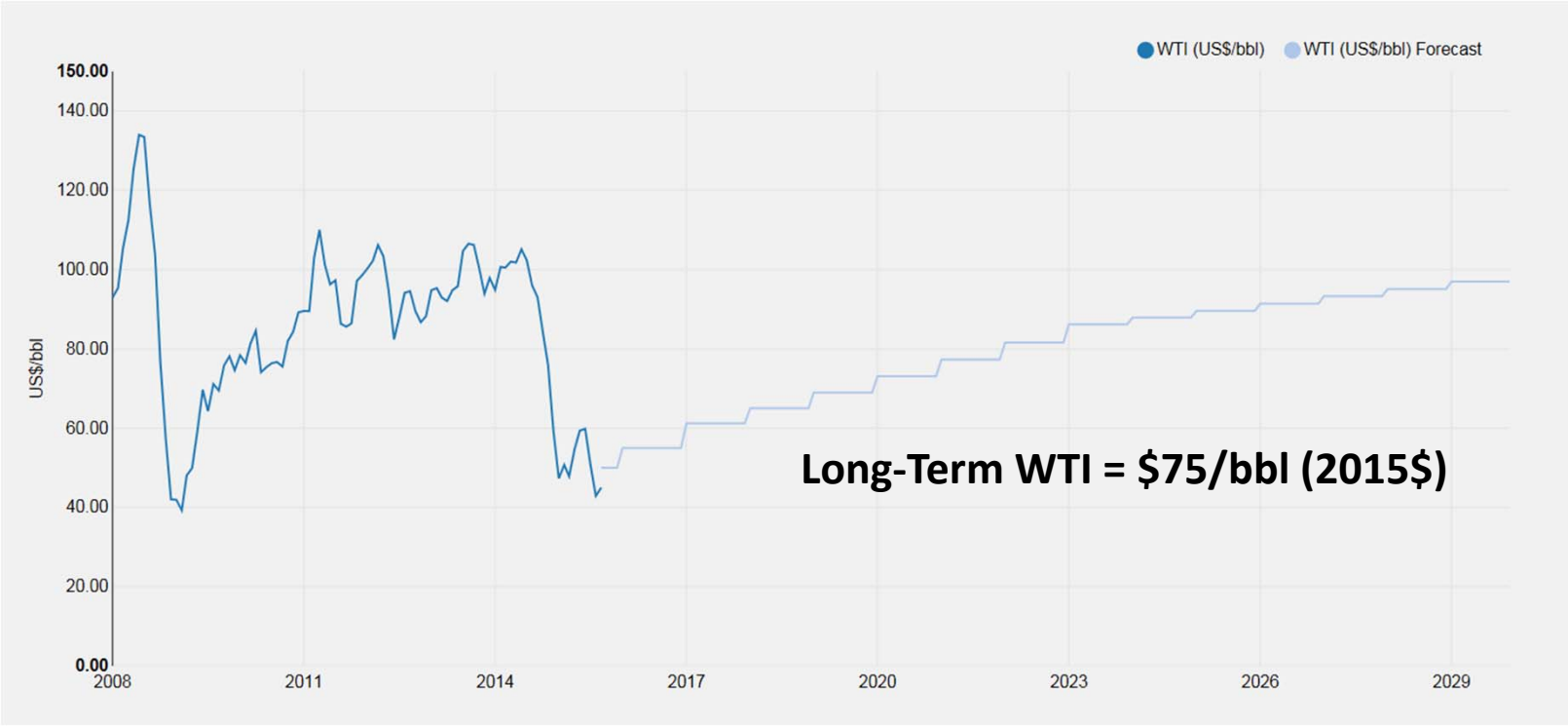
Oil Sands Break-Even: Overview

- **Product Pricing**
  - Baseline pricing
  - Bitumen pricing in a low WTI environment
- **Operating Projects**
  - Reported operating costs
  - Break-Even – short term pricing fluctuations
  - Break Even – sustained low pricing environment
- **Undeveloped projects and expansions**
  - Greenfield Projects
  - Debottleneck Expansions

