

Long term resource adequacy

Blake Shaffer, University of Calgary

Ivey Electricity Workshop

October 2019

What's the problem?

Will electricity markets deliver sufficient investment to meet peak demand now and in the future?

Why do we have a reliability issue?

A first question one might ask is why electricity markets require a regulatory intervention to ensure reliability?

Consumers want to be able to withdraw electricity from the network when they need it, just like other goods and services. But it is unclear why electricity is so fundamentally different from other products that it requires paying suppliers for production capacity to exist.

*For example, consumers want cars, but they do not pay for automobile assembly plants. They want point-to-point air travel, but they do not pay for airplanes. **They want a loaf of bread, but do not pay for the existence of a bakery.***

All these industries are high fixed cost, relatively low marginal cost production processes, similar to electricity supply. Nevertheless, all these firms earn their return on capital invested by selling the good consumers want at a price above the variable cost of producing it. Clearly cars, air travel, and bread are in many ways essential commodities, yet there is no regulatory invention that ensures that there is sufficient production capacity for these products to meet demand.

What's the problem?

- If prices can rise high enough when generation is scarce then demand will fall to clear the market.
RIGHT???
- If price spikes are repeated often enough new generation will be attracted to the market so that all customers demands are met. **RIGHT???**

What's the problem?

- If prices can rise high enough when generation is scarce then demand will fall in the short term to clear the market.
 - Prices are capped
 - Demand rarely faces the realtime price
- If price spikes are repeated often enough new generation will be attracted to the market so that all customers demands are met.
 - If all the revenue is earned in a few hours per year, that increases the risk (and hurdle rate) for new investment
 - Delays in getting new power plants built

Reliability Externality!

A reliability externality exists for two reasons:

1. Prices are capped.

- This leads to under-contracting of power relative to the true **value of lost load** (i.e. willingness to pay)

2. In the event of loss of supply, **blackouts apply randomly** across consumers.

- There is no incentive for *me* to pay up for security of supply; I share the risk across all consumers.

Conclusion: Externality arises because consumers do not face full cost of failing to procure adequate energy in forward market

Long term resource adequacy mechanism

- Because of:
 - Capped short-run prices, and
 - Lack of interval meters and RT price-facing consumers...
- Regulators must have a **long-term resource adequacy mechanism** to ensure adequate supply, or face periodic supply shortfalls
 - Ensures *adequate supply* of energy under all possible future system conditions and allowed short-term prices

