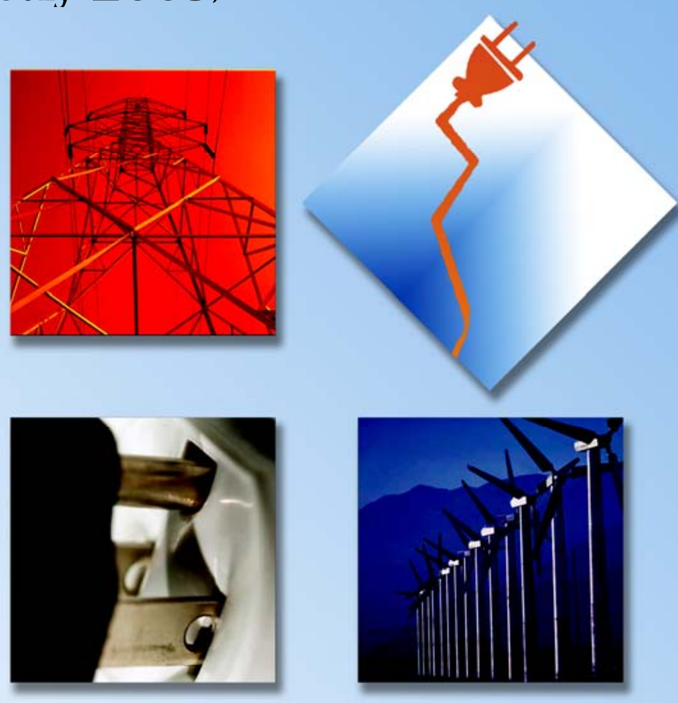
Electricity Framework 5 Year Review

—Generation & Emissions Forecasts—

(Amended July 2009)



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Executive Summary

The Clean Air Strategic Alliance (CASA) has reviewed elements of the Emissions Management Framework for the Alberta Electricity Sector developed by the Electricity Project Team (EPT) in 2003. This 5-year review is in accordance with Recommendation 29 from the CASA EPT Emissions Management Framework, November 2003. The EPT 5-year Review Project Team directed a working group to update the emissions forecast undertaken in 2003, which was completed in September 2008. This report presents an additional update to the 2008 forecast reflecting certain changes regarding several new emission limit standards that are expected to become effective January 2011. During this process some adjustments were made to the emissions forecast summarized in the September 2008 report. The findings detailed below reflect the changes in the emission forecast due to the new emission limit standards relative to the revised 2008 emission forecast[1]. All references to the 2008 emission forecast refer to the corrected 2008 forecast results. The analysis presented herein, does not reflect any other changes.

Having said this however, a quick review of the key changes to market fundamentals over the short time since the last forecast was completed is still warranted simply for context. The key changes that have evolved over the last six months to a year in respect of electricity market fundamentals relate to three key issues. First, the clarity gained from the federal government's GHG policy, released March 2008, helped frame the incremental cost to Alberta's generation fleet to be compliant with the required federal GHG emission reduction targets, in addition to the already existing Alberta provincial targets. Notwithstanding the fact that this policy is now likely to change to some form of a cap-and-trade system consistent with proposed US policy. The future climate change compliance costs are expected to be borne by the electric sector generators – most noticeably coal-fired facilities. This has correspondingly lead to some changes to the expected generation resource mix over time, where slightly more low impact or renewable capacity is now expected along with more natural gas-fired capacity—particularly in the long run. Until the full cost of physical abatement using post combustion carbon capture and sequestration (CCS) or pre combustion integrated gasification combined-cycle (IGCC) technologies are better defined, it is expected that conventional coal-fired stations are likely to find it cheaper to mitigate GHG emissions through offset markets versus physical abatement—at least until CCS technology is commercially viable and lower in expected cost. Second, as a result of the economic slowdown and recession gripping the world economies, we have now seen the first reduction in the expected long term development of Alberta's vast oil sands resource. The corresponding slowdown in electricity requirements—now felt across Alberta—is perhaps just a softening of the significant increases in demand that has occurred over the last couple of years in response to the run up in crude oil and natural gas prices and expected project development. The slowdown has resulted in not only lower electricity demand in the province but also a coincident reduction in some expected cogeneration capacity additions associated with the onsite electricity requirements of some of these large-scale projects. The third issue relates to the significant increase in electric energy pricing post 2015 corresponding to the introduction of GHG emission costs, based on the current GHG intensity based policy in Canada, and the fact that consumer behavior is likely to changed in a way that allows for increased levels of conservation. While our modeling has always incorporated certain conservation measures in response to market price—and incorporates some small change in this regard—we have not yet fully vet the likely market response given a new market awareness and the expected proliferation of demand side management tools and distributed generation that are likely to increase their market penetration. It is the author's opinion that in the longer term a significant contribution will be made to emission reductions attributed to the demand side response that has not yet been incorporated in the emission forecast. This response will be a function of the compliance cost to the electric industry and its impact of market price for electricity as well as advanced metering and demand side response enabling technologies yet to be invented or implemented in a significant way.

[1] The original 2008 emission forecast, dated September 2008, was revised in early 2009, to correct some formulaic errors and omissions that had a material impact on both historical and future emission levels and intensity calculations. For a summary of these corrections please refer to the "Electricity Framework 5 Year Review" report dated June 2009.

