# House Bill 10-1365_Clean Air-Clean Jobs Act
## Fact Sheet

### House Bill 10-1365 represents a historic milestone in energy policy:

- The act creates a new framework for coordination and cooperation among industry, policymakers and regulators.
- The act achieves significant air pollution reductions from power generation by replacing aging coal-fired generation with cleaner, more flexible natural gas generating units.
- Increased use of a quick-starting fuel creates a technology platform to enable higher penetrations of renewable energy sources such as wind and solar.
- The act is designed to mitigate long term financial risk to both utilities and ratepayers from pending U.S. Clean Air Act regulations.

### Key Provisions of Approved Plan:

- Implementation of the act will reduce atmospheric nitrogen oxide (NOx) levels by 88 percent and carbon dioxide ($CO_{2)}$ levels by 28 percent.[1]
- Emission reductions are achieved by retiring 551 megawatts (MW) of coal-fired electric generation, controlling 742 MW of coal-fired generation with emission reducing retrofits, and fuel switching 443 MW of coal-fired generation to natural gas.[2]
- The total construction, capital expenditure and labor requirements needed to comply with the bill create a net positive economic benefit to the State of Colorado by creating up to 630 new jobs in the construction and ancillary services industries.[3]
- A long term natural gas supply contract has been bid and preliminarily approved by the Public Utilities Commission stabilizing rates for increased gas required for replacement facilities.

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[1] **Answer Testimony and Exhibits of the Colorado Department of Health and Environment**, Docket 10A-245E

[2] **C10-1330 Final Order Approving Emission Reduction Plan**, Docket 10M-254E, Colorado Public Utilities Commission.

[3] "**Economic Impacts of Implementing the Colorado Clean Air-Clean Jobs Act under different scenarios**" Exhibit No. TJS-3 to Answer Testimony of Timothy Sheesley, Public Service Company of Colorado, Docket No. 10A-245E.

# Colorado's Clean Air-Clean Jobs Act

A Holistic Approach to Energy, Economy and Environment

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## I. Executive Summary

Colorado HB10-1365 signed by Governor Bill Ritter Jr. on April 19, 2010, established specific goals for investor-owned utilities (IOUs) in Colorado to reduce nitrogen oxide (NOx) emissions from electric power generation.

The act required Colorado IOUs (Xcel Energy and Black Hills Energy) to develop plans to achieve such reductions and to give primary consideration to replacing or repowering coal-fired generation with natural gas and other low-emitting resources, including energy efficiency. This paper summarizes the key policy elements contained in HB10-1365, The Clean Air – Clean Jobs Act, and provides estimates of the economic, environmental and policy impacts to Colorado from implementation of the law.

Important implications of the Clean Air–Clean Jobs Act include:

- Implementation of the act will reduce NOx levels by 88 percent and carbon dioxide ($CO_{2)}$ levels by 28 percent.
- Emission reductions are achieved by retiring 551 megawatts (MW) of coal-fired electric generation, controlling 742 MW of coal-fired generation with emission reducing retrofits, and fuel switching 443 MW of coal-fired generation to natural gas.
- The total construction, capital expenditure and labor requirements needed to comply with the bill create a net positive economic benefit to the State of Colorado by creating up to 630 new jobs in the construction and ancillary services industries.[1]

## II. Background

Faced with looming federal air quality regulations involving multiple state agencies and stakeholders, the Governor's Office, industry stakeholders and the Colorado General Assembly proposed a holistic approach to address emissions in the electric utility sector. Policymakers believed that a coordinated, comprehensive approach to curtail emissions would likely result in superior environmental performance at lower cost than the traditional, piecemeal, plant-to-plant approach. The legislative outcome of this effort was proposed in House Bill 10-1365, the Colorado Clean Air-Clean Jobs Act.

Colorado is subject to federal air quality regulations established under the federal Clean Air Act, which gives the U.S. Environmental Protection Agency (EPA) authority to limit criteria emissions of air pollutants stemming from electric power generation.
Taking a proactive approach to reduce emissions and improve air quality will have significant positive effects on human health. The correlation between poor air quality and negative health effects are well documented.[2] The health effects caused by air pollutants

[1] "**Economic Impacts of Implementing the Colorado Clean Air-Clean Jobs Act under different scenarios**" Exhibit No. TJS-3 to Answer Testimony of Timothy Sheesley, Public Service Company of Colorado, Docket No. 10A-245E.

[2] **U.S. Environmental Protection Agency**, "Ozone and Your Patient's Health, Training for Health Care Providers," http://www.epa.gov/o3healthtraining/refsfigs.html.

may include difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, more doctor or emergency room visits, more hospital admissions and premature death.

Since the advent of Amendment 37 in 2004, the Colorado General Assembly has passed numerous bills that indicate a desire to increase penetration of renewable energy and lower emitting electric generation resources. HB10-1001, passed in 2010, for example, amended the Renewable Energy Standard (RES) requiring Colorado's investor-owned utilities to acquire electricity from eligible renewable energy resources amounting to 30 percent of their retail sales by 2020.

The Clean Air–Clean Jobs Act ("the act") creates a unique and historic opportunity to begin the transition from reliance on aging, high-emitting coal-fired power plants to a cleaner, more sustainable electric system. Two phases of EPA air quality regulations—reduction of ozone and of regional haze—are primarily targeted with the act.

> **Ozone:** Colorado is currently out of compliance with the EPA's 2008 ozone standard of 75 parts per billion (ppb), and the state has been instructed to develop a plan to bring Colorado into attainment. Noncompliance with the ozone standard puts Colorado at risk of serious penalties, including withholding of significant federal funding. In addition to these penalties, a high level of atmospheric ozone puts the health of Colorado citizens at risk.[3] Although Colorado has developed strategies to reach attainment under the 2008 ozone standard, EPA has proposed a more stringent ozone standard. The new standard is based on scientific research that suggests the 2008 standard was not sufficient to safely reduce the harmful effects of ozone relative to known dangers to human health. The suggested range for the new standard, between 60 ppb and 70 ppb, is expected to be finalized in 2011. Regional air quality modeling shows that attaining a more stringent ozone standard will present a significant challenge for the state. Reductions from large emission sources such as coal-fired power plants will be necessary to come into attainment under a new, more stringent standard.
>
> **Regional Haze:** The second major air quality regulation underlying the act is the EPA's Regional Haze Program, which is designed to improve air quality and visibility in the national park and wilderness system. Under the program, the state must periodically submit a State Implementation Plan (SIP) that outlines measures taken to reduce regional haze. Colorado's SIP under the Regional Haze Program currently is overdue. During the summer of 2010, EPA issued a letter to Governor Bill Ritter Jr. stating that Colorado was overdue for SIP submission and that that the state must file with EPA by January 2011. If the Regional Haze SIP is not submitted to EPA in a timely manner, the agency assumes responsibility for the state's regional haze program and develop a Federal Implementation Plan (FIP) to regulate large sources of visibility impairing pollutants, nitrous oxide (NOx) and sulfur dioxide ($SO_2$), This EPA mandate would address only the

[3] **U.S. Environmental Protection Agency**, "Health effects of ozone in the general population," http://www.epa.gov/o3healthtraining/population.html#effects.

federal air quality requirements for regional haze, and would thus contravene the Colorado legislature's intent that air quality issues be addressed in a coordinated and comprehensive manner.

## EPA Ozone Standard

Until the late 1990s, the EPA used a one-hour ozone standard to determine if a region was in attainment. If a region is determined to be in nonattainment, the state risks long-term penalties, including withholding of federal funds. Under this one-hour standard, the Denver metropolitan area was in nonattainment. Controls for volatile organic compounds (VOCs) were installed throughout the 1980s and 1990s, but NOx controls were not considered at the time. In 1997, the EPA moved to an eight-hour ozone standard.

