

Ontario's Proposed Cap and Trade Design Options

Consultation Feedback EBR 012-5666

Final Report

**Marc Brouillette
December 15, 2015**



Executive Summary

The Ontario Ministry of the Environment and Climate Change (MOECC) issued a consultation request on the design options of their proposed Cap and Trade (C&T) regime in Ontario that would be linked to that of California, and Quebec. The MOECC says that C&T will be the primary tool for achieving Ontario's 2020 greenhouse gas (GHG) emission reduction target and is seeking input to assist with preparation of a draft regulatory proposal to be tabled in early 2016. This report has been prepared in response to that request for input. Furthermore, the MOECC states that in choosing to price carbon, Ontario has committed to the most effective and efficient way to reduce emissions and drive innovation and productivity. This submission highlights and initiates a discourse on several of the design features which aim to maximize the likelihood of an implementation program that best serves the interests of Ontarians.

The recently issued Ontario Climate Change Strategy was used as a contextual guidepost in preparing this report. An important aspect of Ontario's carbon reduction strategy is the commitment to meet the ultimate long-term goal of reducing emissions by 80% below 1990 levels by 2050.

The assessment of the C&T Design Options has yielded seven overall findings summarized below that are supported by 76 detailed recommendations for consideration in developing the C&T regulatory proposal.

Overview of major findings

- 1) By leveraging its solid base of nuclear and hydro-electric energy, Ontario is in an enviable position to gain economic advantage and provide the decarbonizing world with environmental leadership.
 - a. Linking these advantages and pursuing synergies in concert with the hydro strengths of Manitoba and Quebec will significantly increase these benefits.
 - b. Ontario's energy mix is very different from that of California. Ontario's challenges are equally different and so should be its strategies. Developing a winning strategy is complex and will take time to be developed in an evidence-based transparent manner.
- 2) The technologies being considered to help Ontario deliver its climate strategy and C&T program must include nuclear in order to realize lower energy costs while achieving economic growth.
 - a. It is clear to Strategic Policy Economics (Strapolec) that any approach to combatting climate change that is most effective and efficient for Ontarians and that allows Ontario to "win" on the global environmental and economic leadership stage must recognize the value and advantages of leveraging Ontario's world class endowment in nuclear energy, science, and technology.
- 3) The C&T program cannot significantly contribute to the reduction of GHG emissions between now and 2020 if it limits significant financial involvement of major industries and institutions until 2021.

- a. Significant industry participation is required to enable a carbon market to exist. It may produce results for 2030 if it is possible to “get it right” with full consideration of the complexities of the import and export implications of Ontario’s globally competing economy.
 - b. Accelerating the magnitude of the carbon price and including as many emitters as possible will help achieve near term success.
- 4) The complexities of managing an emissions C&T program and its interaction with the economy are significant and warrant an integrated energy and greenhouse gas emissions reduction plan.
- a. Jurisdictions are being challenged to get alignment between market drivers, emissions reductions, and consumer behaviors. The Ontario Energy Board (OEB) and the Independent Electricity System Operator (IESO) will need to work with other arm’s length government bodies and collectively take the necessary time to align the programs.
- 5) Integrating small emitting consumers such as residential and small businesses into the emission reduction program is essential to ensure that consumer behavior change, emissions targets are achieved and the C&T program remains viable. This can be achieved in the near term through the OEB’s ongoing regulatory practices and by leveraging available Surplus Baseload Generation (SBG):
- a. A C&T inspired premium on gasoline and natural gas is a near term, low cost, and low risk transition option while the Ontario’s C&T program is being finalized and aligned with California, and Quebec.
 - b. Offer consumers switching options to make use of SBG and reduce their overall energy cost. This could include opportunities for off peak charging of electric vehicles and support for a variety of consumer services that can leverage the SBG in cost effective electrification of current natural gas applications.
- 6) An evidence-based and transparent process is required to protect Ontarians from well-intentioned but unnecessary energy cost increases, . Such an approach will enhance and validate the accountability of the Ontario government as it proceeds to achieve the benefits and objectives of the Ontario climate strategy.
- 7) Independent industry, investment and academic bodies should be charged with making the technical decisions around investing proceeds into all possible carbon reducing innovations.
- a. The Ontario government should be setting clear objectives and goals that are not technology specific.

Recommendation

Clearly, there is urgency to moving forward with strategic actions that will combat climate change and secure the benefits of doing so. The ultimate goal is to achieve significant reductions in GHG emissions while growing the province's economy. The Ontario Government should proceed cautiously with the C&T implementation to ensure that it has the support of all directly affected parties, primarily the 89 large industrial companies that will initially represent the covered entities. These industries must compete in the global marketplace. Support to C&T and its viability will be demonstrated by the willingness of Ontario's industrial leaders to ultimately forego free allowances.

As soon as the new integrated energy and emissions reduction plan for Ontario's future is developed by the responsible agencies, the IESO and the OEB, the government should proceed with the fuel levies. These can be administered by the OEB in concert with other consumer incentives administered by the IESO that will drive Ontario to achieve its emissions reductions at the lowest cost to the economy. Recommendations made in this report regarding gas-fired electricity generators should also be considered.

The addendum to this executive summary includes the 76 detailed recommendations for the design of the C&T program within the context of Ontario's overall climate strategy.

Addendum to Executive Summary

Summary of Detailed Recommendations:

The following outlines the 76 detailed recommendations resulting from Strapolec's review and analysis of the MOECC proposed C&T Design Options.

3.1 Guiding Principles for Design

- (1) The scope of each of the MOECC design principles should be clearly linked and aligned with the full breadth of Ontario's climate strategy and action plan objectives and C&T program.
- (2) The MOECC should use the term "low carbon energy" in lieu of "renewables" and/or "clean technology" when discussing options for reducing carbon emissions.
- (3) The MOECC should explicitly recognize that nuclear energy is currently the most significant source of low carbon emission energy in Ontario.
- (4) "Evidence-based" should be a key decision making criterion that is applied to all economic, policy, design and emissions choices made by the government with respect to the Climate Strategy, Action Plan, C&T Program and their integration with other regulatory regimes in the province.
- (5) "Transparency" should be a key decision making criterion that is applied to all economic, policy, design and emissions choices made by the government.
- (6) "Accountability" should be a key decision making criterion that is applied to and reflected in the design principles applicable to the overall outcomes of the C&T program.

3.2 Winning Economic Conditions for Ontario

- (7) To win, Ontario should optimally: maximize the domestic economic conditions for innovation and emissions reductions; maximize the scope and implementation of a carbon pricing system to encourage electrification; and accelerate the associated build out of low carbon electricity generation.

3.2.1 Low Carbon Solutions and the Role of Nuclear

- (8) All levels of government should recognize that Ontario's endowment of nuclear energy technology and capabilities is a strong and valuable asset in Canada's and Ontario's Climate Strategy.

4.0 Characterize Emissions Coverage and Points of Regulation

- (9) A better definition for the "allocations" principle is required. It may be better defined as an obligation that the definition of allowance obligations for particular stakeholders be developed in realistic and achievable ways to enable covered entities to achieve their emissions objectives while remaining competitive in the global market place.

4.1 Fossil Fuel Distributors

- (10) Fossil fuel distributors allowances should explicitly cover the losses/inefficiencies and direct emissions in their production and distribution system. This is especially important for natural gas distributors where incentives must be included to minimize system leaks.
- (11) Fossil fuel distributors should not have responsibility for emissions related to the consumption of fuels by consumers.
- (12) The OEB should act as the point of regulation for fuel consumption and include the C&T driven carbon premium within the fuel price as a pass-through to consumers.

4.2.1 Fossil Fuel Transporters

- (13) Fossil fuel transportation companies should be assigned caps related to the losses/inefficiencies from their transportation and distribution system; provided they have an aggregate emissions footprint that meets the criteria.

4.2.2 The Challenge of Including Fuels in C&T

- (14) Make the minimum threshold for participation as low as possible and do so as fast as possible to the point of covering all organizations where emissions are measured (e.g. the recommended new 10,000 tonnes/year threshold).
- (15) Instead of regulating only "facilities", regulate large corporations that have multiple sites by aggregating the results from all its locations of business.

4.3 Gas-Fired Electricity Generators

- (16) Gas-fired generators should not be considered Emissions Intensive Trade Exposed (EITE) and should not receive free allowances.
- (17) Gas-fired generators should only be allowed to export electricity when dispatched by the IESO to meet grid reliability objectives and that generation should be subject to inclusion of the carbon price premiums.
- (18) For domestic energy production, gas-fired generators should be treated as industrials with caps and allowances associated with inefficiencies and losses.
- (19) The caps and allowances for gas-fired generator losses/inefficiencies should be based on IESO assessments every six months of the amount of gas-fired generation that will be required. The six-month period is to bridge the quarterly auctions with the semi-annual OEB process for setting rates. The associated pass through costs should be included by the OEB when setting the regulated rates for the Regulated Pricing Plan (RPP).
- (20) The fixed price contracts with generators need to be unravelled to ensure the full cost of using natural gas for its peaking function is visible to both consumers through the Hourly Ontario Energy Price (HOEP) and passed on through the process used to export gas-fired generation.
- (21) The IESO should provide price signals directly to consumers through smart meters when gas fired generation is supplying the system. The signal should identify that gas-fired generation is

being supplied and indicate the full cost of the gas fired generation (e.g. \$200+/MWh) that is in effect.

4.4 Consumers (low emitting)

- (22) The government should publicly disclose any analyses related to how it expects consumer behaviour will be affected by the dynamic of conflicting policies contributing to electricity costs rising faster than fossil fuel costs.
- (23) Push for a faster rising minimum carbon price as a condition for joining with California and Quebec's programs.
- (24) Ensure revisions to the next Long Term Energy Plan (LTEP) focus on finding economies from electricity generation that reduce the cost forecast and that make electricity an attractive alternative to the rising price of natural gas.

4.4.1 Nurturing the Power of Consumer Choice

- (25) The IESO should ensure that a consumer price signal is delivered that indicates when GHG emitting electricity supply is being dispatched and what that true full cost of the gas-fired generation is for the peaking or renewables backup applications present at the time.

4.4.1.1 Supporting Households

- (26) Subsidies for the purchase of low carbon devices should only be offered as a tactic of last resort until it is demonstrated through evidence-based transparent analysis that this is an effective use of funds and achieves relatively good emissions reductions and cost savings as compared to other options.
- (27) Place a carbon price equivalent "luxury tax" on appliances and vehicles at their point of sale based on their expected life cycle emissions.
- (28) Offer incentive options to consumers that make use of SBG and that reduce their overall cost of energy over the next 5 years.
- (29) Support consumer service innovations that can cost effectively leverage the SBG in electrifying natural gas applications.

4.5.1 Institutions

- (30) Institutions should not be given free allowances.

4.5.2 Industrials

- (31) There should be no theoretical need for free allowances for Ontario's industrial covered entities in a mature and functioning C&T program provided the linked jurisdictions have the same policy.
- (32) If EITE issues are warranted, then the percentage of free allowances allocated should be based on the percentage of their business represented by exports.

- (33) In general, low emitters with low trade exposure (as defined in the MOECC design options) should not need free allowances.
- (34) Absent these three recommendations, the government should declare the first C&T compliance period as a trial period. During this trial, steps should be taken to ensure that any risks are mitigated to protect both the companies and government. This should include a clear statement about what the conditions will be when the trial period ends and how alignment with policies in linked jurisdictions interact.

5.1 Ensuring Integrity in a Complex System

- (35) Ontario needs to develop and disclose a clear picture of what participation in the C&T program is expected to cost in comparison to other options. This should include a detailed and evidence-based transparent explanation of the cost benefit equation to Ontarians across all goals.

5.2 Synchronize Regulatory Frameworks

- (36) The Ontario LTEP update should begin immediately and have its scope expanded to include not only the scope of the electricity system it has had traditionally, but also all fossil fuel delivery systems and the emissions management process including trends and target identification.
- (37) IESO should defer ongoing renewables procurement until a review is completed of the planned capacities for wind and solar generation and their cost to reduce carbon emissions. The ensuing readjusted supply mix should maximize use of the lowest cost carbon reducing technologies that meets the technical performance requirements and minimizes the total system cost of generation, transmission, and distribution.
- (38) The C&T system should not be implemented until the supply mix and cost implications of the emission goals are well understood, the desired pace of energy transformation is established and deemed achievable, and what carbon price is necessary to achieve the emission reduction goals.
- (39) A C&T inspired carbon price should be utilized by the OEB to enable proceeding with an equivalent premium on natural gas and on transportation fuels.

5.2.1 New and Expanding Facilities

- (40) As emission reductions are a provincial priority, the IESO should be directed to defer procurement for any gas-fired generating assets, including Combined Heat and Power (CHP), to ensure they are compatible with the long term carbon reduction goals and timelines established by the emission reduction program.

5.3 Linking with Other Jurisdictions

- (41) A full assessment of the implications of aligning annual reduction targets with other jurisdictions should be undertaken before linking with programs in other jurisdictions.

- (42) Commission parallel studies by independent 3rd parties to assess the risks to economic leakage associated with cap setting errors and any mitigation that would be warranted.
- (43) Practice getting it right as frequently as possible during the period prior to linking with other jurisdictions.
- (44) The risk to Ontario's industrial entities and economy should be a primary decision-making criterion. Linking with other jurisdictions should only be made if the risk to Ontario's industrials and economy is acceptable.

5.3.1 Timing and Setting the Cap

- (45) Delay starting Ontario's C&T market to 2018 to provide time to work out any "bugs" and all stakeholders affected by Ontario's program understand and can participate responsibly and cost effectively in their own interests.
- (46) Implement a fossil fuels carbon levy for consumers/uncovered entities as soon as the OEB and IESO can finalize the implementation of price signals to consumers so they are empowered to react to it.
- (47) Caps and allowances need to be set based on adequately informed, evidence-based, transparent analyses to ensure a market exists for trading shares, the impact to the economy is understood, and desired changes in consumer behaviors can be reasonably expected.
- (48) The free allowances should not be 100% of the cap. A margin of 5% needs to be removed to accommodate the reserve. An additional margin over average performance needs to be removed to bias the likelihood of there being more demand than supply. This should promote a healthy market for trading.
- (49) A broad communication and outreach campaign should be undertaken by the government to let people know about the emission and cost consequences. For example, consumers should be made aware of the consequences of running their air conditioning in the summer, and that they will be given sufficient information and additional controls to help them avoid the higher cost and other implications of emitting carbon.

