Appendix G

Technical Aspects of Oversupply in the WCI Market

Contents

This Appendix presents a simple forecast for the WCI carbon market and comments on the impacts of oversupply. These are technical details that were not covered in Chapter 3 of the ECO's 2017 Annual Greenhouse Gas Progress Report.

G1 Outlook for the WCI Carbon Market

Based on current evidence, WCI's cap and trade system is expected to have surplus allowances until well after 2020.[1] California and Quebec both started out oversupplied and still issue excess allowances each year. California reduced its emissions earlier than the cap required. The reasons may include low-carbon policies, innovation in renewable energy, and decarbonisation of the electricity sector.

G1.1 California Has Surplus Allowances

Every year since the program began in 2013, California has issued more allowances than needed by compliance entities. California reduced its emissions earlier than the cap required. The reasons may include low-carbon policies, innovation in renewable energy, and decarbonisation of the electricity sector.

Why is oversupply so common in cap and trade programs?

Oversupply in cap and trade programs is common. Often it reflects "fortuitous overcompliance" in the initial phases of the program.[2] Overlapping policies, such as closing of coal power plants and low-carbon fuel standards, as well as technological advances, can help to reduce emissions under the cap. Economic recessions and other structural changes can also play a role.

In some ways, it is good when emissions are lower than anticipated. But it also means that caps should then be adjusted downward or oversupplied allowances retired in order to meet future reduction targets.

WCI'S CAP AND TRADE SYSTEM IS EXPECTED TO HAVE SURPLUS ALLOWANCES UNTIL WELL AFTER 2020

Furthermore, compliance entities only need allowances to cover 92% of their emission obligations. Until 2020, they can meet the other 8% of their legal obligations with offset credits, then 4% until 2025, and then 6% until 2030 (see Appendix A, available online only at eco.on.ca).

Based on the rate of emissions reductions reported until 2016 (the most recent public data available in November 2017), California will continue to issue more allowances than compliance entities need for several more years. In total, by 2020 California will likely have issued hundreds of millions of allowances that no California compliance entity needs for legal compliance from 2013 – 2020.[3] The forecast in Figure G.1 suggests that compliance entities in California may need only 70 to 80% of the allowances that California will offer for sale by 2020.

