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ECON 366: Energy Economics

Topic 2.4: Oil and Gas Project Valuation

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Net Present Value and other project finance metrics

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Recall the idea of a net present value of a stream of profits Π_t for n time periods indexed by t:

$$NPV = \sum_{t=1}^{n} \frac{1}{(1+r)^t} \Pi_t$$

This concept forms the basis of a number of important measures used to evaluate projects:

- NPV_k, the net present value at a k% rate of discount e.g. NPV_{10}
- *payback* is the number of periods n it takes for NPV_0 to be positive (i.e $r = 0$)
- *discounted payback* is the number of periods n it takes for $NPV_k > 0$ for $k > 0$
    - (i.e for some $r > 0$, usually 10%)
- *internal rate of return* (IRR) is the rate k such that NPV_k = 0
- *supply cost* or *break even oil price* is the price at which $NPV_k = 0$, usually reported for $NPV_{10} = 0$

Net Present Value and other project finance metrics

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Recall the idea of a net present value of a stream of profits Π_t for n time periods indexed by t:

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- Why might an oil company use *payback* or *discounted payback as a metric?
- Does *break even* mean what you think it means?
- Which metric would you prefer?

Net Present Value and other project finance metrics

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Recall the idea of a net present value of a stream of profits Π_t for n time periods indexed by t:

$$NPV = \sum_{t=1}^{n} \frac{1}{(1+r)^t}\Pi_t$$

This deck looks at the last modification to that formula: the *supply cost* for an oil project.

- *supply cost* or *break even oil price* is the price at which $NPV_k = 0$, usually reported for $NPV_{10} = 0$

Supply Cost

Let p be the price of oil

- p is usually a benchmark, WTI or Brent
- p could also be implied plant-gate bitumen prices, for example

Now, allow the stream of profits to be a function of prices p for each time t, denoted by $\Pi_t(p_t)$, and let the supply cost be given by:

$$\text{Supply cost} = \{\bar{p_t}\}_{t=1}^{n} \ni \sum_{t=1}^{n} \frac{1}{(1+r)^t} \Pi_t(\bar{p_t}) = 0$$

i.e. $\{\bar{p_t}\}_{t=1}^{n}$ is the set of constant *real* (or, increasing nominal) oil prices chosen such that the net present value of the project is zero, usually for $r = 10$ or $r = 12$

Oil Sands Project Economics

What does an oil sands investment involve?

- Purchase a lease
- Seek regulatory approval
- Build an extraction facility
- Burn diesel and/or natural gas
- Use chemicals
- Produce bitumen
- Purchase diluent
- Ship and sell diluted bitumen
- Reclaim/remediate land and tailings

Oil Sands Project Economics

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What does an oil sands investment involve for our purposes today?

- Build an extraction facility
- Burn diesel and/or natural gas
- Use chemicals
- Produce bitumen
- Purchase diluent
- Ship and sell diluted bitumen

A simplified version of the problem

The basic approach to a financial model

What do I need to know to assess the NPV (or other metrics) for this project?

- Construction costs and schedules
- Operating and maintenance costs
- Output
- Prices
- Fiscal regimes (taxes and royalties)
- Financing

Initially, let's worry about the big ones

- Prices
- Output
- Capital, operating and maintenance

What am I selling?

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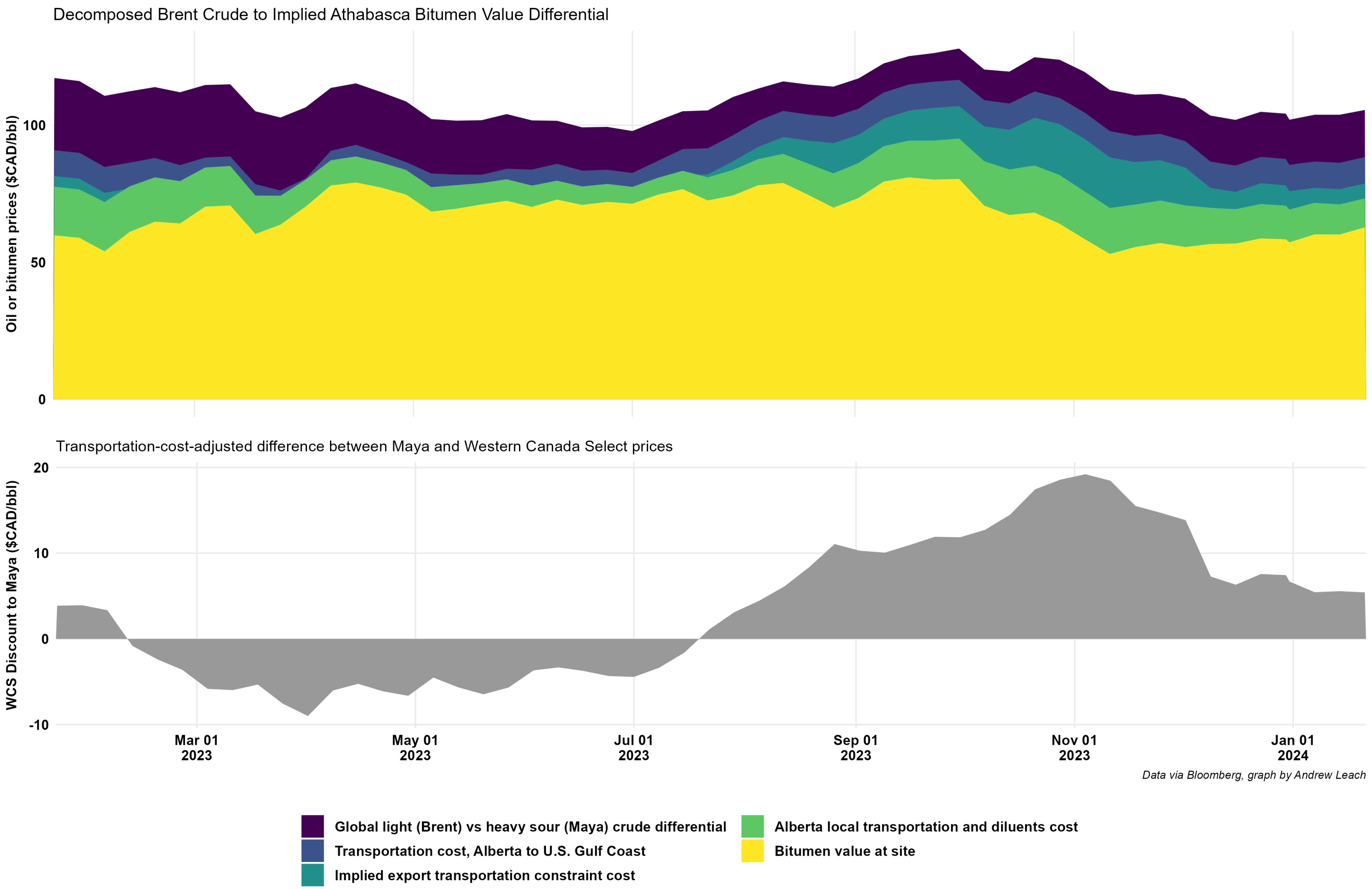
- Oilsands projects produce bitumen (not a homogeneous commodity, but we'll treat it as such for today)
- In order to be transported by pipeline, bitumen must be diluted
- Diluted bitumen trades roughly on par with heavy oil
- Heavy oil trades at a discount to light oil due to its lower value to refiners

Recall this graph of oil sands pricing?



Now we need to solve for the top of the yellow: the implied value of bitumen at the plant gate

Derived value of bitumen

How much is a barrel of bitumen worth?

- Start with the price of a barrel of WCS at Hardisty – $US 56, or $CA 75 per barrel
- Now, what do I need to do to get bitumen from my site to Hardisty in WCS-form?
- A barrel of WCS is (approximately) 30% diluent, 70% bitumen
  - I need to purchase .3 barrels of diluent at Hardisty, for a price of $110/bbl, or $33 diluent cost
  - I need to ship that to my site, at a cost of $1/bbl, or $0.30 total cost
  - I need to ship one barrel of WCS-equivalent to Hardisty, at a cost of $1.50
- My net revenue from the sale of a barrel of WCS equivalent is (75-33-0.30-1.50)=40.20 What's the implied value of a barrel of bitumen at site?

$$\frac{\$75 - \$33 - \$0.30 - \$1.50}{0.7 \text{ bbl bitumen}} = \frac{\$40.20}{0.7 \text{ bbl bitumen}} = \frac{\$57.43}{\text{bbl bitumen}}$$

Pricing in the model template

		2020	2021	2022	2023	2024	2025
Year		2020	2021	2022	2023	2024	2025
Production Year		0	0	0	1	2	3
Years since construction		0	1	2	3	4	5
Operating		1	1	1	1	1	1
Energy Price inflation index (incl pipeline tolls)	2.00%	1.000	1.020	1.040	1.061	1.082	1.104
Overall inflation index	2.00%	1.000	1.020	1.040	1.061	1.082	1.104
Capital Escalation index	2.00%	1.000	1.020	1.040	1.061	1.082	1.104
Non-energy cost escalation index	2.00%	1.000	1.020	1.040	1.061	1.082	1.104
Discount rate	10.00%	1.000	0.909	0.826	0.751	0.683	0.621
Pricing ($CDN/bbl unless indicated)							
WTI forecast, $US	Sproule Forecast						
$US/$CDN	Sproule Forecast						
WTI forecast	Calculated	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edmonton Light Discount to WTI		-	-	-	-	-	-
Edmonton Light Price	Calculated	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
WCS Discount to Edmonton Light		-	-	-	-	-	-
WCS ($CAD)	Calculated	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Condensate Premium to Edmonton Light		-	-	-	-	-	-
Condensate	Calculated	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Blending ratio	30%	0.30	0.30	0.30	0.30	0.30	0.30
Dilbit Quality discount to WCS	$0.00	-	-	-	-	-	-
Athabasca dilbit price	Calculated	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Bitumen (implied)	Calculated	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Natural Gas ($/GJ)							
AECO C	Sproule Forecast						

Sproule Prices

Table 1 - North American Oil
Sproule - GTI
Summary of Price Forecasts, Inflation and Exchange Rates

