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# Pembina Institute Comments on Canada's Proposed *Reduction of Carbon Dioxide from Coal-fired Generation of Electricity Regulations*

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The Pembina Institute welcomes the opportunity to comment on The Government of Canada's proposed greenhouse gas (GHG) regulations for coal-fired electricity generating units.[1]

These comments will build on our previous submission, dated November 15, 2010.[2]

## Context: Coal power in Canada

Coal power is one of the worst global contributors to climate change, air pollution, acid rain precursors and atmospheric mercury emissions. In Canada, coal accounts for a significant share of national greenhouse gas (GHG) emissions. Coal plants emitted 77% of Canada's electricity-related GHGs in 2009 while producing less than one-fifth of the country's national generation.[3] Coal accounts for the majority of electricity generation in Alberta, Saskatchewan and Nova Scotia and is significant in both Ontario and New Brunswick.

Several provinces have taken strong leadership roles in tackling coal power. British Columbia has banned conventional coal-fired power and, by 2016, will require all electricity generation to have net zero emissions.[4] Ontario, which once relied on coal for over 30% of its power, is in the midst of delivering a full phase-out of existing coal generation by the end of 2014,[5] replacing much of it with renewables and conservation — the single largest emission reduction effort in Canada. Nova Scotia has placed a hard cap on emissions from the electricity

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[1] Environment Canada, "Reduction of Carbon Dioxide from Coal-fired Generation of Electricity Regulations," *Canada Gazette Part I* 145(35), August 27, 2011. Available at http://www.gazette.gc.ca/rp-pr/p1/2011/2011-08-27/html/reg1-eng.html.

[2] Matthew Bramley and Tim Weis, *Comments on proposed regulatory approach to coal-fired electricity generation* (Drayton Valley, AB: Pembina Institute, 2010). Available at http://www.pembina.org/pub/2116.

[3] Environment Canada, *National Inventory Report 1990-2009: Greenhouse Gas Sources and Sinks in Canada— Part 3* (Gatineau, QC: Government of Canada, 2011), 38.

[4] B.C. Legislature, *Greenhouse Gas Reduction (Emission Standards) Statures Amendment Act*, Bill 31-2008, Divisions 3–4. Available at http://www.leg.bc.ca/38th4th/3rd_read/gov31-3.htm.

[5] Ontario Regulation 496/07, *Ontario Regulation made under the Environmental Protection Act: Cessation of Coal Use – Atikokan, Lambton, Nanticoke and Thunder Bay Generating Stations*.

sector[6] and plans to cut coal consumption significantly while increasing renewable power to at least 40 per cent of supply by 2020.[7]

Federal limits for industrial GHGs should support and supplement this action, with an emphasis on achieving national and international commitments.

**Federal commitments**

The Government of Canada has committed to reduce national GHG emissions to 17% below the 2005 level (i.e., to 607 million tonnes of carbon dioxide equivalent; Mt $CO_2e$) by 2020.[8] Canada has also "set a national goal of producing 90% of its electricity needs without emitting GHGs by 2020."[9] The extent to which these regulations will contribute to meeting these commitments is an important test of their effectiveness.

**Assessment of the stringency of the proposed regulations**

Without a clear understanding of the emissions reductions that future regulations will require from other sectors, it is very difficult to assess the adequacy or fairness of the approach taken under the proposed regulations for coal-fired power.

Nonetheless, two measures for assessing the regulations are: one, how its projected outcomes compare with the emissions level anticipated under a well-designed climate policy package; and two, to what extent the regulations contribute to achieving the government's target for non-emitting electricity generation.

In our view, a well-designed climate policy package for Canada would have an economy-wide carbon price as a central element. There is widespread agreement among experts and industry that a broad-based national carbon price at levels sufficient to drive technological change is the fairest and most cost-effective approach to reducing national emissions.[10,11,12,13] However,

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[6] *Greenhouse Gas Emissions Regulations made under subsection 28(6) and Section 112 of the Environment Act S.N.S. 1994-95, c. 1 O.I.C. 2009-341* (August 14, 2009), N.S. Reg. 260/2009 Available at http://www.gov.ns.ca/JUST/REGULATIONS/regs/envgreenhouse.htm.

[7] Nova Scotia Department of Energy, *Renewable Electricity Plan* (Halifax, NS: Government of Nova Scotia, 2010). Available at http://gov.ns.ca/energy/resources/EM/renewable/renewable-electricity-plan.pdf.

[8] Environment Canada, *Planning for a Sustainable Future: A Federal Sustainable Development Strategy for Canada* (Gatineau, QC: Government of Canada, 2010), 20. Available at http://www.ec.gc.ca/dd-sd/F93CD795-0035-4DAF-86D1-53099BD303F9/FSDS_v4_EN.pdf.

[9] Government of Canada, *Fifth National Communication on Climate Change: Actions to Meet Commitments Under the United Nations Framework Convention on Climate Change* (Ottawa, ON: Government of Canada, 2010), 41. Available online at http://unfccc.int/resource/docs/natc/can_nc5.pdf.

[10] National Research Council, *America's Climate Choices* (Washington, DC: National Academies Press, 2011), 58. Available at http://www.nap.edu/catalog.php?record_id=12781.

even if governments choose other policies instead of a national price on carbon emissions, it is possible to assess whether a given sector will arrive at the same outcome.

In other words, in the absence of an economy-wide cap-and-trade system or carbon tax, sectoral regulations for coal-fired electricity generation should seek to achieve comparable outcomes to the outcomes that carbon pricing policies could have achieved in the sector.

