

Economic Impact Analysis of New Mexico's Greenhouse Gas Emissions Rule

by

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Background

In 2010, the New Mexico Environmental Improvement Board (EIB) adopted rule 20.2.100 to “establish greenhouse gas emission reduction requirements for sources.”¹ The goal of the rule is to reduce the emissions of greenhouse gasses from high-emissions facilities in the state, including certain oil and gas processing facilities and electric generating plants. Under this rule, facilities with annual greenhouse gas emissions over 25,000 metric tons per year would have to limit their emissions to no more than 2010 levels, on a per-facility basis, in calendar year 2013; thereafter emissions levels must be reduced by 3% of 2010 levels every year for ten years, or until superseded by a federal or regional greenhouse gas rule. The rule contains numerous provisions for banking and borrowing of emissions credits, as well as provisions for purchasing of offsets from non-covered emitters. There is also a provision for maximum compliance price of \$50/ton.

Synapse Energy Economics was asked to analyze the expected economic and employment impact of this greenhouse gas rule on New Mexico, with a focus on impacts in the electric sector. To do this, we have developed a compliance scenario for a New Mexico supply- and demand-side energy resource mix in the ten-year period of 2010-2020. This scenario meets the emissions limits in the rule by replacing carbon-intensive coal generation with more aggressive investments in energy efficiency, development of a modest level of renewable resources, and higher energy output of gas-fired electric generators.

In this report, we compare the costs and benefits of our compliance scenario relative to a base case or business-as-usual scenario, in which projected load growth is met only by increased gas-fired generation. This “base case” scenario itself may be overly optimistic in terms of costs. In particular, the base case does not include certain investments in environmental retrofits that may be required on New Mexico’s coal fleet during the coming decade pursuant to existing and future U.S. EPA regulations that could be quite costly for consumers. Thus in addition to environmental benefits and the economic benefits explicitly calculated here, the compliance scenario reduces risk for consumers by reducing their dependence on coal-fired generation.

¹ NMAC 20.2.100.6

Summary of Results

We have calculated the impacts of both the base case and the compliance scenario by analyzing how the investments in each case would flow through the state's economy, using the IMPLAN macroeconomic model. The analysis indicates that the compliance scenario has significantly lower costs to consumers and substantially more positive impact on employment and output than the base case scenario every year in the analysis period, and overall for the decade. In contrast, the base case scenario produces increasing costs to consumers from year to year without offsetting benefits, resulting in reduced employment and output in New Mexico.

Far from being costly for consumers and the New Mexico economy, we find that the compliance scenario creates jobs and saves money for electricity consumers while reducing greenhouse gas and other pollutant emissions in New Mexico. In our estimation, implementing such a compliance scenario would help to mitigate future increases in electricity bills in New Mexico. It would also result in cleaner air and water from decreased coal-fired generation, reduced demand on the state's water supplies, and better-performing homes and commercial buildings. In short, the compliance scenario consists of actions that would be in New Mexico electricity consumers' interest even in the absence of the rule and which, taken together, are sufficient to reach the emissions threshold and reduce New Mexico's contribution to global climate change.

The annual net jobs impact of the compliance and base case scenarios are shown in **Figure 1**. The compliance scenario involves a significant level of investment in energy efficiency and renewable energy, creating thousands of jobs in New Mexico. Of course, there are costs associated with these investments, but these costs are offset by the savings for consumers associated with increases in energy efficiency. The net effect in employment is an increase of employment by over 17,500 jobs-years, cumulatively, through 2020.²

In the base case scenario, conversely, the bill for electricity for New Mexico homes and businesses continues to increase, resulting in a drag on the economy that reduces employment in the state. There are very few job-creating investments to offset these losses—only an increase in operations at gas-fired power plants to meet growing demand. The net result for the base case scenario is a cumulative *loss* of approximately 5,500 job-years through 2020.

It is important to note that the jobs and economic benefits shown for this compliance scenario are associated with compliance in the electric sector only, without the purchase of offsets. Investments to reduce fuel leakage and other sources of emissions in the oil and gas sector, whether for compliance purposes in that sector or to produce offsets, are likely to result in additional job creation. Because such actions will save fuel, many will also ultimately reduce costs.

² A "job-year" is the equivalent of one person holding a full-time job for one year. For example, five job-years could represent one person holding a job for five years, or five people employed for one year.