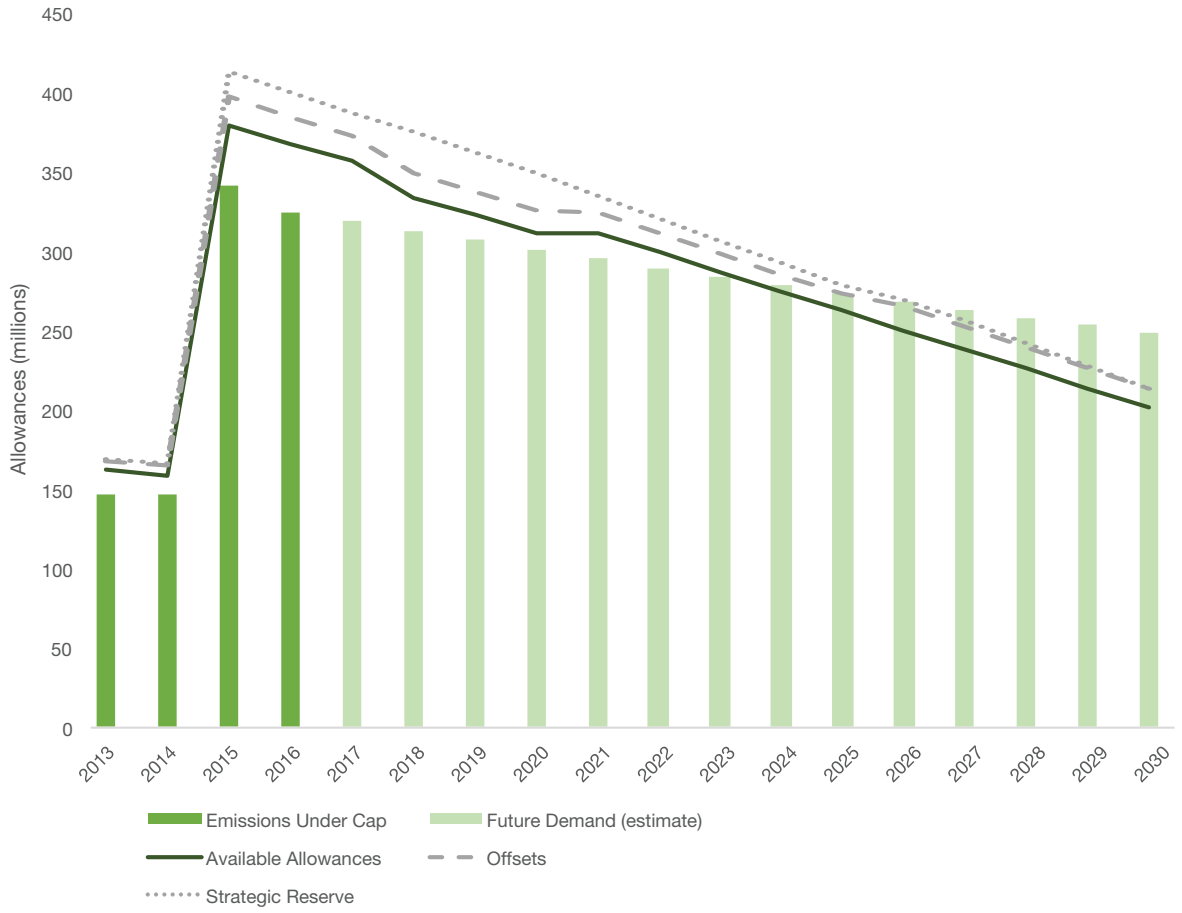

Figure G1. Forecast of California's demand (emissions under the cap). Figure assumes demand will decrease at approx. 1% per year and 4.4% offsets as per current trend until 2020, and then maximum offsets as per AB 398 (4% until 2025 and 6% until 2030). In 2013 and 2014, only large final emitters and utilities were included in the cap and trade program. In 2015, the program was expanded to include transportation fuels.

Under the new law AB 398, California has started to address oversupply by moving some of its surplus 2013-2020 allowances into its strategic reserve (the Allowance Price Containment Reserve, or APCR) to provide a price cushion for the more rapid reductions in its overall cap in 2021-2030. Allowances that have gone unsold for more than two years will be moved into the higher-priced APCR.[4] Moving unsold allowances into the reserve and not offering them at the next auction should reduce the oversupply and increase the proportion of allowances that sell at auctions between now and 2020. The contents of the APCR, which is similar to Ontario's strategic reserve will be offered to California compliance entities at three higher price thresholds to be set by the California Air Resources Board (CARB).

Additionally, carbon traders may buy some or all of the remainder, in order to profit by reselling them in the next decade when allowances will become more expensive. However, California is still likely to have far more allowances than it needs for compliance purposes between now and 2020.

G1.2 Quebec Also Has Surplus Allowances

Quebec linked its market with California in 2014. Its demand for allowances between 2014-2020 is expected to be around 338 million,[5] compared with a supply of allowances to be issued of 360 million.[6] Together with its 8% offset allowance, Quebec is likely to increase the WCI allowance surplus until at least 2020.

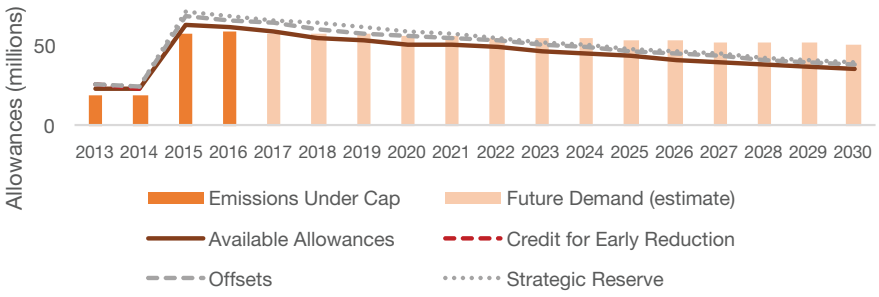

Figure G2. Forecast of Quebec's demand (assumes emissions under the cap will decrease at approx. 1% per year). Assumes 8% offsets as per current trend from 2015 until 2030.