Pricing – McDaniel Baseline



- WTI = $75/bbl (2015$) - Achieved in 2023
- CAD/USD Exchange Rate:
  - 0.76 in 2015 – 2016
  - 0.78 in 2017 – 2018
  - 0.80 in 2019 and after
- WCS:WTI differential = 79%
- Inflation: 0% in 2015-2016, 2% thereafter

Pricing – Low WTI Environment

- Outlined below are estimated pricing for bitumen netbacks for various low WTI pricing environments

	2015 Bitumen Pricing (CAD)	2016+ Bitumen Pricing (CAD)
30 WTI	12.1	15.0
35 WTI	15.8	19.1
40 WTI	19.6	23.1
45 WTI	23.3	27.1
50 WTI	27.1	31.1
55 WTI	30.9	35.1

- The 2015 bitumen pricing reflects current pricing and quality differentials, while the 2016+ pricing assumes a return to historical norms
- Long-term Fx in all cases is 0.8
- Product transportation costs estimated to be ~$4.5/bbl
  - Consistent with reported averages

Reported Operating Costs: SAGD

» Summary of operating costs (excluding transportation and blending) for producing SAGD projects:

Project	Operator	Production (bbl/d)	Non–Fuel Op Costs ($/bbl)	Fuel Gas Costs ($/bbl)	Total Op Costs ($/bbl)
Christina Lake	Cenovus	148,000	$6.08	$2.18	$8.26
Foster Creek	Cenovus	126,000	$11.12	$2.87	$13.99
Great Divide	Connacher	15,000	$12.56	$3.60	$16.16
Jackfish (1,2,3)	Devon	75,000	$12.19	$3.45	$15.64
Christina Lake	MEG	77,000	$7.31	$3.91	$11.22
Orion	Osum	8,000	$14.71	$2.89	$17.60
Lindbergh	Pengrowth	12,000	$13.15	$2.84	$15.99
Firebag + MacKay River	Suncor	200,000	$9.25	$3.80	$13.05
Average			**$10.80**	**$3.19**	**$14.39**

Based on Q1/Q2, 2015 company reported data

Reported Operating Costs: Mining

» Summary of operating costs (including upgrading) for producing bitumen mining projects:

Project	Operator	Production (bbl/d)	Non–Fuel Op Costs ($/bbl)	Fuel Gas Costs ($/bbl)	Total Op Costs ($/bbl)
Horizon	CNRL	115,000	$27.80	$1.72	$29.52
Millennium/ Steepbank	Suncor	225,000	$36.68	$2.25	$38.73
Syncrude	Imperial/Exxon	250,000	$39.28	$3.55	$42.83
Average			**$34.59**	**$2.51**	**$37.03**

Based on Q1/Q2, 2015 company reported data

» Given that these projects are not exposed to the heavy oil differential, they may be more robust in a low pricing environment

Break-Even – SAGD OPEX

- Using the price cases outlined above, we are able to estimate a break-even non fuel opex for a typical SAGD project

WTI Pricing	SOR 2.6	SOR 3.3
30 WTI	7.91	6.87
35 WTI	11.64	10.59
40 WTI	15.13	14.08

- For the average SAGD project with non-fuel opex in the $11/bbl range, WTI price must be at lease $35/bbl to cover the cash costs
  - These values do not include G&A, debt servicing etc. and as such total expenses would be somewhat higher
  - Total expenses would vary by company based

- These values **DO NOT** represent what is needed to sustain production over the mid to long-term

Break-Even – Maintaining Capacity

- In order to maintain production at current producing projects, WTI prices have to be robust enough that operators can profitably drill additional well-pairs to offset production decline
  - Assuming a 10% minimum before tax rate of return will be required to facilitate future drilling

- Using reported OPEX, CAPEX and performance metrics, outlined below are the estimated break even prices for a “top-tier” SAGD project as well as a more typical “average” project

WTI Pricing	Top-Tier Projects	Average Projects
Non Fuel OPEX	~$10/bbl	~$12/bbl
SOR	2.6	3.3
Well-Pair Productivity	900bopd	650bopd
WTI Break-Even	**~$45/bbl**	**~$50/bbl**