This more stringent standard put both the northern Front Range and the Denver metropolitan area in nonattainment. The eight-hour ozone nonattainment area consists of a nine-county area—including the counties of Adams, Arapahoe, Boulder (including most of Rocky Mountain National Park), Broomfield, Denver, Douglas, Jefferson, and a portion of Larimer and Weld. Mobile, area and stationary source controls for VOCs were adopted in 2004, 2006 and 2008. NOx controls were considered, but not implemented.

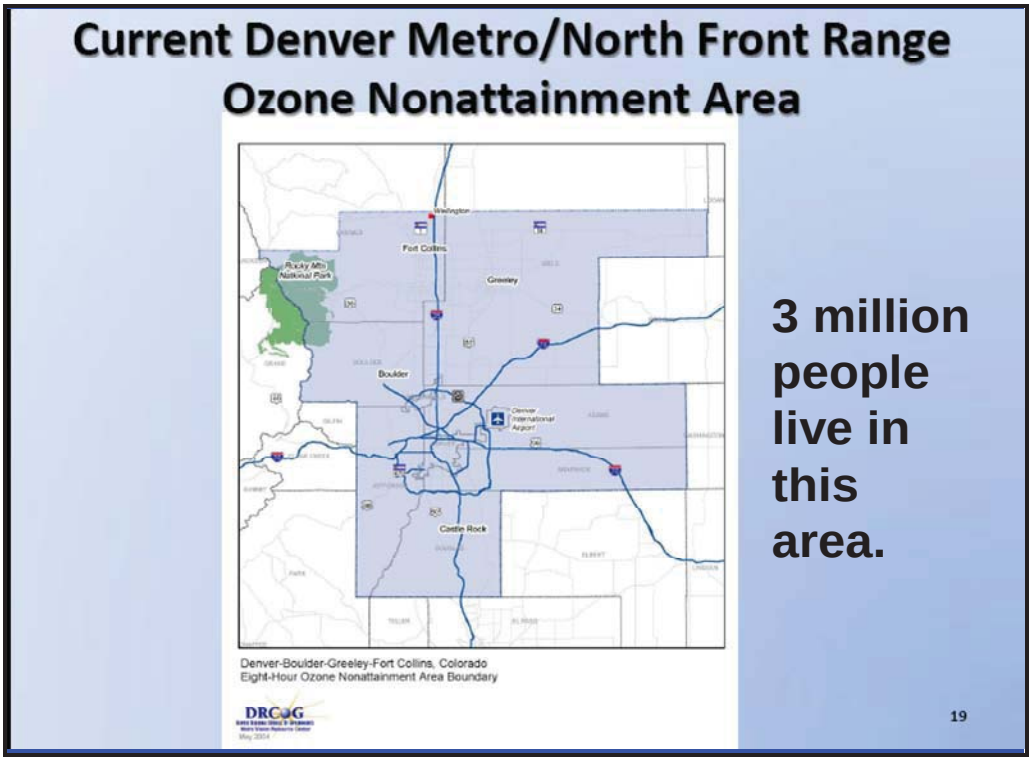


**Figure 1.** *Current Denver Metro/North Front Range Ozone Nonattainment Area*
**Source**: Denver Regional Council of Governments

In January 2010, the EPA proposed an amendment to the existing eight-hour standard. The current standard is being amended based on testimony from the Clean Air Scientific Advisory Council (CASAC), which maintained that the existing standard of 75 ppb fails

to protect human health. This reduction will decrease the negative health effects associated with exposure to ground-level ozone, especially in children, people with lung disease, and older adults who typically are more sensitive to ozone. A final ruling from the EPA has yet to be issued, but the acceptable ozone levels are expected to be lowered from the current standard of 75 ppb to between 60 ppb to70 ppb. The Denver metropolitan area and the northern Front Range are likely to stay in nonattainment, and other regions may be added, depending on the final EPA ozone standard.

### U.S. Clean Air Act and the Regional Haze Standard

The U.S. EPA's Regional Haze Rule went into effect on August 30, 1999. The rule sets "… as a national goal the prevention of any future, and the remedying of any existing, impairment to visibility" in designated "class I areas" such as national parks and wilderness areas as expressed in Section 169A of the Clean Air Act. The EPA identified 156 Class I areas nationwide, 12 of which are located in Colorado. Under the rule, each state is required to submit a Regional Haze State Implementation Plan. The SIP must show (1) reasonable progress toward meeting the national goal and (2) compliance with specific provisions, including the Best Available Retrofit Technology (BART) requirements. Incorporated in the Regional Haze SIP will be changes required under the act to reduce air emissions by replacing or repowering coal-fired power plants with natural gas and other low-emitting resources.

**Photos: Rocky Mountain National Park**
Source: http://www.epa.gov/visibility/parks/rockymtn.html

BART is a key element of the Regional Haze Rule. Section 169A(b)(2)(A) of the Clean Air Act requires BART for certain existing major facilities that began operation between 1962 and 1977 and that potentially could emit more than 250 tons of visibility reducing pollution per year. Electric generating units are included in this list. EPA's Regional Haze Rule requires state SIPs to include BART controls and emission limits for each BART-eligible source that may reasonably be anticipated to impair visibility in any Class I area, unless the state demonstrates that an emissions trading program or other alternative measure will achieve greater reasonable progress.[4] Colorado submitted plans to EPA in 2008 and 2009 that address BART for large stationary sources and that demonstrate how numerous other control measures improve visibility. The EPA

[4] **Colorado Air Quality Control Commission Meeting Minutes**, http://www.cdphe.state.co.us/op/aqcc/meetingmaterials/0810/Reg%20Haze/AICSSigned.pdf page.

informed Colorado that its 2009 Regional Haze SIP, which included most of its BART determinations, was not acceptable in its current form; EPA cited several deficiencies. Colorado was one of 37 states that failed to meet all or part of the Regional Haze SIP requirements. Colorado is now working on the final edition, which addresses the deficiencies identified by EPA and takes a more in-depth look at further reducing emissions from large stationary sources.

In addition, several coal-fired generation facilities statewide will be subject to EPA's Industrial Boiler MACT, proposed in April 2010 and currently scheduled for finalization in January 2011. Those regulations will implement requirements for mercury, carbon monoxide, particulates, hydrogen chloride, dioxins and furans.

### Policy and Public Opinion

The Clean Air-Clean Jobs Act drew wide political and public support and relatively limited opposition. The act passed the House of Representatives on a vote of 53-12 and passed the Senate on a vote of 20-13, with one abstention. A bipartisan research team of Public Opinion Strategies (R) and Fairbank, Maslin, Maullin, Metz & Associates (D) examined public perceptions regarding compliance measures included in the act. The polling data demonstrated overwhelming voter support for shifting Colorado's electricity generation from coal to renewable energy, energy efficiency efforts and natural gas. Research also represented the change in support levels change once citizens understand the cost implications of the proposal.

### Poll Findings

- Colorado voters strongly prefer (79 percent to 17 percent) renewable energy and natural gas over coal as an energy source for Colorado.
- Seventy-six percent support Xcel's plan to shift from coal to natural gas and renewable energy such as wind and solar; they also support an increase in energy efficiency efforts.
- This support was strong among all subgroups, including Democrats (89 percent), Independents (73 percent), Republicans (64 percent) and Denver Metro (78 percent) and West Slope residents (70 percent). No subgroup demonstrated less than 62 percent support for the proposal.
- Support remains solid after voters hear about cost implications of the plan. Seventy-one percent support it with a 1 percent increase in customer prices, and 68 percent support it with a 3 percent increase.
- Nearly two-thirds (64 percent) of Coloradans reject recent coal industry objections and agree that the changes implied in the act will yield critical health benefits.
- Enthusiasm for this proposal may be rooted in long-held concerns about air quality in Colorado—nearly four in ten (38 percent) respondents reported air pollution to be their top environmental concern.