G1.3 WCI Oversupplied Until Well After 2020

As shown in Figure G3 below, the WCI market is forecast to be oversupplied until well after 2020, possibly until 2030. This supports the projection that carbon prices may trade near the floor price most of the time until well after 2020, and not all auctions are likely to sell out. Of course, this could change at any time. The carbon market is affected by many unpredictable factors that are capable of rapid change (global economic factors, local temperatures, technology changes, rate of adoption, etc.)

CARBON PRICES MAY TRADE NEAR THE FLOOR PRICE MOST OF THE TIME UNTIL WELL AFTER 2020, AND NOT ALL AUCTIONS ARE LIKELY TO SELL OUT

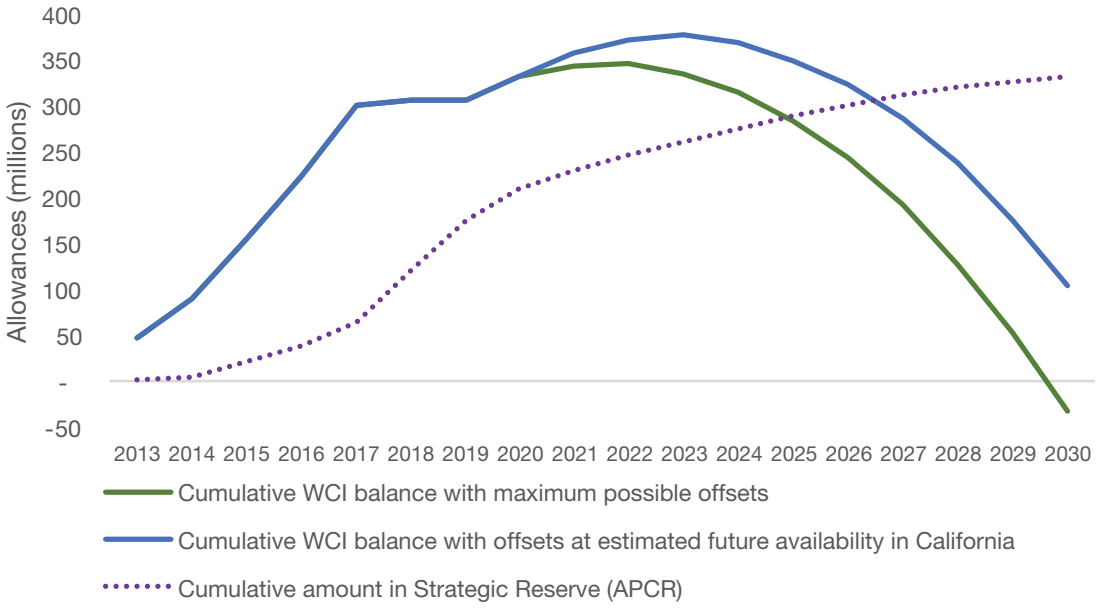

Figure G3. Projected WCI supply and demand to 2030. Analysis includes assumptions for each jurisdiction as explained above, and includes shifting some of the unsold allowances to the strategic reserve (Allowance Price Containment Reserve) in 2018 and 2019, as per AB 398. Analysis does not include moving unsold allowances into the strategic reserve after 2019.

Source: ECO analysis, adapted from ClearBlue Markets, "Ontario and WCI Cap & Trade Supply and Demand Report", (Sept 2017) with input from Chris Busch.

To address this technical detail, the ECO has suggested in this report that the government should work with California and Quebec to reduce the oversupply of allowances, and to adjust future caps and allowance supply as needed to meet GHG reduction targets. Ways to reduce oversupply include lowering future caps, moving surplus allowances to the reserve and/or fully retiring some surplus allowances. California will likely need to take further action in order to meet its 2030 targets.[7] Reducing California's oversupply will also reduce the amount of WCI revenues that could flow from Ontario to California.