So while the above noted changes in the overall market fundamentals would have an effect on the forecast of emissions and subsequent emission intensity calculations, the impact would not likely alter the results presented herein in a material way.

This report presents the results of the 2009 update to the recent 2008 emissions forecasts for the four parameters of NOx, SO_2, Particulate Matter (PM), and Mercury (Hg) due to certain changes made in several emission limits expected to be effective on January 1, 2011 for all new units built beyond that date. Generally speaking the overall results of the emission forecast have not changed materially in this 2009 update relative to previous forecasts in that overall emissions levels and emission intensities are forecast to decline over time, largely due to the changing fuel mix of the expected generating fleet in Alberta. A greater reliance on low impact renewable and natural gas-fired generation in place of conventional coal-fired generation, in addition to much improved coal-fired generation technologies with lower expected emissions, are the leading causes for the change in future emission levels and declining overall emission intensities.

The following points summarize the forecast in the emissions intensities for each pollutant:

- The Mercury emission intensity level is forecast to fall from 11 kg/MWh in 2009 to just above 1 kg/MWh by 2030 or an average decline of 4.1% per year.
- The PM emission intensity level is forecast to fall from 0.09 kg/MWh in 2009 to 0.04 kg/MWh by 2030 or an average decline of 2.5% per year.
- The SO_2 emission intensity level is forecast to fall from 1,542 kg/MWh in 2009 to 686 kg/MWh by 2030 or an average decline of 2.5% per year.
- The NO_X emission intensity level is forecast to fall from 1,117 kg/MWh in 2009 to 576 kg/MWh by 2030 or an average decline of 2.2% per year.

Background & Scope of Work

Background

The Clean Air Strategic Alliance (CASA) was established in March 1994 as a forum to manage air quality issues in Alberta. CASA is a non-profit association composed of diverse stakeholders from government, industry, and non-governmental organizations. Representatives from each of these sectors are committed to developing and applying a comprehensive air quality management system for the people of Alberta.

In 2003 the CASA Electricity Project Team (EPT) evaluated several proposed scenarios for reducing air emissions of 5 priority substances from electricity generation facilities in Alberta. To assist this evaluation process, CASA required modeling of these various scenarios to estimate costs (i.e. impact to wholesale electricity price) as well as electric energy production and emissions. As a result, CASA completed a quantitative assessment of the impact on the electric sector under several distinct scenarios and sensitivities thereto resulting from a variation in certain key assumptions.

The key objectives of the previous study work was: to estimate the incremental impact on the annual average wholesale Alberta electricity price, to estimate the impact on the supply stacking order, that is generation energy production by fuel type, and to determine the electric power generation sector's aggregate emissions profile by fuel type (or by technology type) expressed as an average emission for each year.

In 2008, CASA reviewed elements of the Emissions Management Framework for the Alberta Electricity Sector developed by the Electricity Project Team (EPT) in 2003. The 5-year review was in accordance with Recommendation 29 from the CASA EPT Emissions Management Framework, November 2003. The EPT 5-year Review Project Team directed a working group to update the emission forecast undertaken in 2003, which was completed in September of 2008.

Now in 2009, an update to the 2008 emissions forecast was requested to reflect several changes to certain emission limit standards that are expected to become effective on January 2011.

Scope of Work Required

EDC Associates Ltd. will provide the CASA Electricity Framework 5-year Review Project Team sub-group the Control Technologies and Reductions Strategies, with an update to the 2008 emissions forecasts for the four parameters of NOx, SO_2, Particulate Matter (PM), and Mercury (Hg) due to certain changes made in several emission limits expected to be effective on January 1, 2011 for all new units built beyond that date.

The purpose of this work is to provide the sub-group, with an assessment of the effects that possible changes in the forecast of emissions as compared to the recent forecast analysis conducted in 2008.

EDC Associates Ltd. will provide an update of the 2008 emission forecast for the four parameters: NOx, SO_2, Particulate Matter (PM), and Mercury (Hg) reflecting the change to the emission standards post 2011, however no other changes related to market fundamentals are to be incorporated.

The primary focus is the emission forecast for the 5-year period from 2008-2013, however the sub-group is also interested in a forecast for the next 25 years (or at least until 2030), as it is recognized that the majority of emission reduction actions will be taken within that timeframe.

All materials used to prepare the forecast (i.e. technical reports) should be identified and either listed or included in appropriate appendices. The proposed changes to emission limits were supplied by the working group and are as follows:

Coal-Fired Units

For the purposes of this forecast, all future coal units are assumed to be subject to the following standards:

- Nitrogen Oxides - 0.47 kg/MWh.
- Sulphur Dioxide - 0.65 kg/MWh.
- Primary particulate matter - 0.066 kg/MWh.
- Mercury - design target of 75% capture.

(These standards only apply to coal boiler technologies without carbon capture. The standards do not apply to IGCCs and poly-generation units, which are currently treated as special cases. However, for the purposes of this forecast, all future coal units are assumed to be subject to these standards.)