### Reasonable and Forseeable Requirements

The act requires Colorado IOUs that own or operate coal-fired electric generating units—Xcel Energy and Black Hills Energy—to reduce nitrous oxides (NOx) to 70 percent to 80 percent below the year 2008 recorded emission levels. The emission reduction required

must cover the lesser of 900 megawatts or 50 percent of the utility's coal-fired electric generating units within its fleet of power plants in Colorado.

The IOUs must also meet the current and "reasonably foreseeable" requirements of the federal Clean Air Act and state law. In a new model of air quality and energy policy coordination, the act brings together the associated rulemaking and evaluation process of the Colorado Public Utilities Commission (PUC), the Colorado Department of Public Health and Environment (CDPHE), the Air Quality Control Commission (AQCC), the General Assembly (GA) and IOUs.

### Primary Governmental Agencies:

**PUC:** The Colorado PUC serves the public interest by effectively regulating utilities and facilities so consumers in the jurisdictional markets receive safe, reliable and reasonably priced services consistent with the state's economic, environmental and social goals. The act incorporates public health issues associated with clean air into the regulatory process of the PUC by requiring the approval of a plan by CDPHE to meet the NOx reduction goals. On August 13, 2010, both Xcel Energy and Black Hills Energy submitted separate plans to meet the goals of the act. The PUC could not approve a plan unless the CDPHE determined the plans were consistent with the current and reasonably foreseeable requirements of the federal Clean Air Act. Through these assignments, the act set independent and complementary roles for the CDPHE and the PUC.

**CDPHE:** In determining what was "reasonable and foreseeable," the CDPHE testified that regional haze and ozone were the primary current and reasonably foreseeable air pollution requirements under the federal and state clean air laws. In addition, the CDPHE determined that requirements on sulfur dioxide ($SO_2$) and mercury also were reasonably foreseeable. Also the CDPHE noted the Black Hills Energy facility would be subject to EPA's pending Industrial Boiler MACT rule. Finally, the department gave due consideration to the foreseeable rulemakings on greenhouse gas (GHG) and carbon dioxide regulation as evidenced by the current promulgation of rules surrounding $CO_2$ from stationary industrial sources, otherwise known as the "tailoring" rulemaking.[5] In September 2010, the EPA declared it recently "…finalized an endangerment finding on greenhouse gases, proposed the first national rules to reduce GHG emissions under the Clean Air Act and initiated a national reporting system for greenhouse-gas emissions." All these actions indicate forward movement on greenhouse gas and carbon dioxide regulations.

### Timeline and Logistics

The act outlined a timeline to enable incorporation of utility plans into the Regional Haze SIP due to the Colorado General Assembly and the EPA in January 2011. Figure 2 represents critical milestones associated with the act with the initial regulatory proceedings and the associated final approval of the SIP to be submitted to the EPA as soon as early February[6].

[5] Answer Testimony and Exhibits of Paul Tourangeau, Docket No. 10A-245E
[6] Statement made by staff at the Jan 7, 2011 Air Quality Control Council Hearing

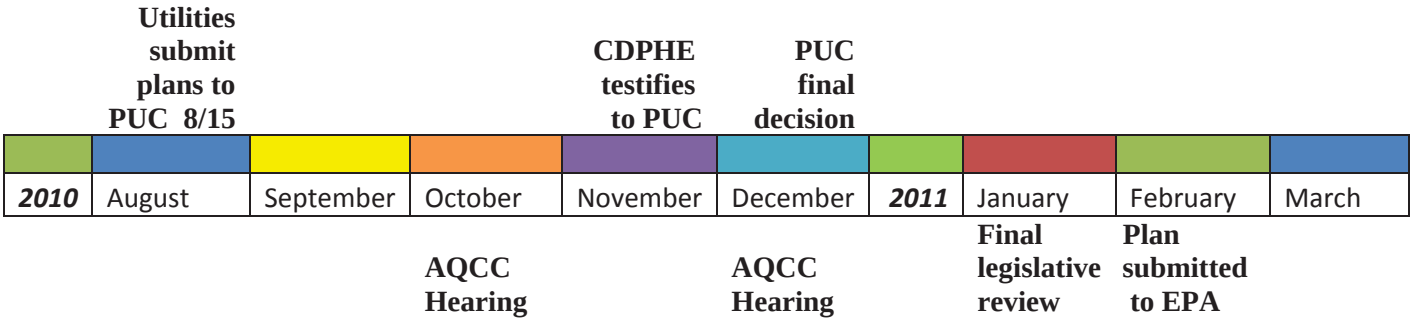


**Figure 2.** Projected *2010-2011 Timeline for House Bill 10-1365*

After the IOU's plan has been approved by the PUC and further approved by the Air Quality Control Commission (AQCC), it proceeds to the General Assembly for consideration as part of the Colorado SIP related to regional haze; the SIP then is submitted to the EPA. If the final approved provisions of the SIP are not consistent with the air quality provisions of the plan the commission approved, the company may file a revised plan with the commission that modifies the original plan to obtain consistency with the SIP.[7] The legislature will have the opportunity to review the approved SIP, which contains large portions of the approved plan from the PUC to meet EPA regulations. The AQCC will approve changes to the SIP, many of which are a direct result of implementation measures taken in the act.

In 2000, the adoption of HB 1172 changed Legislative Council's role in the SIP process from a required review of all modifications adopted by the AQCC to one initiated by a member's written request for a review of specific changes. Under current law, the AQCC must submit a report by January 15 to the Legislative Council chairperson describing any additions or changes to the SIP adopted during the prior year. Copies also must be made available to the public and members of the General Assembly.

If a member would like the Legislative Council to review a particular change noted in the report, he or she must submit a written request to the chairperson by February 15. Upon receipt of the request, the chairperson must schedule a Legislative Council hearing to conduct a review. The review must "… determine whether the addition or change to the SIP element accomplishes the results intended by enactment of the statutory provisions under which the addition or change to the SIP element was adopted."[8] Once the public hearing is conducted, the Legislative Council may recommend the introduction legislation based on the results of its review. If the council does not make such a recommendation and the member who requested the review intends to introduce a bill, he

[7] § 40-3.2-208(3), C.R.S.
[8] § 5-7-133 (2) (a), C.R.S.

or she must provide written notice to the chairperson within three days of council's decision against bill introduction. Any bill, whether sponsored by a member of Legislative Council or other legislator, that addresses changes to the SIP is exempt from the sponsor's bill limit. If neither the council nor the requesting member introduces a bill, the AQCC changes will be submitted to the EPA for approval and incorporation into the SIP. If legislation is introduced but subsequently fails to pass, the AQCC changes then will be submitted for incorporation into the SIP. This final approved plan will be submitted to the EPA for review and approval. EPA approval of the final SIP will allow Colorado to retain federal funding in various areas and move forward with the principle goal of the act, which is to cost effectively meet federal environmental regulations in a holistic, orderly manner rather than to continue with the traditional, piecemeal and increasingly expensive plant-by-plant permitting procedure.

### Environmental and Health Impacts

Another driving factor behind the act is the cost associated with the effects of coal-based electricity generation on health. Testimony on file estimates that neighboring communities will save $90 million in air pollution and health damages when the Cherokee Station plant is retired.[9] Figure 3 shows estimates of the total emissions profile of a 550 MW coal fired power plant versus a natural gas fired power plant running a 75% capacity factor.

