

# The impact of Alberta's Climate Leadership Plan on electricity costs

by Benjamin Thibault | June 15, 2016

## Summary

The implementation of Alberta's Climate Leadership Plan has led opponents to put forward a range of erroneous claims, particularly the potential impacts of the Plan on electricity costs. This FAQ puts those claims to rest by clarifying the facts on the impact of the Climate Leadership Plan on electricity costs.

## Will electricity bills triple as a result of the Climate Leadership Plan?

There is no analysis that backs up any such assertion. These claims have been made without any analytical support. The tripling assertion has been cited widely, including by several media outlets, with absolutely no reference to a particular study or other analysis.

## Will the carbon levy increase electricity rates by 2-3 ¢/kWh?

No. Erroneous claims like this have been made that much more expensive electricity will result from the carbon levy.<sup>1</sup> But they are based on misunderstandings of **how the price of electricity is set** and **how the carbon levy is applied to power generators**. In fact, the carbon levy could eventually lower electricity rates.

## How the market works to set the wholesale price

The wholesale electric energy price is set by only one generation bid in any hour. The energy price that consumers pay depends on the type of retail contract or regulated rate they have

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<sup>1</sup> FirstEnergy Capital, *Alberta Power Price Outlook* (2015). Cited in Stephen Ewart, "High ideals' forecast to generate higher electricity prices in Alberta," *Calgary Herald*, December 23, 2015.  
<http://calgaryherald.com/business/energy/ewart-high-ideals-forecast-to-generate-higher-electricity-prices-in-alberta>

chosen — but one way or another, these are ultimately determined as something of an average of the hourly prices or expected future prices, with retail markup.

Supply and demand sets the wholesale energy price. Each generator puts a bid into the power market for each hour. The bids are ordered from lowest to highest (the “merit order”) and consumer power needs are met by dispatching generators from the bottom up, until there is enough supply to meet demand (see Figure 1). The last generator to get dispatched — the “marginal operator” — sets the price, known as the “system marginal price.” All generators receive this price for the power they produce in this hour, regardless of their bid.<sup>2</sup>

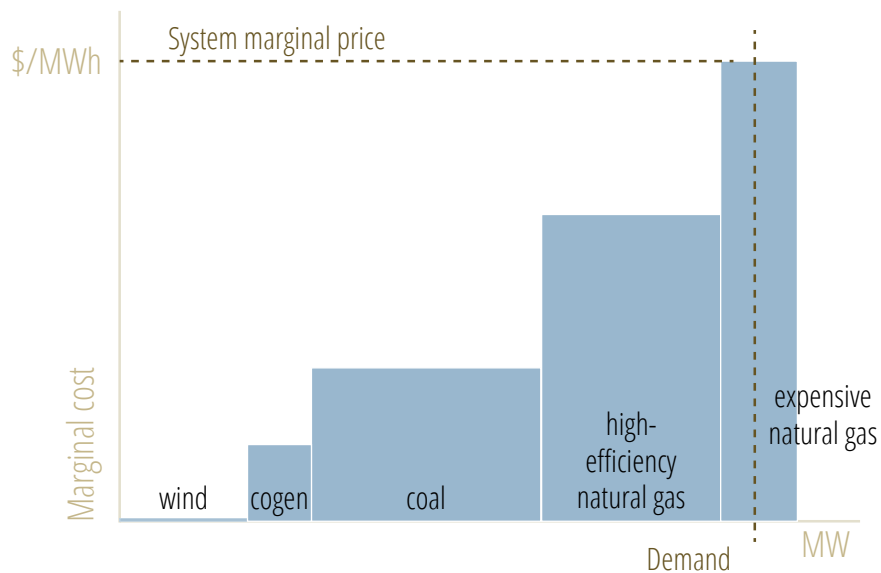


Figure 1. Merit order for electricity generation

Different types of generation tend to position in particular parts of the merit order. This is because they tend to bid something approximating their variable cost of generation — in other words, how much does it cost them to produce the next MWh? For wind, this is essentially zero — once the wind farm is built, the next MWh of energy is virtually free because there is no fuel input and minimal additional operations and maintenance costs (O&M) of producing the next MWh (variable O&M). So, wind is at the “bottom of the merit order,” preferring to be dispatched and get something for the energy it produces almost freely. Because cogeneration facilities are producing electricity as a “secondary” product, using waste heat from the primary heat or steam loads, they similarly bid near the bottom, as the additional variable cost of producing electricity — once they are already producing heat or steam — is very small.<sup>3</sup>