Gas-Fired Units, Nitrogen Oxides

Non-Peaking Standard Formula:

- NOx (kg/h) = [Net Power Output (MW net) x A] + [Heat Output (GJ/h) x B]

Power Rating (per gas turbine only)	**Natural Gas**	
	Non Peaking ("A") (kg/MWh net)	**Peaking Standard**
More than 100 MW	0.09	600 kg/MW annual maximum Design specification of 9 ppmv
25 to 100 MW		750 kg/MW annual maximum Design specification of 15 ppmv
Less than *25* MW	0.60	1512 kg/MW annual maximum

* Note that the Net Power Output includes the capacity of both the gas turbine and any associated combined cycle steam turbine.

Heat Production Allowance "B" (kg/GJ)

- Natural Gas 0.01

Review and Comparison of Emissions Forecasts (Corrected 2008 vs 2009)

This section presents the results of the 2009 update to the corrected 2008 emission forecast results for the four parameters of NO_X, SO_2, Particulate Matter (PM), and Mercury (Hg) due to certain changes made in several emission limits expected to be effective on January 1, 2011 for all new units built and commissioned beyond that date. It should be noted that no other changes related to the underlying market fundamentals are reflected.

The charts in each section below presents the 2009 absolute emissions and emission intensity forecast, including the adjusted 2011 standards and other adjustments, and compares them to the corrected 2008 forecast results. Absolute emissions as a result of the adjusted standards are represented by the bars in the foreground while the corrected 2008 results are denoted by the area graph in the background. Tabular outputs for the 2009 and 2008 results are presented in Table 2 in the Appendix.

The resulting intensity levels for the 2009 adjusted emission standards forecast and the corrected 2008 results are represented by the blue and yellow (respective) line graphs in each chart. The aggregate emission intensity levels are calculated by dividing the absolute emission levels by the total energy production by unit which includes behind-the-fence generation. The absolute emission forecast includes behind-the-fence generation which is modeled as large, non-peaking natural gas-fired generation, since its actual energy production is excluded from the unit by unit dispatch analysis that precedes the emission forecast analysis.

Mercury (Hg) Emissions

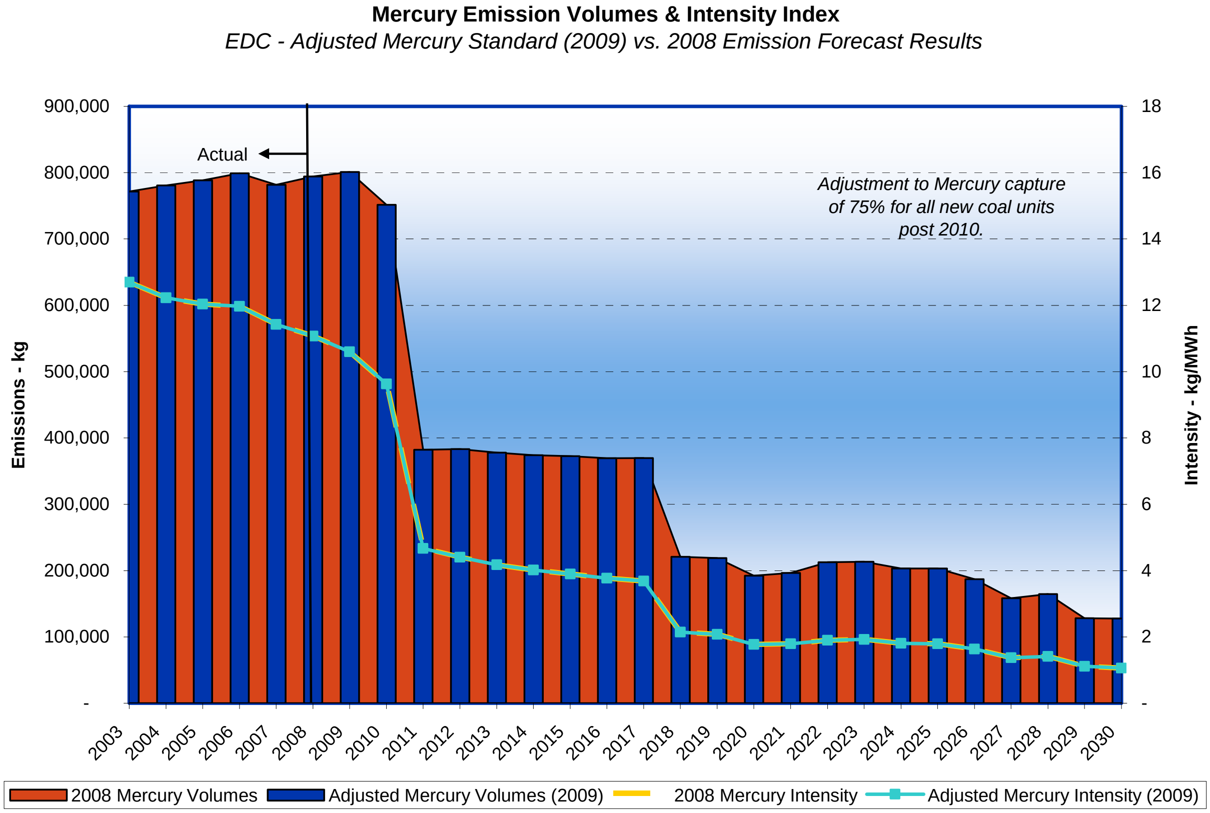
In the 2008 emission forecast results, most existing coal-fired generation facilities were required to capture 80% of their emissions. In contrast, the 2009 update requires coal-fired generators commissioned starting January 1, 2011 to capture 75% of their mercury emissions with no change to the mercury standard for existing coal units. As most new coal-fired generators scheduled to come on-line over the forecast period are proposed to use super-critical technology, absolute emissions were calculated based on 75% capture of typical Genesee 3 mercury emissions. Due to the manner in which mercury emissions for Genesee 3 are calculated there is no difference in the mercury emission intensity of this unit at the 75% or 80% capture level[2]. There was no change to the mercury emission intensity of existing coal-fired generation. Therefore, there is no change to the mercury emissions forecast in the 2009 update.