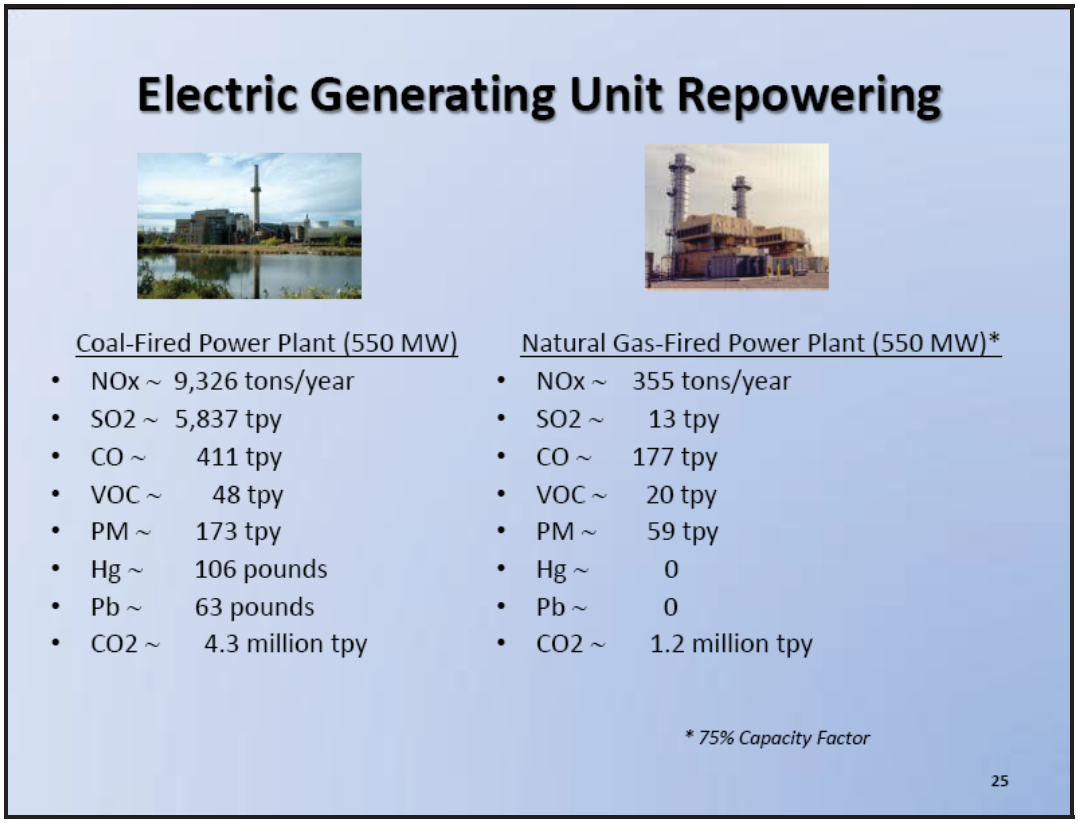


**Figure 3.** *Environmental Performance: Coal-Fired versus Gas-Fired Generation*

[9] Answer Testimony and Exhibits of Paulette Middleton.

**Coal-fired power plants emit ~9,326 tons/year of NOx into the air.** Coal-fired power plants also emit ~48 tons/ of volatile organic compounds per year. This dangerous combination of NOx and volatile organic compounds forms ground-level ozone, especially during summer months. Numerous scientific studies have linked ground-level ozone exposure to a variety of problems, including, but not limited to:

- Airway irritation, coughing and pain when taking a deep breath;
- Wheezing and breathing difficulties during exercise or outdoor activities;
- Inflammation, which is much like a sunburn on the skin;
- Increased susceptibility to respiratory illnesses such as pneumonia and bronchitis; and
- Permanent lung damage with repeated exposures[10]

In addition to the act's requirement for a reduction of at least 70 percent to 80 percent in NOx emissions, it will generate additional air quality improvements from a reduction of emissions of other air pollutants such as $CO_2$, $SO_2$, VOC's, mercury (Hg) and lead (Pb).

In his briefing to the PUC, Paul Tourangueau, director of CDPHE's Air Pollution Control Division, explained that the act will allow for "… a coordinated plan of emission reductions from these coal-fired power plants [that] will enable Colorado rate-regulated utilities to meet the requirements of the federal Clean Air Act and protect public health and the environment at a lower cost than a piecemeal approach."

## III. Xcel Energy Emission Reduction Plan

Xcel Energy began to develop a plan for implementing the act by initially identifying coal units that were subject to current regulations, of certain vintage, and most logical for targeted action to meet the legislation's emission reduction requirements. Xcel considered the age of plants, variable operating costs, location, ownership, existing emission controls, available controls technologies, and foreseeable emission requirements to determine which units would be the most suitable candidates for emission controls, conversion to gas, or retirement.

Based on Xcel's evaluation of its existing coal generation fleet, eight plants were determined to be the best candidates for actions to enable compliance with the act: 1) unit facility shutdown, 2) fuel switching, or 3) adding emission control equipment. The candidate facilities, totaling 1,801 MW in generating capacity, are shown in Figure 4.

[10] U.S. Environmental Protection Agency, "Health effects of ozone in the general population," http://www.epa.gov/o3healthtraining/population.html#effects.

