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SMART CITIES SUMMIT**
DECEMBER 6, 2022 | CANADA

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Smart Cities

Bernard J. Roth, K.C.

December 6, 2022

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Calgary's Climate Emergency Declaration

- “ NOW THEREFORE BE IT RESOLVED ...
- That The City of Calgary declares a climate emergency;
- That The City of Calgary will ... Race to Zero, by adopting best practice and leveraging capital investment with the goal of becoming a global center of excellence in climate adaptation and mitigation, and energy transformation



The Plan

- Total cumulative investment for the net zero scenario is estimated at \$87.89 billion by 2050. Depending on the price of energy, the net costs for implementation ranges from \$5.58 to \$27.4 billion.



Putting the cost into perspective

Daily Oil Bulletin

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Alberta's Forecast Revenue From Non-Renewable Resources Surges

Thursday, November 24, 2022, 2:38 PM MST



Key Energy and Economic Assumptions

Fiscal Year Assumptions ^a	2020-21 Actuals	2021-22 Actuals	2022-23 Forecast		2023-24 Forecast	2024-25 Forecast
			Budget	Q2		
Crude Oil Prices^b						
WTI (US\$/bbl)	42.32	77.03	70.00	91.50	78.50	73.50
Light-Heavy Differential (US\$/bbl)	10.58	13.56	14.30	19.80	18.10	16.10
WCS @ Hardisty (Cdn\$/bbl) ^m	41.42	79.63	70.30	94.70	79.30	73.30
Natural Gas Price^b						
Alberta Reference Price (Cdn\$/GJ)	2.10	3.48	3.20	5.40	4.40	3.80
Production						
Conventional Crude Oil (thousands of barrels/day)	401	445	441	483	492	494
Raw Bitumen (thousands of barrels/day)	2,969	3,197	3,296	3,297	3,357	3,415
Natural Gas (billions of cubic feet)	3,857	4,027	4,118	4,219	4,301	4,330
Interest Rates^b						
3-month Canada Treasury Bills (%)	0.14	0.19	0.70	3.00	3.70	3.00
10-year Canada Bonds (%)	0.74	1.56	1.80	3.10	3.80	3.70
Exchange Rate (US\$/Cdn\$) ^b	75.7	79.8	79.0	75.2	76.3	78.2

The Alberta government's non-renewable resource revenue (NRR) is forecast at \$28.1 billion in 2022/23, \$12 billion higher than in 2021/22 and \$14.3 billion more than estimated in Budget 2022, the province said this afternoon in its mid-year fiscal update.

NRR is forecast to decrease to \$19.2 billion in 2023/24 and then to \$16 billion in 2024/25, as energy

Proven Technology for Carbon Capture

Econamine FG PlusSM is Fluor's commercially proven technology for carbon capture.

It offers clients an energy-efficient and cost-effective process for the removal of carbon dioxide from low-pressure, oxygen-containing flue gas streams.