5.4 Effective Administration

- (50) Practice auctions and early true ups should be introduced as often as possible to help mitigate the substantial risks associated with not getting the process and caps right.
- (51) Aligning Ontario's C&T Program with others in 2021 appears to be a reasonable objective. Strapolec recommends that Ontario consider not starting the market until 2018, even with free allowances, unless the risks to Ontario's economy and covered entities are demonstrated to be acceptable. This provides more time to test the system to ensure it is functioning properly before any financial risks are imposed on the market.
- (52) The banking of free allowances should be evaluated for its contribution in driving innovation.
- (53) Consideration could be a general buy back minimum price at the end of a compliance period for unused allowances that is equal to the auction value.

Strategic Reserve

- (54) Keep the strategic reserve as it is an important tool for market management by government.
- (55) An evidenced-based, transparent analysis should be undertaken by a third party that identifies potential strategic reserve levers and their effects and to inform the development of the preferred approach and framework for same.

5.5 Nurturing Market Demand for Low Carbon Solutions

- (56) Neither a C&T program nor a carbon pricing scheme should be implemented until the impact of the externalities of global competition on imports and exports and the implications for Ontario businesses is understood.

5.5.1.1 Export Crediting and Distributing Allowances

- (57) Export protection can be accomplished by providing free allowances proportional to the level of exports a company actually has, including credits for any carbon premiums that have been paid on fuel.

5.5.1.2 Border Carbon Adjustments Vs Import Carbon Tariffs

- (58) Place a broad based country specific import duty based on their national emissions to Gross Domestic Product (GDP) ratio since it is an easy benchmark to acquire.
- (59) For electricity imports, the tariff should reflect the carbon content of imported energy.
- (60) For natural gas imports, the carbon price import duty should reflect the life cycle emissions associated with the process (extraction, storage, and transportation) that makes the gas available at Ontario's border.

5.5.2 Role of Federal Government

- (61) Import barriers should be included in the dialog between the Federal and Provincial governments.
- (62) A C&T system should not be "implemented" until the mechanisms for mitigating the export and import risks are defined and federal alignment with the implementation is established.

5.6 Using Proceeds to Enable the Innovation Engine

- (63) Subsidies for specific technologies should be avoided.
- (64) There should be a commitment that a substantial amount of the proceeds will be reinvested in carbon reducing technologies, and done so in a transparent, accountable and verifiable manner.
- (65) The government should implement a C&T program that imposes the least cost and provides the most benefit to Ontario.

5.6.1 Investing Directly in Innovation

- (66) The Ontario government should engage with independent third parties to manage the technical decisions for reinvesting proceeds to incent innovation in the province.
- (67) Government should set the criteria regarding the province's objectives, and let the third parties administer the decisions.
- (68) For Venture Capitalists (VCs), the funds should be given to them to invest on behalf of the government as a portfolio such that the government will be able to recover the funds when they sell shares in the successful enterprises down the road.
- (69) For Academic councils, a fund should be provided that can then be accessed based on specific criteria using existing processes and institutions available in Ontario such as NSERC, Ontario Research Fund (ORF), etc.

6.2 Monitoring Outcomes

- (70) Create a long-term forecast for expected emissions that addresses the time frames immediately before and after the emission target milestones.
- (71) Criteria should be developed for monitoring the impacts of the C&T Program on Ontario's economic objectives and competitiveness.
- (72) Annual progress reports should be mandatory and publically available.

6.3 Accountability for Public Costs

- (73) Ontario's action plan should commit to achieving realistic goals with well-articulated costs and benefits.
- (74) The government should commit to getting an "A" score from the OAGO when the OAGO conducts its value for money audits after implementation.
- (75) Ontario's Climate Strategy and the performance of its associated tactics and "tools" should be revisited every three years.
- (76) Analyses should be conducted that includes detailed disclosure of the facts, methodology, and conclusions. The analyses should provide sufficient clarity to support independent third party validation of the data and healthy public debate over outcomes and their implications.

Section	Table of Contents	Page
Executive Summary/Overview		i
1.0 Introduction		1
2.0 The Context for Creating a Cap and Trade Regime		4
2.1 Emission Challenges and the Scope of Cap and Trade Objectives		4
2.2 Context for Implementation Design		6
3.0 Setting Clear Objectives		8
3.1 Guiding Principles for Design		8
3.2 Winning Economic Conditions for Ontario		10
3.2.1 Low Carbon Solutions and Role of Nuclear		13
4.0 Characterize Emissions Coverage & Points of Regulation		14
4.1 Overview of Stakeholder Context		15
4.2 Fossil Fuel Distributors		16
4.2.1 Fossil Fuel Transporters		17
4.2.2 The Challenge of Including Fuels in Cap and Trade		19
4.3 Gas-Fired Electricity Generators		19
4.4 Consumers (low emitting)		21
4.4.1 Nurturing the Power of Consumer Choice		23
4.4.1.1 Supporting Households		24
4.5 High Emitting Enterprises		25
4.5.1 Institutions		25
4.5.2 Industrials		25
5.0 Setting it up		27
5.1 Ensuring integrity in a Complex System		27
5.2 Synchronize Regulatory Frameworks		28
5.2.1 New and Expanding Facilities		29
5.3 Linking with Other Jurisdictions		29
5.3.1 Timing and Setting the Cap		31
5.4 Effective Administration		32
5.5 Nurturing Market Demand for Low Carbon Solutions		33
5.5.1 Imports, Exports and Mitigating Carbon Leakage		34
5.5.1.1 Export Crediting and Distributing Allowances		34
5.5.1.2 Border Carbon Adjustments Vs Import Carbon Tariffs		34
5.5.2 Role of Federal Government		35
5.6 Using Proceeds to Enable the Innovation Engine		36
5.6.1 Investing Directly in Innovation		36
6.0 Monitoring Outcomes and Accountability		39
6.1 Consumer Behavior and Industry Investment		39
6.2 Monitoring Outcomes		39
6.3 Accountability for Public Costs		40
7.0 Summary		41
Appendices		45

List of Figures

Figure	Page
Figure 1 – Ontario Emissions 2013	5
Figure 2 – Ontario Emissions Forecast	5
Figure 3 – Design & Development Process for Cap and Trade	6
Figure 4 – Structure for Cap and Trade	15
Figure 5 – RGGI Compliance Record	31

List of Tables

Table	Page
Table 1 – MOECC Cap and Trade Design Principles	8

1.0 Introduction

The Ontario Ministry of the Environment and Climate Change (MOECC) issued a consultation request on the design options of their proposed Cap and Trade (C&T) regime in Ontario that would be linked to that of California, and Quebec. The MOECC says that C&T will be the primary tool for achieving Ontario's 2020 greenhouse gas (GHG) emission reduction target and is seeking input to assist with preparation of a draft regulatory proposal to be tabled in early 2016. This report has been prepared in response to that request for input. Furthermore, the MOECC states that in choosing to price carbon, Ontario has committed to the most effective and efficient way to reduce emissions and drive innovation and productivity. This submission highlights and initiates a discourse on several of the design features which aim to maximize the likelihood of an implementation program that best serves the interests of Ontarians.

To complement the C&T design guidelines assessment, Ontario's recently issued Climate Change Strategy was used as a guidepost for much of the context under which the comments contained herein have been prepared. An important aspect of a carbon reduction strategy is the ultimate global long-term goal. Ontario has established the goal of an 80% reduction of emissions below 1990 levels by 2050.

The MOECC's Climate Change Strategy consists of 5 elements, four of which are addressed by this submission:

1. **A prosperous low-carbon economy with world-leading innovation, science and technology**
2. **Government collaboration and leadership**
3. **A resource-efficient, high-productivity society**
4. **Reducing GHG emissions across key sectors**

Strapolec understands the goals¹ for the government in combating climate change are to broadly drive the following initiatives across the whole economy:

- a) Support absolute reduction in GHG emissions.
- b) Grow Ontario's economy by transforming to a low carbon environment.
- c) Nurture world leading Science Technology and Innovation (ST&I) to fuel the low carbon economy.

To achieve this, Ontario's government recognizes and asserts that there is a carbon price imperative that must be aligned with emission reduction targets in order to combat global warming. The belief is that the best way to manage such an aligned carbon price is to link to a common framework with other jurisdictions. Ontario wishes to link its C&T program with California, Manitoba and Quebec and to work with them to involve as many other jurisdictions as possible. A universal C&T program would provide a uniform globally established price for carbon.

¹ Ontario's Climate Change Strategy. While the stated goals were quite clear in the discussion document, they are not as clearly stated in the climate change strategy. The strategy seems to dwell on specific instances of potential innovations that might have merit. This tends to obscure the overall picture.

This report provides comments on the proposed C&T design options and their ability to effectively deliver reduced emissions for the 2020 target, support the anticipated action plan objectives, and also achieve all three goals the government has for the climate change strategy: reduce emissions, grow the economy, and advance ST&I. This report provides feedback on how the implementation of a C&T regime in Ontario can be optimized with respect to the design principles articulated by the MOECC as well as recommending additional principles warranted by the economic context of Ontario's energy system.

Approach

Strapolec created a depiction of Ontario's carbon based energy system, including fuel delivery, to illustrate how the scope of the intended C&T system would involve Ontario's consumers. The full description is provided in Section 3. Additionally, Strapolec has developed an approach for the design and development of a C&T system that provides context for assessing the various features and design elements. This process has a simple four-step framework which is expanded upon in Section 2:

1. Establishing what the C&T program should do
2. Clarifying stakeholder involvement
3. Defining how the C&T Program should be set up to reflect the structure and intended transformation of Ontario's economy
4. Letting consumers and businesses then make it happen

The structure of this document follows this framework. The design principles and elements of the design options identified by the MOECC are addressed in the relevant sections.

Structure of this document

This report provides a comprehensive assessment of the perceived drivers, assumptions and expected outcomes of the proposed C&T Design Options. The perspective that Strapolec held during the course of the analysis was one of being an advocate for creating an Ontario that grows to become a globally competitive economy that leads the world in demonstrating what prosperity can look like in a carbon free environment. Ontario has some significant advantages that should drive success in this global effort to decarbonize our use of energy.

Section 2 summarizes the context under which the assessment has been made and introduces the framework under which the underlying assessment was conducted to develop the recommendations that are captured in this report.

Section 3 presents considerations associated with defining what the C&T program should aim to achieve given the unique characteristics of Ontario's energy system and economy.

Feedback on Ontario's Proposed Cap and Trade Design

Section 4 examines the proposed points of regulation and emissions coverage and identifies the challenges these definitions may have for implementation.

Section 5 addresses the various implementation considerations that will create a suitable environment for business decision making and a market demand for innovation while empowering consumer choice.

Section 6 summarizes the high level findings and overall recommendation that has emerged from this study.

2.0. The Context for Creating a Cap and Trade Regime

The Ontario government has resolved that combating climate change is an imperative for all responsible elements of our global society. It has committed to joining a Carbon C&T program with California, Quebec, and Manitoba. The government has stated that C&T is to be the primary tool for achieving Ontario's 2020 objectives and for supporting future GHG emissions reduction targets of 37% by 2030 and 80% by 2050. Ontario's Climate Action Plan to be released in 2016 will provide complementary measures to ensure more GHG reductions within Ontario borders are made and are achieved sooner with low compliance costs.²

2.1. Emission Challenges and the Scope of Cap and Trade Objectives

The key C&T implementation challenge is how to best address the nature of today's emissions while identifying and evaluating the optimal options for future changes in emissions.

Figure 1 contains the 2013 emissions recently used by the MOECC to characterize Ontario's emissions.³ Based on this diagram, the three largest emitting sectors of Ontario's economy are:

1. Transportation (35%)
2. Industry (28%)
3. Buildings (19%)

The next largest category is electricity generation at 7%. Emissions from electrical generation in Ontario are a relatively small contributor to overall emissions when compared to other jurisdictions. The carbon footprint of Ontario's electricity system is lower than many jurisdictions due to the province's low-carbon, baseload nuclear and hydroelectric generation. Nuclear supplies over half of the province's electricity and hydroelectric supplies more than 20%.

The current low carbon footprint has been achieved by the improved output from Ontario's nuclear facilities, which displaced 87% of the fossil-fired generation in the electricity system⁴ and enabled the closure of Ontario's coal plants.

Figure 2 depicts the forecast emissions from all sectors combined. Under current policy conditions, emissions are expected to be 177 Million Tonnes (Mt) in 2030, similar to 1990 levels and 10 Mt higher than Ontario emitted in 2012. This forecast growth does not include about 7 Mt of emissions from the electricity sector that are associated with the expected reduction in nuclear capacity with the 2020 retirement of the Pickering Nuclear Generating Station (PNGS). It is expected that all other sources of emissions will remain relatively flat.

Figure 2 also shows the 2014, 2020 and 2030 emission targets. The 2030 reduction target requires that 37%, or 65 Mt of the 177 Mt, must be removed. This will be a difficult target to achieve. The coal

² Government of Ontario, 2015

³ Minister Murray at APPrO conference, 2015. The MOECC uses older 2012 data in the descriptions of the challenge in its Climate Change Discussion materials and the recently released Climate Strategy.

⁴ Strapolec, 2015

Feedback on Ontario's Proposed Cap and Trade Design

stations are already closed. Electricity consumption will continue to grow at a modest rate. Nuclear capacity will be reduced when the PNGS goes off line in 2020. Ontario's plans to add more renewables will increase the need for back up natural gas generation. The 65 Mt reductions will effectively have to come from buildings, transportation and industry – equivalent to almost a 50% reduction compared to current levels. This is a vast amount of energy that must either be cost effectively reduced and/or substituted.