By 2030, mercury emissions from existing generators are forecast to amount to 120,968 kg while mercury emissions from those units subject to the lower emission standard are forecast to amount to 6,577 kg. The emission from those facilities subject to the 2009 standard represents only 5.2% of total absolute mercury emissions in 2030. Over the forecast period (2009 to 2030), total absolute mercury emissions are down an average of 30,611 kg or 3.8% lower each year in the 2009 forecast. In aggregate, mercury emissions are forecast to fall from 800,994 kg to 127,544 kg in 2030, for a reduction of 673,400 or 84% in the 2009 forecast update.

In general, absolute mercury emissions are forecast to decline significantly over time with the majority of this the result of retirements of coal-fired facilities. The difference between 80% capture and 75% capture for mercury emissions on super-critical technology is non-existent. Consequently, for new units the lower mercury standard proposed in the 2009 update has no impact on future absolute mercury emissions relative to the much larger impact created by the retirement of older units. The mercury emission intensity level is forecast to fall from 11 kg/MWh in 2009 to just above 1 kg/MWh by 2030 or an average decline of 4.1% per year.

[2] The methodology for calculating mercury emission intensity was provided by CASA.

Figure 1 – Mercury Emission Volumes and Intensity Index



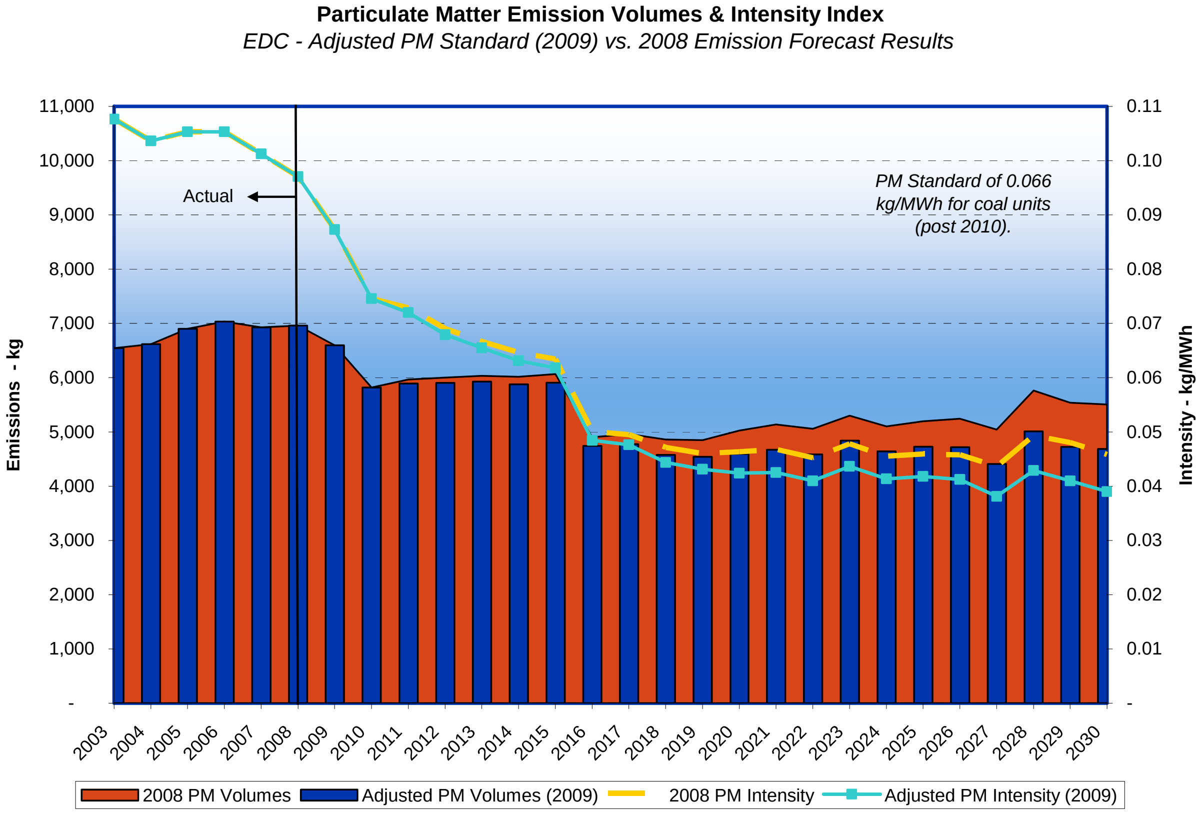
Particulate Matter (PM) Emissions

The 2009 update to the emissions forecast included an adjustment to the PM emissions target level. This analysis reflects a PM emissions target of 0.066 kg/MWh; down from the PM emissions target of 0.095 kg/MWh used in the 2008 forecast. Consequently, absolute PM emissions are expected to be lower due to the 2009 adjustment to the PM emission standard relative to the absolute PM emissions in the 2008 forecast.