Break-Even – Increasing Capacity

- Although most operators are deferring projects and expansions at this time, future expansions may be feasible depending on the price and cost environment as well as other factors such as royalties (under review) and infrastructure (pipelines)

- One key issue around future expansions of any type will be greater certainty around capital costs

- Although we expect a moderate to significant capital cost reduction in the current environment, that relationship has not been well established due to the lack of projects moving forward

- Additionally, uncertainty still remains around what the “true” base costs were before the down-turn as many projects continued to see inflationary pricing

Break-Even – Greenfield Model

- Similar to the break-even sensitivity above, outlined below are economic and performance parameters for "top-tier" and "average" projects
  - Baseline capex is based on "historical" demonstrated costs

WTI Pricing	Top-Tier Projects	Average Projects
Non Fuel OPEX	~$10/bbl	~$12/bbl
SOR	2.6	3.3
Well-Pair Productivity	900bopd	650bopd
Baseline CAPEX ($/flowing)	**~$41,000/bopd**	**~$50,000/bopd**

- Although **potentially** conservative, below are the CAPEX reduction factors for the low WTI environments

	40 WTI	45 WTI	50 WTI	55 WTI
Long-Term CAPEX Reduction Factor	20%	15%	10%	5%

Break-Even – Greenfield Model

» Based on the parameters noted above, outlined below are the NPVs for greenfield expansions

	Top-Tier Project NPV@10% (MM$)	Average Project NPV@10%(MM$)
40 WTI	-800	-898
45 WTI	-475	-626
50 WTI	-192	-375
55 WTI	52	-160
McD Oct. Forecast	1,466	1,061

» Generally speaking, even top-tier SAGD greenfield expansions require WTI of ~$60/bbl to be commercially viable while average projects will require WTI greater than ~$65/bbl

Break-Even - Debottleneck Exp.

- Beyond large greenfield expansions, many operators may resort to smaller debottleneck expansions in order to grow production volumes in a low price environment
- Debottleneck expansions are relatively low cost, small scale expansions that make use of excess process capacity within a facility
- As the name implies, removal of process bottlenecks enables small to moderate increases in total production capacity
- MEG Energy estimates capital for the smaller debottleneck expansions range from approximately $20,000-25,000/Fbbl
- McDaniel currently estimates that debottleneck expansions are approximately 25% lower than a conventional expansion

Break-Even - Debottleneck Exp.

» Using the same economic parameters noted earlier for top-tier and average SAGD projects, outlined below the NPVs for debottleneck expansions