Figure 1 – Ontario Emissions by Sector 2013

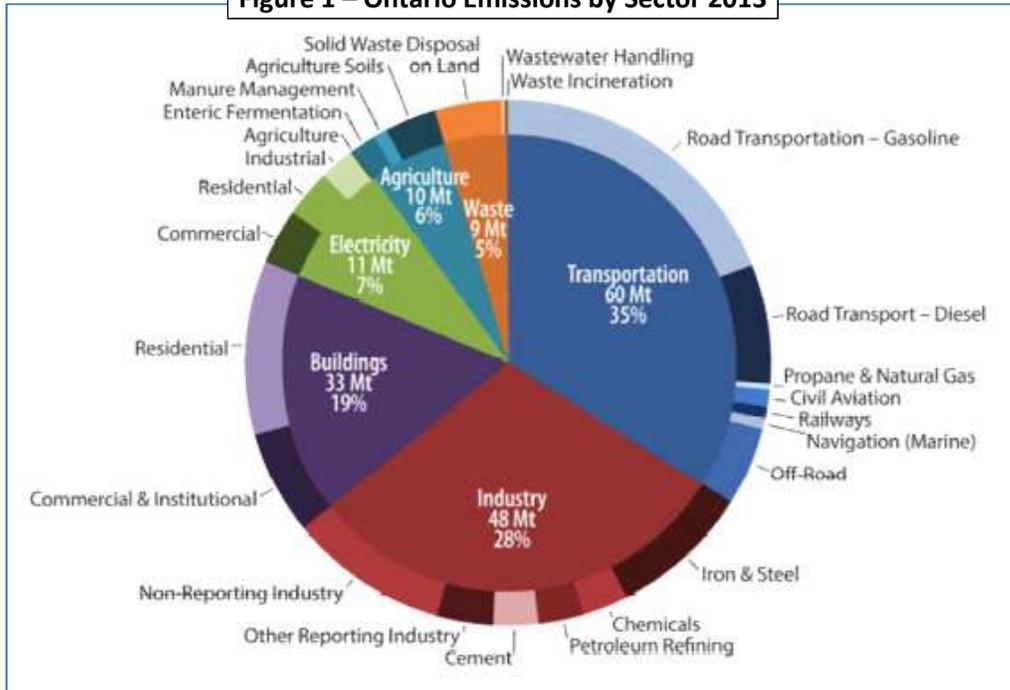
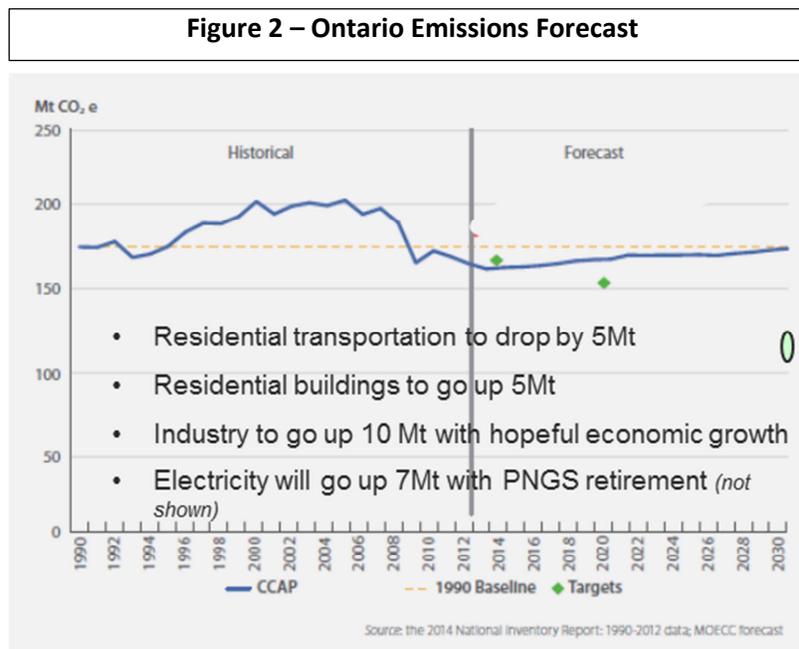


Figure 2 – Ontario Emissions Forecast



The magnitude of the required transformation for Ontario's energy system is significant. According to Enbridge, achieving the 37%, or 65 Mt, emission reduction target via electrification of the energy currently provided by natural gas would require Ontario to triple its electrical generating capacity by 2030.⁵ This is simply not possible in the identified time frame with wind and solar alone in Ontario, even if their intermittent production could be converted to a baseload capability. This is discussed further in section 3.2.

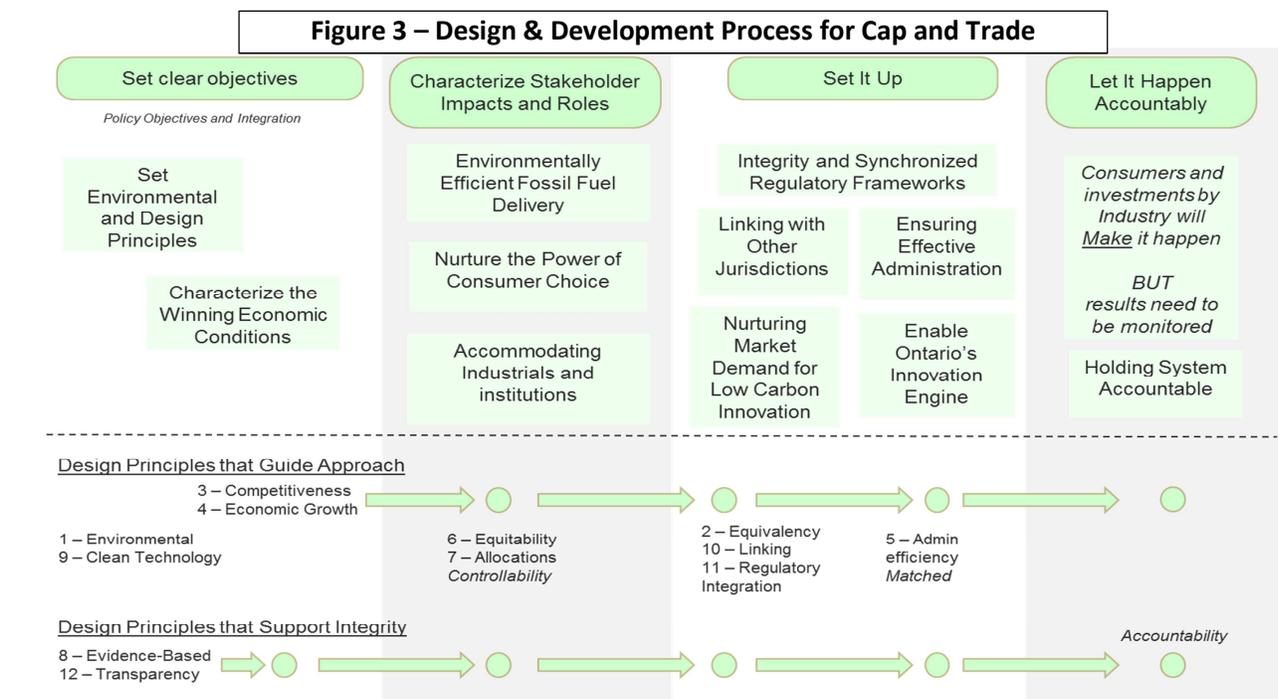
The next section presents an analytical framework for designing and developing a C&T system that minimizes the costs to ratepayers and tax payers in achieving the emission reduction objectives.

2.2 Context for Implementation Design

A review of the C&T Design Options document makes it clear that the design challenge is non-trivial with complexities spanning across many factors. Figure 3 illustrates the holistic framework developed to inform a discussion of the various issues related to implementing a C&T program in Ontario's economy.

The framework is based on four generic, intuitive steps that facilitate the identification of key considerations underpinning the design of such a program. These steps are indicated across the top of Figure 3 as:

1. Establishing what the C&T program should do
2. Clarifying stakeholder involvement
3. Defining how the C&T Program should be set up in the context of Ontario's economy
4. Letting consumers and businesses then make it happen



⁵ Teichroeb, 2015

The blocks in the top portion of Figure 3 represent the main functional steps in the design process and also represent discussion topics presented in this document. The enumerated items at the bottom of the figure are the design principles extracted from the C&T Design Options document. These have been placed to correspond to the elements of the design and development process.

During the course of this assessment, three new design principles were identified as having merit for inclusion in this process. These are indicated with an *italic* font in Figure 3 and include: Controllability, Matching, and Accountability.

The remaining sections of this document discuss the issues relevant to the steps in Figure 3, the applicability of the design principles to those considerations, the related design options components from the C&T Design Options consultation document, and responses to questions posed by the MOECC. Recommendations are also provided.

3.0 Setting Clear Objectives

To guide the design process, the MOECC has established design principles. The objectives and design principles have been used to guide the assessment in this report.

3.1 Guiding Principles for Design

The MOECC has communicated 12 design principles as summarized in Table 1. The principles have been grouped into various areas of applicability to the process steps identified in Section 2.2. Table 1 includes notes suggesting that the scope of the design principles be expanded. The scope should be broadened to include elements and aspects of the climate strategy objectives including: economic growth, innovation enhancement, and emissions reductions. Three new design principles are presented as key success factors in implementing a C&T program in Ontario.

Table 1 – MOECC Cap and Trade Design Principles

Original Order #	Category	Principle	Process Related Element
1	Environmental	Support absolute reduction in GHG emissions	Environmental Sec 3.1 <i>Expand scope</i>
9	Clean Technology	Encourage energy efficiency and the development of clean technologies	
8	Evidence-Based	Use accurate and verified emissions data, supported by transparent analyses	Integrity Sec 3.1, 5.1 <i>Expand scope</i>
12	Transparency	Share information supporting program design decisions	
NEW	Accountability	Outcomes of government policy against goals to be demonstrated	
3	Competitiveness	Employ effective compliance approaches and tools to achieve GHG reductions and support competitiveness of Ontario industries	Economy and Policy Sec 3.2, 5.2 <i>Expand scope</i>
4	Economic Growth	Support low carbon growth and investment in new and existing industries	
6	Equitability	Treat sectors and facilities equitably	Stakeholders and Policy Sec 4, 5.2
7	Allocations	Recognize and account for early action to reduce GHGs by industry leaders (e.g., free allocation through benchmarking)	
NEW	Controllability	Covered entities to have ability to control emissions	
2	Equivalency	Secure equivalency with the federal government to avoid duplicate regulatory regimes	Policy Sec 5.2, 5.3, 5.4

10	Linking	Align with other emissions reduction programs of similar rigour	<i>Expand scope</i>
11	Regulatory Integration	Consider integration with Ontario's other environmental policies	
NEW	Matching	Government use of proceeds only for achieving emission reduction policy objectives in demonstrable manner. Free allowances only distributed if an innovation enabled them.	
5	Administrative Efficiency	Employ simple, consistent, and efficient administrative systems	Admin Sec 5.4

Recommendation:

- (1) The scope of each of the MOECC design principles should be clearly linked and aligned with the full breadth of Ontario's climate strategy and action plan objectives and C&T program.

Each design principle is discussed further in the subsequent sections of this document. Two groups of principles are discussed in more depth below: Environmental and Clean Technology, and Integrity.

Environmental and Clean Technology Design Principles

The first design principle in the C&T Design Options document is the environmental goal to support absolute reduction in GHG emissions. It is very clear that a carbon pricing initiative is about reducing carbon or carbon equivalents, nothing else. However, the presence of a "Clean Technology" design principle is ambiguous. The terms "clean" and "renewables" are extensively used in the Climate Strategy absent any clear definitions. The term "nuclear" does not appear at all. This omission ignores the significant GHG reduction benefit associated with provincially-owned low-carbon nuclear assets. In the last seven years, nuclear power has met more than half of Ontario's electricity demand, reaching a high of 62% last year. Given its inherent advantages, Ontario's nuclear fleet should be an integral part of any plan or program by the province to achieve a low-carbon economy.

The exclusion of nuclear from the MOECC's lexicon is further illustrated by the 2050 vision described on page 37 of Ontario's Climate Strategy. The figure does not identify a nuclear energy component. With the nuclear refurbishments embedded in the Long Term Energy Plan (LTEP) and the recently announced agreements with Bruce Power,⁶ nuclear energy will continue to provide the carbon free baseload energy to power Ontario's economy well past 2050.

⁶ Bruce Power signs deal for \$77/MWh energy, Dec 3, 2015

Recommendations:

- (2) The MOECC should use the term “low carbon energy” in lieu of “renewables” and/or “clean technology” when discussing options for reducing carbon emissions.
- (3) The MOECC should explicitly recognize that nuclear energy is currently the most significant source of low carbon emission energy in Ontario.

Ensuring Integrity

The Office of the Auditor General of Ontario (OAGO) 2015 report identified serious concerns with the lack of transparency and evidence-based decisions in Ontario’s LTEP process for 2010 and 2013. The OAGO also raised concerns about a lack of accountability for managing the costs for all Ontarians associated with the plan. The entire Climate Change Strategy, Action Plan, and C&T design processes should be managed with full transparency and accompanied by evidence-based decisions sufficient to allow third party validation and ongoing accountability of results.

Recommendations:

- (4) “Evidence-based” should be a key decision making criterion that is applied to all economic, policy, design and emissions choices made by the government with respect to the Climate Strategy, Action Plan, C&T Program and their integration with other regulatory regimes in the province.
- (5) “Transparency” should be a key decision making criterion that is applied to all economic, policy, design and emissions choices made by the government.
- (6) “Accountability” should be a key decision making criterion that is applied to and reflected in the design principles applicable to the overall outcomes of the C&T program.

Adopting these recommendations would better ensure Ontario embarks on an evidence-based and cost effective path to emissions reductions while sustaining and improving its economic competitiveness.

3.2 Winning Economic Conditions for Ontario

There are two important design principles identified by the MOECC that are related to winning economic conditions:

3	Competitive-ness	Employ effective compliance approaches and tools to achieve GHG reductions and support competitiveness of Ontario industries	Economy and Policy <i>Sec 2.2, 4.2</i> <i>Expand scope</i>
4	Economic Growth	Support low carbon growth and investment in new and existing industries	

These principles are appropriately broad in nature. They suggest that the competitiveness of all industries in Ontario is important and should be enhanced by developing low-carbon solutions that decarbonize the economy while sustaining and growing existing industries and attracting new one. Maximizing the outcomes from these two principles supports Ontario's intention of providing global leadership in the fight against climate change.

Ontario's energy supply mix and usage profile is virtually unique in the world and distinctly different than that of California and the rest of the United States (US). Quebec is similar to Ontario in that it has a solid low carbon electricity system. Quebec and Manitoba have hydro, Ontario has nuclear and hydro. Together Ontario, Manitoba and Quebec make a large economic base with common goals. The inclusion of Manitoba only strengthens the synergies for Ontario. Energy requirements follow similar and complementary seasonal patterns. California is completely different. Natural gas-fired generation provides 55% of Californian's electricity and the state does not see the same seasonal swing between home heating and air conditioning.