Prices in Canadian Dollars

Year	1 WTI Cushing Oklahoma $US/Bbl	USA LLS Onshore 40 API $US/Bbl	USA Central OK Sweet $US/Bbl	Canadian Light Sweet 40 API $/Bbl	Synthetic Crude Oil Edmonton 32 API $/Bbl	Cromer LSB 35 API $/Bbl	Hardisty Heavy 12 API $/Bbl	Western Canada Select (WCS) 20.5 API $/Bbl	Hardisty Bow River 24.9 API $/Bbl	Cold Lake Blend 22.6 API $/Bbl	2 Energy Cost Inflation Rate %/Yr	Operating Cost Inflation Rate %/Yr	3 Capital Cost Inflation Rate %/Yr	Exchange Rate CAD/USD
2009 Act	61.63	57.23	58.19	66.20	69.20	63.86	55.65	58.66	59.71	57.67	-38.1%	0.7%	-9.0%	0.88
2010 Act	79.43	74.83	75.88	77.80	80.89	76.57	62.30	67.21	68.27	65.96	28.9%	1.7%	4.0%	0.97
2011 Act	95.00	90.36	91.41	95.16	102.33	89.68	69.10	77.09	78.30	74.99	19.6%	1.4%	5.3%	1.01
2012 Act	94.19	89.58	90.63	86.57	92.50	84.42	65.00	73.08	74.36	71.42	-0.8%	1.0%	4.5%	1.00
2013 Act	97.98	97.55	93.26	93.27	100.12	91.59	64.98	74.93	76.16	72.91	4.0%	1.0%	0.7%	0.97
2014 Act	93.00	96.75	86.35	93.99	101.47	92.66	76.40	81.06	81.67	79.02	-5.1%	2.0%	-1.0%	0.91
2015 Act	48.80	52.38	41.71	57.45	62.25	55.57	40.42	44.83	45.35	43.60	-47.5%	1.8%	-18.7%	0.78
2016 Act	43.32	44.88	35.83	52.80	58.17	51.35	34.08	38.89	39.22	37.69	-11.2%	1.2%	-9.7%	0.76
2017 Act	50.95	54.13	44.96	61.85	67.74	62.06	45.76	50.24	50.85	49.33	17.6%	1.7%	2.4%	0.77
2018 Act	64.77	69.81	61.58	68.49	74.95	73.06	44.74	52.34	53.11	51.14	27.7%	2.4%	4.2%	0.77
2019 Act	57.02	62.71	53.34	68.87	75.32	69.68	55.11	58.77	59.10	57.57	-12.0%	-0.7%	0.4%	0.75
2020 Act	39.40	41.20	35.92	45.39	48.47	45.40	31.47	35.59	35.92	34.39	-30.9%	-5.2%	-5.2%	0.75
2021 Act	67.91	69.46	64.41	80.31	83.26	80.07	63.82	68.73	69.04	67.53	72.4%	4.1%	7.9%	0.80
2022 12 mo. Act	94.23	96.65	90.69	119.73	128.54	119.97	95.71	101.64	101.96	100.44	38.7%	8.6%	11.2%	0.77
2023 12 mo. Est	86.00	89.00	82.50	110.67	114.67	110.17	80.96	88.00	89.32	87.00	2.4%	0.0%	0.0%	0.75
2024	84.00	85.97	80.40	101.25	105.37	100.74	82.23	89.38	90.72	88.41	-2.3%	3.0%	3.0%	0.80
2025	80.00	80.95	76.32	96.18	100.38	95.65	77.34	84.06	85.32	83.08	-4.8%	2.0%	2.0%	0.80
2026	81.60	82.57	77.85	98.10	102.38	97.56	78.88	85.74	87.03	84.74	2.0%	2.0%	2.0%	0.80
2027	83.23	84.22	79.41	100.06	104.43	99.51	80.46	87.46	88.77	86.43	2.0%	2.0%	2.0%	0.80
2028	84.90	85.90	80.99	102.06	106.52	101.50	82.07	89.21	90.55	88.16	2.0%	2.0%	2.0%	0.80
2029	86.59	87.62	82.61	104.10	108.65	103.53	83.71	90.99	92.36	89.93	2.0%	2.0%	2.0%	0.80
2030	88.33	89.37	84.27	106.18	110.82	105.60	85.39	92.81	94.20	91.72	2.0%	2.0%	2.0%	0.80
2031	90.09	91.16	85.95	108.31	113.04	107.72	87.09	94.67	96.09	93.56	2.0%	2.0%	2.0%	0.80
2032	91.89	92.99	87.67	110.47	115.30	109.87	88.84	96.56	98.01	95.43	2.0%	2.0%	2.0%	0.80

You can access the latest Sproule forecast here.

Sproule Prices

Year		2023	2024	2025	2026	2027	2028	2029	2030
Production Year		0	0	0	1	2	3	4	5
Years since construction		0	1	2	3	4	5	6	7
Operating		1	1	1	1	1	1	1	1
Energy Price inflation index (incl pipeline tolls)	2.00%	1.000	1.020	1.040	1.061	1.082	1.104	1.126	1.149
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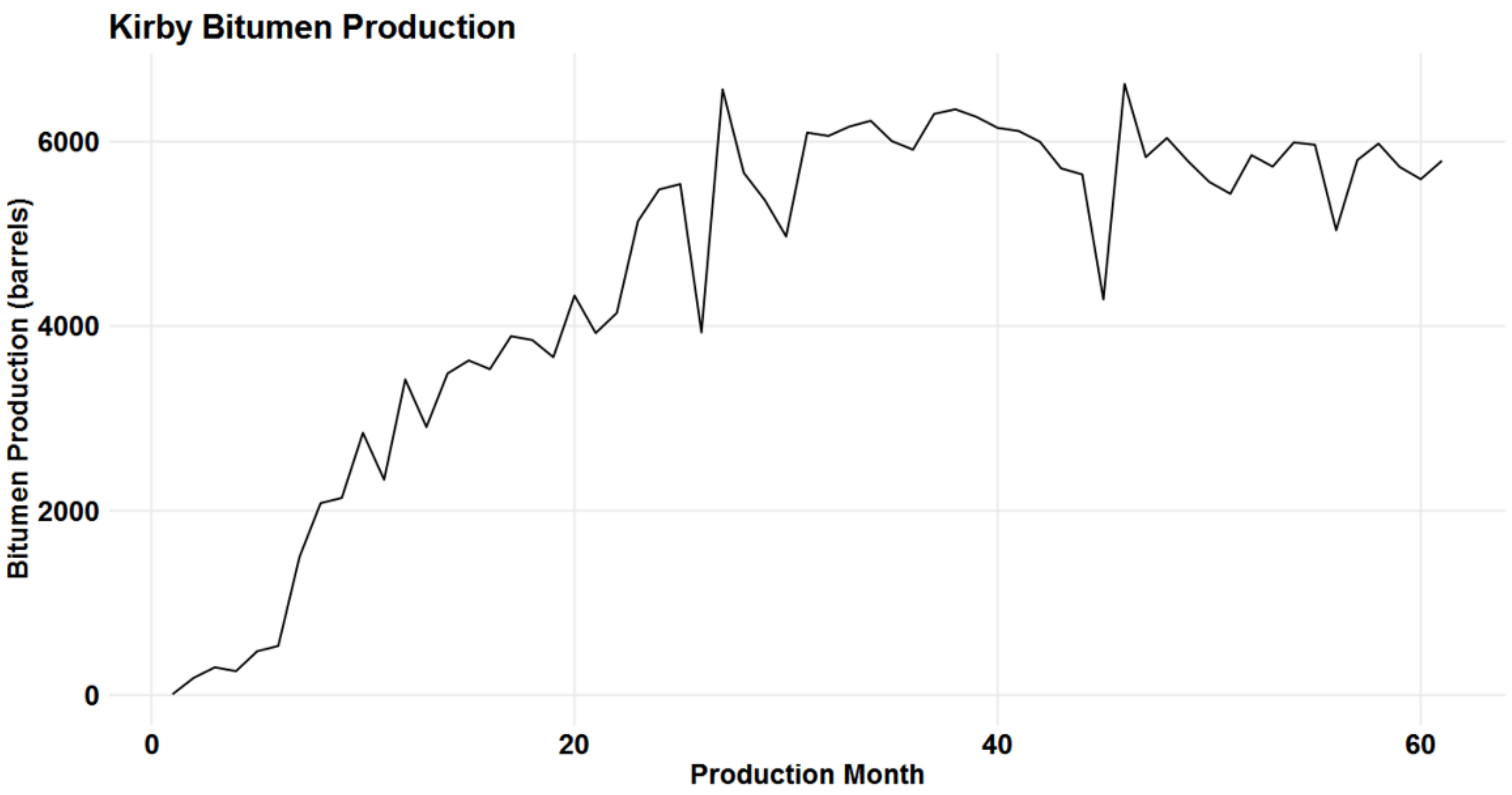
Discount rate	10.00%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513
Pricing ($CDN/bbl unless indicated)									
WTI forecast, $US	Sproule Forecast	86.00	84.00	80.00	81.60	83.23	84.90	86.59	88.33
$US/$CDN	Sproule Forecast	0.75	0.80	0.80	0.80	0.80	0.80	0.80	0.80
WTI forecast	Calculated	114.67	105.00	100.00	102.00	104.04	106.12	108.24	110.41
Edmonton Light Discount to WTI	$0	-	-	-	-	-	-	-	-
Edmonton Light Price	Calculated	114.67	105.00	100.00	102.00	104.04	106.12	108.24	110.41
WCS Discount to Edmonton Light	15%	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
WCS ($CAD)	Calculated	97.47	89.25	85.00	86.70	88.43	90.20	92.01	93.85
Condensate Premium to Edmonton Light	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Condensate	Calculated	116.96	105.02	100.02	102.02	104.06	106.14	108.26	110.43
Blending ratio	30%	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Dilbit Quality discount to WCS	$0.00	-	-	-	-	-	-	-	-
Athabasca dilbit price	Calculated	97.47	89.25	85.00	86.70	88.43	90.20	92.01	93.85
Bitumen (implied)	Calculated	89.11	82.49	78.56	80.13	81.74	83.37	85.04	86.74

Production

- Production timelines will vary by facility, resource type, production technology, etc.
- Production drives the revenue side of your cash flow model
- Oil sands facilities tend to have a long ramp-up (3-4 years for mines, 1-2 years for in-situ) followed by stable production at or close to nameplate capacity for 25-50 years depending on the facility