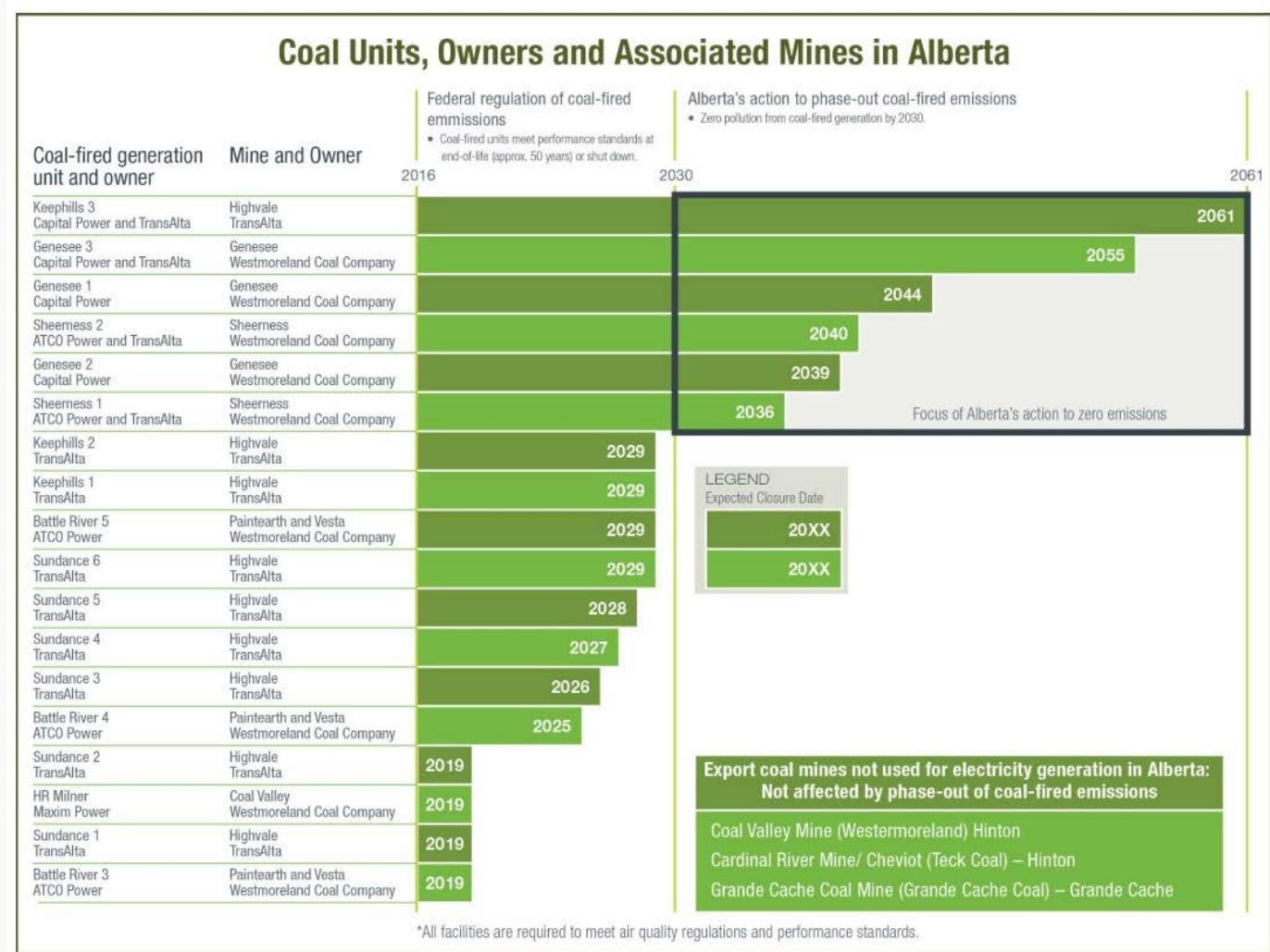
Solutions to the problem

1. Add a **capacity market**: Explicitly procure needed capacity
2. Raise the price cap (to a level near the VOLL)
3. Mandate **forward energy contracting**
4. (In all cases, boost **demand responsiveness** through interval meters and appropriate tariffs)