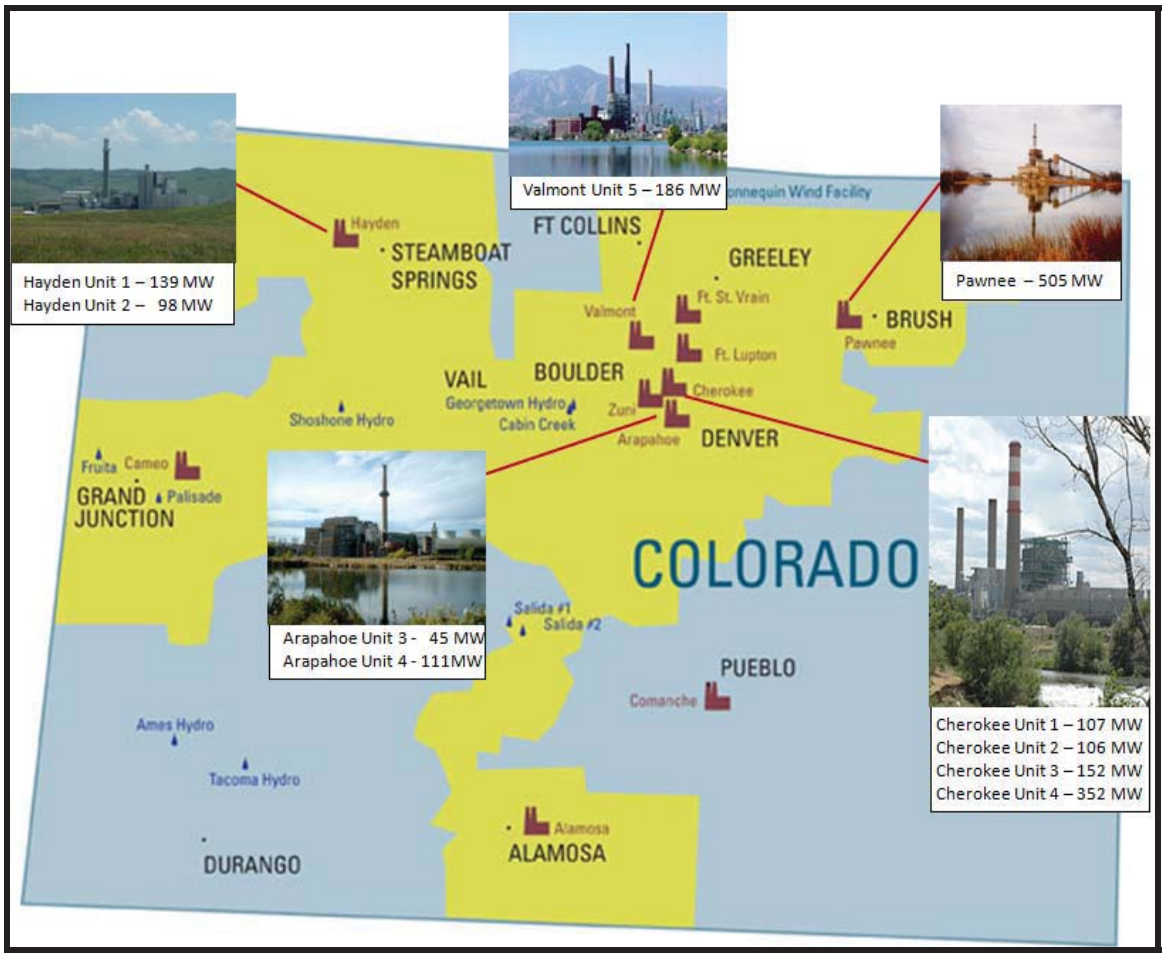


**Figure 4.** *Xcel Plants Analyzed for Retirement, Replacement, or Pollution Controls*

In July 2010, Xcel submitted a series of scenarios to the CDPHE for review. The scenarios modeled various combinations of shutdowns, fuel switches, and emission controls for the plants mentioned above. Xcel's objective was to "…develop emissions-reduction plans that would provide clean, reliable power, without burdening customers with enormous costs."[11] The CDPHE evaluated the scenarios to ensure they met current and "reasonably foreseeable" federal clean air standards. Each plan included a schedule that would result in meeting the minimum NOx reduction on or before December 31, 2017. Finally, both Xcel energy and the PUC considered the critical issue of maintaining transmission system reliability to ensure a stable, controlled voltage level throughout the Front Range transmission system.

With input from CDPHE, Xcel filed the Clean Air-Clean Jobs Act Emissions Reduction Plan with the PUC on August 15, 2010. The plan identified nine scenarios (Benchmark 1.0, Benchmark 1.1, and Scenarios 2, 3, 4, 5, 6, 6.1 and 7) and set forth nine potential portfolios of replacement capacity (PUC Docket No. 10M-245E).

[11] **Answer Testimony and Exhibits of Karen. T. Hyde**, Public Service Company of Colorado, Docket No. 10A-245E.

In October 2010, the PUC began public hearings to evaluate Xcel's proposed plan. The hearings provided an opportunity for stakeholders to submit testimony and documentation to represent their various interests. During the course of the PUC hearings, nearly 40 interveners provided testimony and documentation on the effects of the act. Based upon the statutory language of the act and the jurisdictional authority of the regulatory body, the PUC considered the following factors in evaluating and approving a final plan for implementation:

- Pollution reductions to be achieved
- Increased use of existing natural gas-fired electric generating capacity
- Effect on economic development
- Electricity reliability
- Cost and rate increases

The PUC released its formal written ruling of the final approved plan on December 15, 2010. This approved plan was submitted to the Air Quality Control Commission and is basically the same plan that will be submitted to the Colorado General Assembly in January 2011.

## III. PUC Approved plan for Xcel Energy

In preparing the plan, it was critical to ensure the continued reliable operation of the generation and transmission systems. The existing Denver metropolitan transmission system was designed around the Cherokee and Arapahoe generation facilities. Both sites contain baseload units that operate on a continuous, uninterrupted basis and provide power generation and voltage support to the grid. Therefore, Xcel determined that cleaner replacement generation must be online and ready to serve a similar role to maintain the safety and reliability of the transmission system.

High-efficiency combined-cycle natural gas generation was selected as the replacement technology because it is cost-effective, has low emissions and is flexible enough to integrate wind and solar as they are introduced to the grid. Under the approved emission reduction plan, 551 MW of coal-fired electric generation will be retired, 742 MW of coal-fired electric generation will be controlled with emission reducing retrofits, and 463 MW of coal-fired electric generation will be switched to natural gas.[12]

In its final ruling, the PUC did not select any of the proposed scenarios in their entirety. Instead of selecting a specific scenario, the commission combined strategies within the scenarios proposed by Xcel. The PUC's plan (referred to as the "approved plan") is similar to Xcel's scenario 6E-FS from an air quality perspective, which CDPHE had already determined was consistent with reasonably foreseeable requirements of the Clean Air Act.

[12] **Order C10-1328,** Final Order Addressing Emission Reduction Plan, Docket No. 10M-245E, Colorado Public Utilities Commission.

The approved plan entails early retirement of five coal-fired electric generating units (Cherokee 1, 2, 3; Arapahoe 3; Valmont 5), emission controls for three additional units (Pawnee 1; Hayden 1, 2), and the fuel conversion of two units from coal to natural gas (Cherokee 4, Arapahoe 4).

Under the approved plan, NOx levels would be reduced by a total of 88 percent from the 2008 year baseline. Total $CO_2$ levels would be reduced by 28 percent from the 2005 operating baseline. The approved plan calls for the following actions to be taken on power plant targeted for emissions reductions as shown in Figure 5 below.

| Generating Plant | Size | Action | Compliance Date |
|---|---|---|---|
| Cherokee 1 | 107 MW | Retirement | 2011 |
| Cherokee 2 | 106 MW | Retirement | 2011 |
| Cherokee 3 | 152 MW | Retirement | 2015 |
| Cherokee 4 | 352 MW | Conversion | 2017 |
| Arapahoe 3 | 45 MW | Retirement | 2013 |
| Arapahoe 4 | 111 MW | Conversion | 2014 |
| Valmont 5 | 186 MW | Retirement | 2017 |
| Hayden 1 | 139 MW | Controls | 2015 |
| Hayden 2 | 98 MW | Controls | 2016 |
| Pawnee | 505 MW | Controls | 2014 |
| W.C. Clark[13] | 51 MW | Retirement | 2017 |

**Figure 5.** *Colorado PUC approved actions under Docket 10M-245E*

As shown in Figure 5, a total of 10 coal-fired generating plants are retired, converted to gas or fitted with additional pollution controls to nearly eliminate NOx emissions from the plants. To ensure electricity reliability, the plan allows for flexibility in the schedule if construction is delayed.

The approved plan incorporates a long-term gas contract from Colorado-based gas suppliers. During the time between when Cherokee 1 and 2 are shut down and the new 2x1 natural gas combined-cycle plant[14] is built, Xcel plans to increase use of power produced from existing natural gas–powered plants. According to Xcel, this plan achieves improved system reliability because the planned new generation will replace aging coal units located within the load center, avoiding the need for new high-voltage transmission lines.

[13] **The W.C. Clark plant** is the only coal-fired generating plant owned by Black Hills Energy Corporation and subject to targeted emissions goals under the statute.

[14] **A 2x1 combined-cycle (cc) gas turbine power plant** uses one or more gas turbine generators equipped with heat recovery steam generators. The steam produced from these generators is used to power another turbine that adds to the total output of the system. A "2x1" configuration uses two gas turbines rather than only one, as in a "1x1" configuration.

## Economic and Environmental Impacts of the Approved Plan

### Economic Impacts

The Leeds School of Business at the University of Colorado was commissioned by Xcel to study the effects of four of its proposed scenarios. The report, *Economic Impacts of Implementing the Colorado Clean Air-Clean Jobs Act under Different Scenarios*, found that all scenarios indicated positive economic benefits resulting from construction, operation, employment (operating and construction), capital expenditures, and rate-based revenue requirements.