Production



Kirby Bitumen Production
Bitumen Production (barrels)
6000
4000
2000
0
0
20
40
60
Production Month

Production and revenue in the model template

Year		2020	2021	2022	2023	2024	2025	2026
Production Year		0	0	0	1	2	3	4
Production								
Nameplate Capacity (bbl/d)	35000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
Ramp-up (%)	Assumed	-	-	-	0.30	0.60	0.84	1.00
Percentage design capacity achieved	100.00%	-	-	-	0.30	0.60	0.84	1.00
Operational Capacity (bbl/d)	Calculated	-	-	-	10,500.00	21,000.00	29,400.00	35,000.00
Total Annual Production (mmbbl)	Calculated	-	-	-	3.83	7.67	10.73	12.78
Cumulative Production (mmbbl)	Calculated	-	-	-	3.83	11.50	22.23	35.00
Average daily bitumen production (bbl/d)	Calculated	-	-	-	10,500.00	21,000.00	29,400.00	35,000.00
Condensate req (bbl/d)	Calculated	-	-	-	4,500.00	9,000.00	12,600.00	15,000.00
Annual condensate use (mmbbl)	Calculated	-	-	-	1.64	3.29	4.60	5.48
Dilbit production (bbl/d)	Calculated	-	-	-	15,000.00	30,000.00	42,000.00	50,000.00
Annual dilbit production (mmbbl)	Calculated	-	-	-	5.48	10.95	15.33	18.25
Cumulative Bitumen Production (mmbbl)	Calculated	391.43						
Cumulative Dilbit Production (mmbbl)	Calculated	559.18						
Revenue		2,020.00	2,021.00	2,022.00	2,023.00	2,024.00	2,025.00	2,026.00
Bitumen at site ($/bbl)	From above	51.20	51.93	50.57	51.58	52.61	53.66	54.73
Production (mmbbl)	From above	-	-	-	3.83	7.67	10.73	12.78
Gross Bitumen revenue ($mm)	Calculated	-	-	-	197.67	403.25	575.83	699.23

Initial capital and construction costs (including land)

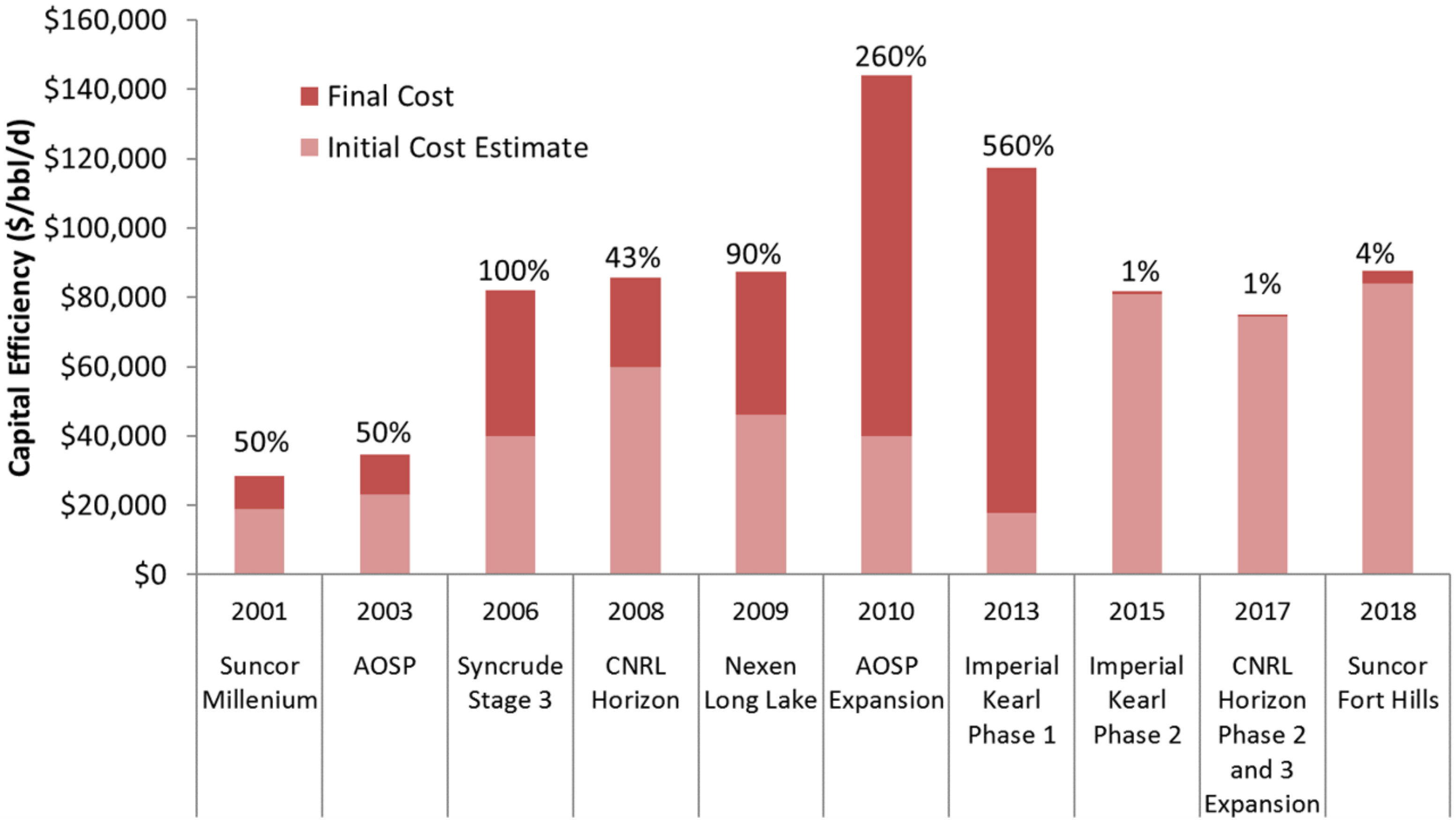
Expressed in cost *per flowing barrel*:

$$\frac{\text{Project capital up-front capital cost (dollars)}}{\text{Project daily production capacity (barrels per day)}}$$

> For example: Firebag 4 total cost was $1.7 billion for 42,500 b/d of capacity = $40,000 per *flowing barrel*

Think of the oil production from a facility as an annuity, and the cost *per flowing barrel* as the up-front payment to access that annuity for a term equal to the project life.

Capital cost inflation was once a major risk



Project operating costs and fiscal policies

OPEN DATA

Alberta Oil Sands Royalty Data

Summary | Detailed Information | Related (1)

DESCRIPTION

Publishing this royalty data as it was a recommendation of the 2015 Royalty Review Advisory Panel that also gave direction on the Modernized Royalty Framework that came into force on January 1, 2017.

UPDATED

August 4, 2022

TAGS

RESOURCES

2021 Oil sands project data as of May 9, 2022 (published in August 2022)

2021 Oil sands project data as of 12:00:00 AM May 9, 2022, industry is...

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2020 Oil sands project data as of May 9, 2022 (published in August 2022)

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2019 Oil sands project data as of May 9, 2022 (published in August 2022)

