Clean Electricity Thought Leader Forum

A Made-in-Alberta Proposal to Green the Grid

Prepared for

Clean Electricity Thought Leader Forum

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List of Figures

List of Tables

Executive summary

The *Clean Electricity Thought Leader Forum* will take a deep dive on a policy, the Clean Electricity Standard. Examining one policy in depth allows time to explore these questions without getting spread too thinly on all possible variants. However, it is important to point out that policy makers in Alberta have not settled on the Clean Electricity Standard, nor necessarily any policy changes. The Clean Electricity Standard is however a policy proposal that has passed tests by many groups and discussions as a plausible and practical option for "greening the grid" in the Alberta context. Examining the ways in which Clean Electricity Standard can fit into Alberta's market as well as barriers to such a standard will help inform broader opportunities or obstacles to future policy development.

Along with this paper (sections 2 and 3), the Forum's morning is intended to help inform participants about the Clean Electricity Standard and bring everyone to a common level of understanding on the topic. The Forum's afternoon then seeks to get as many questions out on the table as we can, so we can explore ways of answering them, as well as being open to the possibility that some questions cannot be answered in the current context. Six discussion topics have been identified for roundtable discussions at the forum. Participants will be asked to prioritize two issue areas based on their interest and expertise. Discussions will be addressed in two separate 45-minute breakout sessions.

Topic 1: Priorities for a clean electricity policy in Alberta

A number of policy objectives can be pursued through clean electricity policy. By discussing policy priorities and objectives, other discussions are better grounded. Questions arising under this topic include:

1. What priorities do we have for clean electricity policy in Alberta and which are the most pressing or important?
2. How could these priorities best be pursued within a CES policy framework?
3. What other policy options, innovations, or additional policy instruments would be necessary or helpful to pursuing these priorities?

Topic 2: Setting a standard

There are many potential considerations in determining the stringency of a policy and the Clean Electricity Standard is no different, including targeted GHG reductions, availability of new low-emissions generation, and consumer price. In order to spur improvement, the emission level would be set to decline over time, with regular reassessment of the program's success and implementation. Questions arising under this topic include:

1. What environmental or economic objectives are most relevant in setting the standard?
2. What constraints exist that limit the rate at which the standard can be declined? Technical? Infrastructural? Financial?
3. What target standards should Alberta envision for its electricity system in the future? In 2020? In 2050?

Topic 3: Interactions with existing policies

Alberta currently has a GHG emissions reduction policy that applies to the electricity sector including an emissions intensity reduction requirement with an offset purchase or technology fund payment provision. The offset credits also include electricity projects. The CES was designed to regulate at the retailer level and as an independent complementary policy to the SGER. Questions arising under this topic include:

1. Does the CES, as conceived in this paper, complement the SGER as currently applied? Or are there potential areas of conflict that are problematic or detrimental?
2. Are there ways to modify or add to the CES to promote complementarity or mitigate conflict?
3. Are there potential changes to the SGER that might be under consideration that would promote complementarity? Promote conflict?

Topic 4: Unintended consequences

As with any policy, particularly novel policy concepts employed in unique circumstances, like the Clean Electricity Standard in Alberta, potential obstacles or concerns cannot be foreseen without the combined wisdom of many people with expertise. The electricity system in Alberta is complex, with many relevant players and many moving parts. Questions arising under this topic include:

1. What unintended consequences, not identified in this paper, do you foresee related to this policy? How important is this consequence in the "grand scheme" — i.e., in comparison to the importance of having this or another effective policy?
2. What solutions or innovations might there be to mitigate negative unintended consequences?
3. Do the suggested solutions or innovations raise their own concerns or complications and, if so, how does the imperfect mitigation compare against the unmitigated consequence?

Topic 5: Compliance and operationalization

A core objective of the CES is to foster private sector PPAs from retailers for clean electricity generation. However, concerns have been raised that retailers lack the credit to enter long-term PPAs. This has led to an innovative idea to foster PPAs while helping retailers attain compliance with the standard. An arm's-length agency (such as the Balancing Pool) could collect non-compliance levies and use them to enter long-term PPAs for new clean electricity developments on a competitive bidding basis. Questions arising under this topic include:

1. How important are concerns about retailers' credit capacity for long-term PPAs?
2. Is the idea of an agency acting as levy collector and PPA purchaser a feasible approach to addressing this problem?
3. What concerns might arise with this approach and what solutions would help improve the functioning of such an agency or provide an alternative for the agency?

Topic 6: Alternative or additional policies

A number of different policies have been canvased in the processes that have led to this point. Still others are likely available, either to complement or as alternatives to the CES, to meet critical policy objectives serve other goals such as promoting uptake of small-scale distributed systems or farmer-owned systems. These approaches should be evaluated for their cost-effectiveness in reaching the objectives of the policy, their appropriateness to the Alberta context and their administrative efficiency. Questions arising under this topic include:

1. Are there important policy objectives that the CES concept fails to address — what are they? Are there core problems with the CES that cannot be addressed with improvements to the CES?
2. What alternative or additional policy options would better address these objectives or would successfully avoid these problems?
3. On addressing the barriers to clean electricity development and accommodating the Alberta-specific considerations for an effective clean electricity policy, how do these alternative or additional policy options fare?

1. How to read this document

Purpose of the Forum

We are not going to solve renewable energy policy in Alberta in one day. Fortunately, many people attending this Forum have been working on the issue for years, and this Forum is one more step in that process. We have chosen to take a deep dive on a policy that has passed many tests to be a plausible and practical option for Alberta to "green its grid". By doing so, we hope to get as many questions out on the table as we can, so we can explore ways of answering them, as well as being open to the possibility that some may be show-stoppers. Examining one policy in depth allows time to explore these questions without getting spread too thinly on all possible variants. Examining barriers to a Clean Electricity Standard will help inform broader opportunities or obstacles to future policy development. Beyond this Forum, much work will be needed to get to a place where a workable solution can be achieved, be it through a Clean Electricity Standard or some other option. It is clear however that without specific renewable electricity policies, we will not achieve either provincial or national targets for greenhouse gas emissions reductions and clean electricity generation.

Purpose of this paper

This paper has been developed as preparatory material for the May 21, 2013, *Clean Electricity Thought Leader Forum* being held in Edmonton, Alberta. It is intended to help inform participants and bring everyone to a common level of understanding on the topic.

Section 2 – History

A short synopsis of renewable and alternative energy policy discussions and efforts that have occurred over the past ten years in Alberta are discussed in this section. It further focuses on more recent discussions, explaining the assessment that has been undertaken following the 2010 *Power Wedges* Thought Leader Forum. This section is also intended to help clarify decisions made to this point to focus on a performance-based standard and, in particular, the Clean Electricity Standard (CES), while acknowledging that other options exist and outlining why they have not been further pursued.

Section 3 – Outlining the Clean Electricity Standard

This section describes the CES concept in greater detail, such as the basics of the idea, including its appropriateness to the Alberta context; a broad overview of how the CES would work in practice along with some of the elements that require discussion; and an indication of the expected outcomes to improve circumstances for clean electricity in Alberta.

Section 4 –Forum discussion questions

This section provides some background information for the six topic options that have been identified for discussion at the Forum. You will be asked at the Forum to prioritize two issue areas based on interest and expertise. Discussions will be addressed in small groups in two separate 45-minute breakout sessions.

2. History & background

To better envision where we are going, we should look first to the knowledge gained from where we have come. Prior multi-stakeholder discussions have already put a significant amount of legwork into identifying both: the barriers that exist to the development of low-emissions electricity generation in Alberta, as well as the potential policy responses and how they will work within Alberta's unique context.

2.1 Timeline of renewable and alternative energy policy development

The Clean Electricity Standard (CES) policy discussed here is the product of a series of policy discussions and has been informed by several multi-stakeholder processes in Alberta going back for at least a decade. The more recent policy discussions and the design of the policy itself has benefitted from this history, which has brought an accumulation of aggregated knowledge and perspectives from stakeholders, and is detailed in the timeline below.

Key milestones

2002: Alberta Environment asked the **Clean Air Strategic Alliance** (CASA) to develop an approach for managing air emissions from the electricity sector.

CASA established the multi-stakeholder Electricity Project Team.