<sup>2</sup> Alberta Electric System Operator, “Guide to Understanding Alberta’s Electricity Market: Market Basics”. <http://www.aeso.ca/29864.html>

<sup>3</sup> Market Surveillance Administrator, *Alberta Wholesale Electricity Market* (2010), 10.

Coal is a fairly cheap fuel source but certainly not free, and the O&M adds up just from running generation facilities, so coal bids somewhat higher on the merit order (at least \$15/MWh).<sup>4</sup> Coal also places large costs in health and environmental burdens on society, most of which are paid for by all of us instead of by the coal plant operators. These costs are not reflected in the coal bids — if we made coal operators pay for all these costs, their bids would be much higher.<sup>5</sup>

Natural gas is a more expensive fuel source, so gas-fired generators bid still higher on the merit order, and because their variable cost is so dependent on the fuel cost, their bids are highly dependent on their efficiency (or “heat rate”). The more efficient plants (such as newer combined cycle, which are generally more expensive to build but cheaper to operate) bid lower than the less efficient plants.

Now, here’s what is crucial to remember: everyone who produces electricity during that hour receives the system marginal price, regardless of what they bid. This means that the only thing that matters for setting the price in any given hour is the marginal operator’s bid. It also means that there are all sorts of other bids that could be moved up or down and have no impact on the price that is set. Only if you change the bid of the marginal operator — or increase a lower bidder’s variable cost enough to make them the marginal operator instead — will you impact the price.

## How the carbon levy affects bidding behaviour

Whether the carbon levy results in an increase of the marginal price depends on the hour. In some hours it will increase but in some it will decrease the price. As coal generation is retired, the decreases will become more significant and the increases will lessen.

The carbon levy will significantly increase the variable cost of coal power, which it should, given that coal is uniquely high-polluting. But it will actually decrease the variable cost of highly efficient gas-fired power, relative to the Specified Gas Emitters Regulation (SGER), Alberta’s current carbon-pricing regime.

Take the illustrated hour as an example, shown as a simplified merit order of bids in Figure 2 . On the left, the “before” world, where the SGER forces all major emitters to reduce their

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<sup>4</sup> Generators are allowed to bid their blocks of their power at one unit at different rates. Because coal is inflexible and so costly to restart if it turns fully off, it usually bids its minimum stable capacity (usually around half of a unit’s capacity) at \$0/MWh, to avoid being dispatched off. However, it is also not uncommon for coal units — as well as other generation types — to bid blocks much higher than their variable cost to exert market control in an effort to increase market costs for the generation company’s overall generation portfolio. Market Surveillance Administrator, *State of the Market Report 2012*, 37-42.

<sup>5</sup> Tim Weis, Noah Farber, Kristi Anderson, Farrah Khan, Beth Nanni and Benjamin Thibault, *A Costly Diagnosis* (Pembina Institute, 2013).

emissions by 20 percent or pay the carbon price for those emissions.<sup>6</sup> Generators must pay down to this 20 per cent regardless of their respective carbon intensity — including highly-efficient natural gas, even though it was already 55-60 per cent lower in carbon emissions than coal. This increased the variable cost of high-efficiency gas-fired power, thus increasing its bid price.