2019 Oil sands project data as of 12:00:00 AM May 9, 2022, industry is...

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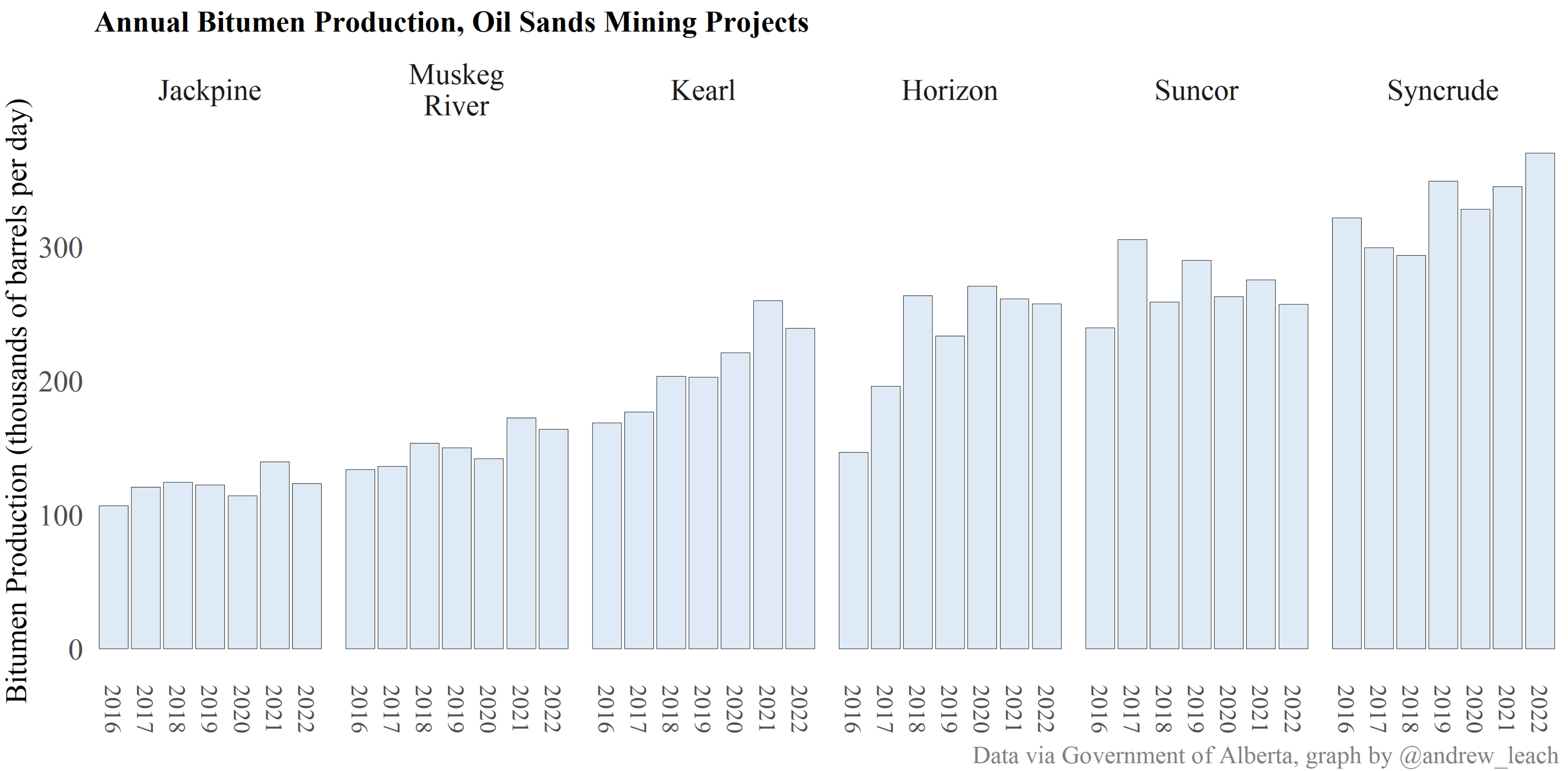
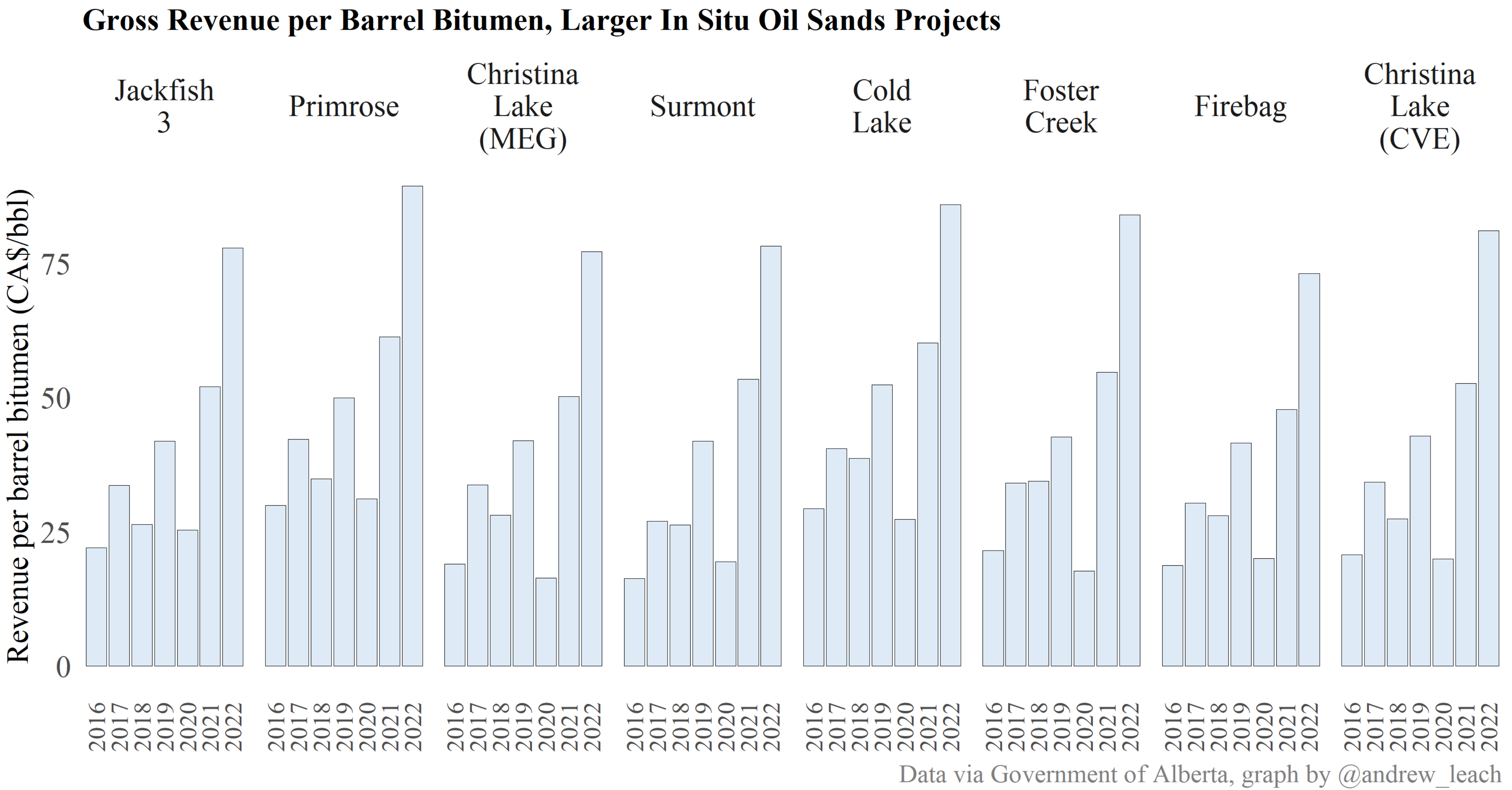
You can access the data here and some background on oil sands royalties here. The historical data and the Alberta Revenue Workbook are going to be used in upcoming data exercises.

Mining Production



In Situ Revenue Per Barrel



Sustaining capital costs

- Ongoing investment for maintenance of large facilities, including pipelines, well-pads, etc.
- Sustaining capital cost captures large expenditures, so does not include all maintenance
- Typical values are between \$10-12/bbl produced for SAGD facilities, and \$6-8 per barrel produced for mining operations

Operating costs

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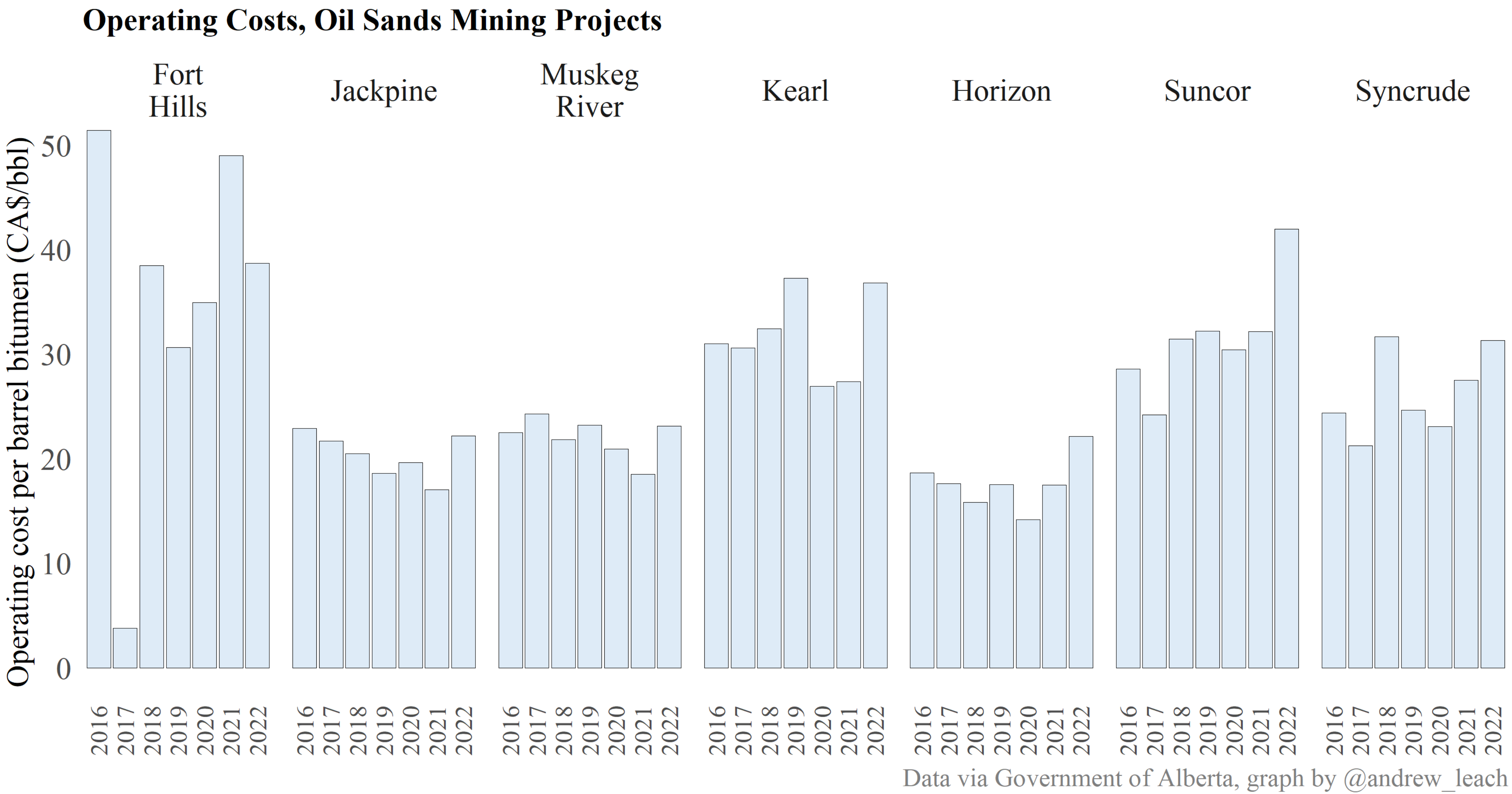
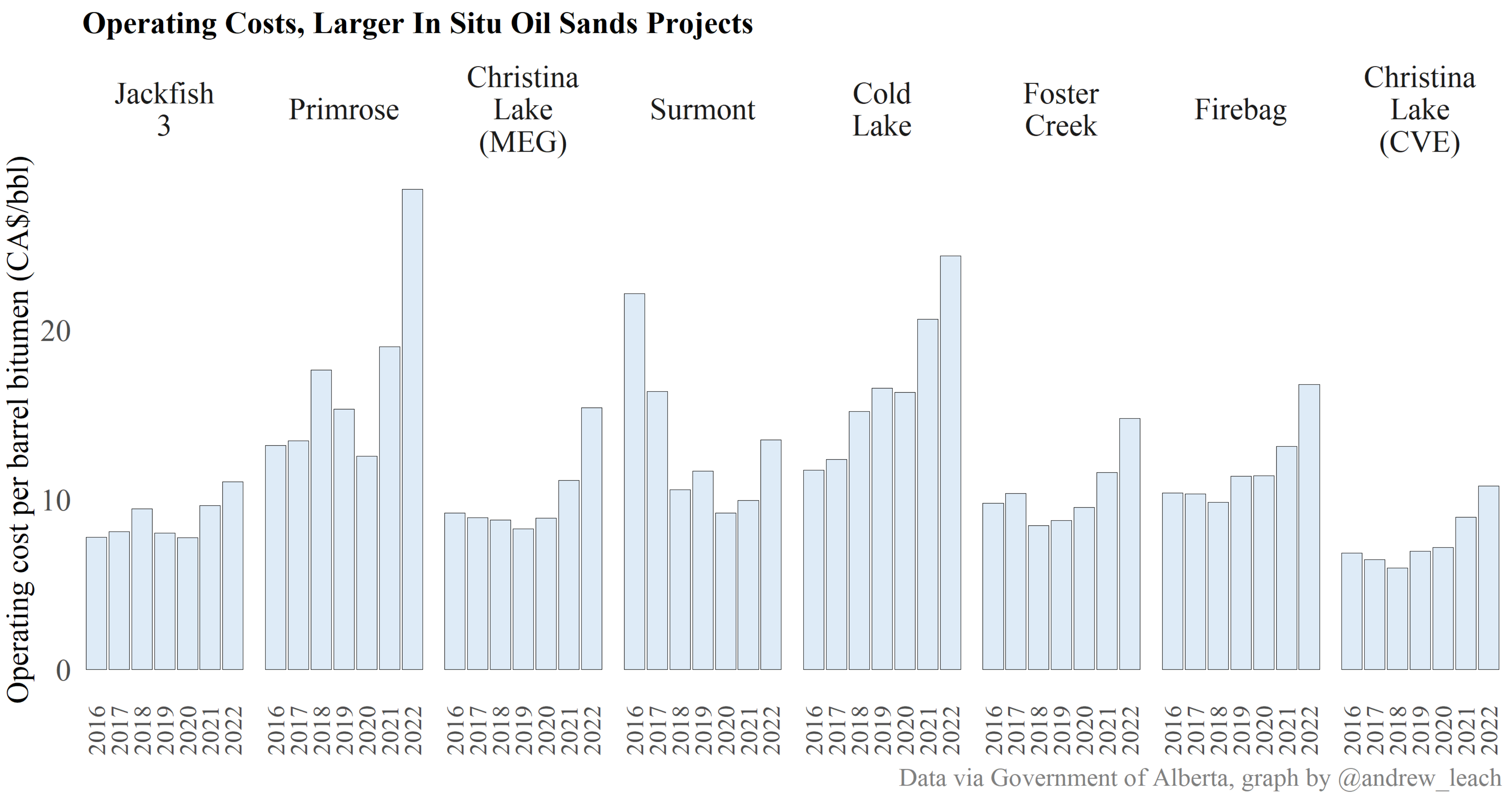
- Traditionally separated into gas and non-gas operating costs
- Natural gas is the single largest component for SAGD facilities.
- Some cost figures will also report labour costs as separate components of operating and sustaining capital expenditures
- Highly variable at the facility level
    - SAGD facilities tend to be in the $5-15/bbl range
    - Mining facilities have increased significantly, to $25-30/bbl (bitumen) ranges, with $40-50/bbl SCO costs in some years
    - Kearl, the only mine to not upgrade bitumen, had reported operating costs at $36-40/bbl, those decreased by about $10/bbl when the next phase came online
    - Fort Hills is...well not good