2003: CASA formed a **Renewable and Alternative Energy subgroup** to look at improving air quality through renewable and alternative energy development.

Subgroup recommended forming a project team to pursue key issues in more detail.

2004: CASA struck a **Renewable and Alternative Energy Project Team** to identify mechanisms to increase Alberta's supply of renewable and alternative energy.

Project team decided to explore and develop options for a policy framework.

2005: Unable to reach consensus in six areas, the CASA Project Team agreed on 17 recommendations and chose to leave it to the Government of Alberta to develop such a framework with assistance from the Project Team.

2006: With Alberta Energy and Alberta Environment representatives, the CASA Project Team continued to develop and explore potential options for a policy framework.

2007: CASA Project Team issued its final report for consideration to Government of Alberta as a summary of its thinking and discussions, including objectives and guiding principles for the framework and options for policy approaches. Overall, CASA recommended that the Government of Alberta develop a policy framework with stakeholder engagement.

2007: Alberta's Climate Change Strategy introduced, which targets a "greening energy production" wedge for 37 Mt of its targeted 200 Mt of CO_2e GHG reduction by 2050.[1]

2009: The Pembina Institute published ***Greening the Grid***,[2] which identified natural gas cogeneration, wind energy and energy efficiency as the three most significant short-term options at the time that would enable Alberta to meet a predicted doubling of electricity demand over the next two decades. While prices for renewable energy, notably solar, as well as natural gas have only improved subsequently, this analysis found adequate natural resources and technology already available in 2009 to significantly lower the environmental impact of the province's electricity supply.

2010: The Pembina Institute and the Institute for Sustainable Energy Environment and Economy (ISEEE) hosted the ***Power Wedges*** **Thought Leader Forum** on practical policy options the province could use to support the key opportunities identified in *Greening the Grid* to meet future demands. More information on the findings and outcomes of *Power Wedges*[3] is presented in the sections below.

Resulting from the *Power Wedges* gathering, a self-selected group of industry representatives joined together with the Pembina Institute to form an Alberta Clean Electricity Working Group to further assess and refine policy options identified at the Forum.

2011: The working group developed and coalesced around the concept of a **Clean Electricity Standard** (CES), and reached out to other stakeholders for inclusion and engagement.

2011: In September, Alberta Energy announced plans to develop an Alternative and Renewable Energy Policy Framework and held an initial information gathering session.

2012: The Canadian Wind Energy Association's Alberta caucus adopted the concept of a CES, and commissioned Solas Energy Consulting Inc. to explore how a CES could be operationalized in Alberta's market.

There are still significant barriers to advancing clean energy that could be addressed by a provincial policy. Building an understanding of these barriers helps to inform how they can be overcome, while maintaining the integrity of Alberta's electricity market.

[1] Alberta Environment and Sustainable Resource Development, "Climate Change Strategy." http://environment.alberta.ca/0909.html (accessed April 30, 2013)

[2] Tim Weis and Jeff Bell, *Greening the Grid: Powering Alberta's Future with Renewable Energy* (Pembina Institute, 2009). http://www.pembina.org/pub/1763

[3] The Pembina Institute, *Power Wedges Thought Leaders' Forum: Wind and Cogeneration Opportunities for Alberta* (2010), 1. http://www.pembina.org/docs/re/tlf-summary-report.pdf

2.2 Policy rationale

Although many renewables are economic on a long-term per-kWh basis, both market and policy barriers still exist. Along with these market barriers are various market failures and existing market advantages for certain electricity generation sources, which further legitimize the role for policy in cleaning Alberta's electricity grid.

2.2.1 Barriers to advancing clean electricity development

Various analyses and experience demonstrate that low- and non-emitting electricity generation options are cost competitive with new high-emitting fossil fuel based energy in Alberta.[4] This is already true for cogeneration and wind energy, while other non-emitting electricity options are showing precipitous or steady year-over-year cost declines.[5]

However, the volatile nature of Alberta's market system has posed a serious barrier to clean electricity development. We heard in both the *Power Wedges* Forum in 2010 and in the subsequent deliberations around clean electricity policy in Alberta that developers of all shapes and sizes have trouble attracting long-term financing to electricity projects. Wholesale electricity prices are too volatile and have too much forward uncertainty in Alberta. As such, large energy companies that finance projects on their balance sheet are unable to justify the risk when compared to higher or safer returns in alternative energy projects or electricity projects in other jurisdictions; while small clean electricity developers have difficulty securing the necessary financing at all.[6] In short, without long-term power purchase agreements with credit-worthy customers, it is extremely difficult to secure long-term financing for new generation builds.

Therefore, while many clean electricity options are economically competitive on a levelized cost of electricity basis, market volatility undermines the ability of companies to finance their projects at this time. As gas plays an increasing role in Alberta's electricity market it helps to reduce the sector's greenhouse gas intensity. However, it also means that settling prices become more increasingly exposed to long-term natural gas prices. As such, capital-intensive generation projects heavily weighted to capital costs compared to operating costs are far more exposed to revenue uncertainty.

According to the Market Surveillance Administrator (MSA), "Long term power sales are rare in the Alberta electricity market and as a consequence do not offer an opportunity to mitigate risk" and "[o]ther electricity jurisdictions are more attractive to some types of investors because of the existence of long term contracts."[7] A Morrison Park Advisors report developed for the MSA that interviewed debt providers found: "All debt providers stated that they would not provide project debt to new generation projects relying exclusively for revenues on the energy-only market",

[4] Dawn Farrell, TransAlta Corporation, presentation to CAMPUT Annual Conference 2011, Vancouver, BC. http://www.camput.org/documents/DawnFarrellTransAltaMay16CAMPUT.pdf; Solas Energy Consulting Inc., *Alberta WindVision Technical Overview Report* (Canadian Wind Energy Association, 2013).

[5] REN21, *Renewables Global Status Report 2012.* http://www.ren21.net/REN21Activities/GlobalStatusReport.aspx

[6] Market Surveillance Administrator, *State of the Market Report 2012: An Assessment of Structure, Conduct, and Performance of Alberta's wholesale electricity market* (2012), 19. http://albertamsa.ca/uploads/pdf/Archive/2012/SOTM%20Final%20Report%2020130104.pdf

[7] Ibid.

whereas "if projects have firm long-term contracts with credit-worthy counterparties, then they would consider providing debt coincident with the length of the contract term."[8] Equity providers "mirrored the concerns of debt providers."[9]

Forecast prices and price uncertainty make building any new electricity generation a challenge. This is aggravated for non-dispatchable electricity sources because they inherently depress the market prices when they are operating, thereby reducing the price they capture. In 2012, wind energy received on average around 60 per cent of the average pool price for the year (see Table 1). No other generation source received less than the average. While this indicates that wind generation is decreasing the cost of electricity in the Alberta power market, it also reveals another barrier to attracting investment for further projects. The less than 9.75 $/MWh[10] available to wind from offset sales only closes one-third of the gap in average revenue between wind generation and coal generation, the next lowest paid generation source.

Table 1. Average generation revenue by fuel type in 2012

Fuel Type	Average Revenue ($/MWh)	% Difference from Average Pool Price
Entire Pool	$64.32	--
Wind	$37.78	-41%
Coal	$65.44	+2%
BC Imports	$67.32	+5%
Hydro	$69.93	+9%
Cogen	$70.47	+10%
Other	$79.41	+23%
Gas	$92.05	+43%
SK Imports	$104.28	+62%
Gas Peaker	$158.54	+146%

Data source: AESO, 2013[11]

[8] Morrison Park Advisors, *Investor Perspectives on the Attractiveness of Alberta's Electricity Generation Market* prepared for Market Surveillance Administrator (2012), 13. http://albertamsa.ca/uploads/pdf/Archive/2012/Investor Perspectives Report to MSA - 17 Augus.pdf

[9] Ibid., 14.

[10] The $15/tonne CCEMC payment available under SGER effectively sets a ceiling on the price renewable energy developers can obtain for credits under the SGER. At a factor of 0.65 tonnes/MWh presently used to calculate credits from electricity grid displacement, the maximum credit available to wind power is $9.75/MWh. In practice, renewable energy is obtaining a little less than the $15/tonne, on average, for its credits.