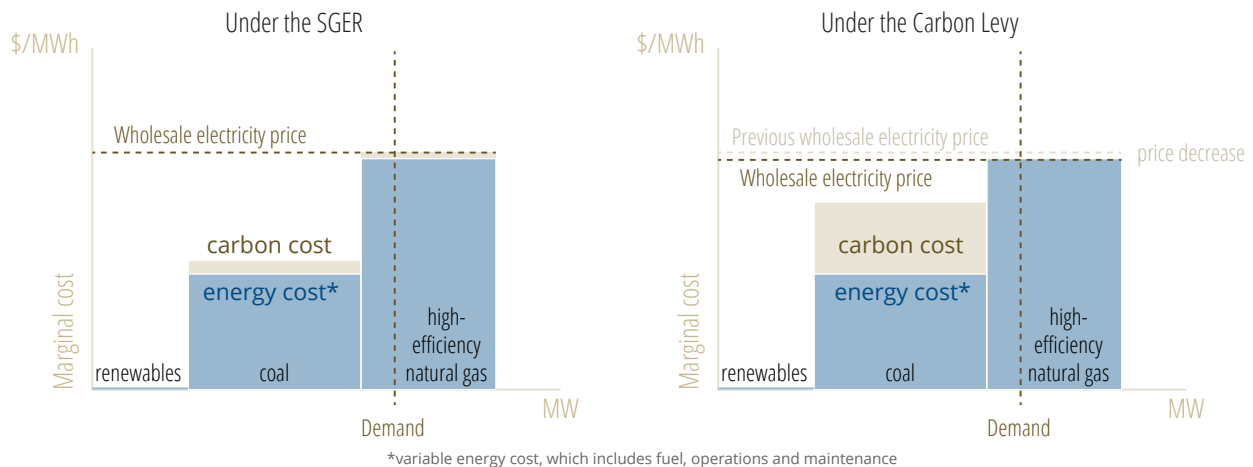


Figure 2. Effect of the carbon levy on electricity prices

On the right, the “after” scenario, where the carbon levy provides output-based allocations based on the highest-efficiency gas-fired generator in the province. A generator that hits the standard will pay nothing for its carbon, meaning it will pay \$1.35/MWh less than it would have to pay under the SGER. If it is setting the price in that moment, as in the illustration, the price will actually fall. So, you might ask: where does the increased cost to coal lie in this hour? The coal generator cannot pass this on when it does not set the price, so the coal generator has to pay the cost and incur a reduction in its marginal profit during that hour.

Assuming that the “best gas” performance standard for output-based allocations is set at 375 t/GWh, the lower cost under the carbon levy than the SGER will still hold for gas-fired power generators up to 426 t/GWh. The savings on the 375 t/GWh will be as good as the increased cost of the carbon levy on gas generators up to 477 t/GWh. This will include many of the gas generators in the province, including many of the generators that may be setting the price at any given time.

Gas-fired power will increasingly set the price in Alberta’s market, as load in most hours grows beyond the \$0/MWh-bid power and remaining coal power that has not yet retired. Therefore, the hours will become more frequent where the carbon levy could actually decrease the wholesale energy market price, relative to the SGER.

<sup>6</sup> This is the rate of the SGER in 2017.

## Can I not just multiply the average grid intensity by \$30/tonne to find out how electricity costs will increase?

No, this does not tell you how the carbon price will impact electricity costs. This calculation — often cited by critics of the Plan — relies on two key falsehoods: that power generators have to pay for all of their carbon, and that coal generators or higher-emitting generators have 100 per cent market control. Both of these assertions are categorically wrong and purposefully misleading.

To better understand how the market works to set the wholesale price and how the carbon price works for electricity generators, see the full explanation above. If you're still having trouble, contact us: [info@pembina.org](mailto:info@pembina.org). We can help.

## Will electricity prices rise in coming years?

Yes. But it was always thus: this is not a result of the Climate Leadership Plan.