Mining Operating Costs



In Situ Operating Costs



Fiscal policies

- Oil sands were, for a long time, the most interesting royalty issue in the province
- Historically, oil sands operations were marginal projects
- Significant dependence on the price of oil
- Role for government to encourage investment to create jobs, stimulate the economy
- *Generic oil sands royalty regime* imposed royalty rates at a fixed 1% of gross revenues until the project costs had been recovered, 25% of net revenues afterwards
- 2008 regime introduced a sliding scale for both the base rate and the post-payout rate based on prices
  - Environmental *costs* were recognized as project costs after 2008
- 2015 Royalty Review largely left oil sands royalties unchanged
- Long run oil price outlook may make new projects challenging regardless of royalty structure

> What makes a *good* royalty regime?

Oil Sands Royalties

- Base royalty rate of 1% for $55/bbl and below, increasing linearly to 9% for $120/bbl
- Post-payout royalty rate of 25% up to $55/bbl, and increasing linearly to 40% for $120/bbl and above

Royalties depend on oil prices, but *what* oil price, *when* and *where*?

- the WTI (Cushing) price for a given month, expressed in Canadian currency, calculated as the product of:

  a. the simple average of the WTI prices for the trading days of the preceding month expressed in American currency, and

  b. the simple average of the daily actual USD/CAD (noon) exchange rates for that month.

Net Revenue Calculation

What's the net revenue for the purposes of royalty calculations?

> The amount by which the project's revenue exceeds allowed costs, minus other net proceeds. Net revenue can never be below zero.
>
> Calculated as Gross Revenue – Operating Costs – Capital Costs – Return Allowance – Other Costs + Other Net Proceeds.

Financing costs are exempt from net revenue calculations

Payout Calculation

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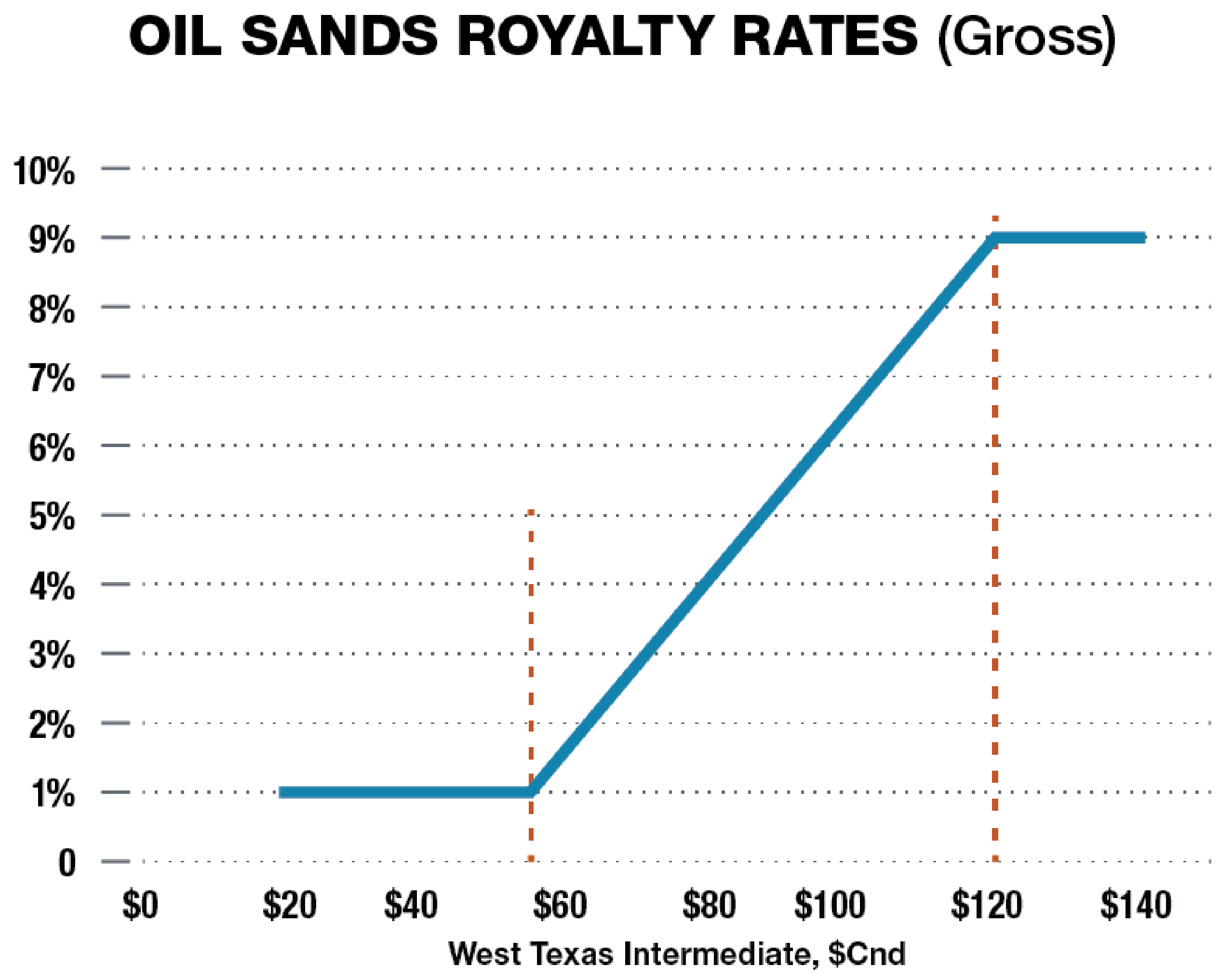
How do you know if a project has paid back its initial investment and you're paying a net or a gross revenue royalty?