[11] Alberta Electric System Operator, 2012 Annual Market Statistics Data File (2013). http://www.aeso.ca/market/8856.html

Solar power systems will incur even stronger price depression from project-to-project correlation than wind, although this would be somewhat mitigated by solar's tendency to correlate more closely with daytime peak prices. Run of river hydro can have similar price implications as wind energy. Larger reservoir hydro and biomass energy (as well as geothermal electricity) are not constrained by non-dispatchability, but very high capital costs also tend to necessitate the need for long-term contracts for financing.

> "Without a power purchase agreement energy developers, including those who develop wind power and hydroelectricity, cannot get their projects financed."[12]

These are the critical barriers that successful policy must overcome to advance the development of clean electricity generation in Alberta — and there is strong justification for doing so. As the Premier's Council for Economic Strategy made clear in 2011, "[t]he province cannot rely on market forces alone to produce enough low-emission, reliable, competitive electricity to support its long-term economic strategy."[13]

2.2.2 Existing market failures and interventions

The existing electricity system in Alberta is not simply the natural manifestation of a liberated market that finds lowest-societal-cost generation sources.

Electricity generation in Alberta creates costs that are borne by society at large instead of the generators that produce them. These costs are externalities. While Alberta has a GHG-intensity target that secondarily employs a carbon-pricing scheme, the price is applied only to a portion of GHG emissions. Moreover, a policy mechanism for air pollution controls has been implemented for coal plants, which have successfully reduced pollutants such as SO_2 and NO_x, but thousands of tonnes annually of both can still be emitted into the atmosphere without a cost to the generator. In other words, Alberta's electricity market does not yet account for its full costs.

Alberta's market is also small enough and generation ownership is sufficiently concentrated for "the larger generators" to "meaningfully influence market outcomes" — in other words, in a small, but significant percentage of hours in the year, "large generators have the ability to affect the market price substantially".[14] Indeed, this is allowed under Alberta's electricity legal framework (so long as the actions are unilateral and do not impede competition), as compensation for a comparatively low $999.99/MWh price cap.[15] The main way through which

[12] Manitoba Hydro in submission to Alberta Standing Committee on Resource Stewardship (2013) *Review of the Potential for Expanded Hydroelectric Energy Production in Northern Alberta*
http://www.assembly.ab.ca/committees/resourcestewardship/RS/Reports/2013/Review of the Potential for Expanded Hydroelectric Energy Production in Northern Alberta - RS March 2013.pdf

[13] Premier's Council for Economic Strategy, *Shaping Alberta's Future* (2011), 81.
http://alberta.ca/AlbertaCode/images/ShapingABFuture_Report.pdf

[14] Market Surveillance Administrator, *State of the Market Report 2012: An Assessment of Structure, Conduct, and Performance of Alberta's wholesale electricity market* (2012), 14-15, 37.
http://albertamsa.ca/uploads/pdf/Archive/2012/SOTM%20Final%20Report%2020130104.pdf

[15] Market Surveillance Administrator, *State of the Market Report 2012: An Assessment of Structure, Conduct, and Performance of Alberta's wholesale electricity market* (2012), 38-39.
http://albertamsa.ca/uploads/pdf/Archive/2012/SOTM%20Final%20Report%2020130104.pdf

large generators exercise this "market power" is with economic withholding of available supply to drive up the pool price at a benefit to their other generation assets.[16] While evidence indicates that increasing wind generation may be limiting the ability for even large generators to influence prices during high wind hours, it is clear that there are still opportunities where large generators may be influencing the market price to their benefit.[17]

Federal and provincial governments have also identified strategic opportunities for carbon abatement technologies, which it has subsidized, providing an advantage relative to other market competitors. One example has been the $2 billion in direct project funding committed in 2008 for carbon capture and storage (CCS) projects in Alberta, including $400 million for a coal-fired electricity generation facility and $285 million for a coal gasification project that would also supply electricity. Although the federal government offered additional funding, no electricity CCS projects ultimately went ahead. Similarly, the province has implemented a multi-year program to sign contribution agreements with bioenergy electricity generation under the Bioenergy Producer Credit Program, which included up to 6 ¢/kWh in production incentive for bioenergy-derived electricity generation. The federal government has in the past offered a 10-year, 1 ¢/kWh production incentive for new wind, biomass, solar and run-of-river projects.

2.3 Focusing the "Alberta lens"

Any renewable energy policy needs to have the central objective of addressing the barriers identified in section 2.2.1. However, it is important to ensure any new effort is appropriate in the existing Alberta context.

The International Energy Agency (IEA) suggests that to be successful, the following principles should be applied in the design of a policy framework to capture our clean energy opportunity[18]:

- The *removal of non-economic barriers*, such as administrative hurdles, obstacles to grid access, poor electricity market design, lack of information and training, and the tackling of social acceptance issues — with a view to dealing with the issues raised — in order to improve market and policy functioning;
- The need for a *predictable and transparent* support framework to attract investments;
- The introduction of *transitional incentives* that decrease over time, to foster and monitor technological innovation and move technologies quickly towards market competitiveness;
- The development and implementation of *appropriate incentives* guaranteeing a specific level of support to different technologies based on their degree of technology maturity, in order to exploit the significant potential of the large basket of clean electricity technologies over time; and

[16] Ibid., 39-40.

[17] Ibid., 42, 44-46.

[18] International Energy Agency, *Deploying Renewable: Principles for Effective Policies* (2008). http://www.iea.org/publications/freepublications/publication/name,15746,en.html

- The *due consideration of the impact* of large-scale penetration of clean electricity technologies on the overall energy system, especially in liberalized energy markets, with regard to overall cost efficiency and system reliability.

Like any jurisdiction, Alberta has its own unique considerations and constraints it must consider, including the clean energy options available to it, existing institutions, and political realities. At the 2010 *Power Wedges* Forum, participants were encouraged to pursue their discussions through an "Alberta lens" which includes the following:

- Alberta's electricity system is a deregulated, market-based power pool system;
- Alberta's social license to market resource products requires demonstration of leadership on environmental measures, while the provincial electricity sector has significant carbon emissions;
- Participants have indicated confidence that targeted policies to help deploy mature, commercially available renewable energy technology can help secure more GHG reductions than the 20 per cent wedge that Alberta's Climate Change Strategy targets for "greening energy production;[19]
- Alberta has an existing intensity-based GHG pricing mechanism, which is up for review in 2014;
- Alberta has a wealth of clean energy options and there is a professed preference for market-based solutions with technology neutrality to accommodate the full suite of clean generation sources — although Alberta also supports strategically investing in targeted energy opportunities, as described in section 2.2.2;
- A significant portion of Alberta's electricity generation is "behind the fence" (generation in place to serve onsite industrial load), particularly in the oil sands; and
- Budgets (government as well as investment capital) are increasingly tight.

2.4 Policy options considered

Alberta can benefit by the wealth of experience with clean electricity policies in other jurisdictions. At the 2010 Forum, eight policy categories were identified and presented to participants. The categories represented functional groups of policies, where some variation in the details of policy design were available within the categories, but where the categories grouped high-level functional characteristics. The categories were:[20]

1) Performance-based standards
2) Taxpayer-funded production incentives
3) Ratepayer-funded production incentives
4) Tax rebates / incentives
5) Financing support

[19] Alberta Environment and Sustainable Resource Development, "Climate Change Strategy." http://environment.alberta.ca/0909.html (accessed April 30, 2013)

[20] The Pembina Institute, *Power Wedges Thought Leaders' Forum: Wind and Cogeneration Opportunities for Alberta* (2010), 2. http://www.pembina.org/docs/re/tlf-summary-report.pdf

6) Infrastructure investments
7) Enhanced carbon pricing
8) Other indirect / enabling support

Live electronic voting was employed to determine participants' initial directional preference of policy categories, asking participants to identify their top three policy priorities. A clear delineation was noted whereby three categories made over half of participants' lists:

- performance-based standards were on 66 per cent of lists;
- enhanced carbon pricing on 62 per cent; and
- ratepayer-funded production incentives on 56 per cent.[21]

Subsequent discussions at and after the *Power Wedges* Forum brought further consideration and assessment to the fore in considering some of the more popular options above.