G.1.4 Impact of Oversupply on Achieving Targets and Future Carbon Prices

California's commitment to reduce its GHGs to 40% below 1990 levels by 2030 will require the state to dramatically reduce the number of allowances it issues each year. These targets, in addition to the new law's requirement that CARB develop a new policy on excess allowances, should mean that the number of allowances available will drop below demand sometime in the next decade. When this happens, the price of carbon should rise.

G.1.5 Impact of Oversupply on Revenues for Ontario

Now that Ontario is linked to the WCI market, all allowances are interchangeable. Compliance entities buy WCI allowances, i.e., Ontario entities can no longer buy "Ontario" allowances. Revenues will be distributed across all jurisdictions proportionally, i.e. if 92% of all WCI allowances are sold, Ontario, Quebec and California will each receive the settlement price for 92% of their auctioned allowances, regardless of where the buyers come from. The other 8% will be considered unsold (see Figure G.4 below). In the first example, Ontario emitters buy the equivalent of 97% of Ontario's auctioned allowances, but only get revenue for 92%. In the second example, if California's oversupply is reduced, all jurisdictions receive an approximately proportional amount of revenues. This is a technical detail, but resolving it will improve the program and help maintain the integrity of the cap.

Note that even if Ontario only sells 92% of its WCI allowances as in example 1, actual revenues depend on the Canadian/U.S. exchange rate. If the Canadian dollar is strong, Ontario might still receive as much revenue as if the auctions were not linked and 97% of Ontario's allowances were sold.

The key point is it is hard to predict how funds will flow between Ontario and its WCI partners, and flows may be different for different auctions.

Furthermore, these examples show that there is little financial incentive for one jurisdiction to reduce their own oversupply. When a jurisdiction has surplus allowances, they receive a greater proportion of pooled revenues. It will take collective effort and time to reduce oversupply across all jurisdictions. The Regional Greenhouse Gas Initiative has done this effectively (see Section 3.5.1.1).