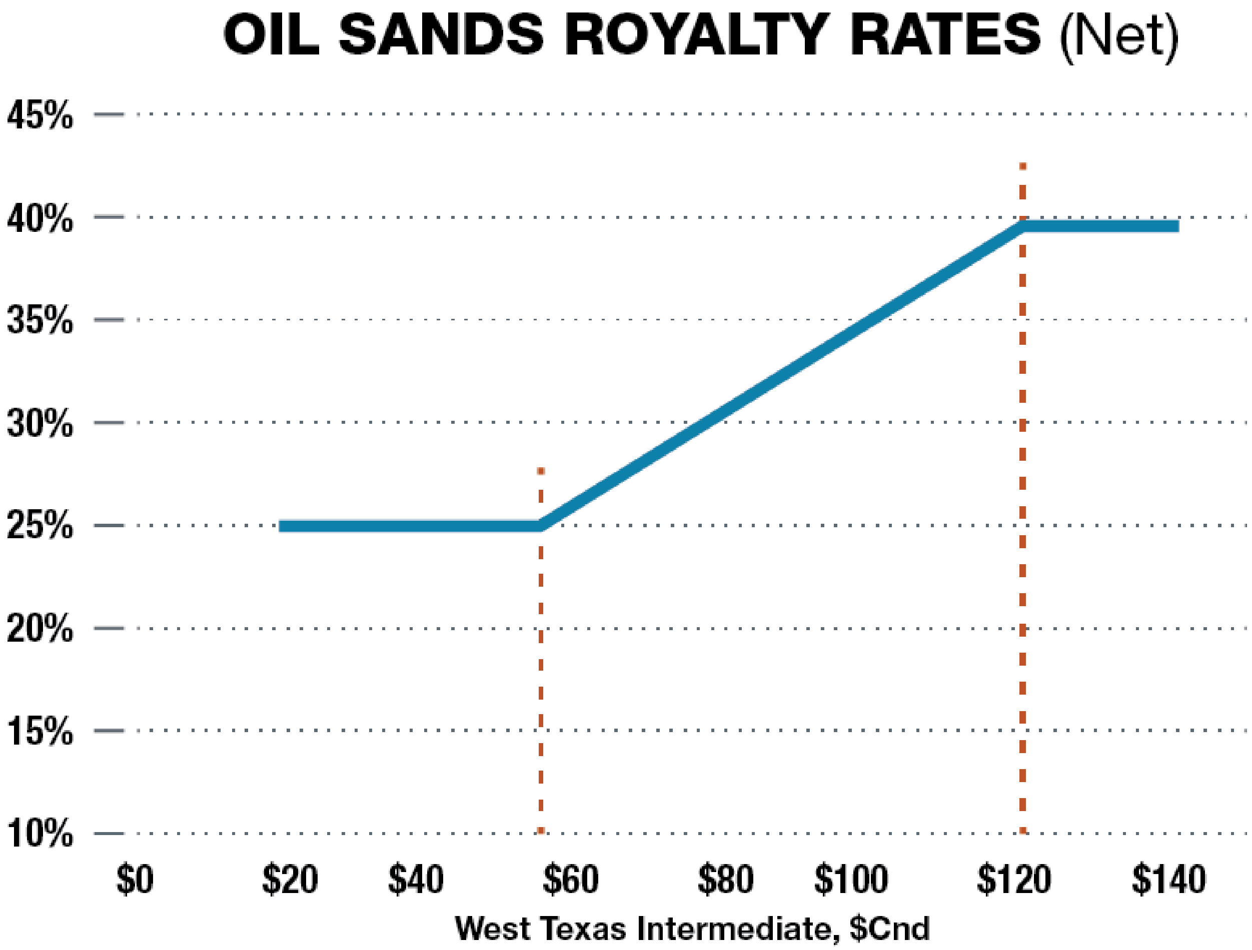
> Project payout occurs when a project's cumulative revenues first equal or exceed its cumulative costs. Royalties are typically higher in the post-payout phase. **Once a project achieves payout it remains in the post-payout phase**.
>
> Payout calculation assumes unrecovered capital costs are carried at the Government Long Term Bond Rate. Think of a virtual line of credit where all expenses are spent via the line, and all revenues deposits to pay back the line. When the line is *paid off*, the project has reached *payout*.

Projects always pay the greater of the calculated net or gross revenue royalty

Gross Revenue Royalty



Net Revenue Royalty



Payment of Royalties

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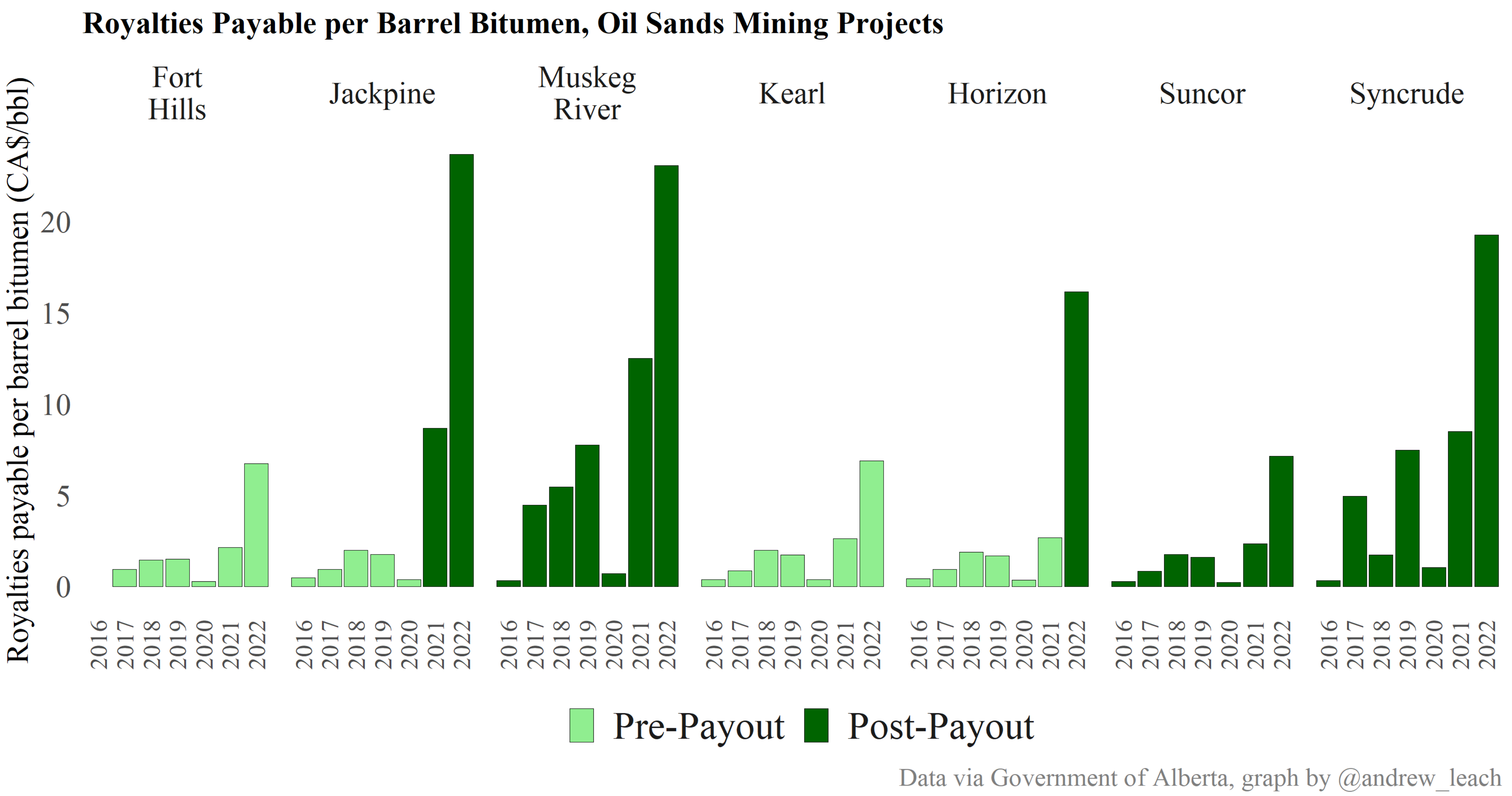
- Always has been “in-kind” for conventional, “in cash” for oil sands
- Government had not wanted to be in the upgrading/refining business, and so did not accept bitumen in lieu of cash

Under the 2008 royalty regime:

> “The government intends to have a portion of its royalty share of bitumen in-kind commercially upgraded to higher value products in the province. The government wants to hear from companies interested in buying bitumen from the province for upgrading and other value-added activities in Alberta.”

For our purposes, that's not really important, but it does matter for producers.

Mining Royalties



In Situ Royalties

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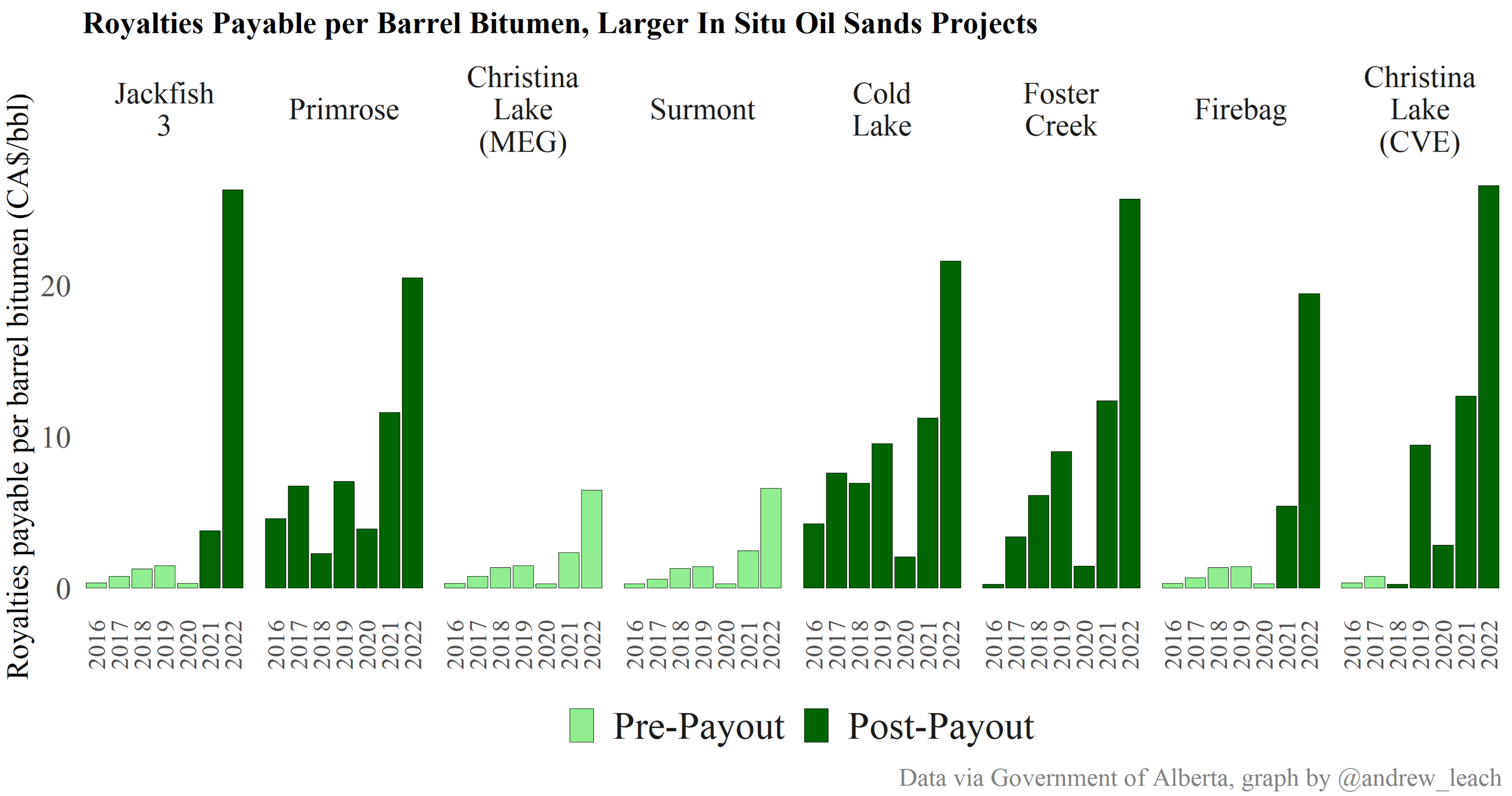