As the new emission standard applied to those units commissioned starting January 1, 2011 the impact of the lower emission standard can be best quantified by separating the PM emissions of these units from the total PM emissions. In 2011, the lower emission standard decreased PM emissions from those units by 75 kg relative to the PM emissions from the same units in the 2008 forecast results. By 2030, absolute PM emissions from units commissioned starting January 1, 2011 amounted to 1,863 kg under the 2009 emission standard compared to 2,682 kg for the same units under the 2008 standards; a decrease of 819 kg or 31% lower than the 2008 forecast.

While the 2009 emission standards did lead to significantly lower emissions from those units commissioned after January 1, 2011, PM emissions from existing units remained unchanged between the two forecasts. Correspondingly, total PM emissions are expected to decline from 6,597 kg in 2009 to 4,688 kg in 2030, for a reduction of 1,909 kg or 29% in the 2009 forecast update. Figure 2 compares the PM emission volume and intensity index from the two forecasts.

Figure 2 – Particulate Matter Emission Volumes and Intensity Index



Similar to the other air pollutants emission forecasts, PM emissions are expected to decline over time, mostly due to the retirement of older facilitates. The difference between the 2009 emission forecast and the 2008 results is most noticeable in the latter years of the forecast where new generation facilities, with their lower emission standard, account for a larger share of energy production. The lower PM emission forecast and no change to energy production resulted in a lower PM emission intensity forecast. As can be seen in Figure 2, there is a slight downward slope to the forecast PM emission intensity as these older units are replaced with lower PM emitting generators. The PM emission intensity level is forecast to fall from 0.09 kg/MWh in 2009 to 0.04 kg/MWh by 2030 or a decline of 56% (2.5% per year) in the adjusted 2009 forecast.

SO_2 Emissions

Similar to the changes to the other forecast absolute emission levels for mercury and PM, the absolute emission forecast for SO_2 is lower as a result of the adjusted emission standards in the 2009 forecast. The 2009 adjustment on SO_2 emissions required those coal-fired units commissioned starting January 1, 2011 to be modeled with a 0.65 kg/MWh SO_2 standard. This was deemed to be the less stringent option for super-critical technology with the alternative being 90% SO_2 removal. Again, like the mercury and PM emissions forecast, the impacts of the adjusted emission standard are best quantified by separating out the emissions from those generators subject to the 2009 emission standard. Starting in 2011, the SO_2 emissions from those new units amount to 1,674 kg under the 2009 emission standard compared to the 2008 forecast results of 2,060 kg in 2011; a decrease of 386 kg in that year. By the end of the forecast period, absolute SO_2 emissions from those units subject to the 2009 emission standard reached 18,349 kg while the same units SO_2 emissions from the 2008 forecast results amounted to 22,583 kg. For the period 2011 to 2030, absolute SO_2 emission forecast for those units subject to the 2009 emission standard were 19% lower than the 2008 absolute SO_2 emission forecast results. Correspondingly, in aggregate SO_2 emissions are expected to decline from 116,567 kg in 2009 to 82,379 kg in 2030, for a reduction of 34,188 kg or 29% in the 2009 forecast update.