**Reductions under current regulations**

According to Environment Canada's modelling, the proposed regulations are anticipated to reduce $CO_2$ emissions by 5.3 Mt in 2020.[14] This represents just three per cent of the total reductions required to fill the gap between the emissions level anticipated under current policies and Canada's 2020 emissions target.[15]

Provincial actions — notably Ontario's coal phase-out — account for a much larger share of projected reductions from the electricity sector to 2020. With provincial and federal efforts taken together, Environment Canada projects the electricity sector will emit 95 Mt $CO_2e$ in 2020.[16]

**Reductions under well-designed climate policy package**

In a well-designed climate policy package, the electricity sector is projected to play a significant role in national emissions reductions, suggesting a relative abundance of low-cost

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[11] National Roundtable on the Environment and the Economy, *Achieving 2050: A Carbon Pricing Policy for Canada* (Ottawa, ON: Government of Canada, 2009). Available at http://www.nrtee-trnee.com/eng/publications/carbon-pricing/carbon-pricing-advisory-note/carbon-pricing-advisory-note-eng.pdf.

[12] Sustainable Prosperity, *Canadian Business Preference on Carbon Pricing* (Ottawa, ON: Sustainable Prosperity, 2011). Available at http://www.sustainableprosperity.ca/article758.

[13] The Senate committee on Energy, the Environment and Natural Resources recently reported that, "the committee found near unanimity among witnesses — from the petroleum industry to environmental organizations — that supported pricing carbon as the most efficient way to reduce emissions." See Standing Senate Committee on Energy, the Environment and Natural Resources, *Attention Canada! Preparing for our Energy Future: Towards a Canadian Sustainable Energy Strategy* (Ottawa, ON: Senate of Canada, 2010), 17. Available at http://parl.gc.ca/40/3/parlbus/commbus/senate/com-e/enrg-e/rep-e/rep07jun10-e.pdf.

[14] Environment Canada, *Reduction of Carbon Dioxide from Coal-fired Generation of Electricity Regulations*, Regulatory Impact Analysis Statement (Gatineau, QC: Government of Canada, 2011), 8.2. Available at http://www.gazette.gc.ca/rp-pr/p1/2011/2011-08-27/html/reg1-eng.html.

[15] To put this into further perspective, under current policies (including Alberta's Specified Gas Emitters regulation), oilsands growth is projected to *increase* annual emissions by 62 Mt — nearly 12 times as much — between 2005 and 2020, to a total of 92 Mt $CO_2e$. Without swift action to control GHGs in this and other industrial sectors, the impact of efforts to reduce emissions from coal power will be significantly diminished. See Environment Canada, *Canada's Emissions Trends*, 25.

[16] Environment Canada, *Canada's Emissions Trends* (Gatineau, QC: Government of Canada, 2011), 28. Available at http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=E197D5E7-1AE3-4A06-B4FC-CB74EAAAA60F.

mitigation options in the sector. Under a carbon price trajectory consistent with achieving the federal government's 2020 emissions target,[17] emissions from the sector are projected to fall by 37% (40.2 Mt) from business as usual (BAU), to a level of 68.3 Mt in 2020.[18] Reductions from the sector accounts for 18% of the total national emissions reduction. About half of the electricity sector's reduction occurs in Alberta, suggesting significant fuel switching away from coal as well as application of carbon capture and storage (CCS).

This level is significantly below the 95 Mt projected for the electricity sector under current policies, including the proposed federal coal regulations. Future regulations for natural gas-fired electricity generation (and potentially refined petroleum products; RPP) will contribute to additional reductions in the sector, but are unlikely to fill the 27 Mt gap between the modelled outcomes of a carbon price and the current sector-by-sector regulatory approach. Gas-fired generators are currently projected to emit 24 Mt in 2010 and 33 Mt in 2020.[19] Therefore, achieving the same outcome as the application of a robust carbon price with the proposed rules for coal-fired electricity would require reductions from the rest of the electricity sector on the order of 68% from BAU by 2020, or from gas-fired generation alone on the order of 80%.

If these reductions do not come from electricity generation, they will need to come from other sectors, where they will be relatively more expensive.

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[17] Matthew Bramley and Pierre Sadik, *Climate Leadership, Economic Prosperity: Final Report on an Economic Study of Greenhouse Gas Targets and Policies for Canada* (Drayton Valley, AB and Vancouver, BC: Pembina Institute and David Suzuki Foundation, 2009). Available at http://www.pembina.org/pub/1909. This report modelled a slightly stronger 2020 target of 20% below the 2006 level instead of the current 17% below the 2005 level. While the two targets are different, the resulting carbon price — reaching $100/t in 2020 — would likely be of the same order of magnitude.

[18] Mark Jaccard and Associates Inc., *Exploration of two Canadian greenhouse gas emissions targets: 25% below 1990 and 20% below 2006 levels by 2020 – Final Report* (Drayton Valley, AB and Vancouver, BC: Pembina Institute and David Suzuki Foundation, 2009), Table 40. Available at http://www.pembina.org/pub/1910.

[19] Ibid.