The US can and will make significant strides toward GHG emissions reductions through fuel switching from coal to natural gas-fired generation, as well as using wind and solar. In California, wind and solar form an integrated supply mix with natural gas-fired generation. As wind and solar capacity goes up, emissions go down, to a "limit" represented by the demand for capacity from the gas-fired generation. In Ontario, this model fails. Today in Ontario the opposite is now true, as wind capacity grows, emissions also increase due to back up by gas-fired generation. Ontario, with its hydro and nuclear capacity, has a carbon free baseload that has already minimized fossil-fired generation to the extent that the current fleet of renewables is already over the limit where other renewables can meaningfully displace emissions from gas-fired generation. So much over the limit that the gas generation is required to fill-in the gaps and ramps as a result of renewables displacing the slower ramping hydroelectric and nuclear baseload.

Ontario has already achieved the practical elimination of GHG emissions from its electricity system by closing the province's coal stations. Ontario's current situation is therefore somewhat equivalent to Quebec's and Manitoba's. Ontario's immediate challenge in achieving its 2020 GHG reduction goals is to increase fossil consumption efficiency and fuel switching by replacing the use of fossil fuels for home heating and transportation with low carbon electricity. Ontario's supply mix is technologically ahead of California's with respect to emissions reductions. Given the inherent differences between the two jurisdictions, in supply mix and demand profile, competing with California and the US on technologies aimed at solving the US problem would be a losing battle for Ontario.

The implementation of wind and solar in Ontario is and always will be more expensive than in the US given Ontario's geography (where there is less useful and reliable wind) and latitude (reducing efficiency

of solar). These geographical realities establish that wind will likely always be 10 to 20% more expensive in Ontario than the US average and solar will be up to 60% more expensive.⁷

Ontario could be at a distinct economic disadvantage should it choose a higher cost technology approach that works well for California but is not suitable for our province. The resulting, higher energy prices will only hurt the competitiveness of Ontario's economy, and compromise achieving the goal of the province's Climate Change Strategy. Further investments in wind and solar solutions would simply be bad environmental and economic policy.

The economic equation for non-hydro renewable energy sources like solar and wind is also worse in Ontario because this generation is non-dispatchable (e.g. not reliably available when needed). Effective and economic use of these intermittent forms of renewable supplies is very much related to the presence of equivalent or greater fossil fuel fired generation in the supply mix. As soon as the non-hydro renewable capacity begins to approximate the baseload fossil capacity, the per MWh lifecycle costs of the renewables begin to rise. This has occurred in Ontario where a significant portion of our non-hydro renewable energy contributes to our Surplus Baseload Generation (SBG) inefficiencies because there is no fossil fuel generation to replace.

- The nuclear option, on the other hand, provides a strong advantage to Ontario that few jurisdictions in the US will be able to follow. Ontario has earned the social license with the population to provide its power with nuclear energy. Furthermore, environmental assessments have already been completed to allow early build out of capacity. In the US, it will take them many years to complete the process for citing the carbon free capacity to replace its coal fleet. If Ontario continues to get this equation wrong, as it has with the last two LTEPs, then Ontario's environment for business will continue to trend towards being economically disadvantaged. Ontario electricity costs are currently 36% higher than the average for the US, more than double the 16% difference that existed in 2011. Pursuing a strategy to combat climate change, when it starts to impact on the province's energy supply mix, must be prudently and responsibly managed with evidence-based decisions.

Recommendation:

- (7) To win, Ontario should optimally: maximize the domestic economic conditions for innovation and emissions reductions; maximize the scope and implementation of a carbon pricing system to encourage electrification; and accelerate the associated build out of low carbon electricity generation.

⁷ The realities are evidenced by Ontario's current efficiencies of wind and solar when compared to the actuals in the US as documented by the Energy Information Administration (EIA).

3.2.1 Low Carbon Solutions and the Role of Nuclear

There is global recognition that sustained GHG emission reduction targets cannot be achieved without expanding the role of nuclear energy in the world's energy supply mix. Under the Clean Power Plan (CPP) in the US, demand for new nuclear is forecast to grow.⁸

Ontario's nuclear capability represents a distinct advantage for the province. The energy production from these nuclear units is a significant driver of Gross Domestic Product (GDP)⁹ and enables significant ST&I capabilities.¹⁰ Nuclear has also been a proven success factor in achieving the province's climate change objectives. The demand for electricity in Ontario could double if energy consumption is decarbonized through electrification to realize the 37% lower emissions level by 2030¹¹. Within the next 10 years, this level of baseload capacity is beyond the physical capacity of other renewables to address. And even if it was physically possible to secure these technologies in lieu of nuclear, the associated costs are an unnecessary¹² and uncompetitive option for Ontario as described above.

Nuclear is the lowest cost, long-term carbon free energy available today. Ontario's decision makers can help leverage the available low-carbon SBG to provide the needed carbon emissions reductions to 2020. Leveraging SBG represents the lowest-cost option available. It would lower costs for consumers and provide less expensive decarbonisation than current MOECC estimates suggest. Higher costs may be true in much of the world, but in Ontario, it does not have to be. These benefits are only sustainable if nuclear generating capacity is sustained and expanded.

Nuclear can accelerate Ontario's emission reductions faster than other options and reduce the impact of carbon pricing on the economy. Nuclear can positively contribute to a winning economic environment in Ontario.

Recommendation:

- (8) All levels of government should recognize that Ontario's endowment of nuclear energy technology and capabilities is a strong and valuable asset in Canada's and Ontario's Climate Strategy.

⁸ US EIA, 2015

⁹ Conference Board of Canada, 2015

¹⁰ KPMG, 2014

¹¹ Teichroeb, 2015

¹² OAGO, 2015

4 Characterize Emissions Coverage and Points of Regulation

Strapolec is of the opinion that the C&T implementation will inevitably devolve into two schemas:

- 1) C&T practices for large emitters or covered entities (currently identified as those with over 25,000 tonnes of emissions);
- 2) A tax equivalent C&T inspired premium for low emitting consumers, in both implementation and perception.

Even if the carbon price premium looks and feels like a tax, having a C&T system behind the carbon prices that are passed on to consumers has the advantage of providing a common base for all consumers in Ontario. This lends transparent legitimacy to the costs and aligns well with the overall objectives of the program.

The MOECC design principles relevant to points of regulation and emissions coverage are:

6	Equitability	Treat sectors and facilities equitably	Stakeholders and Policy Sec 3, 4.2
7	Allocations	Recognize and account for early action to reduce GHGs by industry leaders (e.g., free allocation through benchmarking) <i>This principle should be rejected as stated</i>	
NEW	Controllability	Covered entities to have ability to control emissions in order to meet their caps	

The discussion to follow emphasizes two factors: 1) the need for the system to be fair, as suggested by the “Equitability” design principle; and 2) “Controllability”. Obligating participation by covered entities that have no mechanism for influencing their emissions profile will at worse lead to market dysfunction in its ability to set a compelling carbon price, as has been seen with the Regional Greenhouse Gas Initiative (RGGI) in the US, or at best result in the covered entities using trading proceeds for financial gain purposes as opposed to reinvesting in ongoing innovations. If covered entities cannot control their emissions demand, then they would not have a premise or a motivation to reinvest gains in low carbon innovations.

The “allocations” principle is included here because the method for determining allowances is critically important to making the system work. If the notion of allocations only refers to awarding of free allowances during the first compliance period for the purpose of evolving the market design and practices, then this topic is addressed more fully later on. If not the following recommendation applies.

Recommendation:

- (9) A better definition for the “allocations” principle is required. It may be better defined as an obligation that the definition of allowance obligations for particular stakeholders be developed

in realistic and achievable ways to enable covered entities to achieve their emissions objectives while remaining competitive in the global market place.

- a. In the MOECC design option document, this notion is only relevant to the 89 companies that are large emitters (excluding institutions, waste processing, and electricity generators). Assigning allowances and caps to these will be a challenging arena and the driver of whether a C&T system will have any utility as a price setting mechanism for carbon. The group is too small to award free allocations based on benchmarks as indicated by the definition.

4.1 Overview of Stakeholder Context

The current C&T design options suggest an energy system as illustrated in Figure 4. Points of regulation are indicated by the black circles. The proposed C&T program has been initially scoped to apply to the use of petroleum products by the transportation sector and to the use of natural gas for both electricity and large emitters such as industry and institutions. It is assumed that institutions are defined as the hospitals and universities on the large emitters list.

If the C&T system is intended to achieve the articulated emission reduction goals, the greatest burden will fall to reducing the use of natural gas and gasoline or to their replacement by electrification.

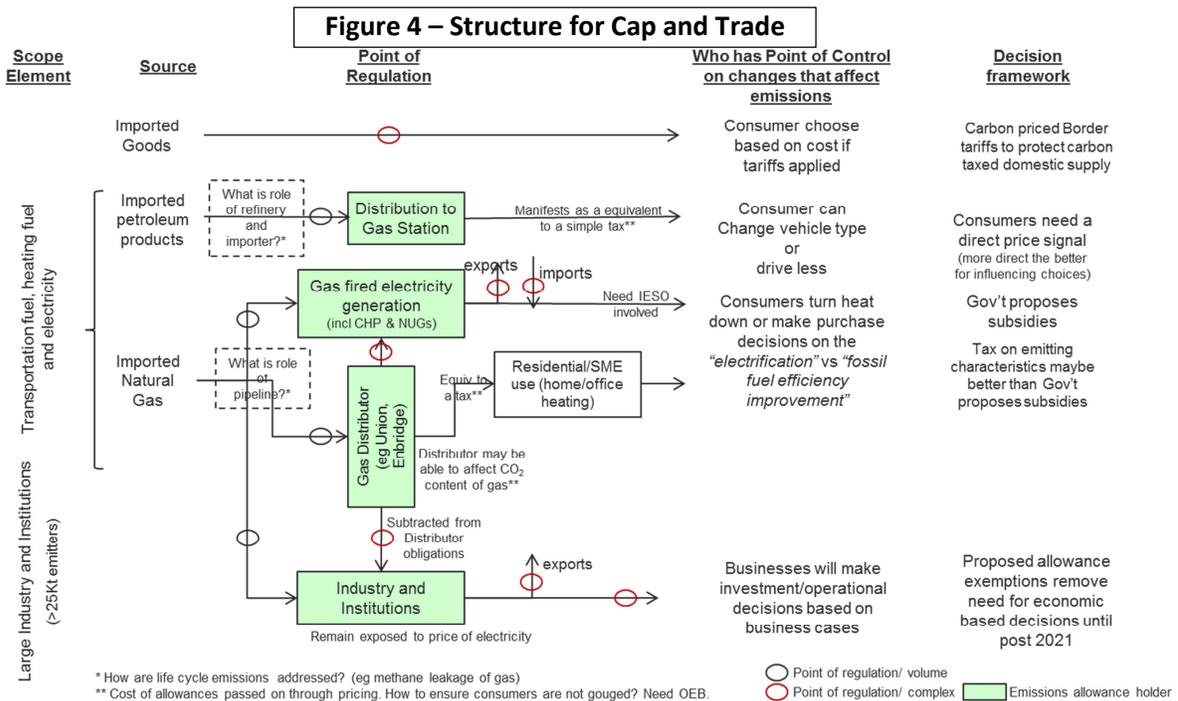


Figure 4 identifies the proposed points of regulation with black circles for subjects such as volume of fuel acquired. The red circles identify more complex areas of regulations such as how emissions are

measured as defined by the GHG Emissions Regulation. Emission measurements can be complicated by industrial process factors and efficiencies. Addressing imports and exports is another example of complexity. Strapolec notes that there is no point of regulation specific to residential, small business, and commercial enterprises. It appears it is assumed that these stakeholders will simply make behavioural changes motivated by increasing costs that will be passed on by the fossil fuel distribution companies. Industry will have similar carbon costs imposed upon them but, unlike consumers, industrials will be in a position to address the investment and operational decisions related to their own industrial processes.

Opportunities exist to engage consumers in a meaningful way if the regulatory environment and use of smart meters can be integrated to deliver price signals to the consumers. These implementation opportunities are identical whether a C&T program drives the cost increases to consumers or whether it is simply a tax that is imposed.

4.2 Fossil Fuel Distributors

The proposed design option for C&T would appear to assign a compliance obligation to natural gas distributors that is equivalent to the full volume of fuel that they will distribute to consumers. This is because no practical point of regulation has yet been developed. Imposing this market responsibility on the natural gas distributors will motivate them to price in market risk. This will add costs to the system that could be avoided. Experience in other jurisdictions suggests that market volume risk has been a common, complicating challenge to getting the C&T markets right. Consumer behavior is not always controllable by the allowance holders and as such it is dysfunctional. The design principle of controllability is relevant here. No stakeholder should have responsibility for allowances dependent on factors outside their control.

Recommendations:

- (10) Fossil fuel distributors allowances should explicitly cover the losses/inefficiencies and direct emissions in their production and distribution system. This is especially important for natural gas distributors where incentives must be included to minimize system leaks.
 - a. There are two natural gas distributors in Ontario (Union Gas and Enbridge) that have emissions above the 25,000 tonne threshold.
 - b. Natural gas distributors should have the ability to blend down the carbon content of the natural gas (e.g. mix in hydrogen). Such things as measuring volume out vs volume in will provide a good indicator of emissions impacted by this at the site.
 - c. As their direct emissions are relatively low compared to the volume of fuel they handle, and their potential ability to blend down the volume may be significant, offset credits for an innovation such as blending down should be considered.
- (11) Fossil fuel distributors should not have responsibility for emissions related to the consumption of fuels by consumers.

- a. It is difficult to understand the rationale behind placing the success of the carbon pricing scheme into the hands of the companies for which the intent of the C&T program is to undermine their business as fast as possible by eliminating demand for their products.
 - b. This also mitigates market risks associated with: 1) the government over or under estimating the allowances needed in the province; and 2) reduces opportunities for gaming in the C&T system.
 - c. Giving the petroleum refineries the carbon pricing responsibility for the entire fuels market will also expose the market to forces outside the control of the petroleum retailers from such causes as consumers changing their usage patterns.
 - Other than through a tax, it is not clear how carbon pricing will be passed onto consumers other than at the discretion of the refineries or fuel suppliers.
 - Similar to natural gas, a premium akin to a tax would be a more cost effective mechanism and provide the greatest risk mitigation against market failure due to these unknowns.
- (12) The OEB should act as the point of regulation for fuel consumption and include the C&T driven carbon premium within the fuel price as a pass-through to consumers.
- a. There is no other legitimate point of regulation for consumers that passes the “controllability” test.
 - b. The OEB currently regulates gas price for consumers and is therefore already equipped with the processes and infrastructure to take on this burden.
 - c. It is difficult to imagine an alternative and robust mechanism that can avoid the market risks that arise from inserting fuel volume uncertainty into the market.
 - The majority of, if not all, carbon markets are currently facing problems due to demand volume uncertainty, a parameter that is practically not possible for governments to control with caps.
 - d. With the OEB managing the consumer based volume demand variations, market risk is reduced. With the OEB involved in the pricing, there is much more policy room for influencing consumer behavior.