Figure 3 – SO_2 Emission Volumes and Intensity Index

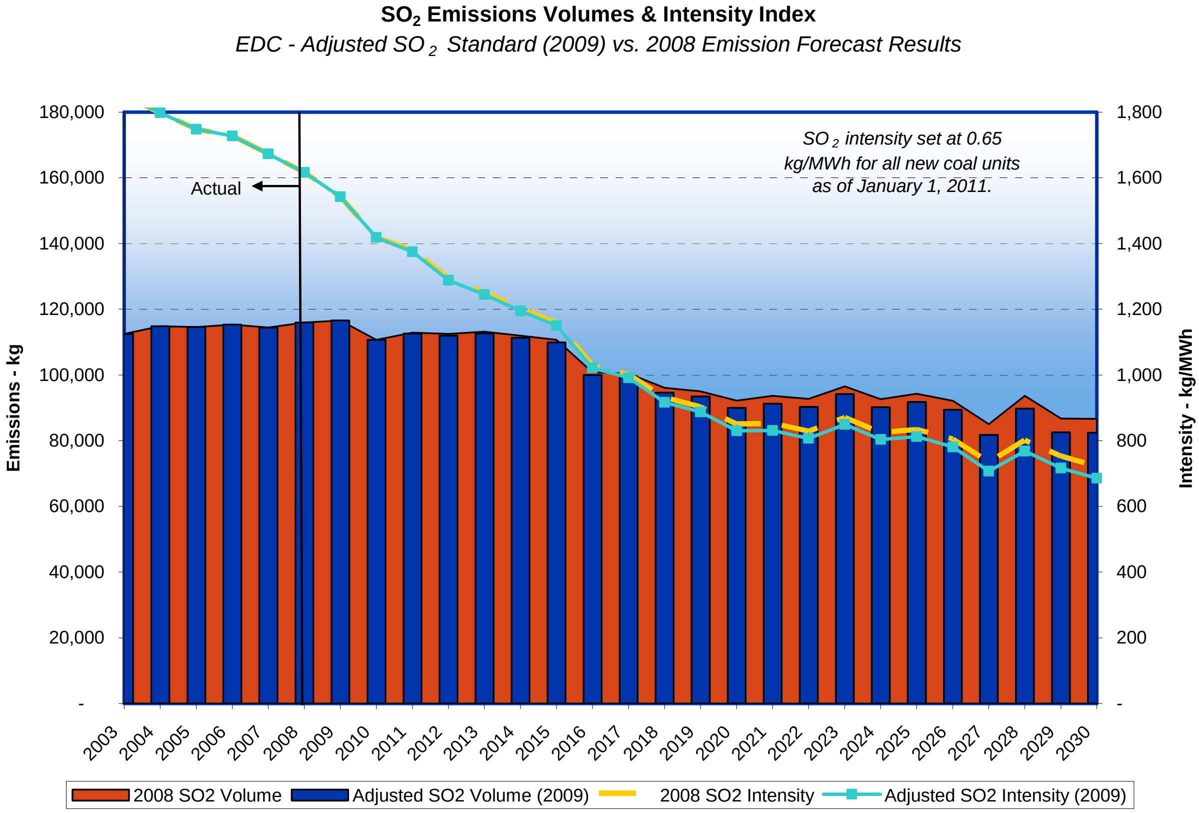


Figure 3 illustrates the difference in the total absolute SO_2 emission and the emission intensity forecasts between the 2008 results and the adjusted results of the 2009 emission standards. As can be seen from the figure, total absolute SO_2 emissions are forecast to be lower due to the 2009 emission standards. Bear in mind, once again, that the majority of the decrease in SO_2 emissions over the forecast period will be the result of the retirement of older generators.

The SO_2 emission intensity forecast is also lower than the forecast SO_2 emission intensity from the 2008 forecast results. Again, this is the result of lower forecast absolute emissions with no change to forecast future energy supply. The SO_2 emission intensity level is forecast to fall from 1,542 kg/MWh in 2009 to 686 kg/MWh by 2030 or a decline of 56% (2.5% per year).