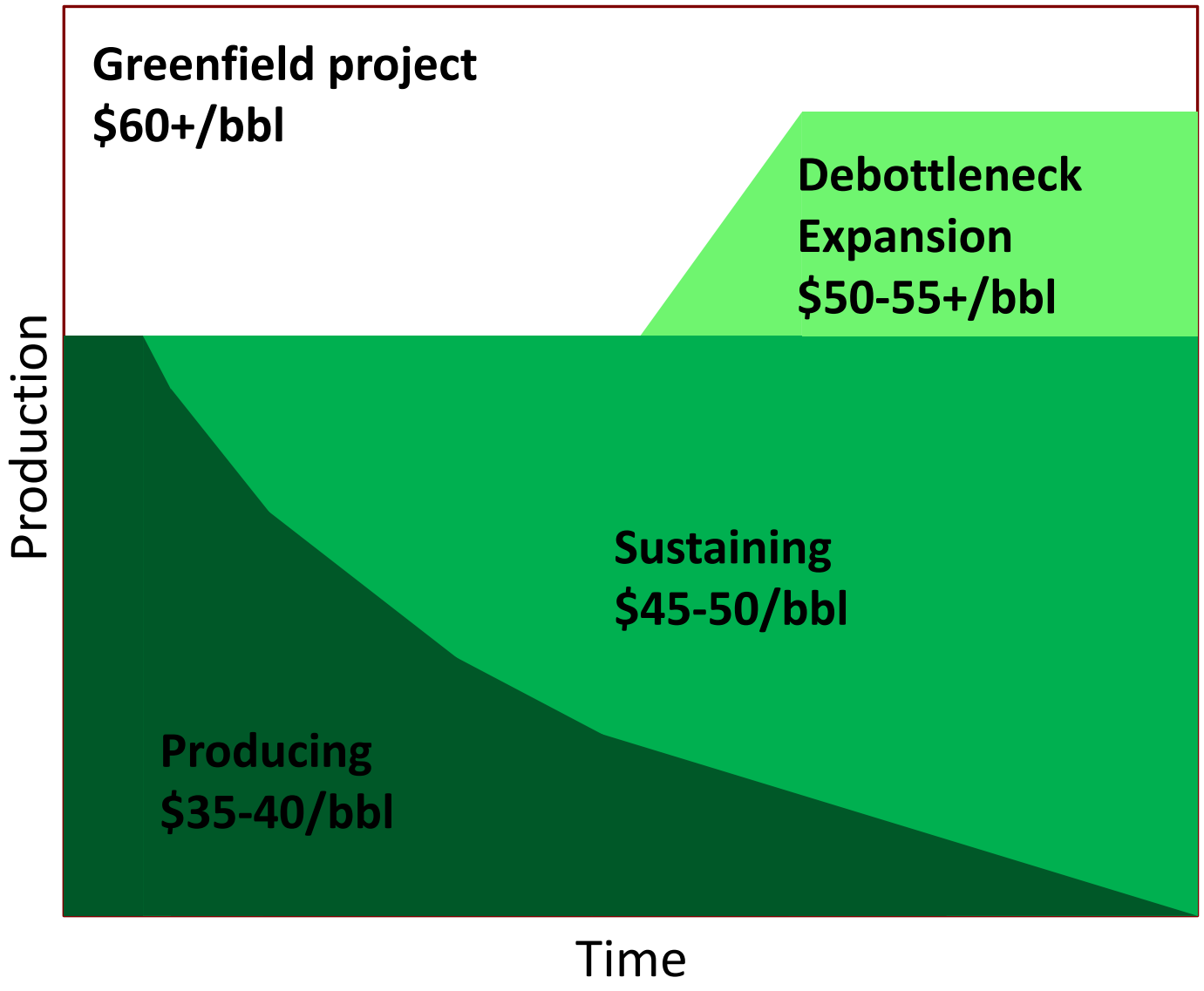
TOP TIER SAGD PROJECT	NPV@0% (MM$)	NPV@5% (MM$)	NPV@8% (MM$)	NPV@10% (MM$)	NPV@12% (MM$)	NPV@15% (MM$)
40 WTI	(563)	(493)	(439)	(405)	(373)	(329)
45 WTI	475	35	(69)	(107)	(130)	(147)
50 WTI	1,388	497	254	152	80	11
55 WTI	2,201	907	540	381	267	151
McD.	6,562	3,065	2,031	1,569	1,227	865

AVERAGE SAGD PROJECT	NPV@0% (MM$)	NPV@5% (MM$)	NPV@8% (MM$)	NPV@10% (MM$)	NPV@12% (MM$)	NPV@15% (MM$)
40 WTI	(2,005)	(1,264)	(1,002)	(871)	(765)	(639)
45 WTI	(884)	(701)	(609)	(555)	(508)	(446)
50 WTI	156	(173)	(239)	(259)	(266)	(264)
55 WTI	1,083	300	93	9	(48)	(99)
McD.	5,618	2,564	1,665	1,266	971	662

Break-Even WTI – Summary

- **Producing Projects**
  - Able to sustain short term pricing fluctuations at US $35-40/bbl WTI
  - Able to sustain production over the mid to long term at US $45-50/bbl WTI
- **Greenfield Projects:**
  - Top tier projects likely feasible at US $60/bbl WTI
  - Average SAGD projects require US $65/bbl WTI
- **Debottleneck Expansions:**
  - Debottleneck expansions provide the greatest opportunity to increase production in a low price environment
  - Top-tier projects can expand at US $50/bbl WTI
  - Average projects expandable at US $55-60/bbl WTI
- **Other Opportunities**
  - Performance enhancing technologies may enable further reductions in supply costs by increasing per well productivity and lowering SOR

Break-Even WTI – Summary



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