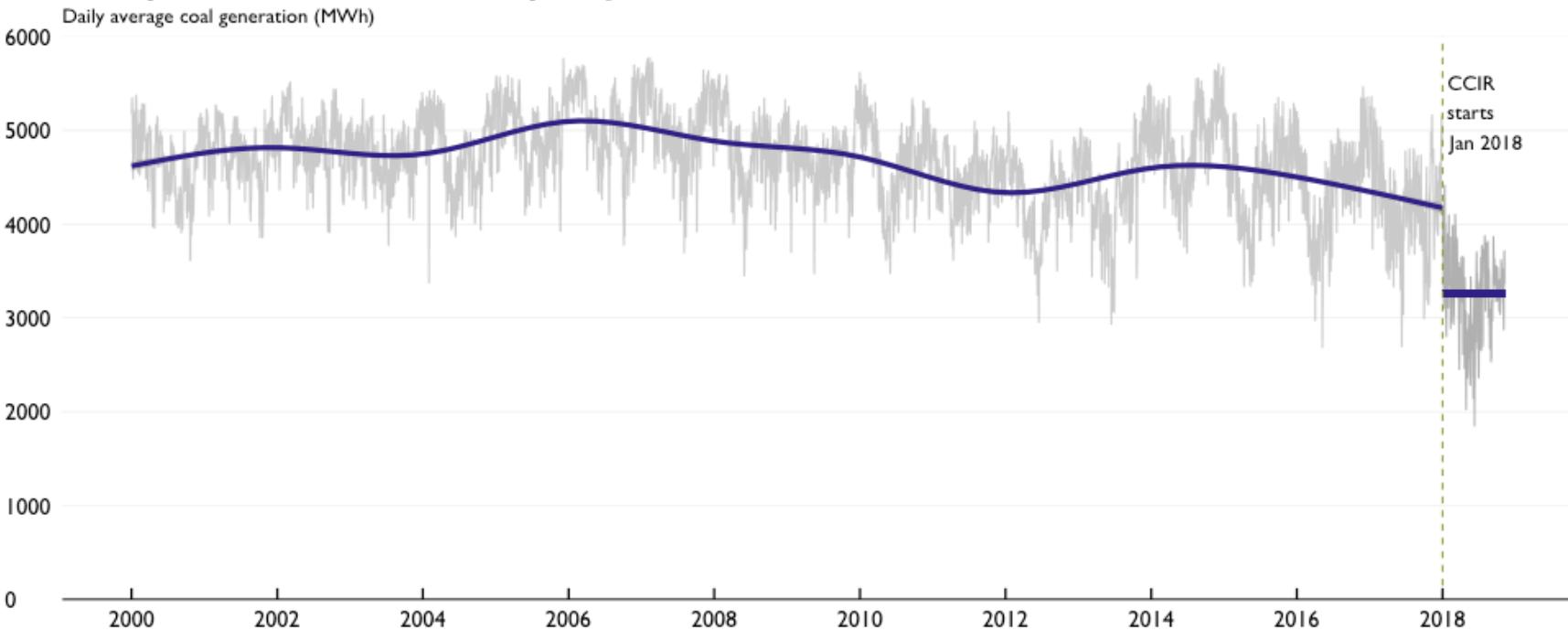
Quick background on Alberta

Coal is in decline

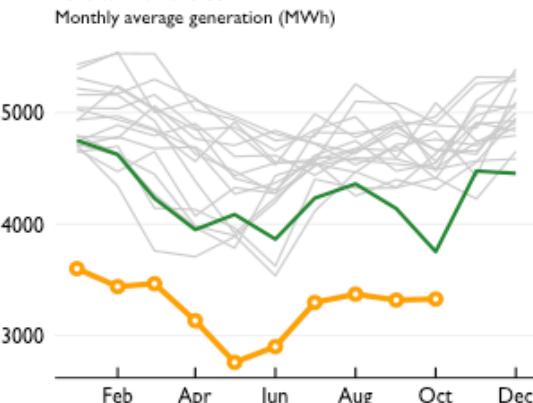
- Currently 5,700MW of 16,000MW system capacity
- Runs at reasonably high capacity factor
- Set to be phased out by 2030
- Some converting to NG



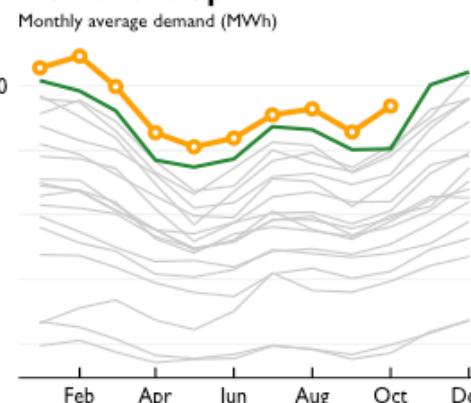
Coal power and the effect of policy in Alberta



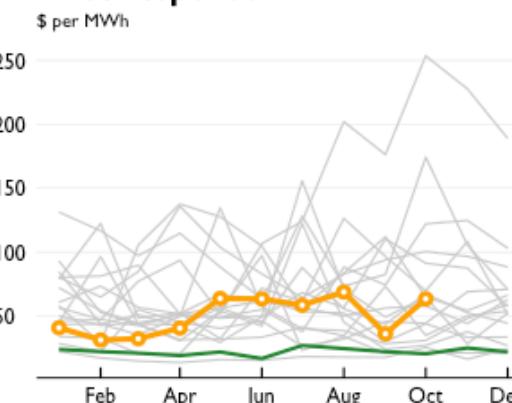
Coal is down



Demand is up



Price responds...



— 2000-2016 — 2017 — 2018

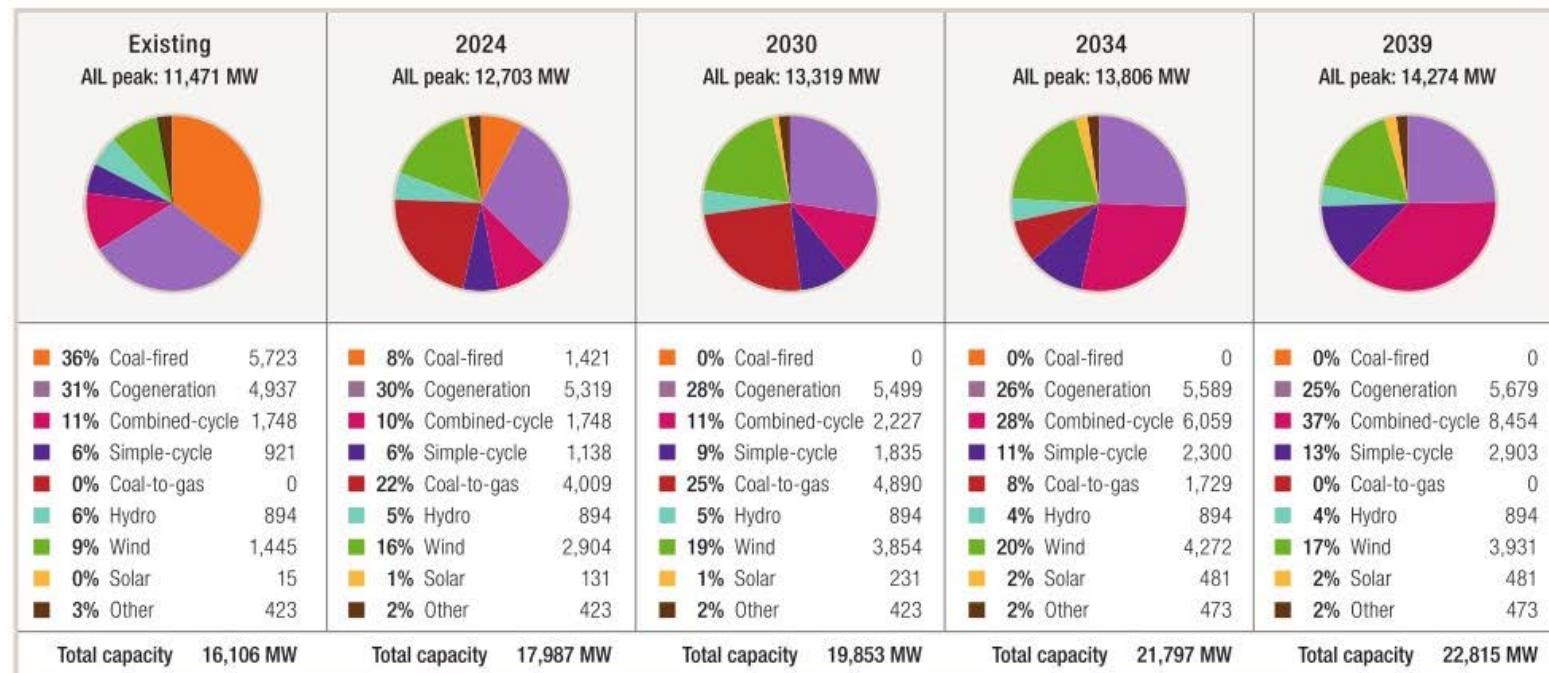
Data source: AESO (accessed via NRGSTREAM). Chart by @bcshaffer