4.2.1 Fossil Fuel Transporters

Fossil fuel transporters refer to businesses such as:

- 1) Trans Canada Pipeline which transports natural gas into the province and Union Gas which manages the DAWN Hub operations. The DAWN storage facility stores gas before giving it to the local Ontario distributors. These two companies account for about 9% of emissions from the industrial sector.

- 2) Oil shipping and import companies that bring product into the province and deliver supplies to the refineries (by ship, rail, truck or pipe).¹³

The extent to which these companies and organizations will be included within the scope of the C&T program is not clear based on the definition of “distribution” contained in the province’s design document.

Recommendation:

- (13) Fossil fuel transportation companies should be assigned caps related to the losses/inefficiencies from their transportation and distribution system; provided they have an aggregate emissions footprint that meets the criteria.

Natural Gas Transportation

Natural gas transportation and distribution system losses are in the form of physical volume differences that can be equated to emissions. Losses from the gas system are often in the form of methane, a more powerful GHG than Carbon Dioxide (CO₂). Methane emissions occur all along the natural gas piping system, particularly at terminals where gas is transferred between systems. The DAWN storage Hub is a repository that manages the seasonal demand for natural gas for Ontario and neighboring areas and may be another source of leakage. It has been reported that in the US shale gas industry, leakages from the system create CO₂ equivalent emissions to such an extent that the life cycle emissions rival those of coal.¹⁴ Putting emissions constraints on this infrastructure will provide the impetus for innovations that reduce the losses from this source.

It is not clear whether these emissions are being recorded in the province’s emissions registry. If they are not, then the gas distribution companies should be accountable for the difference between the volume of gas into their networks and the volume of gas they physically meter for all consumers. This existing system is already perfectly set up due to the billing systems in the natural gas sector.

Petroleum Products

Similar to natural gas, emissions occur through the petroleum product supply chain up to the point where the consumer puts the gas in their vehicle’s fuel tank. Strapolec has not undertaken research to quantify and evaluate the significance of the impacts of these emissions in the province. Should these emissions be measured, such quantification should include the emissions/losses that arise during transportation to the refineries and from the refineries to the retail gas stations. It is assumed that the refineries are treated as large industrial emitters.

Refineries could be made responsible for losses all the way through to the gas stations. Alternatively, the shipping companies could be made responsible for the cargo, but this could be difficult to regulate.

¹³ These may be low emitters, but for completeness of though they are included here

¹⁴ Howarth, 2014

Current proposed measures address how much fuel goes into the trucks leaving the refineries and then how much goes into the large tanks at a retail gas station. Intermediate points may be difficult to track. Failure to measure these emissions would most likely result in costs being passed on to the consumer with no incentive for shippers to reduce their emissions.

4.2.2 The Challenge of Including Fuels in Cap and Trade

It is considered important to include the combustion of fuels within the C&T program for the simple reason that they represent the most significant source of emissions that can be reduced. As mentioned above, the proposed program design does not provide a clear point of regulation for the consumer level combustion of fuels. Without one, within the structure described by the MOECC, the market cannot likely function due to the volume risks that would get introduced into the market. If consumer combustion of fuels must be included within the C&T allowances as opposed to an OEB managed option (recommended later), there are two mechanisms that will support a functional price driven trading market; both involve expanding the number of emitters such that fuels become more encompassed. The role of an OEB or equivalent cannot be avoided for residential and small business use.

Recommendations:

- (14) Make the minimum threshold for participation as low as possible and do so as fast as possible to the point of covering all organizations where emissions are measured (e.g. the recommended new 10,000 tonnes/year threshold).
- (15) Instead of regulating only “facilities”, regulate large corporations that have multiple sites by aggregating the results from all its locations of business.
 - a. Examples could include: Banks who have many offices and many branches, each with gas meters; Telecom companies like Rogers and Bell who have many offices and retail outlets; Logistics companies who manage fleets of vehicles.
 - b. Measuring these could be done using volume of usage records. Natural gas usage is already available for measurement. Fleet operators tend to have fleet purchase cards for fuel.

4.3 Gas-Fired Electricity Generators

The Independent Electricity System Operator (IESO) decides the volume of production from natural gas-fired generators. Natural gas is already managed as the “fuel of last resort”. No carbon price in the next 5 years can have an effect on that IESO decision process as “last resort” criteria arises from grid management and total demand. No amount of non-hydro renewables (i.e. solar and wind) can affect those decisions either.

Recommendations:

- (16) Gas-fired generators should not be considered Emissions Intensive Trade Exposed (EITE) and should not receive free allowances.
 - a. Their business model is fully paid for by the fixed price contracts from the Ontario government. In fact, their export business has been fueled by subsidized pricing.¹⁵
- (17) Gas-fired generators should only be allowed to export electricity when dispatched by the IESO to meet grid reliability objectives and that generation should be subject to inclusion of the carbon price premiums.
 - a. Ontario does not need to suffer the emissions caused by US consumption.
 - b. The IESO should not allow demand to be exported when gas-fired generation is on the margin.
 - i. If the IESO must dispatch, then the exported price should fully reflect the penalty price of carbon (i.e. 4 times the market price) in a manner that doesn't play back onto the domestic Hourly Ontario Energy Price (HOEP).
- (18) For domestic energy production, gas-fired generators should be treated as industrials with caps and allowances associated with inefficiencies and losses.
 - a. Caps on emissions created should be related to efficiency measures of their own operations that will scale with volume.
- (19) The caps and allowances for gas-fired generator losses/inefficiencies should be based on IESO assessments every six months of the amount of gas-fired generation that will be required. The six-month period is to bridge the quarterly auctions with the semi-annual OEB process for setting rates. The associated pass through costs should be included by the OEB when setting the regulated rates for the Regulated Pricing Plan (RPP).
 - a. In the spirit of "controllability", the gas-fired generators do not control the volume of their output except for exports. The IESO dispatches gas-fired generation in order to meet demand.
 - b. Gas-fired generators should be able to sell back their allowances at the price they paid if they did not produce the generation assumed by the OEB. This protects the market from price shocks if there is an oversupply of allowances because demand for gas-fired electricity dropped.
 - c. Gas-fired generators should be allowed to purchase allowances from the strategic reserve if the IESO requests domestic dispatch greater than the OEB assumptions.
- (20) The fixed price contracts with generators need to be unravelled to ensure the full cost of using natural gas for its peaking function is visible to both consumers through the HOEP and passed on through the process used to export gas-fired generation.
 - a. Giving this price visibility will provide true economic signals to consumers to complement the effect of pricing carbon by embedding a more realistic value within the HOEP when gas-fired generation is on the margin.

¹⁵ CCRE, 2015

- b. Exports of fossil based energy to the US should not be subsidized by Ontario electricity rate payers.
- (21) The IESO should provide price signals directly to consumers through smart meters when gas fired generation is supplying the system. The signal should identify that gas-fired generation is being supplied and indicate the full cost of the gas fired generation (e.g. \$200+/MWh) that is in effect.
- a. In this manner, consumers may have the option to meter down their consumption and avoid the generation costs and the GHGs.

4.4 Consumers (Low Emitting)

Low emitting consumers contribute the vast majority of emissions in the province through the use of natural gas for heating and gasoline for transportation. Low emitting consumers include: residential, small and medium enterprises and low emitting commercial enterprises (e.g. banks, large retail, telecom etc.).

The MOECC has appropriately determined that it is impractical to include these consumers within the C&T system. Instead, the MOECC's approach will incorporate the price of carbon into the cost of fuel and products used by these consumers. This approach ultimately leads to a system for consumers of energy (gasoline, natural gas, or electricity) where the costs of the fuels will have an added premium, akin to a tax.

A carbon pricing philosophy is predicated on cost driving the shift towards a low carbon economy. For the carbon pricing regime to achieve its objectives, consumers must be presented with a price signal that allows them to incorporate the costs in their decision making when presented with low carbon choices. There are three distinct fuel pricing regimes:

- 1) price of gasoline
- 2) price of natural gas
- 3) price of gas-fired electricity generation

The gasoline companies will be given the responsibility of embedding the cost of carbon into their pricing which is currently self-regulating. Price gouging is a risk associated with self-regulation. Currently, the OEB regulates the price of natural gas and could easily incorporate the price of carbon in its regulatory proceedings.

For both gasoline and natural gas, the consumer will most likely experience a slow and gradual trend of increases in the average costs of fuel. This trend could provide a deterministic schedule for how costs will behave over time and facilitate how and when consumers and innovators plan their long term decisions over the next 5 to 10 years (e.g. when that new furnace or new car will be needed). Emission

reductions will be dependent upon how consumers make fuel-switching choices as more electrification occurs in the economy.

The fly in the ointment

Unfortunately, consumer behavior in response to small changes in the price of fuel is inelastic. Fuel consumption increased while gasoline prices rose by 50% a decade ago. Experience in British Columbia has not provided any indication that motorists have altered their driving patterns after 6 years of carbon taxes. Small price signals, such as the expected 4% increase in gasoline prices that will arise in the near term are likely to be ineffective.¹⁶

Furthermore, the current LTEP for electricity in Ontario has a high price growth forecast for electricity. According to the OAGO¹⁷ this rising cost has resulted from: 1) the push for wind and renewables which the OAGO says is not the most cost effective way to reduce emissions in this province; and 2) poor policy decisions. Together, the OAGO indicates these have introduced unnecessary avoidable costs. The 2013 LTEP forecast cost of electricity shows a 4% per year growth to 2022. The delivered natural gas price is likely to only rise on the order of 0.5% per year¹⁸ due to carbon pricing. Such price discrepancies suggest that the cost based philosophy behind C&T and carbon pricing will have no impact on decisions in Ontario for quite some time.

The LTEP policies appear to be undermining Ontario's objectives with respect to carbon pricing. From a practical perspective, it is unlikely for C&T to have any major impact on emissions between now and 2020.

With such modest carbon price pressures, it is difficult to imagine that Ontario's C&T program will have the desired effect for quite some time, likely beyond 2030, unless the government takes steps to reduce the rising costs of electricity.

Recommendations:

- (22) The government should publicly disclose any analyses related to how it expects consumer behaviour will be affected by the dynamic of conflicting policies contributing to electricity costs rising faster than fossil fuel costs.
- (23) Push for a faster rising minimum carbon price as a condition for joining with California and Quebec's programs.
- (24) Ensure revisions to the next Long Term Energy Plan (LTEP) focus on finding economies from electricity generation that reduce the cost forecast and that make electricity an attractive alternative to the rising price of natural gas.

¹⁶ Markowitz, 2015

¹⁷ OAGO, 2015

¹⁸ If the price of carbon is 10% of the delivered cost of natural gas and it rises at the 5% currently mandated in the California and Quebec agreements, then the net effect of the escalating carbon price will only be 0.5% per year. This crude approximation should be verified.

4.4.1 Nurturing the Power of Consumer Choice

Ontario's nuclear energy advantage can unlock this dilemma by providing low cost carbon free energy that the province needs to meet its goals for 2020. The OEB currently sets the consumer price of natural gas and in tandem with the IESO, the price of electricity. Reform of the OEB and IESO practices can unlock the power of consumer choice that should drive the most significant emission reductions and lower the total cost of energy to consumers in this province.

Linking nuclear power, the OEB, and the IESO with SBG and smart meters is the opportunity. Consumer behaviour can be affected if the energy system delivers them a robust price signal. The current pricing regime buries all electricity costs within the HOEP and global adjustment and further through the OEB regulatory mechanism of determining the RPP. Not having the carbon price visible on the margin forces expensive government subsidies to drive behavior: a strategy that is almost impossible to get right. A scenario that may be helpful could be as follows:

- 1) The IESO can ensure that smart meters get the signal when gas-fired electricity comes on the margin.
- 2) Smart meters can be used to give consumer choice to peak shave their consumption upon the presence of gas-fired generation. They may do it for cost saving or just because they wish to avoid the generation of emissions on their watch. It won't take many consumers to make this choice and reduce the peak demand.
- 3) The price signal, or HOEP if fixed to address this, should include the full cost of the gas-fired generation, both variable and a substantial portion of the fixed.
 - a. Even the capacity reserve is associated with peak periods and so that should be part of the price signal so consumers can make environmental choices.
- 4) The OEB can adjust the formula for the RPP to accommodate the new gas-fired cost signals associated with gas-fired generation.
- 5) A significant price signal can already exist simply by putting the true cost of gas-fired generation on the margin (e.g. \$200+/MWh).

An approach such as this should cause a shift in consumer behavior that will flatten peaks in the electricity system and reduce emissions. This is a minimal cost approach to emission reductions because it makes better leverage of SBG whose costs already exist in the system.

Recommendation:

- (25)The IESO should ensure that a consumer price signal is delivered that indicates when GHG emitting electricity supply is being dispatched and what that true full cost of the gas-fired generation is for the peaking or renewables backup applications present at the time.

4.4.1.1 Supporting Households

Households can be offered support in several ways:

- Subsidies or incentives to make low carbon choices.
- Employ a carbon price equivalent to act as a disincentive when making high carbon choices.
- No cost options that support low carbon choices.

Recommendations:

- (26) Subsidies for the purchase of low carbon devices should only be offered as a tactic of last resort until it is demonstrated through evidence-based transparent analysis that this is an effective use of funds and achieves relatively good emissions reductions and cost savings as compared to other options.
 - a. Evidence-based transparent analysis should be provided by third parties to confirm the value for money of these options given other options.
- (27) Place a carbon price equivalent “luxury tax” on appliances and vehicles at their point of sale based on their expected life cycle emissions.
 - a. If this option is not deemed acceptable, then it raises the question as to why a carbon pricing regime is acceptable. This option works in tandem with and complements the carbon pricing scheme.
- (28) Offer incentive options to consumers that make use of SBG and that reduce their overall cost of energy over the next 5 years.
 - a. Sanction an evidence-based third party analysis of the potential of this option to achieve desired emission reductions.
- (29) Support consumer service innovations that can cost effectively leverage the SBG in electrifying natural gas applications.