**A brief summary of the report's findings follows:**

> *"Public Service Company of Colorado's compliance with the Clean Air-Clean Jobs Act will have discounted total (direct, indirect, and induced) economic impacts ranging from $778.1 million to $1.1 billion on the state of Colorado between 2010 and 2026, depending on the scenario on which the company embarks. This will result in average annual total employment impacts from 366 to 675 new jobs and discounted total labor income impacts between $282.8 million and $533.9 million in Colorado from 2010 to 2026. Industries that will experience the greatest impact include construction, utilities, professional business services, and mining"*[15]

In some cases, increases in rate requirements or decreases in operating expenditures and employment had negative economic impacts; however, these declines were always dwarfed by increases elsewhere (e.g., construction). The basic conclusion of the report was that the total construction, capital expenditure and labor requirement needed to comply with the bill create a net positive economic benefit to the state of Colorado.[16] It is important to note that costs associated with implementing the provisions of the act are viewed in the context of the expenditures saved by comprehensively meeting the near- and long-term air quality standards of the federal Clean Air Act.

### Rate Impacts of the Approved Plan

In determining whether the plan is likely to help protect Colorado customers from future cost increases, including costs associated with reasonably foreseeable emission reduction requirements, the PUC approved a baseline cost estimate of $20 per ton carbon in evaluating the future impact on rates. Two principal bases exist for assuming a positive cost of carbon emissions.

The first is that it can be reasonably anticipated that carbon emissions will be regulated at some point within the lifetime of existing and new fossil fuel plants, perhaps quite soon. The second is that a general consensus exists among industry, policymakers and

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[15] "**ECONOMIC IMPACTS OF** IMPLEMENTING THE COLORADO CLEAN AIR-CLEAN JOBS ACT UNDER DIFFERENT SCENARIOS**,"** Exhibit No. TJS-3 to Answer Testimony of Timothy Sheesley, Public Service Company of Colorado, Docket No. 10A-245E.

[16] **Ibid**, 2010.

Colorado citizens that there is a cost to the environment from industrial activities, including energy production.

**Figure 6** below represents a general comparison of *estimated* rate impacts of nine different scenarios presented to intervening parties by Xcel energy. It is important to note that these rate impacts are based on assumptions on natural gas, construction costs and other variables that could alter the final overall impacts to rates from the actions approved in the plan. Secondly, there were a range of plans considered and the final plan approved by the PUC was not identified with a numerical label as outlined below. Instead, the approved plan most closely resembles the actions, costs, and timelines associated with the "6E FS" scenario listed below. The PUC and utility have an overall shared interest in mitigating the overall rate impact to customers and there are several components of the plan, such as long term natural gas contracts, that help to control costs and reduce the overall impact to Xcel energy customers.

Annual Rates (cents/kWh)

| NO CO2 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | RATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 Resource Plan | 9.395 | 9.732 | 10.036 | 10.265 | 10.820 | 11.256 | 11.486 | 11.726 | 11.703 | 12.164 | 12.316 | 2.74% |
| 6.1E | 9.395 | 9.801 | 10.062 | 10.386 | 11.036 | 11.659 | 11.730 | 11.927 | 11.882 | 12.335 | 12.455 | 2.86% |
| 6.1E FS | 9.395 | 9.801 | 10.062 | 10.386 | 11.036 | 11.649 | 11.720 | 11.922 | 12.057 | 12.477 | 12.623 | 3.00% |
| Benchmark 1 | 9.395 | 9.725 | 10.062 | 10.340 | 10.954 | 11.556 | 11.885 | 12.304 | 12.103 | 12.480 | 12.542 | 2.93% |
| 3B | 9.395 | 9.776 | 10.040 | 10.362 | 11.039 | 11.694 | 11.846 | 12.127 | 11.943 | 12.379 | 12.414 | 2.83% |
| 5B | 9.395 | 9.793 | 10.058 | 10.376 | 11.037 | 11.676 | 11.775 | 12.051 | 11.939 | 12.364 | 12.408 | 2.82% |
| 6E | 9.395 | 9.824 | 10.088 | 10.398 | 11.036 | 11.639 | 11.806 | 12.037 | 11.966 | 12.558 | 12.660 | 3.03% |
| 6E FS | 9.395 | 9.824 | 10.088 | 10.398 | 11.036 | 11.639 | 11.806 | 12.037 | 12.190 | 12.558 | 12.660 | 3.03% |
| 6.2J | 9.395 | 9.822 | 10.085 | 10.397 | 11.047 | 11.688 | 11.806 | 12.040 | 12.129 | 12.552 | 12.654 | 3.02% |
| 7E | 9.395 | 9.817 | 10.073 | 10.382 | 10.997 | 11.934 | 12.028 | 12.243 | 12.163 | 12.558 | 12.660 | 3.03% |

**Figure 6.** *Rate Differentials of Plan Scenarios (Xcel Energy)*[17]

The estimated capital costs associated with this coordinated approach to emission reductions, including the costs of a new 2X1 natural gas-fired CC plant (569 MW) at Cherokee Station to serve as replacement capacity for the retired units, are presently estimated at approximately $890 million through 2017, within an error band of plus or minus 20 percent.[18] The total cost, including the approval of a natural gas pipeline to the

[17] **Exhibit KTH-6 of Supplemental Direct Testimony of Karen T. Hyde,** Public Service Company of Colorado, Docket No. 10A-245E.

[18] **C10-1330 Final Order Approving Emission Reduction Plan,** Docket 10M-254E, Colorado Public Utilities Commission.

new combined cycle plant at the Cherokee station site is approximately $1 billon.[19] Consistent with the above discussion concerning projections of future coal, natural gas and carbon costs, the commission believed the potential range of overall rate impacts of the approved plan and the corresponding range of emission reductions have been properly developed by Xcel's STRATEGIST model runs. STRATEGIST is an industry standard modeling tool that calculates load, resources, and operating variables to provide a high integrity set of scenarios on resources, costs and options to meet forecasted demand over time.

## Environmental Impacts of the Approved Plan

The implementation of all plant retirement, replacement and pollution controls contained within the approved plan will have both dramatic and positive effects on air quality and human health in the Front Range. Overall, the primary air pollutants (NOx, $SO_2$ and $CO_2$) are dramatically reduced by 2017. The greatest reduction in air pollutants comes as a result of complete retirement of the coal generating facilities (Cherokee 1-3, Arapahoe, Valmont) and their replacement with cleaner burning combined cycle natural gas generation at the Cherokee power plant site. The remaining reductions are achieved by the installation of high-capture pollution controls on the Pawnee and Hayden coal-fired generation plants outside the Front Range area. Figures 7 and 8 show the cumulative reduction effect of the targeted actions under the approved plan