Source code available at github.com/blakeshaffer/macleans2019

Renewables on the rise

- Wind currently 1600MW capacity
 - Expected to grow significantly
- Solar remains small
 - Different views on growth rate...
- Overall:
 - RE is growing

FIGURE 7: Reference Case Generation Scenario Capacity



The market is changing. Frequently.

- 2016:
 - Coal phase-out announced (for 2030)
 - More stringent carbon pricing (Coal: \$1.80/MWh to \$18/MWh)
 - Renewable procurement auctions start
- 2017:
 - Move to add a capacity market announced
- 2019:
 - Decision to stop move to a capacity market
 - End of renewable procurement auctions
 - Carbon pricing?
- 2020:
 - Requested (by Govt, to AESO) modifications to energy-only market announced

Will the market deliver the required capacity?

- Private economics make conversion of coal to simple cycle extremely compelling

Significant Growth Underway					
	Projects	Owned MW	Capital Invested (CAD\$ millions)	Expected Unlevered Returns	Expected COD
RNW	Big Level Wind	90	\$225 - \$240	High single digit	Q4 2019
Potential RNW Drop- Down	Antrim Wind	29	\$100 - \$110	High single digit	Q4 2019
	Skookumchuck Wind ¹	67	\$150 - \$160	High single digit	H1 2020
	Windrise Wind	207	\$270 - \$285	High single digit	H1 2021
	WindCharger Battery ²	10	\$7 - \$8	Low/Mid teens	H1 2020
TA	Boiler Conversions ³	1,260 to 2,430	\$100 - \$200	50+%	Late 2020 – 2023
	Repowering	590 to 1,180	\$500 – \$1,000	Mid/High teens	2023/2024
	Total		\$1,352 - \$2,003		
Expect to invest up to \$2.0 billion in TransAlta and TransAlta Renewables in high returning projects					

1) Represents TransAlta's ownership of 49 per cent. 2) Capital investment represents TransAlta portion. 3) Boiler conversions include Sundance and Keephills units and excludes Sheerness units.

Source: Transalta
2019 Investor Report

Will the market deliver the required capacity?

- Wind and solar proceeding despite lack of government contracts

Calgary · New

Warren Buffett-linked company to build \$200M wind power farm in Alberta



Rattlesnake Ridge Wind project to produce enough energy for 79,000 homes

The Canadian Press · Posted: Oct 15, 2019 10:50 AM MT | Last Updated: 22 minutes ago



Calgary

Alberta solar farm construction to proceed after deal to supply TC Energy



Perimeter Solar Inc. says TC Energy has agreed to purchase 75 megawatts of electricity

The Canadian Press · Posted: Sep 30, 2019 4:25 PM MT | Last Updated: September 30



Will the market deliver the required capacity?

- Remaining policy questions:
 - Capacity market??? (no longer a question!)
 - Does the AESO raise the price cap?
 - (Or consider an administrative scarcity pricing model?)
 - Does AB consider mandated energy contracting?
 - More on that from Frank...