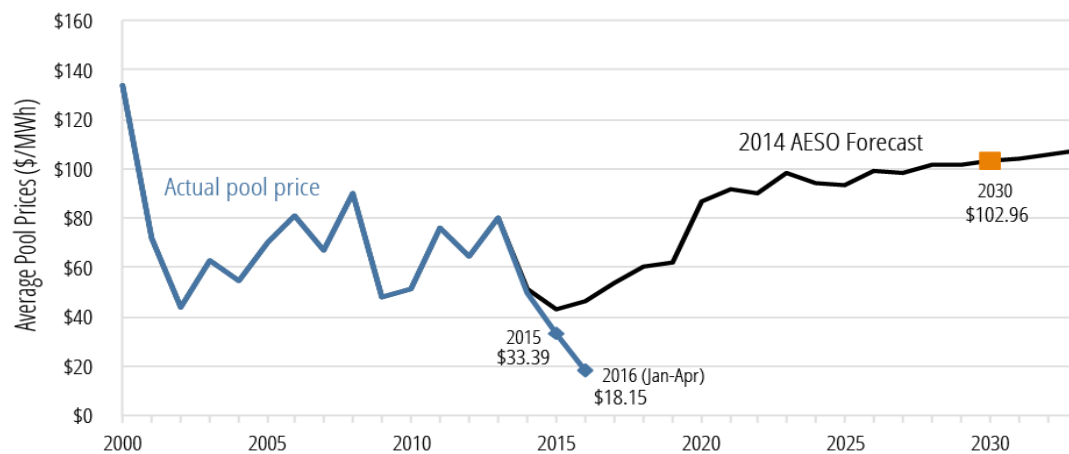


Figure 3. Actual and forecast pool price

Data source: AESO<sup>7</sup>

Electricity prices are unsustainably low at present and must rise. Figure 3 shows where AESO forecasted wholesale electricity prices to go. But they made this forecast in 2014, before the conception of a climate plan — or even the existence of the government that announced it.

This is because prices need to be high enough to incent new supply needed to meet increasing demand and replace end-of-life generation. This means prices around \$80–\$90/MWh to incent the cheapest new supply: a mix of wind and high-efficiency natural gas generation. Clearly,

<sup>7</sup> Alberta Electric System Operator, “Transmission Rate Impact Projection Workbook,” June 2014. <http://www.aeso.ca/transmission/30685.html>

compared to recent prices below \$30/MWh, the *wholesale* energy prices will have to rise, perhaps even triple.

## So, my power bills will, in fact, triple by 2020?

No. The *wholesale* electricity price is only one component of your power bill.

If the price of a bushel of wheat (wholesale price) goes up it raises the price on your loaf of bread – but not proportionally. The bread cost also depends on the costs of other ingredients, like labour, packaging and transportation.

Consumer electric energy prices (the bread) also have other factors mixed in, like your retailer’s mark-up, administration charges and Balancing Pool tariff (which actually falls when the pool price rises). And your power bill (like your grocery bill) has a whole slate of other wheat-free items that are independent of energy prices, like transmission costs, the costs of just having a hook-up to the local grid (fixed distribution costs) and rate riders.

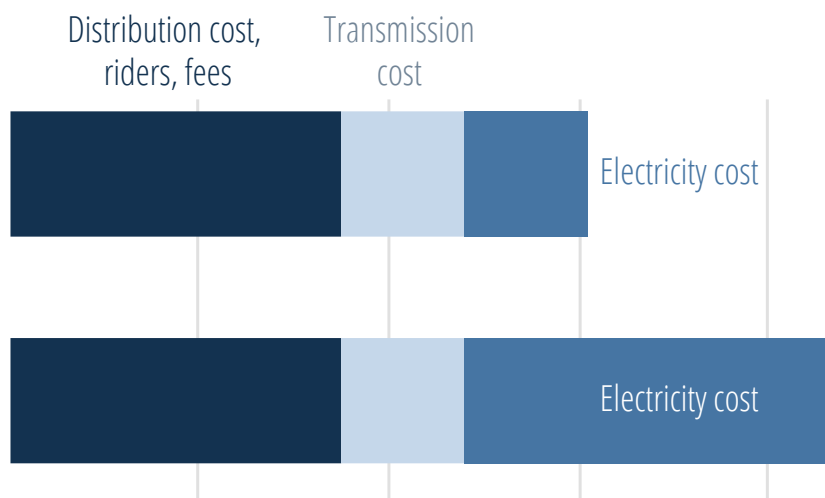


Figure 4. Tripling electricity cost does not triple total bill

Consumer electricity costs are going to rise (Figure 5 shows a typical residential consumer’s power bill), as projected by AESO before the Climate Leadership Plan. But, just as your power bills haven’t gone down nearly as much as wholesale energy prices since 2013, neither will they triple by 2020. And the increase was baked in – it’s not because of the coal phase-out, carbon levy, renewable energy program, or any other element of the climate plan.