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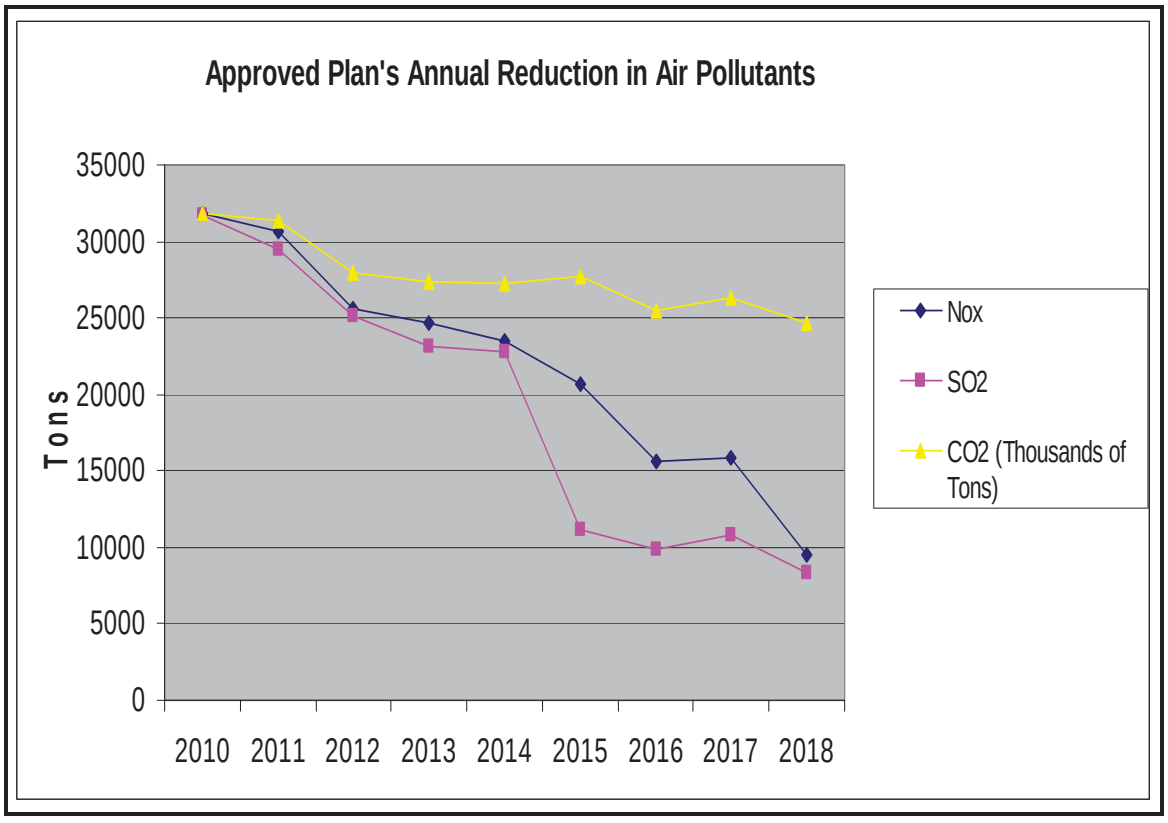


**Figure 7.** *Annual reduction in primary air pollutants from approved plan*

[19] **Xcel Energy "Form 8K" report** to the United States Securities and Exchange Commission

The PUC final order closely follows the "fuel switching" scenario (6E-FS) outlined by Xcel in its October 25 amended filing to the commission. As shown in Figure 7, the final approved plan reduces NOx by 30,000 tons per year to below 10,000 tons per year by 2018. For sulfur dioxide, another regulated pollutant, the reduction is similar in range. Finally, the approved plan helps the state further reduce greenhouse gases with a total reduction in $CO_2$ from more than 32,000 tons per year to less than 25,000 tons per year.

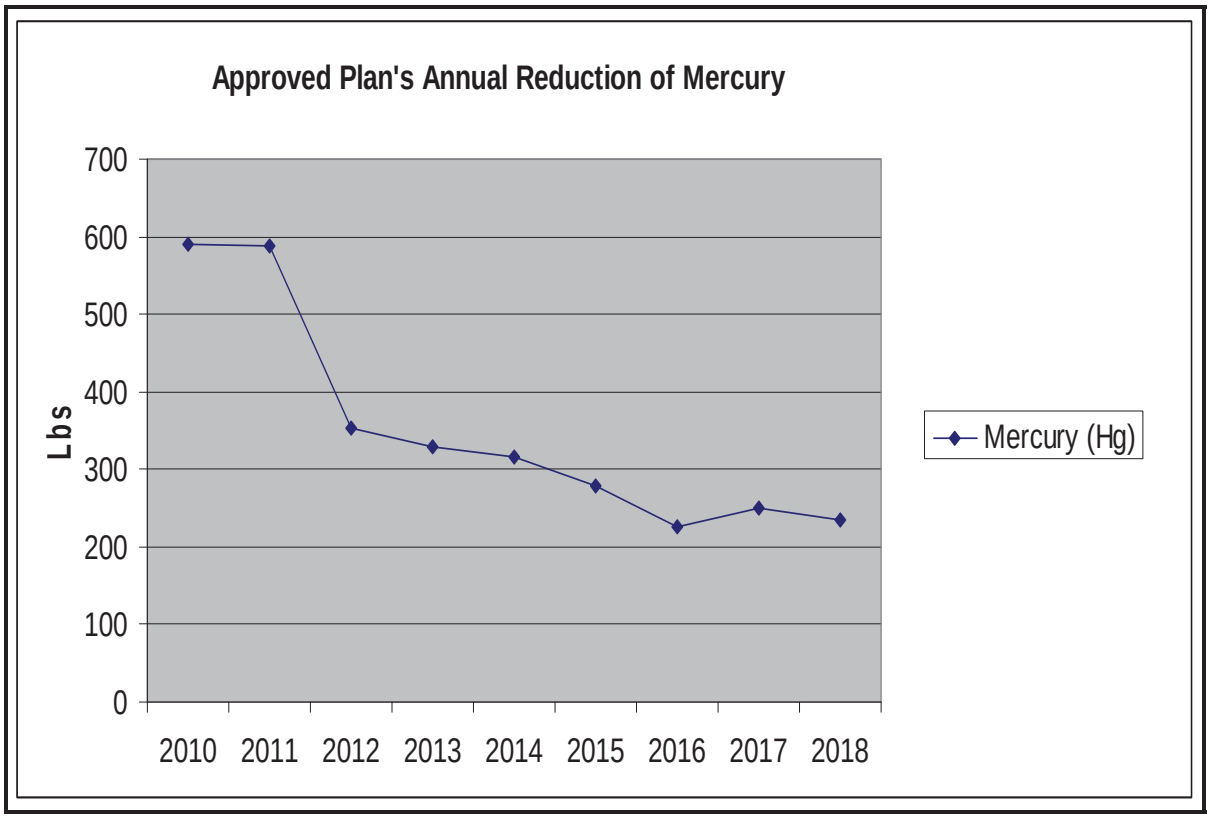


**Figure 8.** *Total reduction of Mercury (HB) from approved plan*

**Mercury (Hg):** Mercury, a known health hazard, is emitted by coal-fired generation. The approved plan results in major reductions of mercury that stem from current coal-fired generation plants in the Front Range, specifically the Valmont, Cherokee and Arapahoe stations. As shown in Figure 8, the annual output of mercury in the Front Range atmosphere will be reduced from roughly 600 pounds to less than 250 pounds by 2018. Mercury has been shown to cause severe cognitive disabilities in infants and has been documented as the cause of other negative health impacts in fish, humans and other species. Reduction of this pollutant for Colorado's citizens and wildlife is a significant and ancillary benefit of the act.

**Water:** Implementation of the approved plan will save water. For example, Xcel's Cherokee Station plant, located just four miles north of downtown Denver, consumes

more than 2.5 billion gallons of water from the South Platte River. For much of the year, only a small amount of water flow is left below the power plant's intake.

Testimony by the Western Resource Advocates, an established expert on the relationship between water and energy, indicates that the original emission reductions plan submitted by Xcel on August 13 would save at least 5,240 acre feet of water annually, enough to meet the needs of 52,000 residents.[20] A substantial amount of water is needed to maintain temperature and provide cooling for coal-fired generation units, compared to lower water requirements for natural gas plants.