IT IS HARD TO PREDICT HOW FUNDS WILL FLOW BETWEEN ONTARIO AND ITS WCI PARTNERS

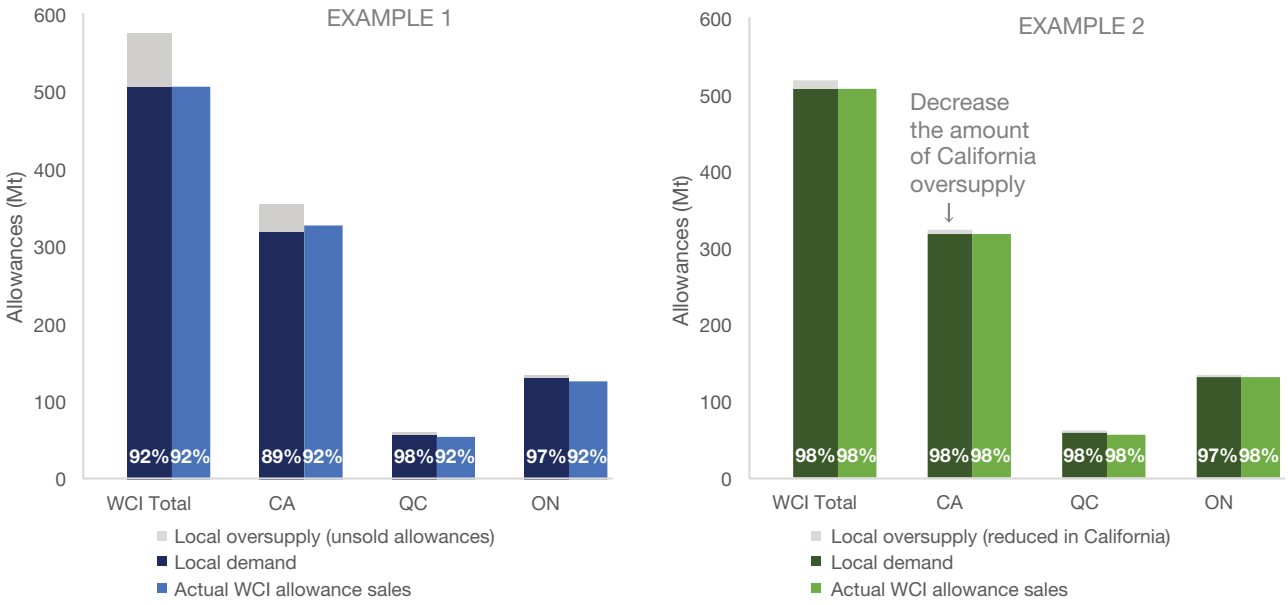

Figure G4. Example annual distributions of WCI revenues compared to local demand. In example 1, local Ontario demand is 97% of Ontario's auctioned allowances, but Ontario only gets revenue for 92% based on total WCI demand. In example 2, California oversupply is decreased, and Ontario gets revenue for 98% based on WCI demand despite only have 97% demand locally, i.e., money would flow into Ontario.

Over time the market may change. The market is currently forecasted to develop a shortage of allowances sometime after 2020, which is when carbon prices are expected to go up. In the future, if California is in a more acute shortage than Ontario, funds could flow from California to Ontario, likely at a higher carbon price per tonne than today.

G.2 What Happens When There is a Shortage of Allowances?

G.2.1 Post-2020, California Will Have a Price Ceiling

An acute shortage of allowances could lead to uncontrolled price increases. California's new law therefore requires the CARB to establish a price ceiling for allowances, in addition to the existing price control mechanism provided by the Allowance Price Containment Reserve (APCR). If auction prices rise substantially above the floor price, the allowances in the APCR will be offered for sale to California compliance entities to help avoid uncontrollable price surges. One-third of the APCR will be sold at each of three price thresholds: two intermediate price steps or "speed bumps" and the price ceiling (see Appendix A for more details on California's cap and trade mechanisms, available only online at eco.on.ca).

What about the reserves?

California, Quebec and Ontario all have large supplies of allowances set aside for sale to compliance entities at high prices. To date, no one has purchased any of the reserve allowances. In 2017, reserve allowances in Ontario were offered for sale at about $51, $58 and $64 and are projected to range from $62 to $78 in 2020.[8]

California's reserve, the APCR, is already quite substantial and will continue to grow. As shown in Figure G.3, the cumulative amount of allowances in the APCR is forecast to grow until it is almost as large as the entire WCI market in 2030. California is also required to move some unsold allowances into the APCR, which will further increase its size. All of this enormous reserve would have to be exhausted before the CARB would issue "extra" allowances because of the price ceiling.

If, after all of the APCR allowances are sold, California compliance entities want to buy even more allowances, the state is required to sell them additional allowances beyond the cap at the ceiling price. This means that "an unlimited number of permits will be made available at a ceiling price to guarantee prices can rise no higher"[9]. This means that California will no longer have an absolute limit on the number of allowances to be issued each year starting in 2021. However, California is required to purchase an equivalent amount of offsets for every "extra" allowance that they sell.

STABILITY ALLOWS MORE AMBITION WITHIN THE CAP AND TRADE SYSTEM, AND MORE BUSINESS CONFIDENCE TO INVEST IN REDUCING EMISSIONS

The final design of the price ceiling mechanism is not yet determined. Section 4 of California's new law[10] requires CARB to consider the following factors, using the best available science, when setting the price ceiling:

a) The need to avoid adverse impacts on resident households, businesses, and the state's economy;

b) The 2020 tier prices of the allowance price containment reserve;

c) The full social cost associated with emitting a metric ton of greenhouse gases;

d) The auction reserve price (or *price floor*);[11]

e) The potential for environmental and economic leakage; and

f) The cost per metric tonne of greenhouse gas emissions reductions to achieve the statewide emissions targets.

CARB has an elaborate rule-making process that is likely to take at least 12 to 18 months to complete. Thus, it will likely take a year or more before Ontario knows what California's price ceiling will be. Even after the price ceiling is set, allowance prices may or may not approach that ceiling for years, if ever.