**Table 1: Projected 2020 outcomes in electricity sector**

| | **Well-designed climate package** | **Current policies** |
|---|---|---|
| Source of data | *Climate Leadership, Economic Prosperity* | *Canada's Emissions Trends* |
| Reference emissions, including ON coal phase-out (Mt $CO_2e$) | 109 | 100 |
| Emissions w/ policies fully implemented (Mt $CO_2e$) | 68 | 95 |
| Generation (TWh) | 749 | 734 |

**Support for non-emitting electricity generation**

The contribution that the proposed regulations make towards achieving the federal government's target of 90% non-emitting electricity generation by 2020 is minimal. Environment Canada's modelling finds the proposed regulations will have "a negligible impact on non-emitting generation," even in 2030.[20] With a projected increase of 0.3 TWh, non-emitting sources account for an insignificant 0.2% of total increased generation in the regulatory scenario to 2030. The remaining ~99.8% comes from gas-fired units.[21]

It is clear that the proposed regulations are not stringent enough to drive the required transition to low-carbon electricity generation. Environment Canada's modelling shows that the federal government's goal of generating 90% of Canada's electricity from non-emitting sources will not be achieved under current regulations. Even in 2030 — a decade late — non-emitting sources will provide only 83% of Canada's electricity generation.[22]

The failure of these regulations to increase non-emitting generation stems from both the level of the performance standard as well as the design of the regulation. In particular, allowing all existing units to operate for a full 45 years before facing any GHG constraints (or incentives for reduced emissions) significantly limits the impact of the regulations, especially in the short- and medium-terms.

**Opportunities for improvement**

As proposed, it appears unlikely that these regulations will contribute sufficiently to the level of emissions reductions required from the electricity sector to achieve Canada's emissions

[20] Environment Canada, *RIAS*, 8.3.
[21] Ibid, Table 10.
[22] Ibid, Table 9.

target at lowest cost. Nor will they contribute to meeting Canada's goal for non-emitting electricity generation.

While a comprehensive climate change policy package featuring a robust national carbon price remains the best option for delivering significant emissions reductions, there is space to improve the proposed regulations and deliver a greater environmental benefit. Our recommendations for strengthening the regulations as they apply to new and end-of-life units can be found in Section 1, below.

Further, a core issue is the lack of requirements and incentives for existing units to reduce emissions. We propose several options to address these issues in Section 2, below. Several of these recommendations also address the lack of incentive for regulated units to exceed the performance standard.

# 1. Requirements for new and end-of-life units

## 1.1 Level of performance standard

The level of the performance standard is a central part of the proposed regulations, determining the extent to which CCS or other technologies must be implemented in order to build a new coal-fired power plant in Canada or extend the operation of an end-of-life unit.

The justification for setting the level of this standard at emission rates that are achievable using existing natural gas combined cycle (NGCC) generator technology under specific operating conditions is not clear. A much more ambitious standard is both technically feasible and necessary in order to swiftly decarbonize Canada's electricity system.

The urgent need to reduce emissions requires Canada to rapidly transition to non-emitting forms of electricity generation. Building additional fossil-fired generators, especially with only partial emissions capture required, is inconsistent with this goal. Further, it does little to achieve the government's 2020 commitments for GHG reductions and non-emitting electricity generation.

### Recommendation: Tighten the performance standard significantly

Much higher capture rates are feasible from CCS systems than the roughly 50% capture required from a new plant under the proposed regulation. A new pulverized coal plant with CCS can achieve an emissions rate of 112 t $CO_2$e/GWh (an 85% reduction of $CO_2$ per net kWh),

according to a recent assessment of studies.[23] If Canada truly wants to be a world leader in CCS, it must demonstrate its commitment by requiring the lowest achievable emissions rate. This means setting the performance standard for new plants at a much lower level than uncontrolled natural gas.

Coal-fired units have extremely long lifetimes, as evidenced by the regulation's proposed 45-year definition of useful life. If Environment Canada is planning to allow a new coal unit to be built and operated under the proposed standard for nearly half a century (or for an old unit to extend its life considerably), it must reflect the best available technology in its performance standard.

At worst, the standard should be set no higher than the best achievable emissions rates from baseload advanced NGCC plants. Today's advanced NGCC plants[24] can achieve average emissions rates between 341 t $CO_2$/GWh[25] and 345 t $CO_2$/GWh.[26] However, given the wide variety of operating conditions NGCC plants face, these rates will not always be feasible for every operator. A standard of 360 t $CO_2$/GWh, as originally proposed by Environment Canada, therefore appears reasonable as an initial benchmark level if there is a need to reference the standard to baseload NGCC plants.

The level of the performance standard should be tightened over time as control technologies improve through a regular review of the standard level.

**Recommendation: Do not link the performance standard with natural gas-fired electricity regulations**

Even if the performance standard for coal-fired power is ultimately benchmarked to baseload NGCC technology, which we strongly advise against, the level set in these regulations should not be the basis for the future natural gas-fired electricity generation regulations. We hold this

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[23] Edward Rubin, *Coal Initiative Reports: A Performance Standards Approach to Reducing $CO_2$ Emissions from Electric Power Plants* (Arlington, VA: Pew Center on Global Climate Change, 2009), Table 2. Available at http://www.pewclimate.org/publications/report/coal-initiative-series-performance-standards-approach-reducing-co2-emissions-ele.

[24] Defined by CEC as including two H-class turbines with a combined gross capacity of 800MW, and by EIA as including one H-class turbine with a net output of 400 MW. Conventional NGCC plants use F-class turbines in both cases.

[25] U.S. Energy Information Administration, *Updated Capital Cost Estimates for Electricity Generation Plants* (Washington, DC: Government of the United States of America, 2010), 6-2. Available at http://www.eia.gov/oiaf/beck_plantcosts/pdf/updatedplantcosts.pdf.

[26] California Energy Commission, *Comparative Costs of California Central Station Electricity Generation — Final Staff Report* (Sacramento, CA: Government of California, 2010), Table C-15. Available at http://www.energy.ca.gov/2009publications/CEC-200-2009-017/CEC-200-2009-017-SF.PDF.

perspective for two primary reasons:

First, a performance standard in this range is not an adequate objective given the federal government's GHG reduction targets.

Second, a single performance standard based on baseload advanced combined cycle gas generators will not be applicable to all types of natural gas plants (especially those that operate at lower capacity factors).