www.fluor.com

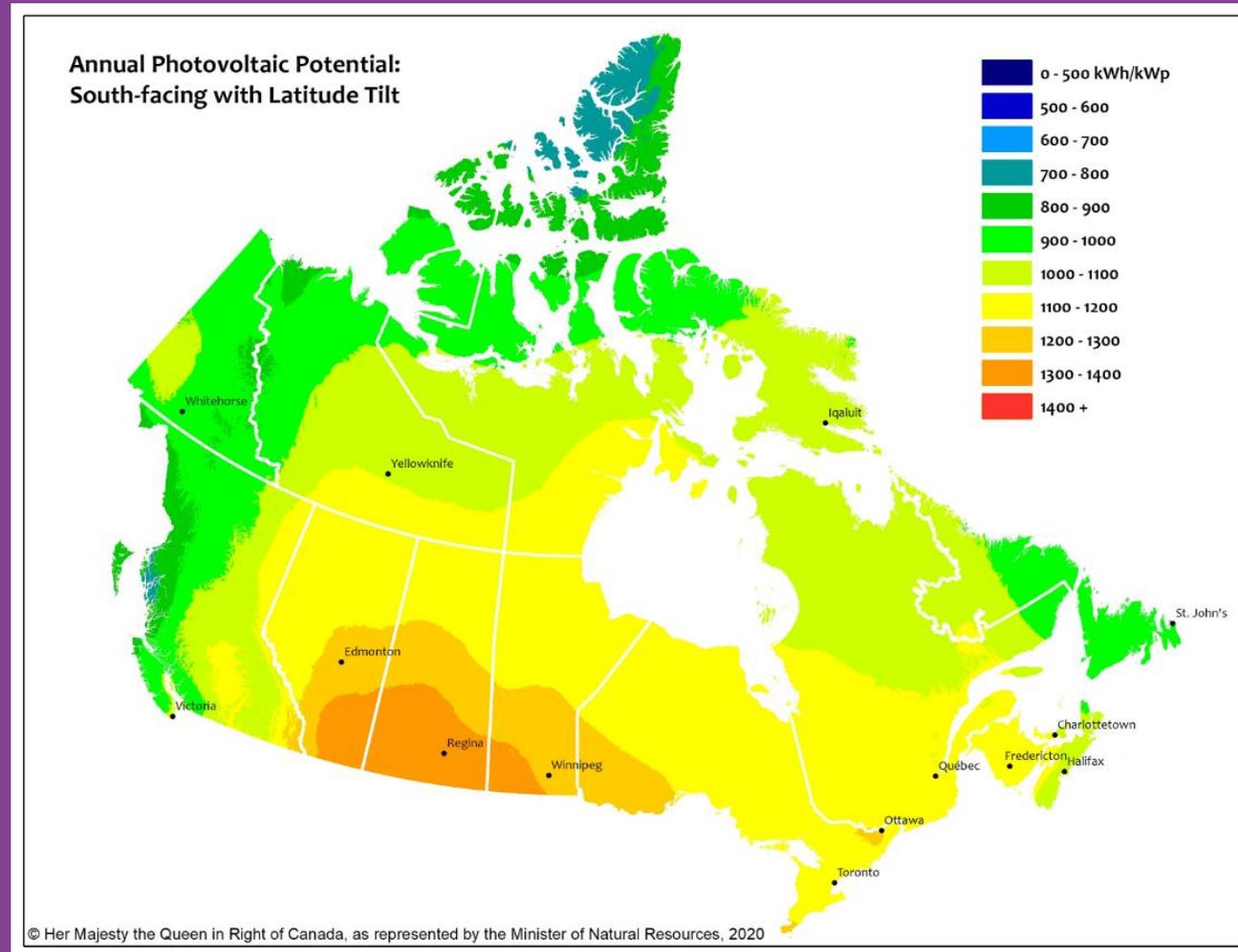
FLUOR

Smartness in the Plan

- Much of the smartness is about reducing energy consumption through municipal planning and building better (which is interesting but I won't talk about)
- For remaining power requirement the plan is to rely heavily on renewables (that's what I will talk about)