2.4.1 Taxpayer-funded production incentives

Taxpayer-funded production incentives are direct subsidies to support production from targeted technologies. They are paid on a production basis (e.g., 1¢/kWh) from general government revenues.

Canada's experience with taxpayer-funded production incentives at the federal level include both the Wind Power Production Incentive (WPPI) and the ecoENERGY for Renewable Power program, both of which have ceased to enter new contribution agreements. Alberta has also had the Bioenergy Producer Credit Program, with 1.7-6 ¢/kWh incentive rates.[22] These incentives have been successful in the past, but only add a small increase to uncertain forecast revenue, and therefore do not necessarily overcome the long-term certainty required for project financing. This barrier has since been aggravated as installed wind capacity (with strong project-on-project correlation) has increased while natural gas price forecasts remain low. There is also concern that the general revenue funding is not conducive to increasingly tight budgets.

2.4.2 Enhanced carbon pricing

An enhanced carbon price would increase the prices paid for GHG emissions from electricity generators and/or the coverage of those fees, and result in a more level the playing field between emitting and non-emitting sources of electricity.

While it was agreed that an increased carbon price was an essential element for long-term carbon reductions, incremental changes from the existing Specified Gas Emitters (SGER) structure alone do not overcome price uncertainty barriers. This is primarily due to the fact that there are very few long-term financeable contracts for carbon offsets. As such, very large increases in SGER coverage and/or carbon pricing rates are necessary to drive new clean generation development.

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[21] The Pembina Institute, *Power Wedges Thought Leaders' Forum: Wind and Cogeneration Opportunities for Alberta* (2010), 2-3. http://www.pembina.org/docs/re/tlf-summary-report.pdf

[22] Alberta Energy, *Bioenergy Producer Credit Program Frequently Asked Questions*, http://www.energy.alberta.ca/BioEnergy/1826.asp (last visited May 11, 2013).

2.4.3 Ratepayer-funded production incentives

This is similar to taxpayer-funded production incentives, but the funding source is from electricity consumption.

The key ratepayer-funded production incentive considered was the feed-in tariff (FIT). FITs are the most common clean electricity policy in Europe where they have successfully driven substantial uptake of renewable energy technologies in several countries (see Figure 1), as well as Ontario and a growing list of municipalities in North America and elsewhere. Feed-in tariffs specifically address the central problem of attracting financing by overcoming the price uncertainty issue, by providing long-term contracts for guaranteed prices for electricity generated. By establishing rates of return for plants that successfully operate, a FIT is similar to the power purchase agreements established for the coal plants when the market was de-regulated.

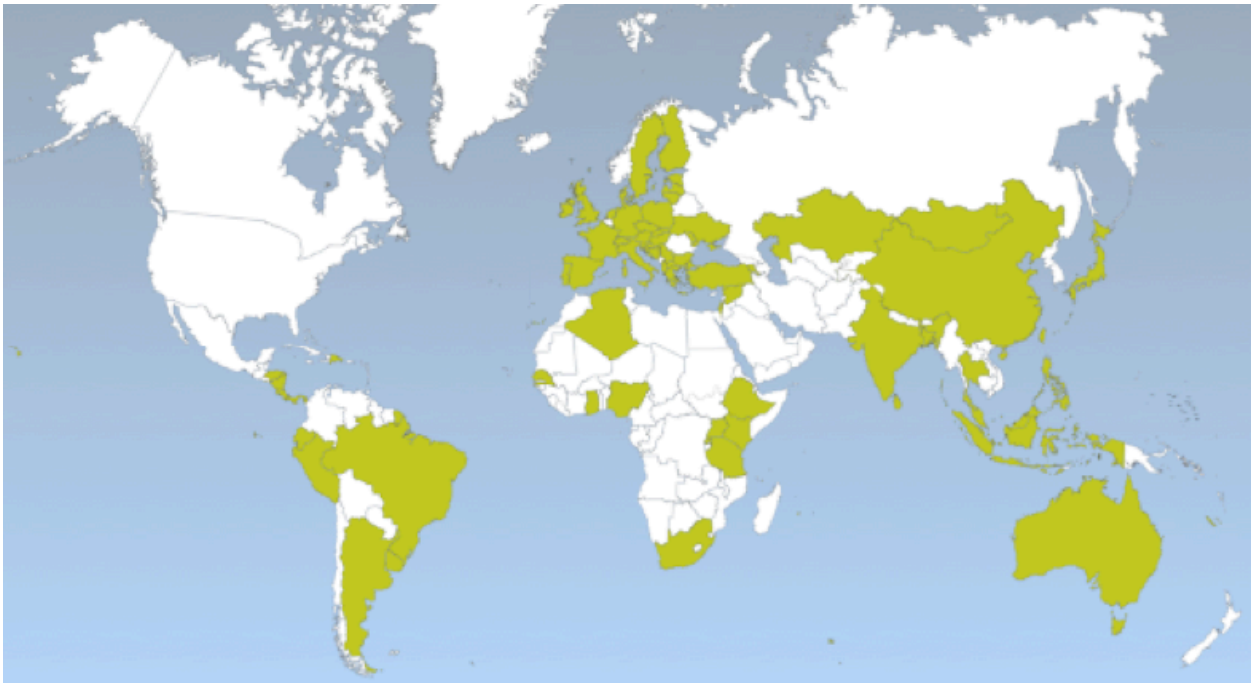

Figure 1. Countries with Feed-in Tariffs[23]

FITs address the key market barrier by guaranteeing a fixed price for electricity based on an assumed return-on-investment. The Stern Review on the Economics of Climate Change found that, when properly deployed, "feed-in mechanisms achieve larger deployment at lower costs"[24] compared to other deployment support programs. However, feed-in tariffs typically give preferential access to renewables with the explicit intent of replacing polluting sources with clean ones. Though major electricity generators in Alberta have direct experience participating in these programs in other jurisdictions, the lack of technology neutrality and the guaranteed price setting were both deemed inconsistent with the current Alberta market.

[23] Map compiled from Renewable Energy Policy Network, http://www.ren21.net

[24] Stern Review on the Economics of Climate Change (2006), 366. http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm

2.4.4 Performance-based standards

Performance-based standards set a government mandate for a particular quota or outcome for the electricity generation mix, which is then left to the private sector to meet.

The wealth of North American experience with performance-based standards has mostly come in the form of renewable portfolio standards (RPSs), which mandate that a certain proportion of electricity generation come from "renewable" sources. RPSs are the most popular policy in the United States, where 29 states have implemented such policies, with different stringencies of quotas (see Figure 2). They are even common in states with deregulated electricity markets, such as Texas.