This "price collar" (a price floor and a price ceiling) was an essential element of the compromise that allowed California to resolve its political uncertainty and adopt its ambitious cap and trade program for 2021-2030. There are good theoretical arguments for having a price ceiling, i.e. a hybrid system between cap and trade and a carbon tax[12], in terms of program stability and predictability. This stability allows more ambition within the cap and trade system, and more business confidence to invest in reducing emissions.

G2.2 How will the Price Ceiling Impact Ontario?

The impact of the California price ceiling on California emissions will depend both the balance between allowance supply and demand, and on how high CARB sets the price ceiling.

If the price ceiling were set high, say, $100/tonne in 2018 and increasing annually, California emitters are not expected to rely on it and it should not have any practical effect. If the price ceiling were set too low, say, $40/tonne, California would no longer have any meaningful cap on its emissions, and its system will function more like a carbon tax if prices hit the ceiling, with an added requirement to purchase equivalent offsets.[13] If set too low, this could reduce a key benefit of cap and trade, the hard cap on emissions. The state would have to rely on purchasing offsets in non-capped sectors and states to counter the "extra" allowances provided beyond the cap (see Chapter 4 for the ECO's recommendations regarding requirements for offsets and concerns about Californian offsets).

If WCI prices hit the California price ceiling, since WCI allowances are interchangeable across jurisdictions, Ontario and Quebec would, in effect, also have a price ceiling, but with the price ceiling money flowing to California and then spent on offsets. To avoid this result, the government should consider matching California's price ceiling mechanisms, with a requirement for the province to purchase quality Ontario-based offsets for any allowances sold above the cap.

G3 If Ontario Emitters Purchase WCI Allowances From Outside Ontario, do GHGs Go Down?

Before AB 398 and the oversupply in the WCI market, there was a clear, if delayed, link between purchases of allowances by Ontario emitters, and GHG reductions in California, as long as demand for WCI allowances by compliance entities eventually exceeds supply. The reduced availability of WCI allowances would then induce California emitters to reduce their emissions. In this way, WCI allowance purchases by Ontario emitters could be reliably linked, tonne to tonne, to (eventual) GHG reductions in California.[14]

After AB 398 and the oversupply, (depending on the price ceiling and how many unsold allowances are moved into the APCR) it may no longer be possible to prove such a tonne-to-tonne link. Instead, allowance purchases by Ontario emitters will influence California emissions indirectly, through the price of allowances. Carbon market dynamics are uncertain, and are affected by unpredictable factors that are capable of rapid change.[15] Scenario analysis and computer models can estimate what may happen, but certainty about precise cause-and-effect relationships may be unachievable. This is partly why the ECO has recommended Ontario work with its WCI partners to reduce oversupply.

Thus, while allowance purchases by Ontario emitters should eventually put upward pressure on WCI allowance prices, it may be impossible to know by how much and when (reductions may actually be caused by other complementary low-carbon policies). In turn, a rise in WCI allowance prices should encourage all WCI emitters to reduce their GHG emissions, but we may not know when or how much. Instead, Ontario will have to rely on the cap on emissions and models which predict that the linked market will gradually develop a shortage of allowance, and therefore rising prices, which in turn will stimulate reductions.

This uncertainty can be unnerving for policy makers, but it is not unanticipated. A linked carbon market between three different economies in two different countries, with differing climates and differing laws, is a complex system. By definition, complex systems cannot be completely understood the way simple systems can.[16] However, that doesn't mean the simple system is better. Systems can benefit from some complexity to deliver better or more equitable results. It takes time to sort out and properly manage a carbon market with multiple players. The Regional Greenhouse Gas Initiative provides a good example of different jurisdictions working together to take surplus allowances out of their cap and trade system (see section 3.5.1.1). Although prices are still low and it required time to get it right, emissions are going down, air quality is improving, and overall the program is working quite well.

If the government and its WCI partners follow the ECO's recommendation to reduce oversupply, the cap will become binding at an earlier date, which will help reduce this uncertainty around this technical detail.