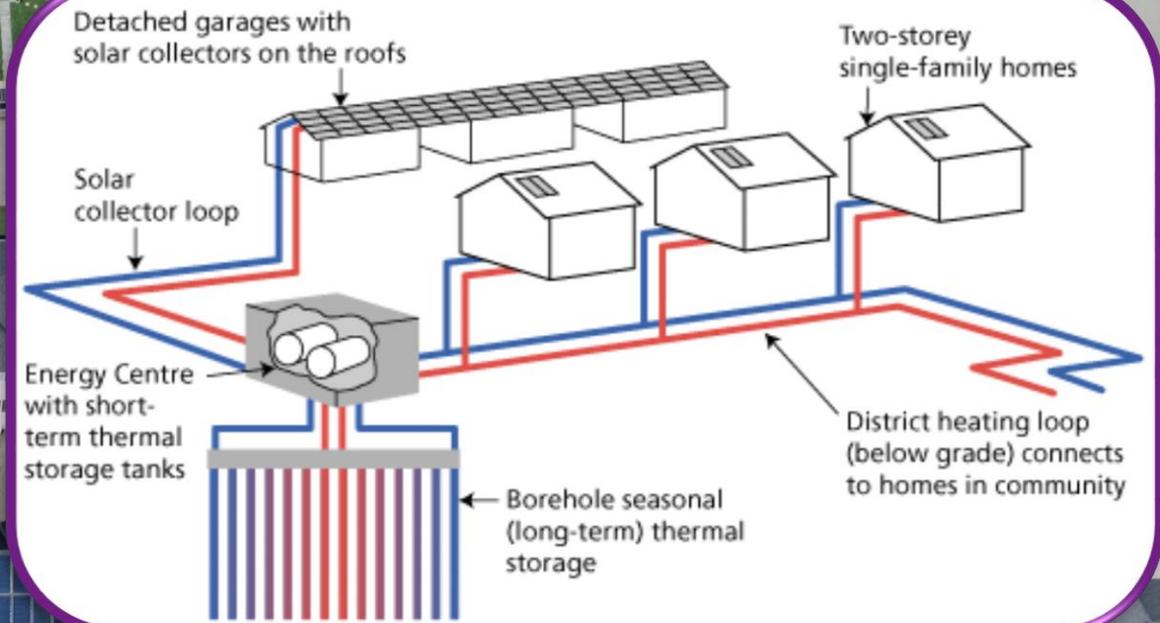
The Sun Shines on Calgary

Oh the prairie lights are burnin' bright (First Lyric to Alberta Bound by Gordon Lightfoot)