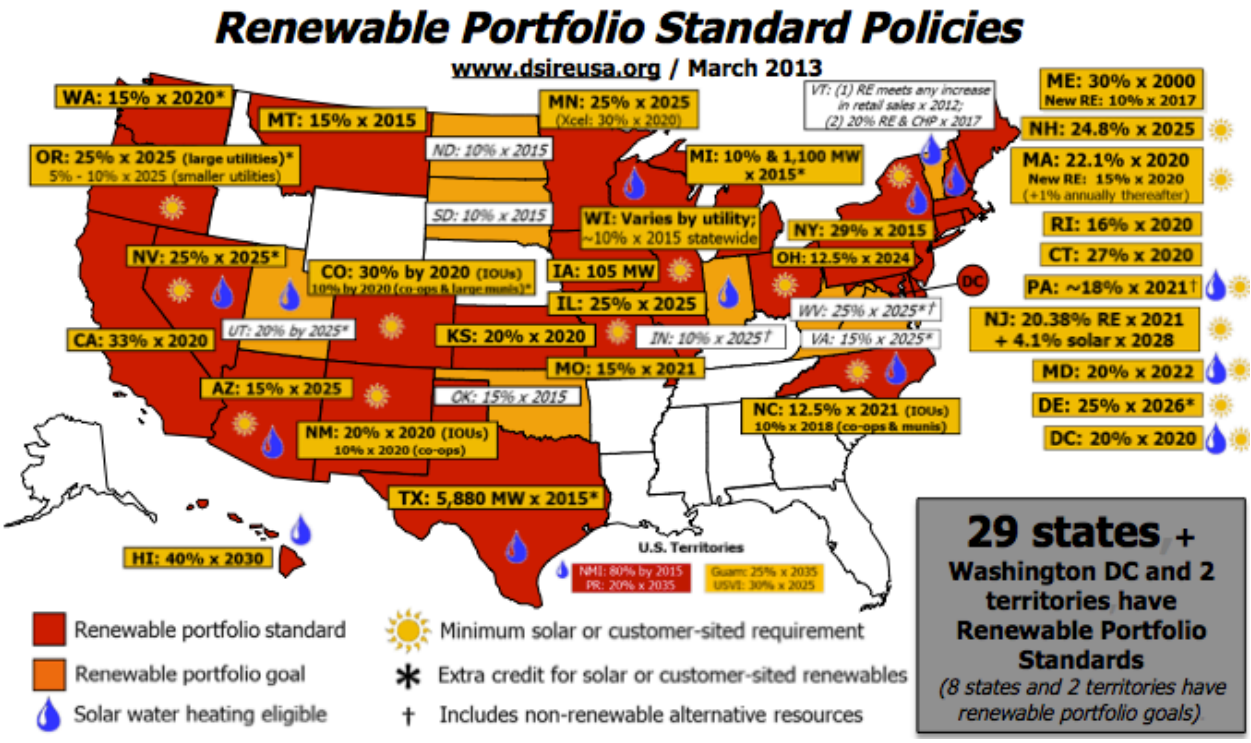

Figure 2. The adoption of renewable portfolio standards by U.S. states[25]

This concept appeared, at a high level, to potentially fit in Alberta's market. The performance-based standard won the initial participant vote at the *Power Wedges* Forum. Breakout groups then identified policy priorities, separately considering the best policies for cogeneration and for wind power. For both resource types, performance-based standards rose to the top of priorities and was identified as likely the "most politically feasible option in Alberta."[26]

However, RPSs require some definition of "renewable" to determine eligible sources and also exclude, by definition, low-emissions non-renewable options such as cogeneration or carbon-

[25] Source: Database of State Incentives for Renewables and Effieincy, http://www.dsireusa.org/summarymaps/index.cfm?ee=1&RE=1

[26] The Pembina Institute, *Power Wedges Thought Leaders' Forum: Wind and Cogeneration Opportunities for Alberta* (2010), 5-6, 9. http://www.pembina.org/docs/re/tlf-summary-report.pdf

capture and storage. The discussions revealed a concern that explicitly calling for renewable sources would pre-suppose technologies. While Alberta has a history of supporting specific technologies including direct incentives for carbon capture and storage, offering double offsets for carbon capture and storage under the SGER, as well as the Bioenergy Producer Credit Program, a more technology-neutral approach was preferred.

3. The Clean Electricity Standard

3.1 Deriving a made-in Alberta option

Given that participants and stakeholders early on felt most positive about an RPS-like concept, the subsequent discussion focused on the performance-based standard category of policy options. It was determined that the definable policy outcome for the Government of Alberta is to ensure GHG reductions from the electricity sector, to contribute to the Climate Change Strategy's 2020 and 2050 targeted GHG reductions. Given this objective, participants developed a technology-neutral approach to set the expected GHG outcome desired and leave it to the market to find the most cost-effective mix of generation that will meet the mandated GHG intensity. In other words, instead of a renewable portfolio standard, use a GHG emissions-intensity-based standard, or a "clean electricity standard" (CES). The Clean Electricity Standard would apply to electricity retailers.

This approach allows the market to decide which mix of technologies to implement including renewable energy, high-efficiency natural gas, cogeneration, CCS, etc. Low-emissions non-renewable generation sources are eligible—there is no definition to exclude them as with a RPS quota.

Because it is market-based and technology-neutral, a CES can work within Alberta's competitive electricity market and can complement the Specified Gas Emitters Regulation. The working group found that this type of policy can be particularly tailored to the Alberta context, but is somewhat unique as most other jurisdictions specifically target a technology or technology type.

This allows government policy to send a clear market signal to realize its emissions goals, while creating the framework to establish power purchase agreements between electricity retailers and clean energy developers. This addresses the key barrier that clean electricity developers encounter in Alberta's electricity market: the difficulty of obtaining financing for upfront-capital-intensive projects in market uncertainty.

The CES, a GHG emissions-intensity standard, is designed to suit these policy objectives, which are, in summation:

- Market-based;
- Maximizing lowest-cost options through the market;
- Technology-neutral;
- Flexibility in compliance; and
- Ensures the GHG reduction outcome.

3.2 Operation of the CES

In the absence of a centralized power authority, in order to operationalize a CES, one option is to require retailers to source the mix of electricity that they sell to their customers to come from a portfolio that has a specified maximum average GHG intensity level (X $kgCO_2e$/MWh). Retailers would be able to meet the standard by purchasing power, either on the spot market through the pool or through direct power purchase agreements if the pool's intensity was above that of the target level.[27]

The province would set the intensity level ("X") with a forecast scheduled reduction in the emissions-intensity level over at least a ten year period, providing certainty for the market, such as shown in Figure 3. Competition for non- and low-emitting sources of electricity would heighten as the intensity standard is tightened over time.

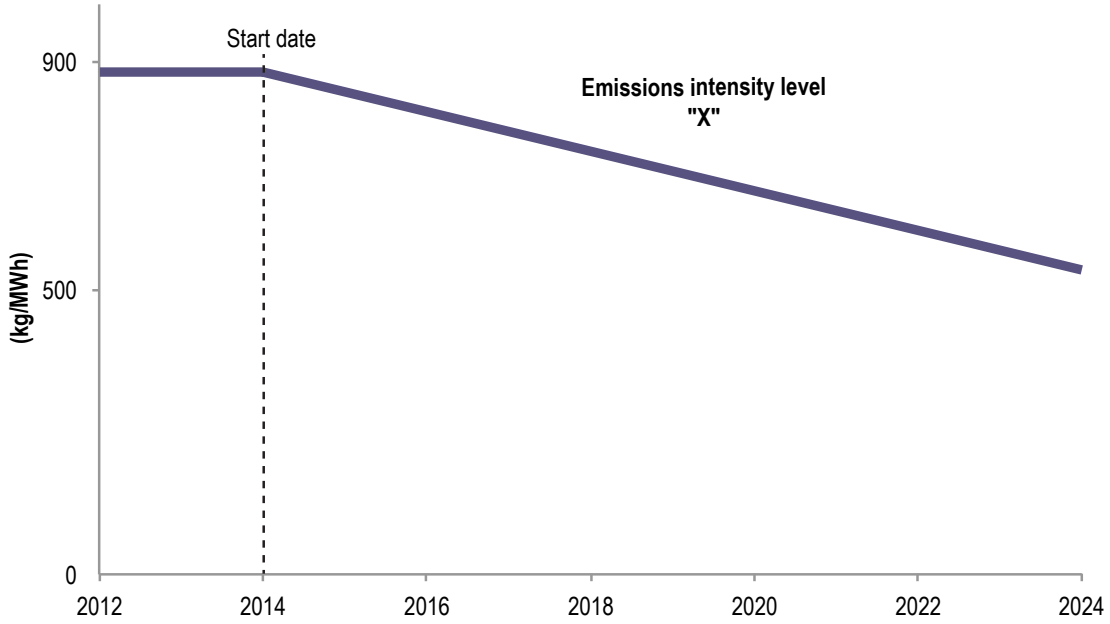

Figure 3: Hypothetical emission target decline in a CES

The emissions intensity ("X") would be set in the near term such that retailers could meet the standard with currently available and planned sources. The standard would then become more stringent over time to spur development of lower emitting sources.

Retailers would be able to contract with electricity generators to purchase electricity with a specified emissions intensity level. The generator would supply the retailer with its actual emissions intensity level so that the retailer could calculate the impact on its ability to meet the emissions intensity standard. Retailers would continue to be able to purchase electricity on the spot market. Electricity that is purchased on the spot market from the power pool would be assigned a power pool average – a "deemed emissions intensity". Figure 4 shows how a retailer could meet a hypothetical 600 kg/MWh GHG emissions-intensity standard with a mix of

[27] Retailers include competitive and regulated-rate retailers (who sell to final consumers), self-retailers (mostly industrial consumers and municipal utilities who purchase electricity wholesale), and rural electrification associations.

generation options, illustrating how generation source portfolios are calculated using weighted averages.