SBG and the low carbon nuclear energy can be combined to create compelling no cost options to consumers to incent electrification. Using up SBG, which is frequently exported at near to or negative prices does not increase the cost of the electricity system. This “free” energy can be leveraged to reduce emissions. An example would be an electric home heating conversion scenario. This solution can be implemented with no additional costs to the energy system.

- If electric heaters are installed and smart meters are used to turn them on when surplus energy conditions exist, then:
 - emissions from the gas heating system will be reduced,
 - the resident’s natural gas bill will drop
 - if the resident is credited with free SBG, their hydro bill will not go up
- Many business models can be imagined to enact this approach. Third party service providers could provide the heater free of charge in exchange for managing the resident’s bill in a manner that reduces the residents’ costs.

- The government can determine what the best approach is for sharing the benefit of using SBG.
- Uptake can be limited to a group of early adopting consumers based on how much SBG is available for some time period to be determined.

Solutions like this, which are unique to Ontario's market situation due to its low carbon nuclear power base, will become increasingly required around the world and could yield globally competitive capabilities leading to export economies for Ontario based products and services.

4.5 High Emitting Enterprises

4.5.1 Institutions

Institutions are the high emitting hospitals and universities identified in the emissions registry. Where institutions are large emitters, it is mostly the result of cogeneration facilities. If they have co-generation facilities, then they should be part of the C&T so that their emissions will be forced down over time, a strategy that will likely lead to the closure of the cogenerating facility once they are no longer proving the institution with a cost benefit.

Institutions are not exposed to trade. They are publicly funded. The costs can be passed on to the consumer, which is the provincial government. Providing free allowances to institutions could provide the provincial government with the opportunity to avoid cost increases in its budget. However, compliance with the program design principles of equitability should not support the government in exempting itself from its own policies. Provincially funded institutions should be given the same strong incentive to reduce emissions that other emitters will be subject to. This is consistent with Ontario's commitment to reduce the carbon footprint of the public sector as stated in the provinces Climate Strategy.

Recommendation:

- (30) Institutions should not be given free allowances..

4.5.2 Industrials

The C&T system is essentially constructed on the principle assumption that emitters will engage in trade to optimize their costs as they are encouraged to reduce emissions. There are 89 industrials in Ontario to which the C&T program will apply. These companies represent 16% of the provinces emissions. It will fall to these industrials to engage in trade, create a market that can be unified globally, and that can create a global price for carbon that eventually leads to a level playing field. Industrials are the only participants that will have a true economic incentive to leverage the market.

The notion that all industrials should receive 100% free allowances for a benchmark level of emissions for the first four years of the program basically undermines the full utility of the C&T process in reducing

near term emissions. With no clear timeline for commitment to eliminating free allowances then compromises the programs longer term effectiveness. The marginal cost for allowances over the free allocations level does not represent a sufficiently sized monetary incentive to innovate (e.g. only 3% of the energy base will see a 5% increase in cost every year). These conditions are not likely to achieve emission reductions in the near term. With no long-term rules in place, companies will have no certainty regarding future cost implications.

Recommendations:

- (31) There should be no theoretical need for free allowances for Ontario's industrial covered entities in a mature and functioning C&T program provided the linked jurisdictions have the same policy.
 - a. It is better to have a system designed such that border provisions are crafted to obviate the need for 100% allowances (see section 4.5).
- (32) If EITE issues are warranted, then the percentage of free allowances allocated should be based on the percentage of their business represented by exports.
- (33) In general, low emitters with low trade exposure (as defined in the MOECC design options) should not need free allowances.
- (34) Absent these three recommendations, the government should declare the first C&T compliance period as a trial period. During this trial, steps should be taken to ensure that any risks are mitigated to protect both the companies and government. This should include a clear statement about what the conditions will be when the trial period ends and how alignment with policies in linked jurisdictions interact.

The rationale for the last recommendation above is that a reasonable reason to issue free allowances could be if the four years is being treated as a trial period to help work the bugs out. In that case, the free allowances mitigate risks to participants as the system is matured. There are good reasons to approach this in such a manner as described later.

The reality of C&T programs at this stage is that for the international examples reviewed, none have been successful at creating a market where the price is stable and large enough to demonstrate influence on behavior. This is because it is incredibly difficult to control the price of a commodity in a complex market such as the entire energy infrastructure of a jurisdiction. This has proved to be true in Europe, the RGGI and California, the three jurisdictions examined. There are simply too many variables. As an example, the Bank of Canada has many decades of economic and market theory that supports how economic growth can be levered through interest rates. There is no economic theory with evidentiary proof that a multi-jurisdictional price of carbon can be controlled through the individual jurisdictions involved adjusting their own caps. Consider further the challenges the European Union (EU) has had with getting the Euro to work. Currency functions are an additional hurdle in the long run. Taking time to get it right makes solid sense. In the meantime, the process can begin using the "equivalent tax" approach that would apply to the majority of emissions in the province anyway and get the innovation engine started.

5.0. Setting it up

5.1 Ensuring Integrity in a Complex System

A successful climate change strategy for Ontario requires the provincial government to simultaneously reduce emissions, improve the province's economic competitiveness, and enhance its base of science technology and innovation. For this to occur, Ontario needs a C&T program that is premised on trust. The importance of this prerequisite is evident in the design principles that support integrity.

- Evidence-based decisions
- Transparency
- Accountability

These design principles need to be integral to the processes that are implemented to achieve all three of the goals presented in Ontario's Climate Change Strategy: emissions; economy; and, ST&I.

Ensuring that all of Ontario's regulatory and administrative bodies are properly and fully engaged is one of the best mechanisms in support of all of the above design principles. Implementing Ontario's C&T Program is, and will continue to be extremely complicated. No jurisdiction has yet to get it right. The proposed provincial program will be accompanied by a substantial regulatory burden. Conceptually, both approaches can deliver the same carbon price, however a tax like premium is far more controllable for public policy purposes. A premium approach also provides greater certainty with respect to the funds raised and the proceeds available for other investments. In contrast, C&T derived carbon prices will be solely determined by market forces; albeit in response to government regulated pressures on the caps. C&T does come with benefits, but the costs need to be explained so that Ontarians are comfortable with the choice. This includes the overall costs and use of the proceeds and the benefits derived there from.

Recommendation:

- (35) Ontario needs to develop and disclose a clear picture of what participation in the C&T program is expected to cost in comparison to other options. This should include a detailed and evidence-based transparent explanation of the cost benefit equation to Ontarians across all goals.
 - a. Costs extend to the support and ancillary industries that will be created in legal, accounting, market trading and speculation, error and risk margins, litigation around border issues, etc.
 - b. It is currently not clear what all the costs are. EITE and border provisions won't protect Ontario businesses from these other hidden costs, which may be substantial, and should be regulated to be recovered from the market along with the carbon price so as to accelerate the impact of the carbon pricing.

5.2 Synchronize Regulatory Frameworks

The province's Climate Change Strategy will fundamentally affect practically all aspects of Ontario's economy. The stakes are extremely high since its consequences will last for generations. The LTEP has made 20-year commitments that will cost Ontario's economy significantly according to the OAGO. With an effective climate change strategy and an effective approach to C&T, Ontario has the opportunity to provide economic and environmental global leadership. The Ontario government recognizes substantive policy integration across a range of provincial ministries will be required in order to achieve success.

Recommendations:

- (36) The Ontario LTEP update should begin immediately and have its scope expanded to include not only the scope of the electricity system it has had traditionally, but also all fossil fuel delivery systems and the emissions management process including trends and target identification.
- a. Ontario needs to have a long term integrated view of pipes, wires, and emissions.
 - i. There is an obligation to consider the infrastructure associated with Ontario's energy distribution assets. The year 2050 is not that far away when we consider the life cycle of municipal energy infrastructure. Energy infrastructure we build today in cities and at energy centers will last much longer than 2050. Consideration may be warranted for examining such things as heat pumps for new land developments in lieu of natural gas piping. The risk of ever increasing levels of stranded assets is important to address.
 - b. The OEB and the IESO should be tasked with providing the best cost solution for the total economy in achieving the emission targets.
 - c. An arm's length agency such as the IESO or the OEB needs to have the mandate for emissions as opposed to a ministry.
 - i. Lessons from past LTEPs suggest political influence needs to be removed from the evidence-based recommendations process in order to ensure integrity and transparency.
 - d. Considerations must include:
 - i. All infrastructure required, not just supply mix.
 - ii. The rate of electrification required to meet targets and the impact this will have on natural gas supply capacity and electrical generation, transmission and distribution capacity.
 - iii. Costs and economic impacts including how Ontario's cost of energy will compare to neighboring jurisdictions, how GDP will be impacted with associated impacts to Ontario's fiscal position.
 - e. Consideration for including the transportation fuel sector may be warranted given the potential need to address electrification for EV fueling.
- (37) IESO should defer ongoing renewables procurement until a review is completed of the planned capacities for wind and solar generation and their cost to reduce carbon emissions. The

ensuing readjusted supply mix should maximize use of the lowest cost carbon reducing technologies that meets the technical performance requirements and minimizes the total system cost of generation, transmission, and distribution.

- a. It is now well understood that the wind and solar technologies are not economic for Ontario given the degree to which Ontario's electrical system is already decarbonized, Procurements for additional capacity should be deferred until the new LTEP confirms the optimal economic share these technologies should have in Ontario's energy mix.
 - b. If the government is effective at its LTEP process, the hiatus may be short.
- (38) The C&T system should not be implemented until the supply mix and cost implications of the emission goals are well understood, the desired pace of energy transformation is established and deemed achievable, and what carbon price is necessary to achieve the emission reduction goals.
- a. If the required carbon price is higher than can be reasonably expected from the joint C&T programs, the decision to join may warrant consideration for merit.
- (39) A C&T inspired carbon price should be utilized by the OEB to enable proceeding with an equivalent premium on natural gas and on transportation fuels.
- a. The sooner this starts the better to minimize the shock and prepare those portions of the economy to begin considering the transformation.

5.2.1 New and Expanding Facilities

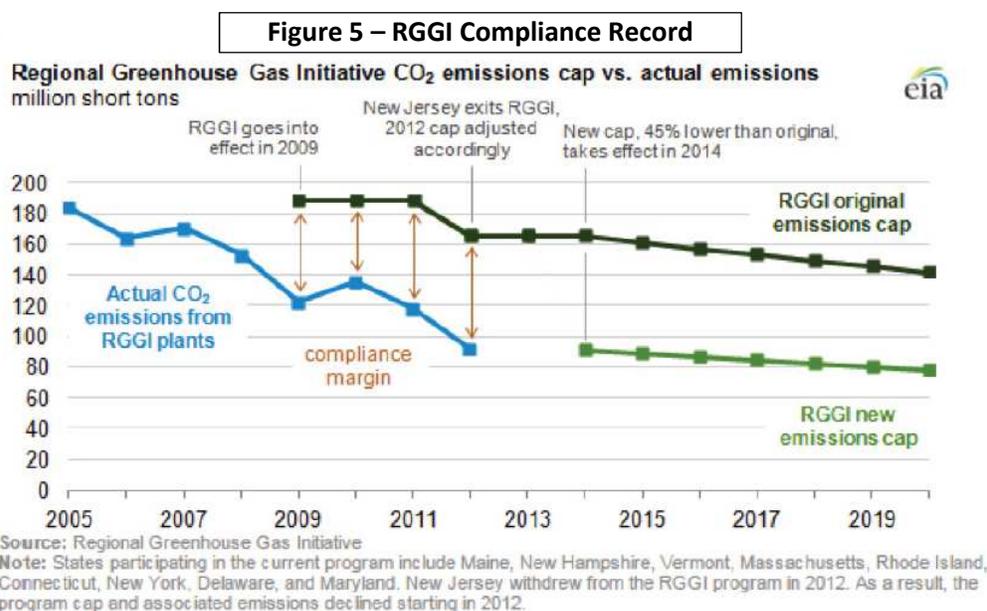
Recommendation:

- (40) As emission reductions are a provincial priority, the IESO should be directed to defer procurement for any gas-fired generating assets, including Combined Heat and Power (CHP), to ensure they are compatible with the long term carbon reduction goals and timelines established by the emission reduction program.
- a. Procurement of such supply has 20+ year emission commitment consequences that need to be factored into Ontario's emissions targets.
 - b. The emission targets will require these facilities to cease operations within that time frame creating a stranded asset issue.

5.3 Linking with Other Jurisdictions

Establishing a global price for carbon is dependent upon successfully linking C&T programs in multiple jurisdictions. However, markets evolve at different rates due to jurisdictional specific conditions. It is therefore critical to know when those markets are mature enough to be linked to and when Ontario is adequately prepared to join them.

The RGGI experience illustrated in Figure 5 shows that cap setting is difficult to get right. So many other environmental and economic factors drove emissions that the C&T market price could not be sustained at a meaningful level given the cap setting process that was applied. The European experience was similar with too many allowances being available for emitters.



Ontario's 89 large industrial will have burden of trading in the market. As such these industrials must be fully prepared and resourced to participate. The EU and RGGI markets have experienced price collapses that have resulted in negative risk exposures to allowance holders. California and Quebec have price controls to prevent this, but the market has not been driving the price.

The ability to set the caps correctly determines if the market is mature enough to achieve the intended goals. Sufficient knowledge is critical for setting the right caps. This is a primary responsibility of government and must be approached fully recognizing the risks of misaligned cap and jurisdictional markets:

- Ontario's strategic focus should be how best to align the province's parameters with other jurisdictions so as to facilitate the sale of Ontario's allowances to these other jurisdictions. The competitiveness of Ontario's industrials is dependent upon "out performing" the caps in other jurisdictions. Ontario will need to avoid actions that lead to market failure and also a net economic drain out of the province. For example, the inclusion of allowance obligations on gasoline distributors for fuels for which they have no control over consumer behavior has already led to forecast that Québec will have to purchase between \$500 million and \$800 million in California allowances over the next 8 years.¹⁹

¹⁹ Markowitz, 2015

The trick is to get ahead of other jurisdictions on performance not just the “optics” of having aggressive targets and caps. On balance, Ontario should be able to win this game, given its nuclear advantage, but it will require a well-informed, evidence-based decision framework so that Ontario does not find itself in a trade deficit situation. Simply aligning Ontario’s percentage emission reductions to those in other jurisdictions does not guarantee economic success. Other jurisdictions with more experience may already be very sophisticated on this front.