As they apply to new units, the proposed coal regulations will require major reductions from future plants compared to existing technology. It will be important that the government is consistent and equitable in looking for proportionally similar reductions from other emitting sources in the sector, namely natural gas-fired generation. A similar need for near-term reductions from existing coal-fired generation is discussed in Section 2 of this submission.

Natural gas plants operate significantly differently than coal plants do, and have a wider range of technologies with different capital stock lifetimes. As such, future natural gas-fired electricity generation regulations should not necessarily emulate the same approach taken with the currently proposed coal-fired electricity generation regulations. As such, rather than taking a plant-by-plant approach to natural gas, one option we recommend for future natural gas-fired electricity regulations would be to set a fleet-wide standard that is combined with new renewable electricity generation, as natural gas is often cited as a tool to balance variable output generation from renewable energy sources.[27]

Such a standard should be set lower than the benchmark for coal. This approach would provide flexibility for peaking plants where it would be very expensive to meet a low emissions standard, while also requiring fleet-wide reductions that could be in line with the government's GHG reduction targets. It would also ensure that equitable reductions are also achieved from natural gas fired generation, and will assist the government in meeting both its climate change goals as well as its non-emitting targets.

## 1.2 Application of Performance Standard

### Recommendation: Apply the standard to new projects immediately

In light of the urgency of moving to deep GHG reductions, new coal units without CCS are

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[27] See, for example, International Energy Agency, *Harnessing Variable Renewables: A Guide to the Balancing Challenge* (Paris, FR: IEA/OECD, 2011). Summary available at http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2403.

unacceptable *today*. Then-Environment Minister, Jim Prentice's commitment to "guard against any rush to build non-compliant coal plants in the interim" [28] must be reflected in the regulations. The simplest way to do this would be to make the performance standard for new units apply immediately, not in mid-2015.

Given Maxim Power's intention to rush construction of its H.R. Milner expansion to beat the July 2015 deadline,[29] this is far from an academic concern; it is a serious test of the integrity of these regulations. Allowing this unit to operate without any federal emissions constraints until 2060 is unacceptable and must not be allowed.

Minister Kent has recently made encouraging comments in this regard,[30] but these must be clearly reflected in the final regulation.

**Recommendation: Apply the standard without deferral to new units that incorporate CCS**

Equally important to safeguarding the environmental integrity of these regulations is removing the deferral provision for new units that are built CCS-ready. As it stands, the performance standard for new units effectively does not apply until 2025. Any coal-fired unit would need to apply CCS to meet the performance standard, so if *every* unit that proposes to apply it is exempt from the standard until 2025, the 2015 entry-into-force date is rendered meaningless.

The effect of each such deferral is up to a decade of additional emissions from a conventional coal unit. Were such a unit commissioned in the second half of 2015, the deferral would allow additional emissions of approximately 3 Mt $CO_2$ per year for eight years, with an additional 2 Mt in 2024, totaling roughly 26 Mt over the period of the deferral (per unit).[31] This is more than the total estimated emissions of all natural gas-fired electricity generation in 2010.[32]

**Recommendation: Apply the standard without deferral to end-of-life units that incorporate CCS**

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[28] Hon. Jim Prentice, *Announcement — Canada shows leadership on climate change and the environment,* address at National Press Theatre, 23/06/2010. Available at http://www.ec.gc.ca/default.asp?lang=En&n=6F2DE1CA-1&news=BB5AC3DC-837A-406E-AD28-B92ED80F5A81.

[29] John E. Lowe, letter to AUC re: Application No. 1604766 – Proceeding 203, Maxim Power Corp. HR Milner Power Plant Expansion, June 7, 2011. Available at http://www.pembina.org/docs/maxim-letter-to-auc.pdf.

[30] The Canadian Press, "Ottawa warns pending emissions rules will be enforced," *CTV News online*, September 9, 2011, http://www.ctv.ca/CTVNews/Canada/20110909/peter-kent-emissions-110909/.

[31] Assuming a supercritical 500MW baseload unit, based on emissions estimates from Maxim Power for their proposed H.R. Milner expansion.

[32] Environment Canada, *Canada's Emissions Trends*, 28.

The proposed deferral of the performance standard for end-of-life units planning to refurbish with CCS is equally unjustifiable. The concerns that prompted condensed CCS milestones for existing units are valid.[33] However, the approach taken to address them in the proposed regulations will result in an unnecessary weakening of environmental integrity by allowing extra emissions.

The simplest way to address the risk of end-of-life units operating through the deferral period only to close before the standard applies is to remove the deferral altogether. All units should be required to meet the standard upon reaching end-of-life, without exceptions, save for well-defined emergency circumstances.

Allowing units to continue generating conventional coal power well past their end-of-life is a significant weakening of the standard.

As with the deferral for new units that incorporate CCS, discussed above, the impact will be additional emissions on the order of 3 Mt $CO_2$ per unit for the first six years of the deferral and roughly 2 Mt each year thereafter until 2025.

This deferral only further erodes the contribution that these regulations will make to achieving the government's 2020 targets for emissions reduction and non-emitting electricity generation, and should be removed.

### 1.3 Equivalency agreements

**Recommendation: Allow equivalency with provinces where greater GHG reductions are projected from coal power under enacted policies**

Several provinces have taken a lead in addressing GHG emissions from coal-fired electricity generation. While some will have no coal-fired electricity generating units operating during the regulatory period (Ontario is expected to have phased out its coal generation completely by the time the regulations come into effect), others, such as Nova Scotia, are seeking to reduce generation from existing units significantly.