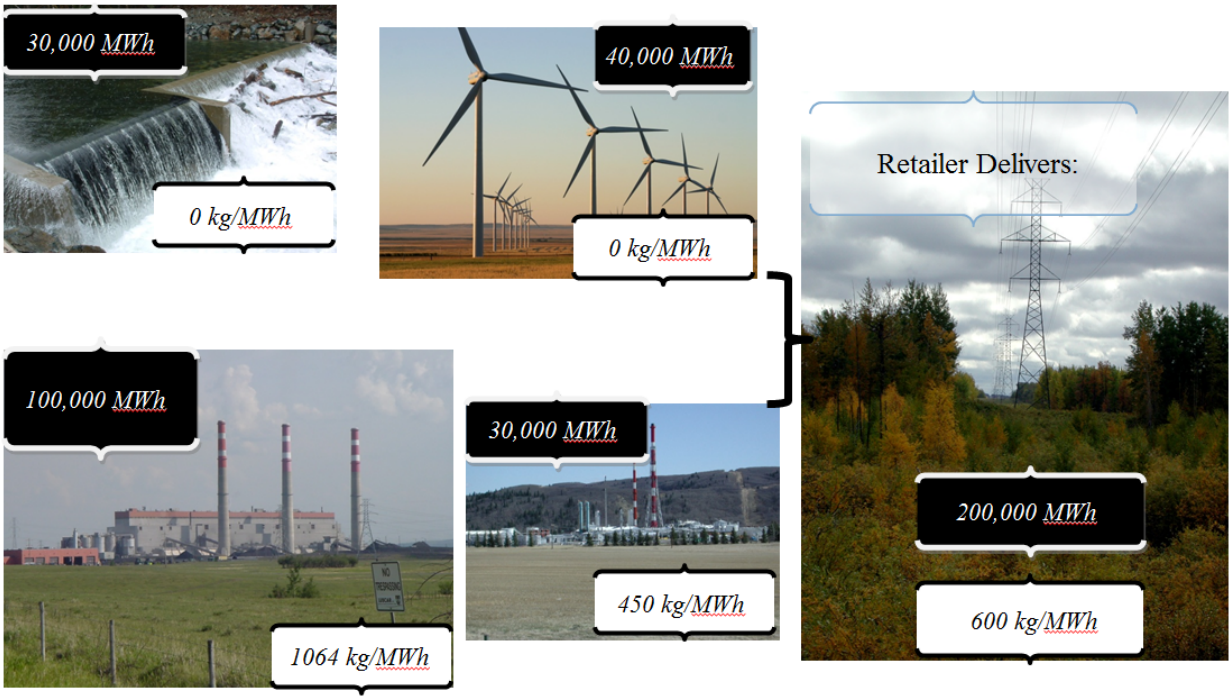

Figure 4: Example showing how a retailer with 200,000 MWh of customer accounts could meet a hypothetical 600 kgCO_2/MWh emissions standard with a mix of generation sources

If, after contracting with generators and managing purchases of electricity for the emissions level, a retailer fails to meet the emissions intensity standard, then as a last resort, retailers can pay a non-compliance levy of $Y/tonne CO_2e above the intensity standard on the total electricity the retailer sells in that year. The compliance fee puts a cap on industry's risk and provides a "last resort compliance option". The compliance levy must be sufficiently stringent either to encourage contracting for clean electricity generation or to provide sufficient funding to the administrative agency collecting the levies to allow them to contract directly for cleaner electricity.

3.3 Anticipated outcomes

The result is a market-based policy approach where government sets the target and leaves it to Alberta's deregulated, competitive electricity market to find cost-effective clean electricity without picking winners. In this way, the policy is technology neutral, leaving it to the market to decide the most efficient no- or low-emission options to meet the standard, allowing investments in CCS as well as lower-emissions natural gas generation options to compete with renewables on a level playing field and without further subsidy. Additionally, it does not require all generators to make changes to existing facilities if their facilities do not warrant it, but allows them much greater flexibility in developing a portfolio for the retail market to adapt to an emissions intensity limit.

The CES is expected to foster market demand for power purchase agreements with low- or non-emitting generation sources, as this allows retailers to ensure that their generation portfolios, when mixed with purchases from the power pool, will comply with the standard. The anticipated result is a greater number of longer-term contracts available to producers of cleaner sources either directly from retailers, or through other compliance options discussed in section 4.5. This policy will increase the demand for both renewable energy, cogeneration and, in the short- to medium-term, high efficiency natural gas. Importantly, with PPAs to secure low-emissions power, it will also address the key barrier to investment in cleaner electricity development, which is the uncertainty in revenue from pool prices.

4. Forum discussion topics

Six topics have been identified for discussion at the 2013 Clean Electricity Standard Forum. Here is a brief explanation of each, along with topical questions, to inform the sessions, seed ideas and foster discussion. Participations will be asked to select two different breakout sessions to examine two of the following six discussions.

4.1 Priorities for a clean electricity policy in Alberta

Policies that promote clean electricity development can serve a variety of policy objectives, including, among others: improving environmental performance of the electricity sector; improving the province's international standing for product marketing; diversifying the energy mix that constitutes Alberta's electricity generation to mitigate forward fuel price risk; diversifying the fossil-fuel basis of Alberta's energy export sector; preparing Alberta's electricity sector, as well as transportation and heating fuels, for a carbon-constrained future; laying the groundwork for a zero-carbon electricity sector; and supporting different scales of energy developments that diversify electricity generation ownership in the market.

When policy discussions become difficult or contentious, it can help to return to a widely agreed-upon policy objective that underlies the discussion. By discussing policy priorities and objectives, we can ground the other discussions in a sort of mission statement for the policy program.

4.1.1 For discussion

1. What priorities do we have for clean electricity policy in Alberta and which are the most pressing or important?
2. How could these priorities best be pursued within a CES policy framework?
3. What other policy options, innovations, or additional policy instruments would be necessary or helpful to pursuing these priorities?

4.2 Setting a standard

There are many factors to consider in setting a emissions intensity standard, such as: targets or objectives for GHG reductions; the pace of change and the readiness of lower emission generation; consumer price; and environmental urgency.

There are numerous ways to calculate the "X" (the intensity standard) based on desired outcomes or objectives for the electricity system and on available opportunities to be harnessed:

- Based on our national GHG emission reduction target;
- Based on today's best available technology;
- Based on Alberta's clean energy potential;

- Based on a scheduled phase-out of coal-fired electricity or more stringent standards applied to coal-fired electricity;
- Based on the federal government's clean electricity target; or
- Based on equivalency with the federal government's GHG regulations.

More insight on these options is found in Appendix A.

Regardless of the approach taken to set the standard, near-term emission levels should be set at levels that can be achieved with currently available technology, while considering low- and non-emitting clean energy potential and immediate constraints such as transmission infrastructure. In order to spur improvement, the emission level would be set to decline over time, becoming more stringent as new development is available on the time horizon and as constraints are addressed (see Figure 3, above). Implementation will require annual reassessment of the program's success and implementation and regular reviews to extend the tightening standard going forward, while respecting industry's need for predictability and stability.

4.2.1 For discussion

1. What environmental or economic objectives are most relevant in setting the X?
2. What constraints exist that limit the rate at which the X can be declined? Technical? Infrastructural? Financial?
3. What ultimate target should Alberta envision for its electricity system in the future? In 2020? In 2050? In 2080?