Recommendations:

- (41) A full assessment of the implications of aligning annual reduction targets with other jurisdictions should be undertaken before linking with programs in other jurisdictions.
- (42) Commission parallel studies by independent 3rd parties to assess the risks to economic leakage associated with cap setting errors and any mitigation that would be warranted.
- (43) Practice getting it right as frequently as possible during the period prior to linking with other jurisdictions.
- (44) The risk to Ontario’s industrial entities and economy should be a primary decision-making criterion. Linking with other jurisdictions should only be made if the risk to Ontario’s industrials and economy is acceptable.

5.3.1 Timing and Setting the Cap

The proposed four-year time frame appears to be adequate. However, a 2017 start date may be aggressive, given the afore-noted challenges. The creation of a new market that requires the government to set control points for emission caps to drive pricing, as well as other challenges, presents a complicated mix of incentives and unpredictable behaviours.

Recommendations:

- (45) Delay starting Ontario’s C&T market to 2018 to provide time to work out any “bugs” and all stakeholders affected by Ontario’s program understand and can participate responsibly and cost effectively in their own interests.
- (46) Implement a fossil fuels carbon levy for consumers/uncovered entities as soon as the OEB and IESO can finalize the implementation of price signals to consumers so they are empowered to react to it.
- (47) Caps and allowances need to be set based on adequately informed, evidence-based, transparent analyses to ensure a market exists for trading shares, the impact to the economy is understood, and desired changes in consumer behaviors can be reasonably expected.
 - a. This includes the consideration of all regulatory and government policies and incentives and an assessment of consumer behavior.
 - b. The EU and RGGI have had problems with this so far.

- (48) The free allowances should not be 100% of the cap. A margin of 5% needs to be removed to accommodate the reserve. An additional margin over average performance needs to be removed to bias the likelihood of there being more demand than supply. This should promote a healthy market for trading.
- (49) A broad communication and outreach campaign should be undertaken by the government to let people know about the emission and cost consequences. For example, consumers should be made aware of the consequences of running their air conditioning in the summer, and that they will be given sufficient information and additional controls to help them avoid the higher cost and other implications of emitting carbon.
 - a. Empowering citizens may cause behavioral changes that do not cost anything.

5.4 Effective Administration

The administrative process should focus on ensuring the data, registrations and information flow is seamless. It is also about ensuring that proper mechanics for trades are in place and that trading is occurring in accordance with established rules. These are critical factors related to market viability.

Recommendations:

- (50) Practice auctions and early true ups should be introduced as often as possible to help mitigate the substantial risks associated with not getting the process and caps right.
- (51) Aligning Ontario's C&T Program with others in 2021 appears to be a reasonable objective. Strapolec recommends that Ontario consider not starting the market until 2018, even with free allowances, unless the risks to Ontario's economy and covered entities are demonstrated to be acceptable. This provides more time to test the system to ensure it is functioning properly before any financial risks are imposed on the market.
- (52) The banking of free allowances should be evaluated for its contribution in driving innovation.
 - a. Free allowances should only be offered at the beginning to help get the market debugged. Covered entities should not profit from the free allowances process.
 - b. Considerations should be considered as to whether free allowances that are unused or unsold at the end of a compliance period should be traded in (buy back) for free.
- (53) Consideration could be a general buy back minimum price at the end of a compliance period for unused allowances that is equal to the auction value.
 - a. It is assumed that unused allowances that are unsold at the end of a compliance period are unsold because there was no reasonable market for them.

Strategic Reserve

The penalty option could be used to serve the same purpose as the strategic reserve. With penalties, emitters must pay a higher price for emissions that exceed their cap. The advantage of the strategic

reserve is it serves to manage all of the allowances within the desired cap for the jurisdiction. Unaddressed penalties would represent a failure to reduce overall jurisdiction emissions.

The size of the strategic reserve can also influence the price. The larger the strategic reserve, the greater the likelihood that the carbon price in the market will drift towards the strategic reserve pricing.

Recommendations:

- (54) Keep the strategic reserve as it is an important tool for market management by government.
 - a. It can reduce the risk of market failure be an additional lever to control market price.
- (55) An evidenced-based, transparent analysis should be undertaken by a third party that identifies potential strategic reserve levers and their effects and to inform the development of the preferred approach and framework for same.

5.5 Nurturing Market Demand for Low Carbon Solutions

To nurture the market demand for low carbon solutions, the market needs to be bounded in a manner that strongly encourages innovation. The language in Ontario's C&T design options refers to this mechanism as free allowances, EITE, and border controls. All of these tools serve to protect business from exposure to the forces in external markets where equivalent carbon pricing regime may not be in place.

These protective tools are critically important to an effectively functioning market. Inadequate protections can materially impact Canada's international competitiveness.

The mechanisms proposed so far will undermine the provinces C&T program. Including free allowances removes economic risk and hence incentives. Border adjustments are complicated and are facing legal challenges. Neither appears effective nor offers an expiration schedule. Simply allowing time for "industry to adjust" will not create an environment where the free allowances can be easily removed. As well, the competitive pressures on C&T parameter selection emanating from international competition will not go away until the external markets incorporate similar carbon pricing premiums.

Recommendation:

- (56) Neither a C&T program nor a carbon pricing scheme should be implemented until the impact of the externalities of global competition on imports and exports and the implications for Ontario businesses is understood.
 - a. There are many alternatives to the proposed design options that can be explored in a short period of time if an evidence-based approach is pursued transparently.

5.5.1 Imports, Exports and Mitigating Carbon Leakage

Mitigating carbon leakage is a broader problem that impacts more than Ontario's 89 large industrial companies. The problem affects all of Ontario's businesses.

5.5.1.1 Export crediting and distributing allowances

Administratively, the management of free allowances must be sufficiently broad to ensure Ontario's businesses are not uncompetitive with jurisdictions that do not have a carbon pricing mechanism.

For example, the HST is managed such that expensed HST is subtracted from the amounts collected. The carbon analogy would yield credits for carbon premiums that a company pays. Full export protection would include carbon pricing that has been included in the use of fuels and electricity. This becomes increasingly important when lower emitters and aggregated entities are included and as the carbon price for fuels begins to climb. Since Ontario's exports are a major part of Canada's economy, such a mechanism that broadly protects Ontario business is important. A free allowance system is not an appropriate mechanism over the long-term method for ensuring Ontario is not disadvantaged in the export market.

Recommendation:

- (57) Export protection can be accomplished by providing free allowances proportional to the level of exports a company actually has, including credits for any carbon premiums that have been paid on fuel.

5.5.1.2 Border Carbon Adjustments Vs Import Carbon Tariffs

Export measures do not address the dynamics of the domestic market. All companies compete internally for market share with international companies selling in to Ontario. This is not only a large emitter issue. Providing free allowances to Ontario's large emitters may help some compete in the domestic market but not all of them. However, it is important that all of Ontario's suppliers be protected from an unintentional government subsidy of foreign products in Canada as Ontario's fuel prices rise with the carbon price. To create a fair and proper environment that will maximally stimulate the innovation of low carbon solutions, Ontario must develop a comprehensive approach.

Recommendations:

- (58) Place a broad based country specific import duty based on their national emissions to GDP ratio since it is an easy benchmark to acquire.
 - a. A simple approach could be to compute the cost of emissions in a country by using their emissions data and multiplying it by Ontario's carbon price. Dividing that by the country's GDP will yield a percentage that can be applied as a duty for all products from that country. Products from the higher emitting countries will have a higher duty.

- b. For countries that object, they would have the option to impose the duty internally themselves or join the C&T program.
 - c. Ontario can benefit from this approach in the long run, likely also in the short run, due to the ability to rapidly electrify with low cost carbon free hydro and nuclear energy.
- (59) For electricity imports, the tariff should reflect the carbon content of imported energy.
- a. The highest carbon content operating within the foreign jurisdiction being imported from should be used.
 - b. For example, if imports are coming from Michigan and there are coal fired generators operating in Michigan, then the carbon price import duty should be based on coal fired emission assumptions. The IESO has the ability to develop an implementation for this.
 - c. The electricity system should pass this signal on to the consumers just in case with wish to peak shave at the time.
 - d. If fossil based electricity costs are buried within an average cost of electricity, there will be no cost signal. The premise of carbon pricing is the costs will change behavior. The RPP will not achieve this objective.
- (60) For natural gas imports, the carbon price import duty should reflect the life cycle emissions associated with the process (extraction, storage, and transportation) that makes the gas available at Ontario's border.
- a. For example, the emissions produced by extracting shale gas should be included. Shale gas is known to produce more emissions than Alberta's natural gas.

5.5.2 Role of Federal Government

Ontario's economic advantage in combatting climate change will be influenced by Federal government activities. The federal government has signalled that it will be a global leader in the fight against climate change and that it will work with the provinces to develop effective actions. The federal government can influence the global community to move towards a carbon pricing. This represents an opportunity for Ontario to leverage its low-cost, low-carbon hydroelectric and nuclear assets.

The federal government can also help influence the unfolding CPP in the US. This represents an opportunity to create a larger market for carbon-free Canadian electricity exports. The federal government should have a lead role with respect to the development of import duties. The management of free allowances for export relief is likely non-contentious and within each jurisdiction's prerogative.

There federal government could also play a beneficial role in the area of interprovincial trade. From a market management perspective, the proposed import and export measures would create barriers between provinces. The more provinces that are involved in a common scheme the better.

Recommendations:

- (61) Import barriers should be included in the dialog between the Federal and Provincial governments.
- (62) A C&T system should not be “implemented” until the mechanisms for mitigating the export and import risks are defined and federal alignment with the implementation is established.

5.6 Using Proceeds to Enable the Innovation Engine

As a global citizen, Ontario should use the proceeds from carbon pricing levies, allowances or taxes to reinvest in lowering the carbon footprint of Ontario's economy.

Recommendations:

- (63) Subsidies for specific technologies should be avoided.
 - a. Governments are notoriously bad at picking winners, witness the LTEP.
 - b. As mentioned earlier, it may be better to reflect a carbon premium on appliances and vehicles that will emit more than alternatives, rather than subsidize the recommended alternative. This is the entire principle behind carbon pricing.
- (64) There should be a commitment that a substantial amount of the proceeds will be reinvested in carbon reducing technologies, and done so in a transparent, accountable and verifiable manner.
 - a. The C&T program should not be just to lift government general revenue.
 - b. Ontario's commitment should be higher than other jurisdictions (it is 50% in the EU)
- (65) The government should implement a C&T program that imposes the least cost and provides the most benefit to Ontario.
 - a. Minimizing economic burden of the implementation should be considered.

5.6.1 Investing directly in Innovation

For the last decade, Canada has lagged behind other nations on the innovation index as reported by the World Economic Forum. In particular, Canada performs poorly with respect to taking innovation ideas to commercialization. The poor performance is often cited as the reason Canada fails to attract venture capital. Ontario's Climate Strategy indicates that it will use the proceeds from its C&T program to stimulate innovation.

Experience demonstrates that governments are notoriously ineffective at trying to predict technological winners. Numerous studies indicate that the most effective way to drive innovation is to place the proceeds in the hands of investors and research councils. They are better at making these kinds of decisions and have demonstrated their ability to leverage more financial resources. Such bodies could

be venture capitalists supporting new start-ups and or academic research bodies that understand how to leverage such funding sources as NSERC, the Ontario Research Fund (ORF), etc.

Recommendations:

- (66) The Ontario government should engage with independent third parties to manage the technical decisions for reinvesting proceeds to incent innovation in the province.
- (67) Government should set the criteria regarding the province's objectives, and let the third parties administer the decisions.
 - a. This will get government out of making technology specific choices.
- (68) For Venture Capitalists (VCs), the funds should be given to them to invest on behalf of the government as a portfolio such that the government will be able to recover the funds when they sell shares in the successful enterprises down the road.
 - a. VCs will be administers only, supplying a service to government by picking investments for using the proceeds.
 - b. Government gives funds to VCs with explicit criteria tied to explicit objectives such as:
 - i. Technologies that contribute to decarbonisation, a portfolio approach of short medium and long term, and for low, medium, and high risk.
 - ii. Amount of investment, jobs, and patents that remain in Ontario.
 - iii. Companies invested in should be Ontario not foreign owned.
 - iv. Criteria cannot be technology specific → let the market decide on solutions, but success criteria should reflect value for money against government objectives.
 - Criteria for amount/share of investment could include expected cost per Mt saved, volume of Mt saved, and probability of realization.
 - c. Funds to remain government funds → it is NOT a gift
 - i. e.g. government gets equity in the investments, with a sufficient role to influence as a shareholder who buys the firm(s) later. A timeline could be defined for when the government should exit by selling shares.
 - ii. Could enable Ontario to compete internationally on a similar basis to China with its corporate owned enterprises.
 - iii. There is a difference between government influence on a company, and political influence on market players.
 - d. Should be more than one VC at any one time, maybe 3 to 5 separate parallel contracts due to the magnitude of investments that may arise.
 - i. VCs mandates could be three year terms renewed based on performance of the investments (e.g. returns/prospects).
 - Investment decisions should be based on transparent decisions re criteria including the future cost implications.
 - ii. Coinciding with the C&T windows?
- (69) For Academic councils, a fund should be provided that can then be accessed based on specific criteria using existing processes and institutions available in Ontario such as NSERC, ORF, etc.

- a. Investments should permit applications for any research infrastructure that support science technology and innovation in:
 - i. Decarbonisation applications that could have economic benefit in Ontario's situation.
 - ii. Canada's manufacturing sector or other value added export potential technologies – e.g. materials science infrastructure that is leveraged by all sectors for materials science.
- b. Leverage the proceeds with other federal or provincial academic programs, perhaps significant industrial matching.

6.0. Monitoring Outcomes and Accountability

Ontarians need to be cautious about the government trying to proceed too quickly. A climate strategy and C&T system design should include incentives that will encourage consumers to do what they think is best. It should also include a mechanism by which the government is held accountable for the success or failure of the path it ultimately decides to follow. The process that drives the implementation of Ontario's C&T program should be evidence-based and transparent. This should surface and support the best choices and methods for managing all of the relevant challenges in a cost effective and efficient way.