In cases where provinces have implemented legislation or regulations that they can credibly demonstrate will likely reduce emissions from their existing coal-fired electricity generation at least as much as the reductions projected under the federal regulations, provincial regulations could be considered equivalent to the federal ones. Given there is not yet a clear picture of

[33] As explained by Environment Canada in the RIAS, "the potential for taking advantage of the system is greater for old units as the capital investment in these units has already been recovered, and an old unit could simply treat this provision as an opportunity to defer closure until 2025."

what regulations for electricity generated from other fossil fuels will look like, this equivalency test should be confined to electricity generated from coal.

In cases where equivalency is requested, the request should be tested on an annual basis by comparing actual emissions from the province's coal-fired generators with the emissions they would have had if solely regulated by the federal regulations. The federal regulation case used for comparison should exclude any flexibilities allowing for a deferral of the standard or extension of end-of-life date.

The benchmark date for this assessment should be the date of publication of the final regulations in Canada Gazette II to avoid a situation where historical plant closures are counted against the federal regulations.

The federal regulations should continue to apply as a backstop. In the event that the provincial regulations are weakened or do not perform as expected, the federal regulations should come into force immediately. Prior to 2016, allowance could be made for a province underperforming in one year, so long as compliance is met or exceeded in all other years.

No equivalency-based exemptions should be allowed for new plants. Simply put, Canada should not allow for any new conventional coal-fired electricity generation.

**1.4 Treatment of CO2 emissions from biomass combustion**

One potential means for units to comply with the draft regulation is to co-fire biomass (typically woody biomass) with coal. Co-firing is a demonstrated technology that can be integrated with most kinds of boilers with minimal modifications;[34] however, biomass co-firing at rates high enough to meet the proposed standard is currently rare.[35] A more extensive retrofit to fire 100% biomass (commonly known as "repowering") is another option currently being adopted at units in Europe, the U.S.,[36] and Ontario.[37]

In either case, before coming into force the regulation will need to associate a deemed $CO_2$ emissions intensity to different categories of biomass. It is not environmentally acceptable to deem that intensity to be zero, because the direct $CO_2$ emissions from burning biomass may

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[34] Ausilio Bauen et al., *Bioenergy — a Sustainable and Reliable Energy Source: a review of status and prospects* (Paris, France: IEA Bioenergy, 2009). Available at http://www.ieabioenergy.com/LibItem.aspx?id=6479.

[35] One example is Vasthamnsverket in Sweden, which has co-fired up to 70% wood pellets with coal (by mass). See Yimin Zhang et al., "Life Cycle Emissions and Cost of Producing Electricity from Coal, Natural Gas, and Wood Pellets," *Environmental Science and Technology* 44 (2010), Supporting Information.

[36] Ibid.

[37] Ontario Power Generation intends to repower its Atikokan generation station with biomass in 2013. See http://www.opg.com/power/thermal/atikokan.asp.

not be fully offset by vegetation re-growth (particularly where land-use change occurs), and because there may be other significant emissions from the lifecycle of the biomass, depending on the feedstock.[38]

As a recent draft opinion from the Scientific Committee of the European Environment Agency noted, laws that exclude emissions from biomass "treat the shift from fossil fuels to any source of biomass as a 100% reduction in $CO_2$ emissions. This treatment is incorrect."[39] Rather, they suggest, emissions reductions from biomass should be counted only to the extent that use of biomass sequesters additional carbon beyond what would have occurred.

There is also considerable concern about indirect emissions from land-use changes induced by crop-based biomass production. These emissions must be taken into account in the deemed intensity factors for these fuels to ensure that the regulation realizes the full GHG reductions intended.

Despite these serious concerns, all emissions from biomass combustion are excluded under the draft coal regulation.

**Recommendation: Update treatment of biomass $CO_2$ emissions prior to entry-into-force**
Environment Canada's justification for excluding $CO_2$ emissions from biomass from the performance standard is that this approach is consistent with the Intergovernmental Panel on Climate Change (IPCC) treatment of biomass combustion for national emissions inventories.[40]

While this may be true at the moment, scientific understanding of the lifecycle emissions of bioenergy and rigorous approaches to accurately account for them have both advanced significantly since the IPCC's latest guidelines were published in 2006. This process continues, and Environment Canada should seek to account for the net climate impacts of different technologies and resources as accurately as possible in its policies.

Environment Canada is currently leading a full life cycle assessment on the use of biomass for

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[38] Timothy Searchinger et al., "Fixing a Critical Climate Accounting Error," *Science* 326 (2009), 527–528. For a perspective on standard-setting for GHG emissions from biomass, see Judith Bates et al, *Minimising greenhouse gas emissions from biomass energy generation* (Bristol, UK: Environment Agency, 2009). Available at http://www.environment-agency.gov.uk/static/documents/Research/Minimising_greenhouse_gas_emissions_from_biomass_energy__generation.pdf.

[39] EEA Scientific Committee, *Opinion of the EEA Scientific Committee on Greenhouse Gas Accounting in Relation to Bioenergy* (Brussels, BE: European Commission, 2011), 2. Available at http://www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas.

[40] Environment Canada, *RIAS*, 20.3.

electricity production to analyze the carbon impacts and non-air environmental issues.[41]

The U.S. Environmental Protection Agency (EPA) recently finalized a three-year deferral in accounting for biogenic $CO_2$ emissions under its Clean Air Act GHG programs so that it could undertake a detailed scientific and technical study to advance the issue. Based on the findings of the review it will issue any final regulations within the three years of the deferral.[42] Therefore, by mid-2014 or earlier, the EPA will have published its study as well as its revised regulations to better account for $CO_2$ emissions from biomass. The European Commission is likely to do the same.

The IPCC is also continuing to advance work on the issue. While it is not clear if the Fifth Assessment Report, to be published in 2013-2014, will include biomass-specific updates to the 2006 methodology guidelines, it will synthesize and assess the latest science around this complex issue.