4.3 Interactions with existing policies

Alberta currently has a GHG emissions reduction policy that applies to the electricity sector. The Specified Gas Emitters Regulation requires facilities that emit more than 100,000 tonnes of GHGs per year to reduce emissions intensity by 12 per cent. This includes coal- and natural gas-fired electricity generation facilities that meet the threshold. Where companies cannot attain this improvement within their operations, they must meet the standard by purchasing offset credits or contributing the $15/tonne charge to the Climate Change and Emissions Management Fund.[28] The Alberta-based offset credits available for purchase, meanwhile, include electricity projects that are accepted as reducing GHG emissions in the electricity sector by supplying low- or non-emitting electricity into the Alberta electricity grid. In other words, the SGER applies to the electricity sector in two ways: 1) by applying the emissions intensity reduction requirement to fossil fuel-powered generation facilities; and 2) by allowing low- and non-emitting electricity facilities to generate offset credits for sale into the SGER system.[29]

[28] Alberta Environment and Sustainable Resource Development, "Greenhouse Gas Reduction Program." http://environment.alberta.ca/01838.html (accessed May 1, 2013)

[29] It is important to note that the SGER expires in 2014 and is currently under review. A variety of options are available for the next iteration of the program, including greater stringency and changes in the specific application of the SGER by sector from the uniform system in place today. See Shawn McCarthy and Nathan Vanderklippe, "Alberta's bold plan to cut emissions stuns Ottawa and oil industry," *The Globe and Mail* (April 3, 2013). http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/albertas-bold-plan-to-cut-emissions-stuns-ottawa-and-oil-industry/article10762621/ ("The Alberta government … is open to creating a regime that imposes different burdens on different industries, under the principle of 'use the right tool in the right sector.'")

The CES was designed to regulate at the retailer level and as an independent complementary policy to the SGER. It is independent in the sense that it could operate without the SGER in place or without application of the SGER to the electricity sector. But it is complementary in the sense that it was designed not to conflict with the SGER, but rather to operate separately but in parallel to the SGER. Both seek GHG emissions reductions from the electricity sector. But both would treat the concept of emissions accounting separately, as described further in Appendix A.

4.3.1 For discussion

1. Does the CES, as conceived in this paper, complement the SGER as currently applied? Or are there potential areas of conflict that are problematic or detrimental?
2. Are there ways to modify or add to the CES to promote complementarity or mitigate conflict?
3. Are there potential changes to the SGER that might be under consideration that would promote complementarity? Promote conflict?

4.4 Unintended consequences

As with any policy, particularly novel policy concepts employed in unique circumstances, like the CES in Alberta, potential obstacles or concerns cannot be foreseen without the combined wisdom of many people with expertise. The electricity system in Alberta is complex, with many relevant players and many moving parts. To the greatest extent possible, it is important to try to identify potential unintended consequences from such a policy — but primarily with an eye to ensuring that solutions or innovations are identified that can mitigate the potential problems, not to derailing an important policy opportunity.

4.4.1 For discussion

1. What unintended consequences, not identified in this paper, do you foresee related to this policy? How important is this consequence in the "grand scheme" — i.e., in comparison to the importance of having this or another effective policy?
2. What solutions or innovations might there be to mitigate negative unintended consequences?
3. Do the suggested solutions or innovations raise their own concerns or complications and, if so, how does the imperfect mitigation compare against the unmitigated consequence?

4.5 Compliance and operationalization

A core objective of the CES is to foster private sector PPAs from retailers for clean electricity generation, both to incentivize clean electricity in the market and to help overcome the risk barrier to clean electricity financing. However, concerns have been raised that retailers lack the credit to enter long-term PPAs and that taking on such obligations pose either an absolute obstacle for smaller entrant retailers and/or a significant increase to the companies' borrowing cost for large retailers.

This has led to an innovative idea to foster PPAs while helping retailers attain compliance with the standard. As noted above in section 3.2, non-compliant retailers will have to pay a non-compliance levy for the GHG emissions that are over the standard's maximum emissions intensity. An arm's-length agency (such as the Balancing Pool) could collect the levies and use them to enter long-term PPAs for new clean electricity developments on a competitive bidding basis. Then, when the generator is producing, the agency could sell the electricity into the power pool to reduce the emissions intensity of the power pool, or put the clean electricity up for bid at auction.

4.5.1 For discussion

1. How important are concerns about retailers' credit capacity for long-term PPAs?
2. Is the idea of an agency acting as levy collector and PPA purchaser a feasible approach to addressing this problem?
3. What concerns might arise with this approach and what solutions would help improve the functioning of such an agency or provide an alternative for the agency?

4.6 Alternative or additional policies

As indicated in section 2.4, a number of different policies have been canvased in the processes that have led to this point. Still others are likely available, either to complement or as alternatives to the CES. Other potential approaches could be better than the CES in meeting the objectives of the policy, or they might serve other goals such as promoting uptake of small-scale distributed systems or farmer-owned systems. As indicated, these approaches should be evaluated for their cost-effectiveness in reaching the objectives of the policy, their appropriateness to the Alberta context and their administrative efficiency.

4.6.1 For discussion

1. Are there important policy objectives that the CES concept fails to address — what are they? Are there core problems with the CES that cannot be addressed with improvements to the CES?
2. What alternative or additional policy options would better address these objectives or would successfully avoid these problems?
3. On addressing the barriers discussed in section 2.2 and accommodating the Alberta-specific considerations listed in section 2.3, how do these alternative or additional policy options fare?

Appendix A. Further insight into setting the 'X'

There is more than one way to calculate the appropriate emissions standard to meet specific objectives and to ensure that available generation opportunities will be technically and economically feasible, and they are not necessarily mutually exclusive.

A.1 Use GHG targets as a basis

Canada's greenhouse gas emission target by 2020 is 17 per cent below 2005 levels. If this target were applied sector by sector, a 2020 and 2030 target could be set in Alberta to work towards. Alberta's own targets are different than the Federal ones, and the target of 37 Mt of CO_2e reductions by 2050 could be back-cast to set 2020 and 2030 targets. This target would likely need to be re-visited, however, as CCS projects have not been viable in the near term in the electricity sector.

A.2 Use "best available technology" as a guide

Coal-fired facilities can use carbon capture and storage to divert a large proportion of their GHG emissions from entering the atmosphere. Gas plants can increase their efficient use of natural gas by incorporating cogeneration for district heating, while industrial consumers of natural gas for heating can more efficiently use gas by creating electricity. Substantial renewable energy generation is commercially available already, with few technical constraints beyond transmission capacity.

The emissions intensity level could be calculated by determining what the average grid intensity would be if all facilities were to incorporate the best available technology by a particular target date. Progressively ratcheting the stringency thereafter will continue to drive technological advancement.

A.3 Achieving a clean electricity target

The federal government has announced a target to increase Canada's reliance on non-emitting sources of power to 90 per cent by 2020, from the current level of 75 per cent. Alberta's electricity system is the largest emitter of GHGs among the provincial grids; thus, we have the greatest responsibility and opportunity for reducing our emission levels. Setting a provincial standard that would ensure that Canada can meet the federal target would be one way of determining the level at which that the emissions intensity standard should be set.

A.4 Equivalency with the federal GHG regulations

As a market-based instrument with inherent compliance flexibility, the CES could be a more cost-effective way of obtaining the same GHG emissions reductions as the federal government's GHG regulations for the electricity sector, including both the existing coal regulations and the coming natural gas electricity generation regulations. The government of Alberta has signaled intent to develop an equivalency agreement for coal emissions reductions. To attain true equivalency through the CES, the CES standard would have to demonstrate the same GHG reductions as the federal approaches. Such an approach to setting the X would have to take care to incorporate concerns about additionality and double counting, given that some low-emissions generation development in Alberta might have taken place under the federal regulations. This could be accomplished with rigorous projections for the emissions intensity of Alberta's electricity under the federal regulatory scenario, as it takes effect and impacts GHG emissions. If Alberta intends to seek equivalency with the CES, this option should operate as a floor that the CES must at least meet.

Appendix B. SGER interactions

The participants that recommended the CES designed it with the goal of making it complementary to the SGER's emissions intensity target for electricity generation facilities and opportunity for generation facilities to produce offset credits. This appendix explains the reasoning and how each system would funciton separately but in parallel.

B.1 Complementarity between CES and SGER's intensity target

Technologies that are employed by a large emitter to bring a facility into compliance with the SGER (eg. carbon capture and storage) would result in a lower emissions intensity for that facility under both the SGER and the retailer portfolio. This would be the intensity level reported to the retailer and used by the retailer to calculate their portfolio emissions intensity level. In other words, a facility that invests in technology to reduce its emissions benefits by 1) enabling it to meet its reduction obligations under the SGER, and 2) being more attractive to electricity retailers seeking lower carbon intensity sources of electricity under the CES.