### Power, Resource Planning and Fuel Impacts of the Approved Plan

Other expected benefits of the approved plan include increased use of natural gas to further displace coal generation beyond immediate repowering projects. Using natural gas-fired power plants to provide a larger portion of the generation required to maintain the baseload of electricity offers greater flexibility to utilities. Natural gas-fired power plants can be brought on and offline and dispatched faster than coal-fired plants. Reducing the time needed to bring power online allows utilities to acquire power from intermittent sources such as wind and solar. This increased generation flexibility ultimately will allow use of more renewable sources, which will further improve air quality, improve human health and reduce environmental impacts.

### Natural Gas Contracts

The act also allows regulated utilities to enter into long-term natural gas supply contracts. Such contracts are relatively rare in utility market operations. Financial markets have viewed long-term natural gas contracts as risky due to concerns about whether utilities would be able to fully recover all associated contract costs. This view negatively affected the perceived financial risks and creditworthiness of regulated utilities in the eyes of financial ratings agencies.

The act acknowledges the importance of giving financial markets confidence that utilities will be able to recover costs associated with such long-term contracts. The act also promotes greater latitude for the PUC to work with utilities to proactively manage the costs associated with complying with the law. During the proceedings, Xcel implemented a request for proposal (RFP) process for long-term gas contracts to complement the company's proposed emissions reduction plan.

Public Service solicited bids for either five- or ten-year terms with pricing that: (a) was fixed for the entire term; (b) had a price floor and ceiling; and/or (c) had a fixed price with an annual adjustment or escalation. In order to maximize the positive effects on the Colorado economy, the RFP required the gas to be produced in the state, consistent with HB 10-1365. Although the overall market fuel contract prices for natural gas can be volatile, the unique feature of this regulatory proceeding and legislation enabled a stable price and steady supply of fuel to protect Colorado ratepayers from traditional market volatility.

[20] **Answer Testimony of Stacey Tellinghuisen**, Western Resource Advocates , Docket 10A-245E

Without divulging the confidential terms of the winning Anadarko Contract, Xcel states that it falls within the bidding category which contains "a fixed price offer with an annual adjustment or escalation." To help the commission and other parties evaluate the Anadarko Contract, Public Service provides a public estimate of $5.48 per (Decatherm) Dth over the ten years as the average nominal cost of the associated gas supply.

Xcel energy has stated that, if an annual forecast cost of the Anadarko Contract volumes is applied to resource modeling, the Anadarko Contract could result in approximately $100 million in savings in present value revenue requirements. Finally, it is important to note that, although the contract price has escalators and is not a purely a fixed price contract, it provides a price that will likely be more stable than traditional index-based contracts.

In its final ruling, the PUC found the contract to be in the public interest and created a presumption of prudence for the utility to seek procurement of replacement gas resources should there be a breach in contract. The final ruling on the gas contract protects both the consumer and the utility.

## IV. PUC Approved plan for Black Hills Energy

Black Hills Energy (BHE) was the other investor owned utility (IOU) subject to the Act. The only generating asset under the Act's jurisdiction is the W.N. Clark coal-fired generating station (42 MW) in Cañon City, Colorado. On August 13, 2010, BHE filed its plan at the Colorado PUC ("Commission") which contained two options for the Clark generating facility: a) convert the entire plant to be fueled with woody biomass (wood pellets) by December 31, 2017; or b) retire both coal units at the Clark Station by December 31, 2017 and replace that capacity with utility-owned natural gas-fired generation The Company proposed that the Commission approve its Plan with both options and allow the Company to select between the two options at a later point in time.

Several parties intervened in the case, including the Governor's Energy Office, Wal-Mart and the Office of Consumer Counsel. After several months of testimony and analysis, BHE in a November 24, 2010 filing, identified Option 2 as the superior option for compliance: proposing retirement of Clark power station by December 31, 2013 and replacement of the capacity with a new natural gas generating unit, already included in the air permit for BHE's Pueblo Airport Generating Station. Although the PUC ultimately chose Option 2, a complete engineering analysis found both options met all legislative requirements of the Act.

**BHE stated the following in support of Option 2:** a) the target facility has only five to ten years of remaining life, requiring the company to accelerate cost recovery through rapid rate increases as opposed to long amortization of new builds; b) the cost of adding pollution controls on the existing plant is 12 percent, more than double the replacement gas option; c) CDPHE found Option 2 met both current and reasonably foreseeable air quality regulations (ozone, NOx, $SO_2$, methyl-mercury, carbon dioxide); d) the addition

of a new gas generator at the Pueblo Airport Generating Station site will provide sales and property tax revenue to the City and County of Pueblo.

On December 15, 2010, the PUC approved the plan to retire and replace the Clark coal-fired generation units with new gas generation (LMS 100 turbine engines) as proposed by the utility. In its final order approving the plan,[21] the PUC found that Option 2 satisfied or exceeded the evaluation criteria set out in the act, including, but not limited to, the following: a) meeting the minimum 70 percent reduction in NOx; b) CDPHE determination of meeting "reasonably foreseeable" EPA regulations; c) increasing use of natural gas generation; and d) preserving reliable electric service.

### Economic, Environmental and Electric System Impacts of Option 2

The total revenue impact to BHE customers was estimated to be a less than 5 percent increase in rates during the life of replacement facilities. In addition to increased sale and property tax revenue for Pueblo, the existing PAGS natural gas facility, in conjunction with the additional LMS replacement unit, will create a peak of 400 new local jobs for the Pueblo community.

Retirement and replacement of the Clark plant will have a significant positive effect on air quality. According to CDPHE, the retirement and replacement scenario will result in a reduction of 862 tons per year of NOx, (100 percent reduction). $SO_2$ and other particulate matter, known sources of asthma and cardio-pulmonary complications,[22] will be reduced by 1,457 tons per year and 72 tons per year, respectively.

## III. Conclusion

Under the leadership of Governor Bill Ritter Jr., Colorado has led the nation in creating and expanding a "New Energy Economy." This successful economic transformation, recognized in Washington, D.C., and countries worldwide, has evolved through a series of policy, legislative and economic development actions that recognize a 21st century shift in how the world will produce and consume energy.

The combination of HB10-1001 and HB10-1365 represents major electricity sector policy shifts. The changes will have significant positive implications for economic, environmental and technological growth, not only for the state, but also for the nation at large. Addressing increasingly stringent air quality regulations under the Clean Air Act and developing a cleaner electric power generation fleet are priorities many states are considering.

The Clean-Air, Clean-Jobs Act represents a historic milestone in energy policy for several reasons:

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[21] **C10-1330 Final Order Approving Emission Reduction Plan**, Docket 10M-254E, Colorado Public Utilities Commission.

[22] **U.S. Environmental Protection Agency**, http://www.epa.gov/air/ozonepollution/basic.html.

1. The act creates a new framework for coordination and cooperation among industry, policymakers and regulators.
2. The act achieves significant air pollution reductions from power generation by replacing aging coal-fired generation with cleaner, more flexible natural gas generating units.
3. Increased use of a quick-starting fuel creates a technology platform to enable higher penetrations of renewable energy sources such as wind and solar.
4. The combined effects of these lower emissions will not only benefit the health and welfare of the state's citizens, but also will reduce the accumulation of climate-forcing gases in the atmosphere.

Colorado has become a national leader in promoting renewable energy and energy efficiency by making the policy connections between energy, environment and the economy. Colorado's 30 percent RES is the most proactive in the interior West and the second most aggressive in the country.

The implications for utility-scale renewable energy development and the need for expanding the high-voltage transmission infrastructure is directly associated with the HB10-1001 RES and, to a lesser extent, with HB10-1365.The Clean Air-Clean Jobs Act is a critical component of Colorado's much-heralded New Energy Economy.

The changes the act will bring to the state's energy infrastructure will lead to greater energy independence, economic development, environmental security and increased health and well-being for future generations of Coloradans.