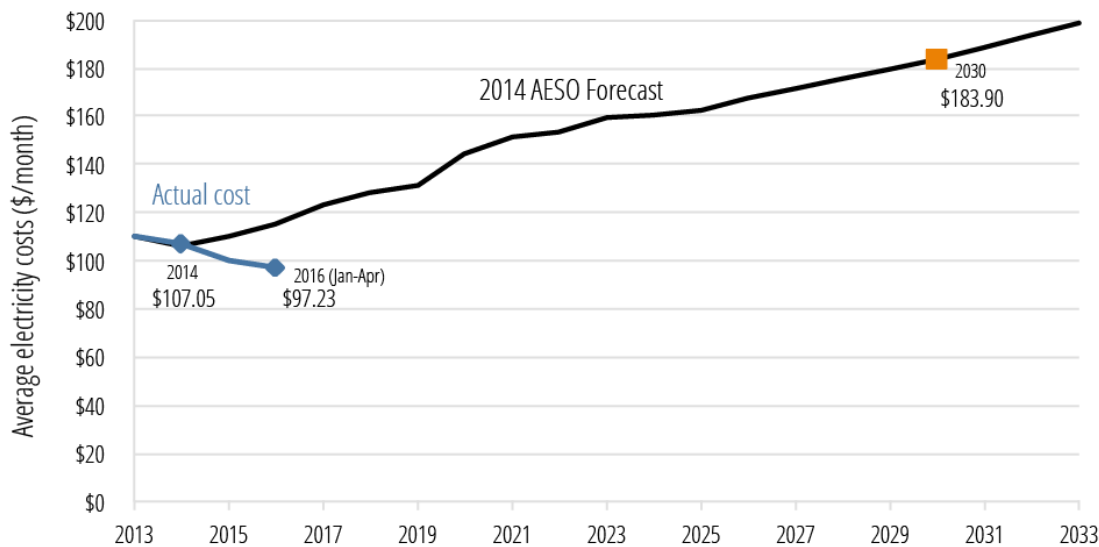


Figure 5. Actual and forecast electricity cost

Data source: AESO<sup>8</sup>

## What effect will the climate plan have on electricity bills?

Minimal. The rest of this FAQ series will explain different aspects of the climate plan’s impacts on consumer costs. Here’s a summary on electricity prices:

- **Renewable Energy Program:** Renewables are competitive on a cost basis, today, and the greater complement of fuel-free power generation to diversify today’s fossil-centric mix will provide a hedge for consumers against future fuel price increases.
- **Carbon levy:** Because of the details of the carbon levy and the way that electricity prices are set in the wholesale market, the carbon levy will have limited impact on electricity prices — and as high-efficiency natural gas increasingly sets the price as time goes on, could decrease prices relative to today’s SGER system.
- **Coal phase-out:** With demand growth and the retirement of some coal units at the end of this decade (already scheduled under federal rules), natural gas will be setting the price in our market the vast majority of the time by the beginning of next decade. What happens at the bottom of the merit order (coal, cogeneration or renewables) will become far less relevant to the market’s price setting.

In short: there is no reason to fear that the Climate Leadership Plan will increase electricity prices. The prices *will* rise, as seen in Figure 5, but this was always expected, long before the plan. But, along with the small expected impact of other elements of the climate plan on electricity bills,<sup>9</sup> the province’s forthcoming energy efficiency programs will help consumers decrease their costs, or at least help mitigate against the “baked-in” increases.

<sup>8</sup> Alberta Electric System Operator, “Transmission Rate Impact Projection Workbook,” June 2014.

<sup>9</sup> Alberta Climate Leadership Panel, *Climate Leadership: Report to Minister* (2015), 53-54.