Greenhouse gas offsets, which do not lower the actual emissions intensity of the facility, would NOT be included in the intensity calculation under the retailer portfolio, but could continue to provide compliance for the SGER. For example, the facility could not use GHG emissions offsets from agricultural sources or wind energy to lower their emissions intensity under the retailer portfolio, but such offsets can continue to help a large emitter meet their obligation under the SGER. Wind energy sold as an offset to a large emitter could also be sold to an electricity retailer to build their portfolio since the actual wind energy would only be sold once under the retailer portfolio. Offsets used to satisfy the SGER requirements would be retired.

Under the SGER, the generator reports the emissions intensity of the facility *including offsets*. Under the CES, the generator must report to the retailer the *actual* emissions intensity of the facility *without offsets*. This prevents double counting of the benefits of wind power.

The following conditions would apply to the CES in relation to the SGER:

(i) retailers WOULD be allowed to count purchased wind power towards their computation of GHG intensity even when that wind power is generating offsets that are used to comply with the SGER. This allows wind to be treated in the same way as the low GHG intensity of CCS or fuel switching that can help generators that are directly covered by the SGER comply with it; but

(ii) the GHG reductions represented by offsets acquired by generators to comply with the SGER (whether wind or other forms of offsets) WOULD NOT be included in the computation of those generators' GHG intensity when reporting to retailers — because that would mean double counting wind power in retailers' compliance with the CES (once through lowering the generator's GHG intensity and a second time through lowering the retailer's GHG intensity directly).

B.2 Relationship to offsets: hypothetical wind and coal portfolio

Under the existing SGER and offsets system in Alberta, wind power creates two "products": 1) electricity, and 2) GHG offsets. The offsets are specifically designed for compliance with the SGER and are calculated based on the offset protocol. Generators purchase GHG offsets to be in compliance with the SGER. Under the CES, retailers are building a portfolio of facilities to meet the standard. For the CES, the calculation of emissions intensity is based on the *actual* emissions per unit of electricity (i.e. kg CO_2e/MWh) from the facility. Offsets do not reduce facility emissions, they are a compliance mechanism for the SGER, and are therefore not part of the calculation for the retailer portfolio. This is illustrated in Figure 5.

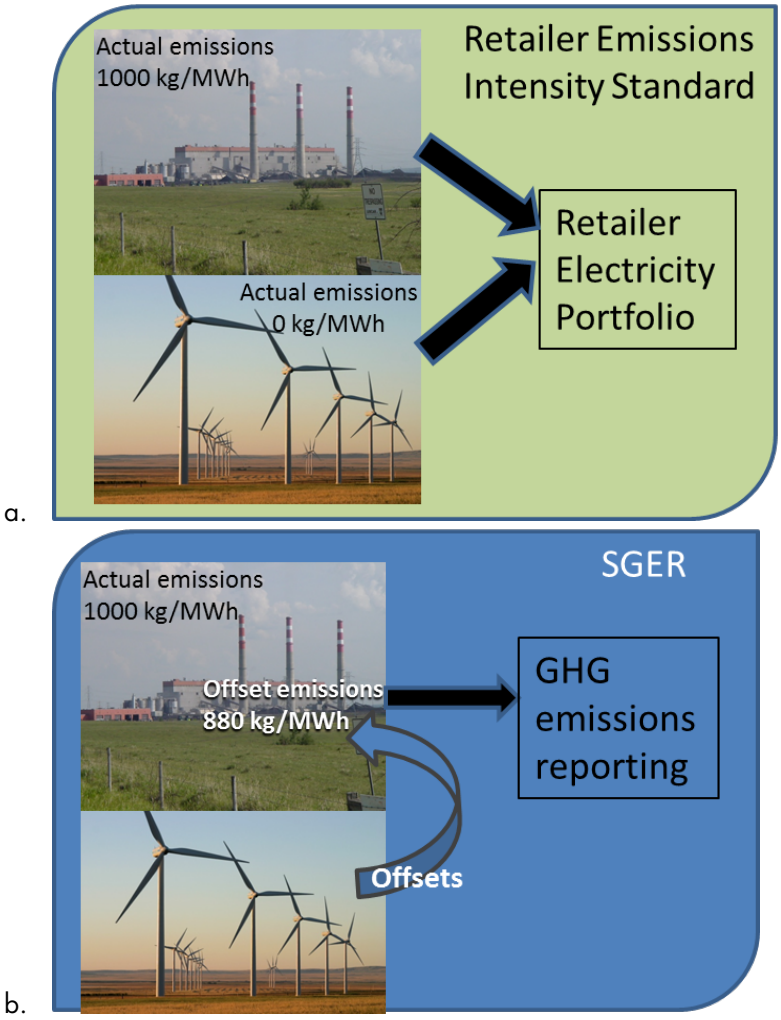

Figure 5: The use of offsets applies to the SGER but is not counted in the CES

The CES is based on purchases of electricity. It is not an accounting system for GHG emissions and does not recognize offsets. Only actual emission levels are used to build a retailer's portfolio.

For example, a coal-fired facility would report the GHG emission levels WITHOUT using offsets to the retailer. As shown in Figure 5a, that number would be 1000 kg CO_2e/MWh. This is the number that the retailer would base its portfolio on.

This standard does not preclude generators from purchasing or selling offsets under other legislation, including the SGER. For example as shown in Figure 5b, a coal-fired facility could purchase offsets from a wind energy generator. For the purposes of the SGER only, the coal-fired generator's emissions level would be lowered to 880 kg CO_2e/MWh. However, this does not change the ACTUAL emissions level that is reported to the retailer for use in the CES.

Under the CES, wind energy generators would sell electricity to a retailer with an emissions level of 0 kgCO_2e/MWh. Only electricity would be sold to the retailer. This would not preclude the wind energy generator from selling offsets to a coal-fired facility to lower its emissions under the SGER. The offsets are only used once as part of the emissions accounting system of the SGER.

If a coal-fired generator were permitted to use offsets from wind energy for their emissions intensity, then this would be double counting of the offsets, such as in the example shown in Figure 6.

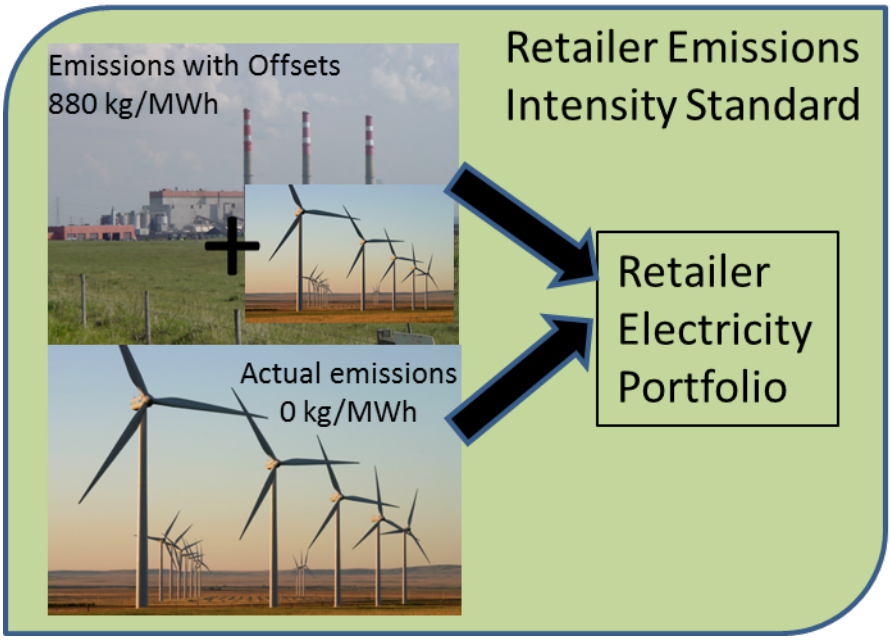

Figure 6: Offsets double-counted in CES

Since the offsets from wind or any other source do not affect the actual emissions intensity, the retailer needs only to know the quantity of electricity purchased from each generator and the actual emissions intensity level from the generators. Retailers can achieve the standard by purchasing a mix of electricity from various sources or from a single generator that can provide electricity at or below the level specified by the emissions intensity standard.