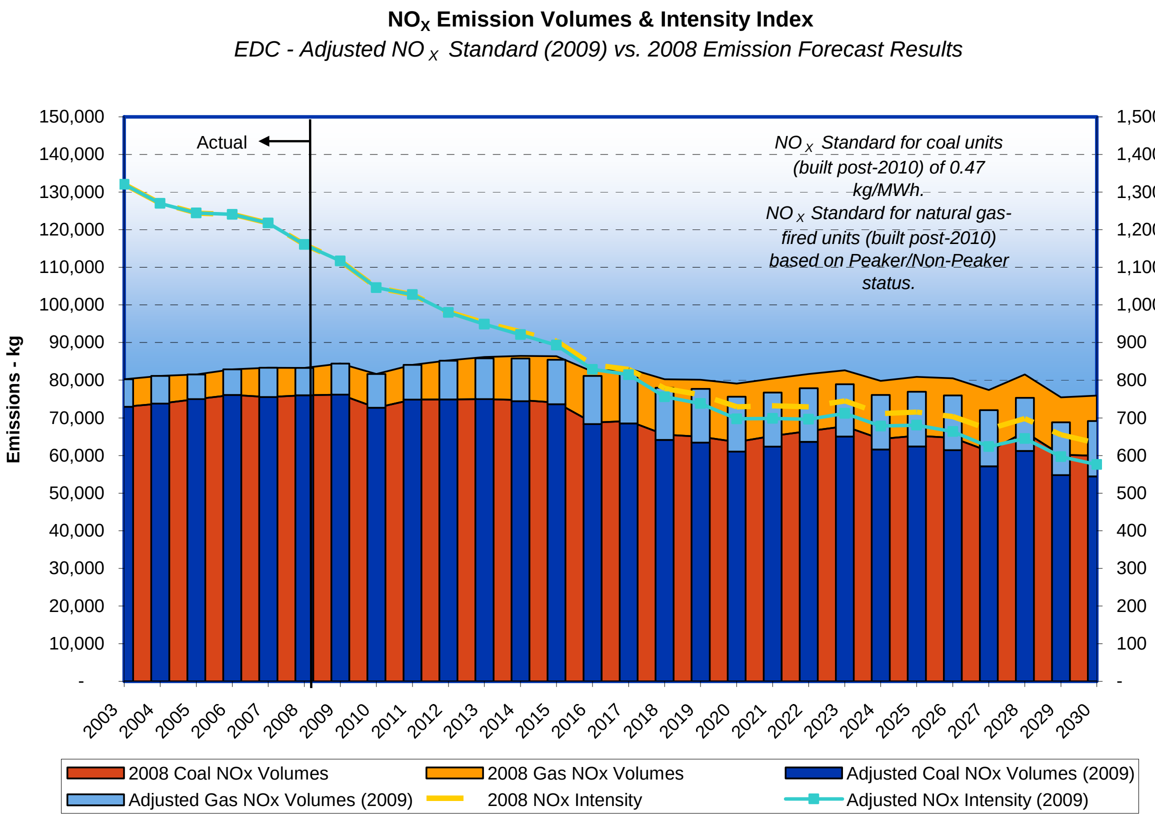
NO_X Emissions

NO_X is emitted from both coal and gas-fired generation technologies. The 2009 adjustments to emission standards incorporated a standard where future natural gas-fired facilities NO_X emissions be based on a peaker/non-peaker basis. Units were assigned a peaker/non-peaker status based on proposed technology type where simple-cycle natural gas-fired turbine and Rankin-cycle steam turbines were deemed to be peakers while all cogenerators (simple and combined-cycle) and combined-cycle natural gas turbine generators were assumed to be non-peakers. For modeling purposes, NO_X emission intensity was calculated for each natural gas-fired generator commissioned after January 1, 2011 consistent with the updated natural gas standard, as provided by CASA, depending on the size of the unit and its peaker/non-peaker designation.

In the 2008 NO_X emission forecast, all future natural gas-fired generation units were assumed to have a NO_X emission intensity of 0.3 kg/MWh. For several non-peaking natural gas-fired generators, the adjustment to the 2009 emission standard resulted in a lower NO_X emission intensity. On the other hand, the NO_X emission intensity for a couple peaking natural gas-fired units increased as a result of the 2009 emission standard adjustments. The majority of the difference between the two forecasts results in a lower NO_X emission standard for non-peaking units as an increasing amount of future natural gas-fired generation is forecast to come from non-peaking facilities. Consequently, absolute NO_X emissions from natural gas-fired generation are forecast to be lower in the 2009 update.

Again, like the other air pollutants, the impacts of the adjusted emission standard are best quantified by separating out the emissions from those generators subject to the 2009 emission standard. Starting in 2011, natural gas NO_X emissions from those new units amount to 212 kg under the 2009 emission standard unchanged from the 2008 forecast results in 2011; however by the end of the forecast period, absolute natural gas NO_X emissions from those units subject to the 2009 emission standard reached 2,427 kg while the same units natural gas NO_X emissions from the 2008 forecast results amounted to 3,728 kg. By 2030, absolute natural gas NO_X emission forecast for those units subject to the 2009 emission standard were 35% lower than the 2008 absolute natural gas NO_X emission forecast results. In aggregate, natural gas NO_X emissions are expected to increase over the forecast period as natural gas-fired generation makes up a large share of the forecast generation fleet. Natural gas NO_X emissions are forecast to amount to 8,233 kg in 2009 rising to 14,735 kg in 2030, for a increase of 6,502 kg or 79% in the 2009 forecast update.

Figure 4 – NO_X Emission Volumes and Intensity Index



The NO_X emissions associated with coal-fired generation was also adjusted based on the 2009 emission standard. Since this emission standard applies to those coal generators commissioned after January 1, 2011, the impact of the change in emission standard is best quantified by distinguishing the absolute emissions of these effected units[3]. Starting in 2011, coal-fired NO_X emissions from those new units amount to 1,777 kg under the 2009 emission standard unchanged from the 2008 forecast results in 2011; however by the end of the forecast period, absolute coal-fired NO_X emissions from those units subject to the 2009 emission standard

[3] This is with the exception of KH3 which has a NO_X emission intensity of 0.69 kg/MWh as per the emission intensity breakdown provided by CASA (dated June 19, 2009).

reached 14,026 kg while the same units coal-fired NO_X emissions from the 2008 forecast results amounted to 19,478 kg. By 2030, absolute coal-fired NO_X emission forecast for those units subject to the 2009 emission standard were 28% lower than the 2008 absolute coal-fired NO_X emission forecast results. In aggregate, coal-fired NO_X emissions are expected to decrease over the forecast period mostly as older coal facilities retire and are replaced with lower emitting technologies. Coal-fired NO_X emissions are forecast to amount to 76,193 kg in 2009 declining to 54,441 kg in 2030, for a decrease of 21,752 kg or 29% in the 2009 forecast update.

Over the forecast period (2009 to 2030), natural gas-fired NO_X emissions are forecast to rise by an average of 296 kg or 3.6% each year while coal-fired NO_X emissions are forecast to decrease by an average of 989 kg or 1.3% each year. Natural gas-fired emissions are expected to increase over the forecast period as a result of increase electricity production from gas-fired generators. In contrast, coal-fired NO_X emissions are forecast to decrease largely as existing units with higher NO_X emission intensities retire and are replaced, to some extent, with lower emitting technologies. Correspondingly, aggregate NO_X emissions are forecast to decline from 84,425 kg in 2009 to 69,176 kg in 2030 for a reduction of 15,249 kg or 18% in the 2009 forecast update.

The NO_X emission intensity level is expected to fall over the forecast period in the 2009 update as a result of lower absolute NO_X emissions and no change to energy production from the 2008 forecast with the majority of the change the result of the lower coal based NO_X emission standard in the 2009 forecast. The NO_X emission intensity level falls from approximately 1,117 kg/MWh in 2009 to 576 kg/MWh by 2030 a decline of 48% (2.2% per year).