Mining unrecovered capital costs

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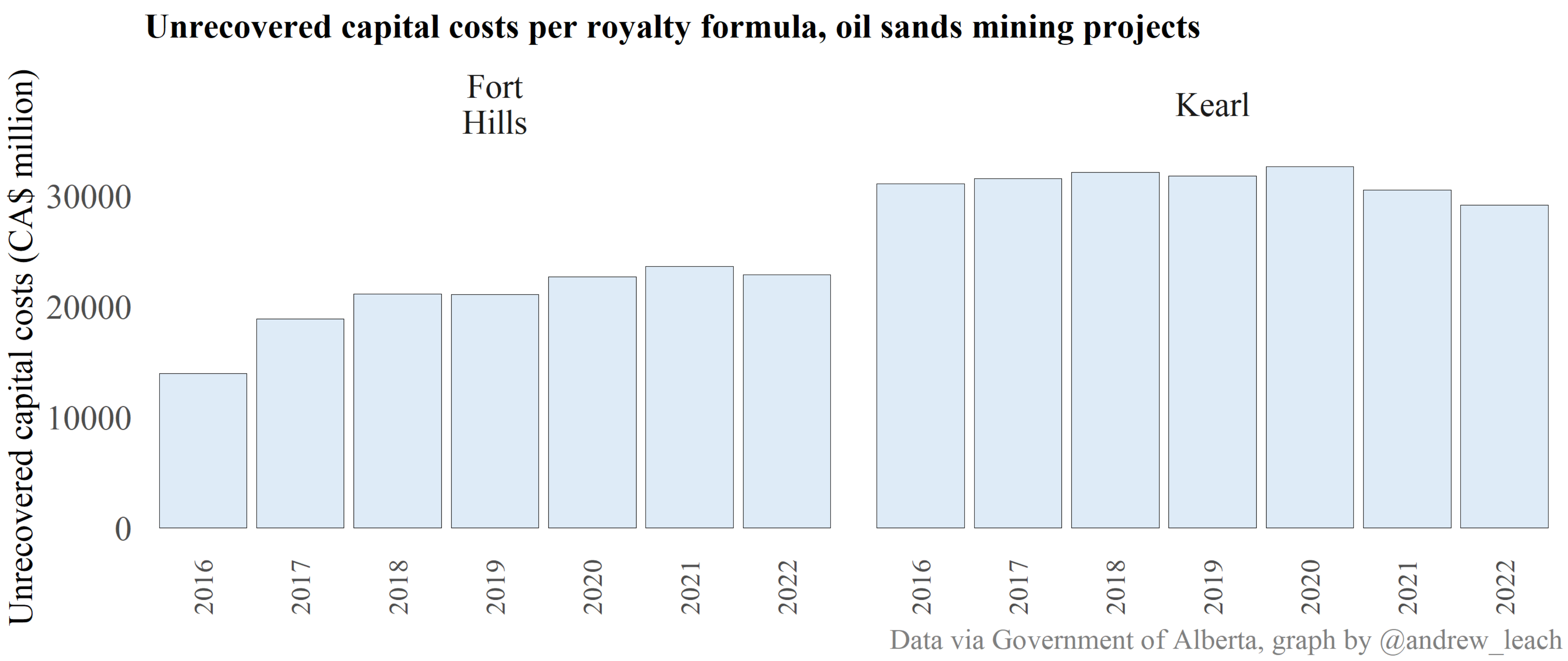
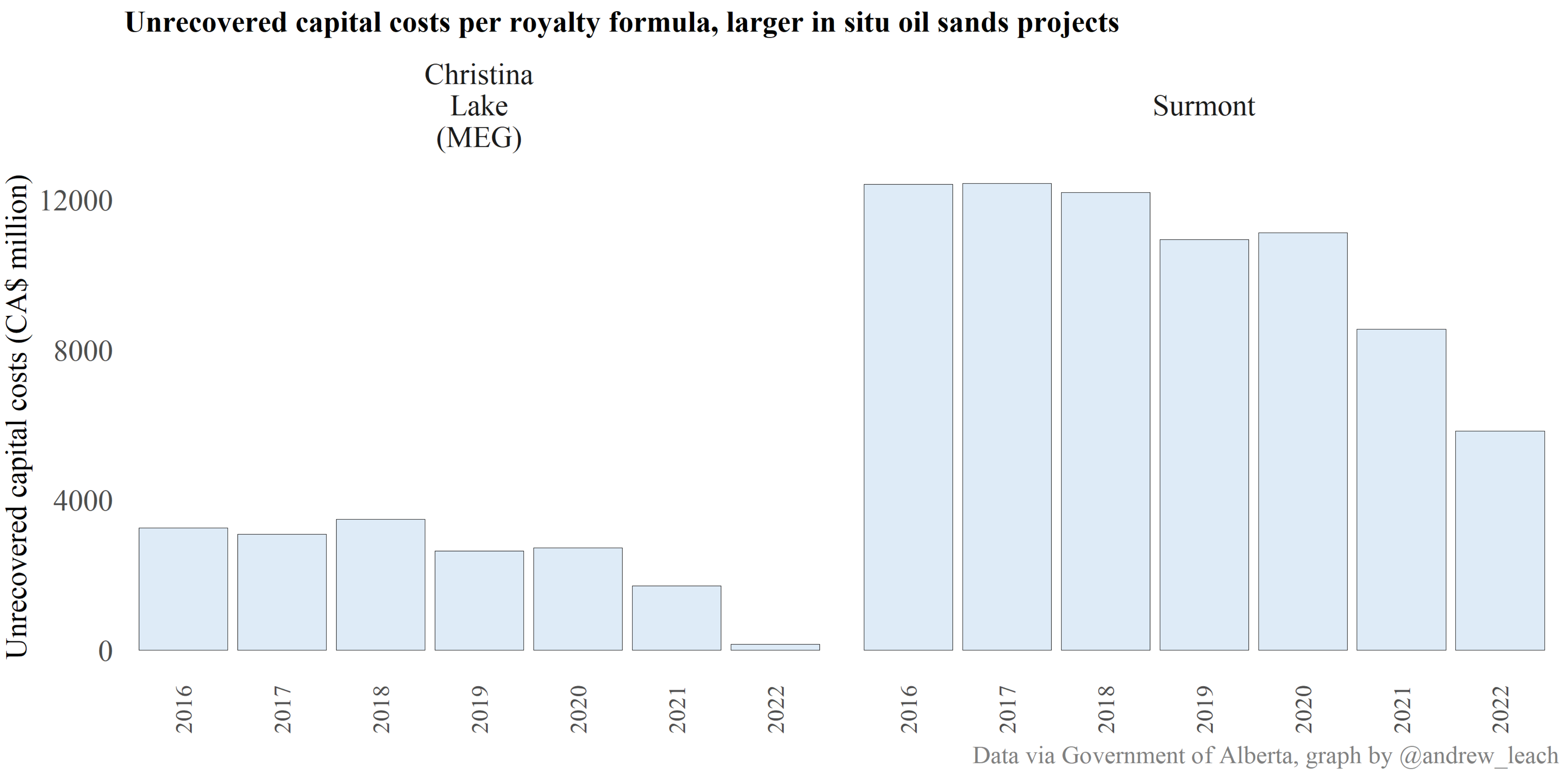
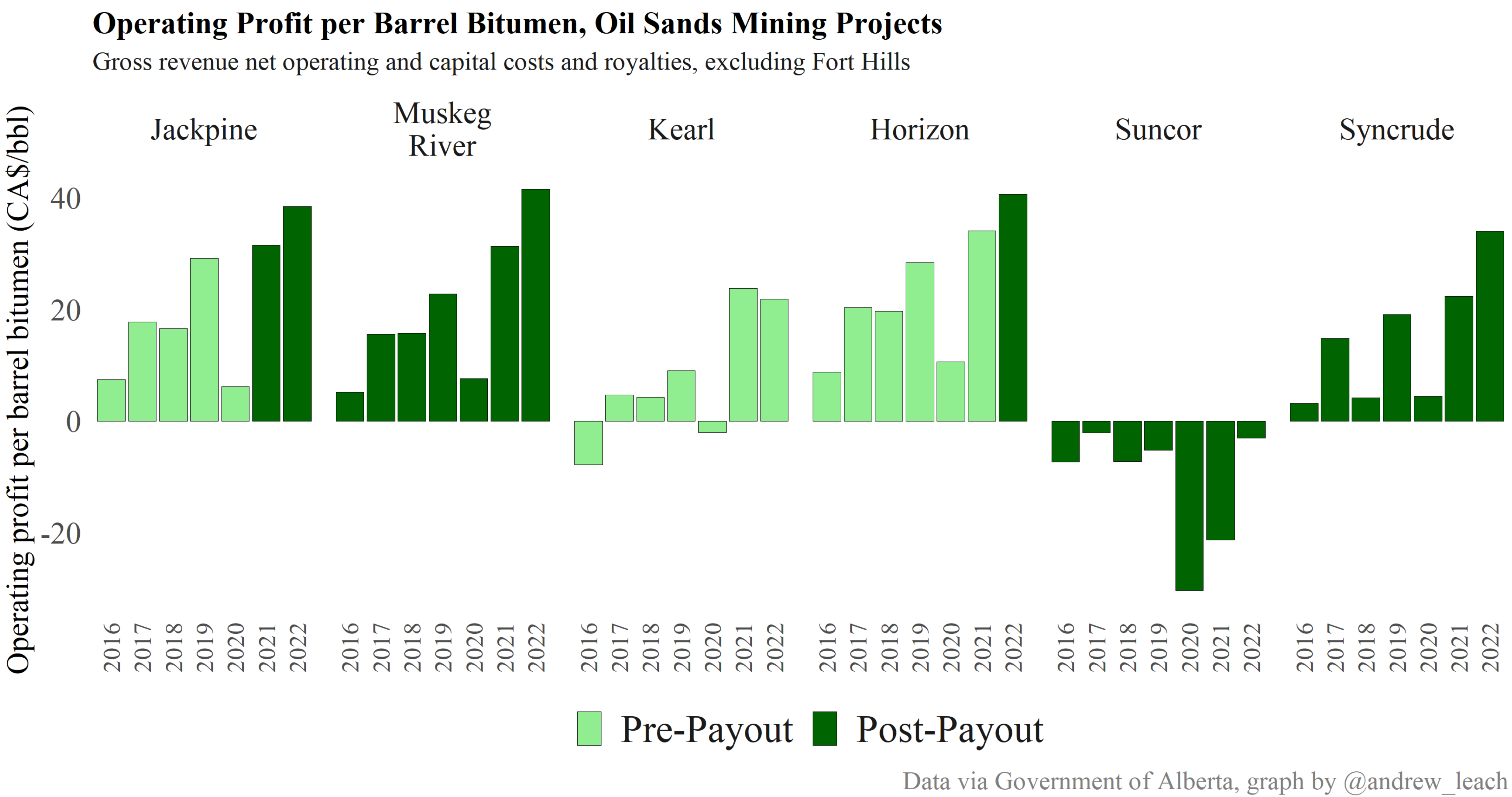