G.4 Conclusion

There are a few technical details that should be "tuned up" moving forward to improve the WCI carbon market, including oversupply, the validity of offsets and the integrity of the price ceiling. Overall, the ECO expects that these issues will be addressed by policy makers. Part of the pressure to make these changes for each jurisdiction include meeting future targets and meeting each jurisdiction's part of their Nationally Defined Contribution towards Paris agreements.

Endnotes

1. Reasons typically given for the existence of this large surplus include the regulatory measures that California has used to drive down emissions from electricity generation and transportation, two of its largest sources of GHGs. This predicted surplus combined with the legal uncertainty described on page 72 in *Facing Climate Change* may help explain the low demand for California allowances at auction in 2016 and early 2017.

2. Chris Busch, "Oversupply Grows in the Western Climate Initiative Carbon Market: An Adjustment for Current Oversupply is Needed to Ensure the Program will Achieve its 2030 Target" (December 2017), online: <energyinnovation.org/wp-content/uploads/2017/12/Oversupply-Grows-In-The-WCI-Carbon-Market.pdf>

3. Some California allowances have been, and may continue to be, purchased by non-compliance entities, presumably in the hope of selling them later and/or on the secondary market at higher prices. Allowance purchases by non-compliance entities, and trades on the secondary market, are important factors in carbon market functioning, but they have no direct relevance to GHG emissions reductions and are therefore discussed no further in this chapter.

4. The contents of the Allowance Price Containment Reserve will be sold to California compliance entities at three price thresholds to be set by CARB; two intermediate price steps or "speed bumps" and the price ceiling discussed below. One third of the APCR will be allocated to each threshold, establishing a mechanism to slow down price increases with an additional supply of allowances. See Appendix A for more details, available only online at eco.on.ca.

5. This is a projection based on reductions occurring the trend rate. Under a high demand/high emissions scenario, aggregate demand is projected at 346 million versus a low demand scenario that would result in 329 million aggregate demand. As per ECO communications with Chris Busch, Energy Innovation: Policy and Technology LLC.

6. Environment Quality Act, c Q-2, r 15.2, Determination of annual caps on greenhouse gas emission units relating to the cap-and-trade system for greenhouse gas emission allowances for the 2013-2020 period, online: http://legisQuébec.gouv.qc.ca/en/ShowDoc/cr/Q-2,%20r.%2015.2.

7. ibid

8. The price of allowances that are offered for sale at three thresholds are defined in Ontario's *The Cap and Trade Program*, O.Reg 144/16, s 80. The price thresholds increase annually by 5% plus inflation, as measured by the Consumer Price Index, data used from "Table 326-0020 Consumer Price Index (CPI), monthly (2002=100)", online: Statistics Canada <www5.statcan.gc.ca/cansim/a01?lang=eng>

9. Chris Busch, "Implications of Assembly Bill 398 for Oversupply in the California-Québec Carbon Market: An Easy Fix Exists to Resolve Oversupply Concerns" (September 2017) at 4.

10. This section of AB 398 amended Section 38562 of the Health and Safety Code.

11. USD $15.06 per allowance in November 2017. Similar to Ontario's, California's auction reserve price increases annually by 5% plus inflation, as measured by the Consumer Price Index.

12. Richard Schmalensee and Robert N Stavins, "lessons Learned from Three Decades of Experience with Cap-and-0Trade" (2017) 11:1 Review of Environmental Economics and Policy at 59. <doi.org/10.1093/reep/rew017>

13. ibid

14. The reductions would occur years later than if there had been no link, which is highly undesirable from a climate point of view, but least they would eventually be sure to occur.

15. Including weather, GDP, technological developments, economic and tax policy, and other impacts, such as the damage done by Hurricane Harvey to gasoline refining capacity in the U.S., which in turn drove up gasoline prices.

16. Paraphrased from Thomas Homer-Dixon's speech, "Complexity Science and Public Policy", Manion Lecture for the Canada School of Public Service, in Ottawa, Canada, May 5, 2010, https://homerdixon.com/complexity-science-and-public-policy-speech/