Allowing the regulations to indefinitely treat all biomass as carbon neutral is inappropriate and could significantly undermine the environmental integrity of the regulations by allowing for inaccurate accounting of the net amount of $CO_2$ emissions resulting from sourcing and combusting biomass.

Through Environment Canada's work, as well as that of the EPA, European Environment Agency and IPCC, considerable progress will be made on accounting for $CO_2$ from biomass before theses regulations come into force. Environment Canada must stay current with best practice by including a provision for regular scientific review and update of the treatment of $CO_2$ from biomass. Such a review and update is essential prior to 2015.

### 1.5 Emissions from U.S. electricity imports

In Environment Canada's modelling of the regulatory scenario, international electricity imports increase in B.C. and Saskatchewan.[43] While B.C.'s current U.S. imports come from a

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[41] Environment Canada, *Request for Proposal: Life-cycle analysis expertise for bioenergy production*, July 5, 2011. Available at http://www.merx.com/English/SUPPLIER_Menu.asp?WCE=Show&TAB=1&PORTAL=MERX&State=7&id=223008&src=osr&FED_ONLY=0&ACTION=&rowcount=&lastpage=&MoreResults=&PUBSORT=0&CLOSESORT=0&IS_SME=N&hcode=fbSI2NzkRyI1YZE8fZpDAw%3D%3D.

[42] U.S. Environmental Protection Agency, "Deferral for CO2 emissions from bioenergy and other biogenic sources under the Prevention of Significant Deterioration (PSD) and Title V programs," *Federal Register* 76 (139), July 20, 2011. Available at http://www.gpo.gov/fdsys/pkg/FR-2011-07-20/pdf/2011-17256.pdf.

[43] Environment Canada, *RIAS*, Table 14.

number of states, they are mainly sourced from Washington,[44] which has the second lowest-emitting electricity system in the U.S., resulting in a weighted average emissions rate of 155 t $CO_2$ / GWh for current imports.[45] The projected additional imports to B.C. would thus add just under 1 Mt $CO_2$ over the 2015-2030 period if sources and emissions rates remained constant.

Saskatchewan gets U.S. imports almost exclusively from North Dakota,[46] which has the third most emissions-intensive electricity generation in the U.S., emitting 953 t $CO_2$/GWh.[47] Saskatchewan's increased imports would thus add 6.7 Mt $CO_2$ over the 2015-2030 period if emissions rates remain constant.

**Recommendation: Apply an equivalent standard to all U.S. electricity imports**

It is important to the integrity and fairness of these regulations that electricity imported from the United States be subject to the same performance standards as domestic generation. Replacing domestic coal-fired generation with coal-fired imports does not lead to emissions reductions.

Such an approach is already taken in California[48] and Washington,[49] where long-term contracts for out-of-state generation are subject to the same performance standard as domestic baseload generation.

Applying the standard to new import agreements would ensure that reduced coal-fired generation in Canada is not replaced with increased coal-fired generation from the U.S., and would also support domestic deployment of non-emitting generation.

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[44] Data for January-August 2011 from National Energy Board, *Electricity Exports and Imports: Monthly Statistics for August 2011* (Calgary, AB: Government of Canada, 2011), Table 3B. Available at http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/sttstc/lctrctyxprtmprt/2011/lctrctyxprtmprt2011_08-eng.pdf.

[45] Pembina Institute calculation using 2009 data. All U.S. data from U.S. Energy Information Administration, *State Electricity Profiles – 2009 Edition* (Washington, DC: Government of the United States of America, 2011). Available at http://www.eia.gov/cneaf/electricity/st_profiles/e_profiles_sum.html.

[46] Data for January-August 2011 from National Energy Board, *Electricity Exports and Imports*.

[47] 2009 data from U.S. Energy Information Administration, *State Electricity Profiles*.

[48] State of California, SB 1368 (2006). Available at http://www.energy.ca.gov/emission_standards/documents/sb_1368_bill_20060929_chaptered.pdf. Summary and associated documents available at http://www.energy.ca.gov/emission_standards/index.html.

[49] State of Washington, SB 6001 (2007). Available at http://www.leg.wa.gov/pub/billinfo/2007-08/Pdf/Bills/Senate%20Passed%20Legislature/6001-S.PL.pdf.

## 2. Lack of requirements and/or incentives for existing units

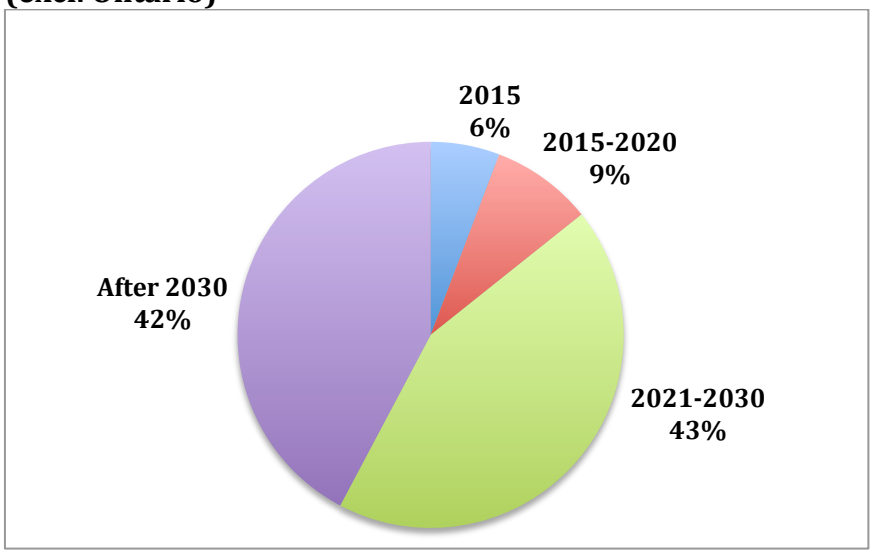
We have serious concerns with the lack of treatment of existing units in the proposed regulations, as well as with the lack of incentives for new and end-of-life units to exceed the standard.