In Situ Unrecovered Capital Costs



Mining Operating Profits (Post-Royalty)



In Situ Operating Profits

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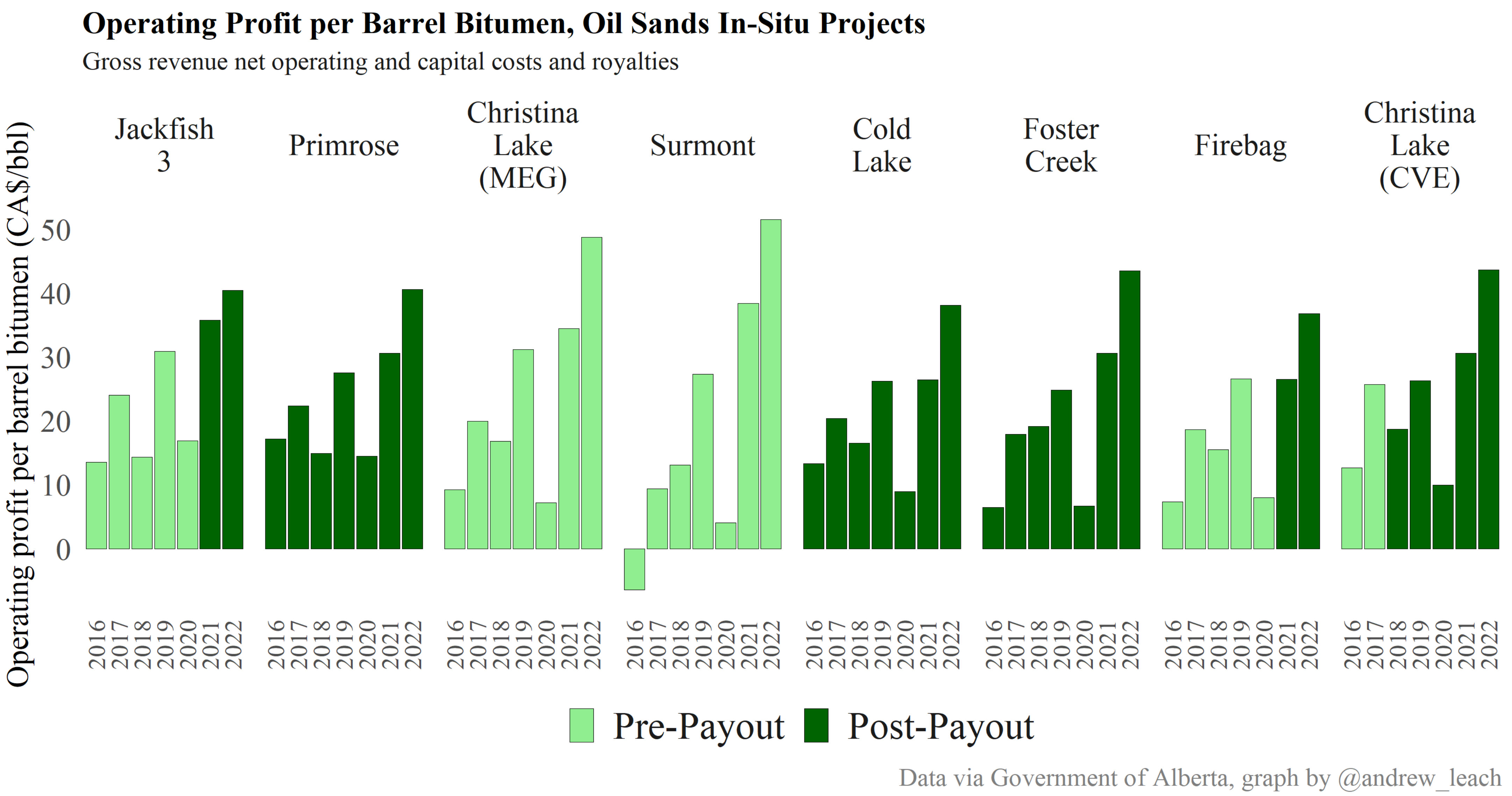

Taxes

Main tax policies include

- Federal and provincial corporate taxes
  - Capital cost allowance
  - CDE and CEE
- Other issues affect junior oil and gas companies a lot more than oil sands firms
  - e.g. flow-through shares and tax losses

We won't go into details on corporate taxes, but they are calculated in your model

The inutition in the model: commodity prices

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Project NPV_{10} sensitivity to commodity prices

		WTI price (US$ 2023)						
		30	40	50	60	70	80	90
NIT Gas Price (CA$ 2023)	3.00	-517	216	863	1447	1971	2463	2942
	4.00	-639	113	766	1355	1883	2377	2859
	5.00	-770	9	669	1262	1794	2292	2776
	6.00	-902	-95	572	1169	1705	2206	2693
	7.00	-1034	-201	474	1076	1616	2120	2610
	8.00	-1167	-309	376	983	1527	2035	2526

The inutition in the model: differentials

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Project NPV_{10} sensitivity to heavy:light differentials

Differential (% discount for WCS vs Edm Light)	WTI price (US$ 2023)						
	30	40	50	60	70	80	90
10%	-368	392	1070	1684	2235	2754	3260
12%	-442	304	967	1565	2103	2608	3101
14%	-517	216	863	1447	1971	2463	2942
16%	-593	128	759	1328	1839	2317	2783
18%	-678	39	655	1209	1706	2171	2624
20%	-762	-50	551	1090	1573	2025	2465

Supply cost basics

- the particular project in the model I've given you has a supply cost of about $40/bbl WTI
- supply costs will vary (all else equal) with:
  - heavy oil differential (+, higher diff means higher WTI price needed)
  - CAD (+, stronger CAD (fewer CAD per USD) means higher WTI price needed)
  - gas prices (+, higher gas price means higher WTI price needed)
  - capital costs (+, higher Capital cost means higher WTI price needed)
  - operating costs (+, higher op costs means higher WTI price needed)
  - taxes and royalties (+, higher taxes mean higher WTI price needed)

Supply Costs in Practice

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Table S3.4 Alberta crude bitumen supply costs, 2021

Project type	Production (10^3 m^3/d)	Production (bbl/d)[a]	Capital cost range (millions of dollars)	Capacity utilization	Estimated supply cost ($US WTI equivalent per barrel)
In situ SAGD	6.4	40,000	620 – 1,400	90%	43 – 51
Standalone mine	15.9	100,000	,600 – 11,00	90%	73 – 82

[a] bbl/d = barrels per day.

Supply Costs in Practice

Table S4.3 Alberta crude oil supply costs by PSAC area, 2021

Area	Formation	Type of well	Type of oil	Total measured depth (m)	Initial productivity (m^3/d)	Total capital cost (Cdn$000)	Fixed operating cost (Cdn$000/year)	Variable operating cost (Cdn$/$m^3$)	Crude oil supply cost- single well (Cdn$/bbl)	Crude oil supply cost- multiwell pad with 4 wells (Cdn$/bbl)
PSAC 2	Cardium	Horizontal	Sweet light	3 900	16.0	2 791	74.93	46.38	29.51	21.02
PSAC 2	Cardium	Horizontal	Sweet medium	3 600	9.1	3 039	61.68	53.21	57.67	42.97
PSAC 2	Spirit River	Horizontal	Sweet light	4 230	10.5	4 919	65.63	46.38	70.23	41.94
PSAC 3	Sunburst	Vertical	Sweet medium	1 540	4.6	875	39.02	83.56	39.75	n/a
PSAC 3	Banff	Horizontal	Sour medium	3 800	12.9	4 597	31.60	87.65	95.30	45.71
PSAC 3	Viking	Horizontal	Sweet medium	2 000	5.8	1 236	20.77	27.62	27.83	22.97
PSAC 4	Lloyd SS	Vertical	Sweet heavy	1 100	4.2	1 130	68.18	64.80	57.85	n/a
PSAC 4	Sparky SS	Horizontal	Sweet heavy	1 600	4.2	1 347	68.18	64.80	65.65	54.08
PSAC 5	Rock Creek	Horizontal	Sweet medium	2 300	5.3	2 045	61.97	43.31	66.31	57.10
PSAC 5	Cardium	Horizontal	Sweet light	3 800	13.5	2 530	74.93	46.38	32.98	27.43
PSAC 7	Gilwood	Vertical	Sweet light	1 770	5.8	1 417	69.70	79.81	42.37	n/a
PSAC 7	Keg River	Horizontal	Sweet light	2 050	8.9	2 847	187.01	23.87	63.52	55.80
PSAC 7	Beaverhill Lake	Directional	Sweet light	2 500	6.1	2 077	69.70	79.81	65.27	n/a
PSAC 7	Montney	Horizontal	Sweet light	4 000	19.7	4 710	76.61	90.72	46.62	35.90

Note: Cost data from petroCUBE and the PSAC Well Cost Study Winter 2021 have been used to estimate the supply costs.

(m^3/d) = cubic metre per day.

(bbl) = barrel.

Key concept review

- Netback bitumen pricing
- Royalty regimes for oil sands and non-oil sands extraction in Alberta