Appendix 1 – Energy Production, Emission Forecasts and Emission Intensities

Table 1 – 2009 Update vs. 2008 Results AIES Energy Production by Fuel type Comparison

2009 Update

Annual Energy Output by Fuel (GWh/Year)	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Coal	45,256	45,523	43,885	46,879	47,494	48,210	48,824	48,827	48,739	50,654	53,081
Natural Gas	21,276	24,288	26,620	27,470	31,199	34,019	35,877	37,954	48,336	48,806	51,151
Hydro	1,786	1,763	1,797	1,765	1,808	2,066	2,024	2,040	2,386	2,707	2,831
Wind	1,675	1,977	3,136	3,914	4,444	4,515	4,717	5,126	6,499	7,178	7,164
Imports	937	1,181	1,682	963	1,045	817	758	751	1,557	1,286	3,785
Other	801	842	940	874	939	864	925	902	901	2,393	2,094
Total	**71,731**	**75,574**	**78,061**	**81,866**	**86,929**	**90,492**	**93,124**	**95,600**	**108,419**	**113,024**	**120,107**

2008 Results

Annual Energy Output by Fuel (GWh/Year)	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Coal	45,256	45,523	43,885	46,879	47,494	48,210	48,824	48,827	48,739	50,654	53,081
Natural Gas	21,276	24,288	26,620	27,470	31,199	34,019	35,877	37,954	48,336	48,806	51,151
Hydro	1,786	1,763	1,797	1,765	1,808	2,066	2,024	2,040	2,386	2,707	2,831
Wind	1,675	1,977	3,136	3,914	4,444	4,515	4,717	5,126	6,499	7,178	7,164
Imports	937	1,181	1,682	963	1,045	817	758	751	1,557	1,286	3,785
Other	801	842	940	874	939	864	925	902	901	2,393	2,094
Total	**71,731**	**75,574**	**78,061**	**81,866**	**86,929**	**90,492**	**93,124**	**95,600**	**108,419**	**113,024**	**120,107**

Table 2 – Annual Emission Values Comparison

EDC - 2009 Update vs. 2008 Results Update

Mercury	Annual Mercury Emission (kg/MWh) and Annual Mercury Index (kg/MWh)										
	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
2009 Update - Mercury Volume	794,342	800,994	751,640	382,106	383,183	377,807	374,122	372,797	192,199	203,019	127,544
2009 Update - Mercury Intensity	11	11	10	5	4	4	4	4	2	2	1
Corrected 2008 Update - Mercury Volume	794,342	800,994	751,640	382,106	383,183	377,807	374,122	372,797	192,199	203,019	127,544
Corrected 2008 Update - Mercury Intensit	11	11	10	5	4	4	4	4	2	2	1

SO_X	Annual SO_X Emission (kg/year) and Annual SO_X Index (kg/MWh)										
	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
2009 Update - SO_X Volume	115,940	116,567	110,713	112,541	111,976	112,651	111,279	109,913	89,998	91,808	82,379
2009 Update - SO_X Intensity	1,616	1,542	1,418	1,375	1,288	1,245	1,195	1,150	830	812	686
Corrected 2008 Update - SO_X Volume	115,940	116,567	110,713	112,927	112,477	113,191	112,000	110,720	92,228	94,236	86,614
Corrected 2008 Update - SO_X Intensity	1,616	1,542	1,418	1,379	1,294	1,251	1,203	1,158	851	834	721

NO_X	Annual NO_X Emission (kg/year) and Annual NO_X Index (kg/MWh)										
	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
2009 Update - NO_X Coal Volume	76,012	76,193	72,683	74,883	74,942	74,955	74,432	73,616	61,028	62,431	54,441
2009 Update - NO_X Gas Volume	7,248	8,233	8,986	9,223	10,239	10,910	11,352	11,793	14,585	14,511	14,735
2009 Update - NO_X Volume	83,261	84,425	81,668	84,106	85,180	85,865	85,784	85,408	75,614	76,942	69,176
2009 Update - NO_X Intensity	1,161	1,117	1,046	1,027	980	949	921	893	697	681	576
Corrected 2008 Update - NO_X Coal Volum	76,012	76,193	72,683	74,883	74,942	74,997	74,745	74,046	63,552	65,247	59,893
Corrected 2008 Update - NO_X Gas Volum	7,248	8,233	8,986	9,223	10,325	11,210	11,744	12,328	15,522	15,634	16,035
Corrected 2008 Update - NO_X Volume	83,261	84,425	81,668	84,106	85,266	86,207	86,489	86,374	79,074	80,881	75,928
Corrected 2008 Update - NO_X Intensity	1,161	1,117	1,046	1,027	981	953	929	903	729	716	632

PM	Annual PM Emission (kg/year) and Annual PM Index (kg/MWh)										
	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
2009 Update - PM Volume	6,962	6,597	5,819	5,892	5,905	5,929	5,877	5,911	4,595	4,726	4,688
2009 Update - PM Intensity	0.10	0.09	0.07	0.07	0.07	0.07	0.06	0.06	0.04	0.04	0.04
Corrected 2008 Update - PM Volume	6,962	6,597	5,819	5,967	6,002	6,033	6,016	6,067	5,026	5,196	5,506
Corrected 2008 Update - PM Intensity	0.10	0.09	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.05	0.05