Allowing all coal-fired units built prior to July 2015 to operate without restriction for a full 45 years, with no emissions requirements or incentives for earlier closure, is not consistent with the urgency of cutting Canada's GHG emissions.

Without an accelerated retirement of Canada's coal-fired capacity or significant additional investment in reducing its emissions, the environmental impact of these regulations and their contribution to a swift transition to non-emitting generation are severely constrained.

As shown in Figure 1, defining the economic life of a coal-burning unit as 45 years means that only about 14% of national capacity (excluding Ontario) will be subject to regulation before the end of 2020.[50] A further 42% of capacity will not be affected by the regulations until after 2030.

**Figure 1: Timing of draft regulation's impact on national coal-fired generating capacity (excl. Ontario)**

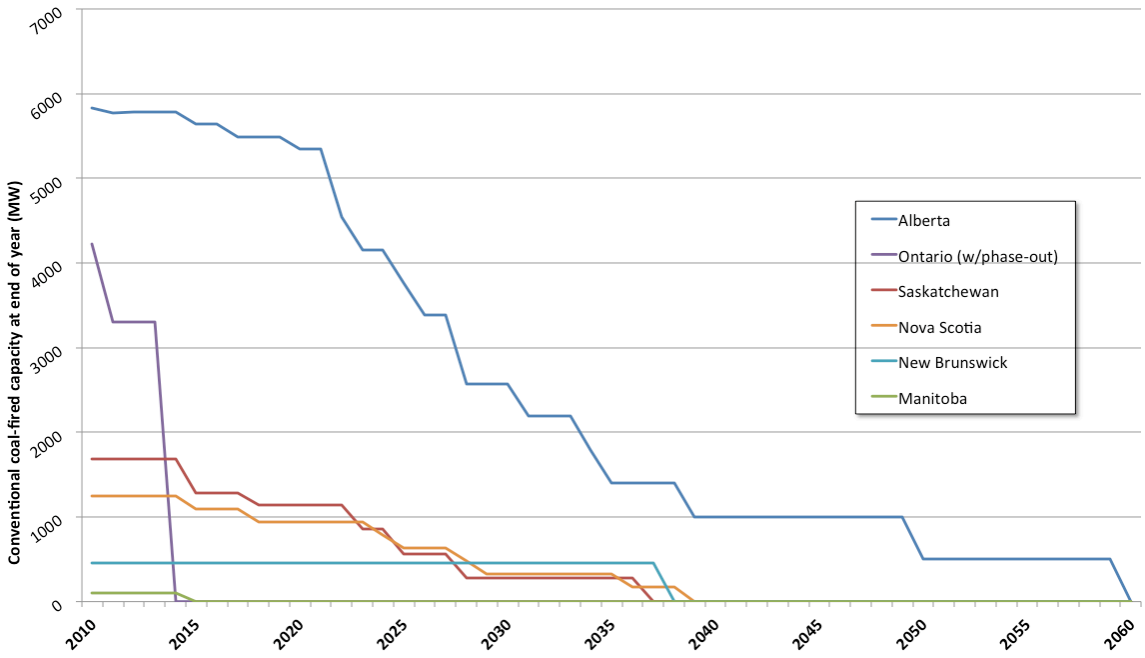



All end-of-life dates are from Environment Canada, and do not account for flexibilities. Capacity information is from other public sources.

[50] Totals do not add up identically due to rounding.

The impact this will have on individual provinces is evident in Figure 2.

**Figure 2: Provincial conventional coal-fired generating capacity under the proposed regulations**




There are several options available to address these issues and greatly increase the potential of the regulations to reduce GHGs and decarbonize the Canadian electricity sector. These are presented below and summarized in Table 1, below.

**Option 1: Apply the performance standard to existing units at the earlier of 45 years from commissioning and 2025.**

Under this approach, the performance standard would apply to any units that reach their end of useful economic life (as currently defined in the regulations) before 2025 in the same way it does now. These units may choose to meet the standard or retire; however, an added requirement is that *all* units must meet the standard by 2025 at the latest.

A full phase-out of conventional coal power by 2025 is much more consistent with the deep emissions reductions required to combat dangerous climate change. Apart from the significant domestic reductions such an action would deliver, it also places Canada in a global leadership role in this critical area. It would open a space for demonstrating widespread application of

CCS or other mitigation technologies to existing coal units — applications that, if demonstrated commercially, hold very large emissions reduction potential internationally, especially in emerging economies.[51]

Environment Canada expects that CCS will be commercially viable by 2025.[52] Technological advances and lessons learned from demonstration projects in the EU are anticipated to bring costs down significantly, making post-demonstration CCS cost-competitive with other low-carbon sources of electricity generation.[53] These benefits should apply broadly in Canada as well, both from our own demonstration projects and those in Europe. Given the anticipated cost reductions, it is reasonable to require all units to meet a standard based on its application by 2025.

Furthermore, this approach would be comparable in ambition to Ontario's coal phase-out. The capacity-weighted average age of units closed under Ontario's policy (assuming no further early closures beyond what has been announced) is between 38 and 39 years. The average age of units affected by a 2025 application of the performance standard would be approximately 37 years. Of course, units can choose to meet the federal standard by applying CCS or other technologies, giving more compliance options than in Ontario's case, where a complete cessation of coal burning is required.