6.1 Consumer Behavior and Industry Investment

Ontario's carbon pricing regime and climate strategy and action plan are intended to change the energy consumption behaviour of consumers and business in the province. These expected behavioral changes should be defined as they relate to the measures being put in place. The expected behavior should be founded in evidence-based analyses and forecasts, thereby enabling the outcomes can be monitored.

6.2 Monitoring outcomes

The joint development of a long-term forecast of emissions and costs and the next iteration of the LTEP by the OEB and IESO is a critical element for defining the framework for government policy accountability. It will be important to provide a transparent a perspective on both the near and long term emissions implications that span such events as the nuclear refurbishments and the retirement of the PNGS. For example, emissions may be forecast to be low in 2020, a target year in the climate strategy, but much higher in 2021.

Recommendations:

- (70) Create a long-term forecast for expected emissions that addresses the time frames immediately before and after the emission target milestones.
- (71) Criteria should be developed for monitoring the impacts of the C&T Program on Ontario's economic objectives and competitiveness.
- (72) Annual progress reports should be mandatory and publically available.

6.3 Accountability for Public Costs

Recommendations:

- (73) Ontario's action plan should commit to achieving realistic goals with well-articulated costs and benefits.
 - a. The action plan should not be initiated until evidenced based transparent rationale is provided for the plan, there has been sufficient consultation on the validity of the expected outcomes, and the expected evidence-based outcomes are measurable in a transparent way.
- (74) The government should commit to getting an "A" score from the OAGO when the OAGO conducts its value for money audits after implementation.
- (75) Ontario's Climate Strategy and the performance of its associated tactics and "tools" should be revisited every three years.
 - a. Every 5 years, the proposed cycle for assessing Climate strategy, may be too long of a period.
 - b. Must at least support the 3-year C&T cycle that Ontario will be joining with California and Quebec.
 - c. A 3-year period also aligns with the notion of a 3-year cycle for the LTEP.
- (76) Analyses should be conducted that includes detailed disclosure of the facts, methodology, and conclusions. The analyses should provide sufficient clarity to support independent third party validation of the data and healthy public debate over outcomes and their implications.

7.0. Summary and Recommendation

This report has been written to support a dialogue towards setting up Ontario for the greatest possible success. In the short time available, a number of hypotheses have been put forward, which, like most hypotheses, are mostly well founded in observed facts, but not necessarily yet proven true. It is hoped that they are provocative because what Ontario has to get right is the chosen carbon pricing mechanism that is a C&T option. An evidence-based and transparent strategic policy development process on climate change can make Ontario's economy the envy of the world. It is Ontario's to get.

The assessment of the C&T Design Options within the context of Ontario's Climate Strategy has yielded several recommendations for maximizing the benefits and likelihood of the desired outcomes. Of the 76 recommendations described, the following seven themes have emerged as possible guidance for the C&T program design as it is evolved over the next few months.

- 1) By leveraging its solid base of nuclear and hydro-electric energy, Ontario is in an enviable position to gain economic advantage and provide the decarbonizing world with environmental leadership.
 - a. Linking these advantages and pursuing synergies in concert with the hydro strengths of Manitoba and Quebec will significantly increase these benefits.
 - b. Ontario's energy mix is very different from that of California. Ontario's challenges are equally different and so should be its strategies. Developing a winning strategy is complex and will take time to be developed in an evidence-based transparent manner.
- 2) The technologies being considered to help Ontario deliver its climate strategy and C&T program must include nuclear in order to realize lower energy costs while achieving economic growth.
 - a. It is clear to Strategic Policy Economics (Strapolec) that any approach to combatting climate change that is most effective and efficient for Ontarians and that allows Ontario to "win" on the global environmental and economic leadership stage must recognize the value and advantages of leveraging Ontario's world class endowment in nuclear energy, science, and technology.
- 3) The C&T program cannot significantly contribute to the reduction of GHG emissions between now and 2020 if it limits significant financial involvement of major industries and institutions until 2021.
 - a. Significant industry participation is required to enable a carbon market to exist. It may produce results for 2030 if it is possible to "get it right" with full consideration of the complexities of the import and export implications of Ontario's globally competing economy.
 - b. Accelerating the magnitude of the carbon price and including as many emitters as possible will help achieve near term success.

- 4) The complexities of managing an emissions C&T program and its interaction with the economy are significant and warrant an integrated energy and greenhouse gas emissions reduction plan.
 - a. Jurisdictions are being challenged to get alignment between market drivers, emissions reductions, and consumer behaviors. The Ontario Energy Board (OEB) and the Independent Electricity System Operator (IESO) will need to work with other arm's length government bodies and collectively take the necessary time to align the programs.
- 5) Integrating small emitting consumers such as residential and small businesses into the emission reduction program is essential to ensure that consumer behavior change, emissions targets are achieved and the C&T program remains viable. This can be achieved in the near term through the OEB's ongoing regulatory practices and by leveraging available Surplus Baseload Generation (SBG):
 - a. A C&T inspired premium on gasoline and natural gas is a near term, low cost, and low risk transition option while the Ontario's C&T program is being finalized and aligned with California, and Quebec.
 - b. Offer consumers switching options to make use of SBG and reduce their overall energy cost. This could include opportunities for off-peak charging of electric vehicles and support for a variety of consumer services that can leverage the SBG in cost effective electrification of current natural gas applications.
- 6) An evidence-based and transparent process is required to protect Ontarians from well-intentioned but unnecessary energy cost increases. Such an approach will enhance and validate the accountability of the Ontario government as it proceeds to achieve the benefits and objectives of the Ontario climate strategy.
- 7) Independent industry, investment and academic bodies should be charged with making the technical decisions around investing proceeds into all possible carbon reducing innovations.
 - a. The Ontario government should be setting clear objectives and goals that are not technology specific.

Recommendation:

Clearly, there is urgency to moving forward with strategic actions that will combat climate change and secure the benefits of doing so. The ultimate goal is to achieve significant reductions in GHG emissions while growing the province's economy. The Ontario Government should proceed cautiously with the C&T implementation to ensure that it has the support of all directly affected parties, primarily the 89 large industrial companies that will initially represent the covered entities. These industries must compete in the global marketplace. Support to C&T and its viability will be demonstrated by the willingness of Ontario's industrial leaders to ultimately forego free allowances.

Feedback on Ontario's Proposed Cap and Trade Design

As soon as the new integrated energy and emissions reduction plan for Ontario's future is developed by ministry assigned responsible agencies, the IESO and the OEB, the government should proceed with the fuel levies. These can be administered by the OEB in concert with other consumer incentives administered by the IESO that will drive Ontario to achieve its emissions reductions at the lowest cost to the economy. Recommendations made in this report regarding gas-fired electricity generators should also be considered.

Appendix A - References and Bibliography

- Aldy, Joseph and Robert Stavins. The Promise and Problems of Pricing Carbon: Theory and Experience. *Journal of Environment & Development*. May, 2012.
- Canada's Ecofiscal Commission. Provincial Carbon Pricing and Competitiveness Pressures. November, 2015.
- Canada's Ecofiscal Commission. The Way Forward: A Practical Approach to Reducing Canada's Greenhouse Gas Emissions. April, 2015.
- CCRE. Rethinking Ontario's Long Term Energy Plan. December, 2014.
- Clean Economy Alliance. Getting it Right - Design Recommendations for Ontario's Cap-and-Trade System. October, 2015.
- Conference Board of Canada. Refurbishment of the Darlington Nuclear Generating Station. November, 2015.
- Dentons Climate Change Newsletter – Issue 8. Ontario's Climate Change Discussion Paper, 2015 – What's in it and where will it lead? March 31, 2015. Retrieved from <http://www.dentons.com/en/insights/newsletters/2015/march/31/climate-change-newsletter/climate-change-newsletter-issue-8#ontario>.
- Ecojustice. Want to make polluters pay? Opt for a carbon tax over cap & trade. April 27, 2015. Retrieved from <http://www.ecojustice.ca/want-to-make-polluters-pay-opt-for-a-carbon-tax-over-cap-trade/>.
- ENE, Regional Greenhouse Gas Initiative: A successful Carbon Pricing Program. September, 2014. Retrieved from http://acadiacenter.org/wp-content/uploads/2014/11/RGGI_SuccessfulCarbonPricingProgram_102214.pdf.
- EUR-LEX, 32009L0029. European Parliament and the European Council. Directive 2009/29/EC: so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. 23 April 2009. Retrieved from <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32009L0029>
- Government of Ontario. Ontario's Cap-and-Trade Design Options. 2015.
- Government of Ontario. Ontario's Climate Change Discussion Paper. 2015. Retrieved from http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2015/012-3452.pdf
- Government of Ontario. Ontario's Climate Change Strategy. 2015.
- Government of Ontario. Ontario's Climate Change Update. 2014. Retrieved from <https://dr6j45jk9xcmk.cloudfront.net/documents/3618/climate-change-report-2014.pdf>.
- Howarth, R. W. A Bridge to Nowhere: Methane Emissions and the Greenhouse Gas Footprint of Natural Gas, *Energy Science & Engineering*. 2014. Retrieved from

http://www.eeb.cornell.edu/howarth/publications/Howarth_2014_ESE_methane_emissions.pdf

International Carbon Action Partnership. Emissions Trading Worldwide: International Carbon Action Partnership Status Report 2015. Retrieved from https://icapcarbonaction.com/images/StatusReport2015/ICAP_Report_2015_02_10_online_version.pdf.

International Emissions Trading Association. The World's Carbon Markets: A Case Study Guide to Emissions Trading. Retrieved from <http://www.ieta.org/worldscarbonmarkets>.

KPMG. A Report on the Contribution of Nuclear Science and Technology (S&T) to Innovation. 2014.

Markowitz, Tom. What on Earth is Cap-and-Trade? 2015 Retrieved from [Enerhope.com](http://enerhope.com)

McKinsey & Company. Opportunities for Canadian energy technologies in global markets. 2012. Retrieved from <http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2013/McK-Report-eng.pdf>.

Mindfirst. Summary Report: Carbon Pricing and Ontario's Cap-and-Trade Announcement. June 22, 2015. Retrieved from <http://mindfirst.com/seminar-summary-report-carbon-pricing-and-ontarios-cap-and-trade-announcement/>.

Minister Murray. APPrO Conference. November, 2015

New York State Energy Research and Development Authority. Draft for Stakeholder Comment: Relative Effects of Various Factors on RGGI Electricity Sector CO₂ Emissions: 2009 compared to 2005. 2010. Retrieved from https://www.rggi.org/docs/Retrospective_Analysis_Draft_White_Paper.pdf.

Office of the Auditor General of Ontario. 2015 Annual Report. Chapter 3, Section 3.05. 2015.

Ontario Society of Professional Engineers Research Report. Engineering a Cleaner Economy: Examining Ontario's Carbon Pricing Program and the Role of Innovation. September, 2015.

Pavel G. Darling, Paul J. Hibbard, Andrea M. Okie and Susan F. Tierney. The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States: Review of the Use of RGGI Auction Proceeds from the First Three-Year Compliance Period. Analysis Group. November 15, 2011. Retrieved from http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf.

Regional Greenhouse Gas Initiative. Model Rule. 2013. Retrieved from http://rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_FINAL.pdf.

Report from the Commission to the European Parliament and the Council – Progress Towards Achieving the Kyoto and EU 2020 Objectives. 2014. Retrieved from http://eur-lex.europa.eu/resource.html?uri=cellar:eb290b32-5e8e-11e4-9cbe-01aa75ed71a1.0019.03/DOC_1&format=PDF

Strapolec. Extending Pickering Nuclear Generating Station Operations. November, 2015.

Teichroeb, David. APPrO Conference. November, 2015

The Centre for Climate Change Economics and Policy and the Grantham Research Institute on Climate Change and the Environment. Assessing the effectiveness of the EU Emissions Trading System. January, 2013. Retrieved from <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP106-effectiveness-eu-emissions-trading-system.pdf>

The World Bank. State and Trends of Carbon Pricing. May, 2014. Retrieved from <http://www.worldbank.org/en/news/feature/2014/05/28/state-trends-report-tracks-global-growth-carbon-pricing>.

Toronto Atmospheric Fund. Cap and Trade an important signal – but needs stricter allowances. November 20, 2015. Retrieved from <http://taf.ca/cap-and-trade-an-important-signal-but-needs-stricter-allowances/>.

Torys' LLP. Ontario Cap-and-Trade Program Design Options Released. November 24, 2015. Retrieved from <http://www.torys.com/insights/publications/2015/11/ontario-cap-and-trade-program-design-options-released>.

U.S. Energy Information Administration. Analysis of the Impacts of the Clean Power Plan. May 2015. Retrieved from <http://www.eia.gov/analysis/requests/powerplants/cleanplan/pdf/powerplant.pdf>

Western Climate Initiative. Draft statement of principles on competitiveness and review of options. 2009. Retrieved from <http://www.westernclimateinitiative.org/document-archives/Cap-Setting--and--Allowance-Distribution-Committee-Documents/Draft-Statement-of-Principles-on-Competitiveness-and-Review-of-Options/>.

Appendix B - List of Abbreviations

C&T – Cap and Trade
CHP – Combined Heat and Power
CO₂ – Carbon Dioxide
CPP – Clean Power Plan
EIA – U.S. Energy Information Administration
EITE – Emission Intensive Trade Exposed
EU – European Union
GDP – Gross Domestic Product
GHG – Greenhouse Gas
HOEP – Hourly Ontario Energy Price (wholesale market)
IESO – Independent Electricity System Operator
LTEP – Long Term Energy Plan
MOECC – Ministry of the Environment and Climate Change
Mt – Million Tonnes
MWh – Mega-watt Hour (one million watts being produced for 1 hour, enough to power ten thousand 100W light bulbs for one hour)
OAGO – Office of the Auditor General of Ontario
OEB – Ontario Energy Board
ORF – Ontario Research Fund
PNGS – Pickering Nuclear Generating Station
RGGI – Regional Greenhouse Gas Initiative
RPP – Regulated Pricing Plan
SBG – Surplus Baseload Generation
ST&I – Science Technology and Innovation
US – United States
VC – Venture Capitalist

Contact Information

Strategic Policy Economics

Marc Brouillette
Principal Consultant
(416) 564 - 4185
marc@strapolec.ca
www.strapolec.ca