Drake Landing Solar Community

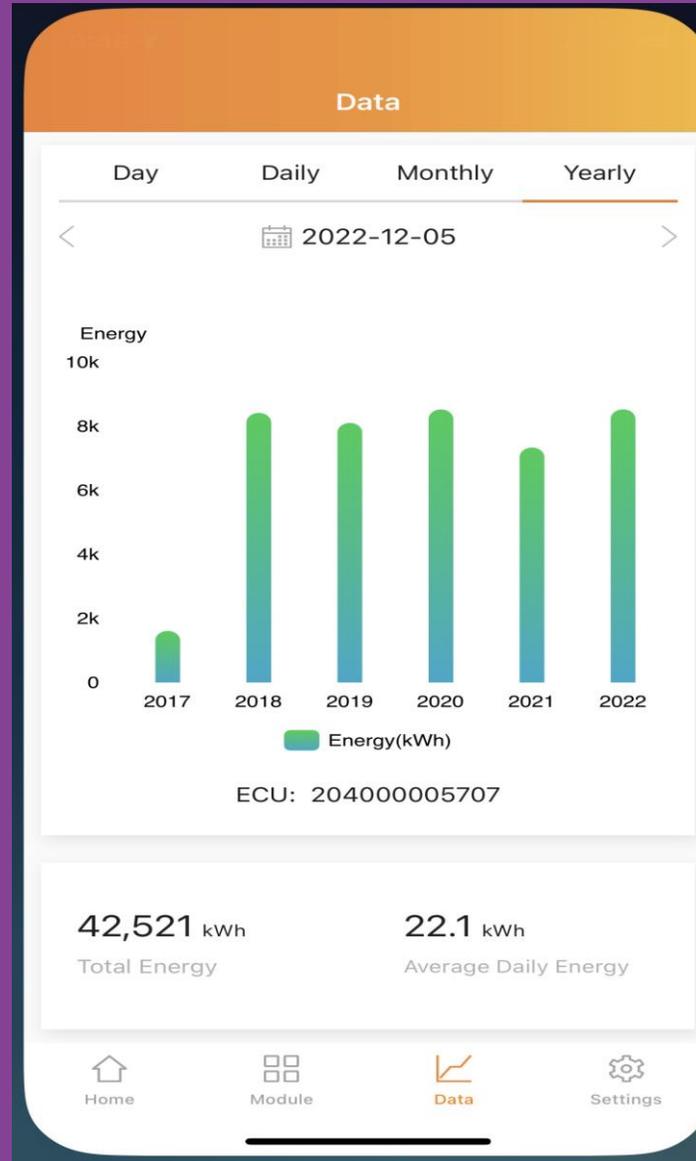
Okotoks, Alberta



Calgary Rooftop Solar

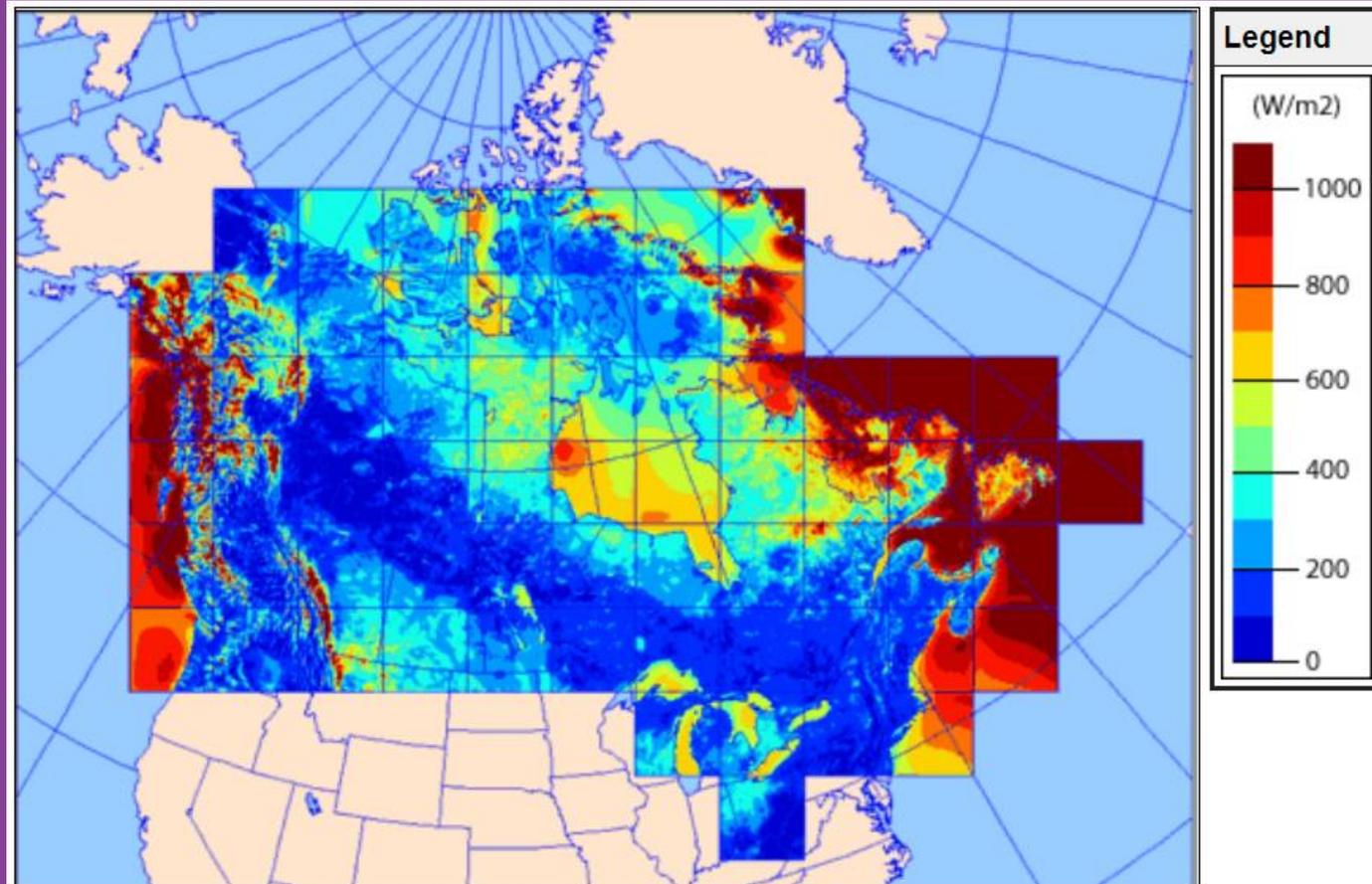


Average Calgary Electricity Consumption is 8,000 kWh a year



And the Wind Blows

The Chinook wind is a-movin' in (Second Lyric to Alberta Bound by Gordon Lightfoot)



Overview of the Numerical Simulations on Canadian Territory

Ride the Wind

Calgary's light rail system

- All light rail “c-trains” have been powered by wind-generated electricity since 2001
- It is the only LRT system in North America to use wind-generated electricity



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