By 2025, older units will be approaching their end-of-life dates and should be fully paid off. In Alberta, where many newer plants are situated, all extant power purchasing agreements (PPAs) will have expired by 2020 and any units built in the province prior to 1996 should have fully recovered their costs. Units built more recently will face greater costs, but these units were constructed with a much clearer understanding of the regulatory risk facing high-emitting electricity generation units. The application of CCS or other control technologies in 2025 should therefore be within their expectations of future compliance costs. In Alberta's deregulated market, these units are developed with private capital, and generation owners must accept the financial risk for their decisions.[54]

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[51] International Energy Agency, *World Energy Outlook 2010* (Paris, FR: OECD, 2010), 395, 423.
[52] Environment Canada, RIAS, 16.1.
[53] Zero Emissions Platform, *The Costs of CO2 Capture, Transport, and Storage: Post-Demonstration CCS in the EU* (Brussels, BE: ZEP, 2011). Available at http://www.zeroemissionsplatform.eu/library/publication/165-zep-cost-report-summary.html.
[54] Alberta Utilities Commission, "Alberta's Energy Market," webpage, http://www.auc.ab.ca/market-oversight/albertas-energy-market/Pages/default.aspx [accessed 4/10/2011].

**Option 2: Implement a tradable performance standard with increased stringency**

Economic modelling by Resources for the Future suggests that an approach based on tradable performance standards can reduce the cost of achieving a given emissions reduction in the U.S. coal-fired electricity sector by two thirds, compared to the use of an inflexible performance standard.[55] Under a flexible approach, generators that exceed the performance standard generate emissions performance credits (EPCs) that they can sell to generators who are unable to meet the standard.

The flexibility of this approach should be leveraged to increase the stringency of the proposed regulations and incentivize early action to reduce emissions from coal-fired generation. The regulation would set a schedule of decreasing emissions performance limits for existing units, reaching levels consistent with the outcomes of a well-designed climate policy package, as discussed previously.

Units that outperform the emissions standard in a given year will be credited, and those that underperform will be required to purchase credits to cover the gap between their performance and the standard. These credits could be traded between utilities, encouraging the implementation of the most cost-effective emissions reductions by allowing generators to determine where investments are most valuable. For example, a firm may choose to keep a unit operating as a conventional unit by investing in a full-capture CCS system elsewhere.

In order to encourage early closures, units that close prior to their end-of-life date would be eligible to generate credits, based on the demonstrated emissions intensity of the replaced generation in that year. This further encourages earlier retirement of conventional coal units and supports the transition to the lowest-emitting sources of replacement generation available, maximizing the benefit.

It should be noted that we strongly support the draft regulations' approach of not allowing the use of offsets for compliance with the proposed standard since there is a high risk that offsets will not represent genuine emission reductions.[56] This approach should be maintained.

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[55] Dallas Burtraw et al., *Retail electricity price savings from compliance flexibility in GHG standards for stationary sources* (Washington, DC: Resources for the Future, 2011). Available at http://www.rff.org/Publications/Pages/PublicationDetails.aspx?PublicationID=21606.

[56] P.J. Partington, *Comments on the Proposed Federal Offset System, "Canada's Offset System for Greenhouse Gases"* (Drayton Valley, AB: The Pembina Institute, 2009). Available online at http://www.pembina.org/pub/1868.

### Option 3: Apply a carbon fee to coal-fired generation

A final option would be to levy a fee on GHG emissions from coal product combustion. This creates both an incentive to improve emissions performance while a unit remains in service, as well as an incentive to invest in alternatives, including conservation and efficiency.

Significantly, it could also generate a revenue stream that could be used for transitional investments within the industry, such as support for technology demonstration projects or renewable power incentive programs. It could also be directed towards minimizing any impacts on ratepayers through support for conservation and efficiency programs, as has been successfully demonstrated in the Regional Greenhouse Gas Initiative (RGGI) program in the Northeastern and Mid-Atlantic U.S. states.[57] In either case, this option creates new revenue for important programs in an era where significant public funds are likely to be scarce.

The carbon fee would work well in combination with the current draft regulations, or with the options above. In the every case it could play a significant role in facilitating a more rapid transition towards lower-carbon generation for both generators and consumers.

**Table 2 – Summary of options for accelerating reductions from existing coal-fired units**

| Option | Stronger incentive for existing units? | Helps encourage plants to exceed standard? | Helps lower costs for a given level of ambition? | Notes regarding the use of options in parallel |
|---|---|---|---|---|
| 1. End-of-life set at earlier of 45 years or 2025. | Yes | No | No | All three options could complement the proposed regulations, as well as the other two options. |
| 2. Tradable emissions performance credits | Yes – if level of ambition is increased | Yes – if level of ambition is increased | Yes | |
| 3. Carbon fee | Yes | Yes | No – unless used as a replacement for regulations.[58] | |

[57] Thus far, RGGI member states have auctioned at least 86% of total allowances for public benefit, raising nearly $1 billion USD, of which over 50% has been earmarked for energy efficiency programs. A significant additional portion of auction revenues and allowance allocations are dedicated to additional clean energy programs. It is estimated that the efficiency funding alone has boosted regional economic activity by $2.6 billion, and created over 20,000 jobs. See Environment Northeast, RGGI Auction Tracker: State Allocations and Spending Plans – September 15, 2011 (Rockport, ME: ENE, 2011), 1. Available at http://www.env-ne.org/public/resources/pdf/ENE_Auction_Tracker_110915.pdf.

[58] However, revenue could be recycled within the sector, reducing costs for consumers and/or early technology demonstrators.