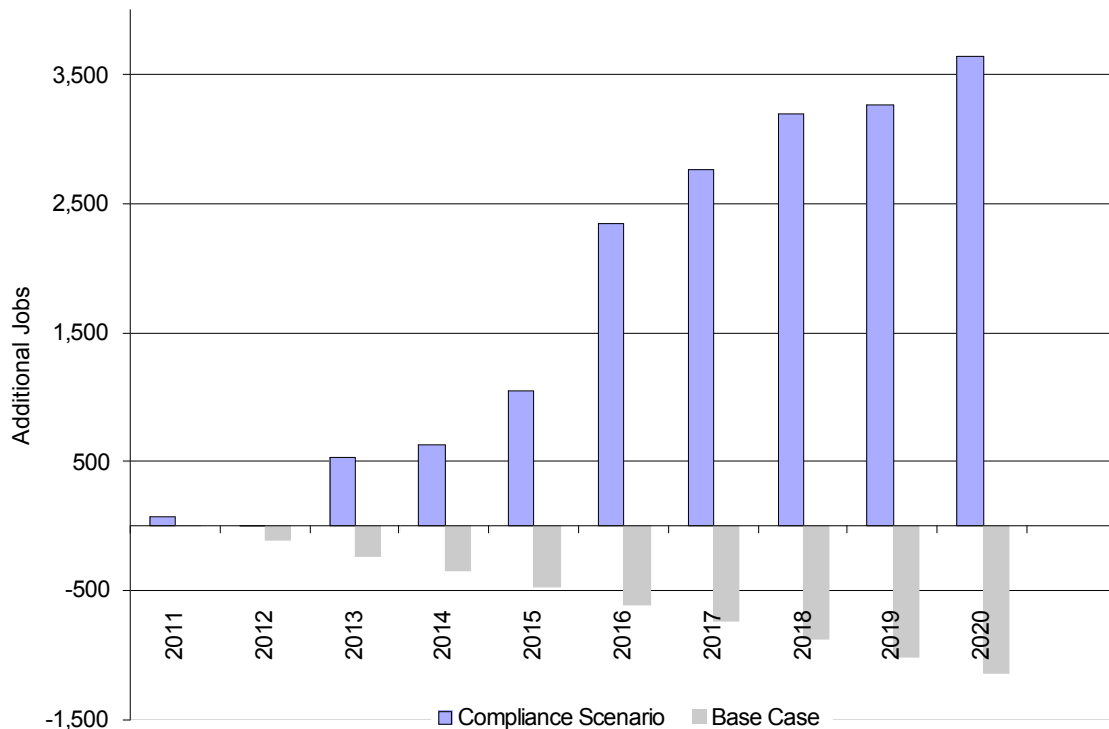


Figure 1. Comparison of increase or decrease in jobs (relative to 2010) associated with the compliance and base case scenarios.

Over the course of the decade, the jobs created by this compliance scenario for the electric sector only would result in over \$1 billion in new labor income in New Mexico. In addition, the compliance scenario results in almost \$2 billion in total value added for New Mexico businesses. The details of this analysis, and the sources of jobs and value added, are discussed below.

The compliance scenario we have analyzed is not the only option for meeting the emissions goals of the greenhouse gas rule. Were New Mexico’s utilities to invest more heavily in energy efficiency than we have assumed, for example, we would expect that the ultimate costs would be even lower and the employment benefits greater. However, despite evidence from other states that such high levels of efficiency investments are achievable and cost-effective, many utilities have been reluctant to fully develop this resource. Also, the rule has considerable flexibility for the purchase of emissions offsets from other sectors of the economy. Others analysts³ have shown that such offsets would be available in abundance, notably from the oil and gas sector where large potential emissions reductions could be exploited. Our scenario is just one possible approach, and very likely not the optimal one for New Mexico. Thus the reader should conclude that the potential benefits of the rule are *at least* as great as the benefits we have identified, and potentially significantly greater.

³ See testimonies of Steve Michel and Ron Collings before the Environmental Improvement Board under Docket No. EIB 08-19(R).

Macroeconomic Impact of Compliance with the Greenhouse Gas Rule

Scenario Definition

To calculate the macroeconomic impact of the emissions rule, our compliance scenario involved a number of investments in strategies to reduce electric sector emissions. As a constraint on our scenario we ensured that emissions reductions in each year would meet or exceed the requirements of the rule (Figure 2). In years where reductions exceeded the requirement, emissions credits were banked for use in future years.

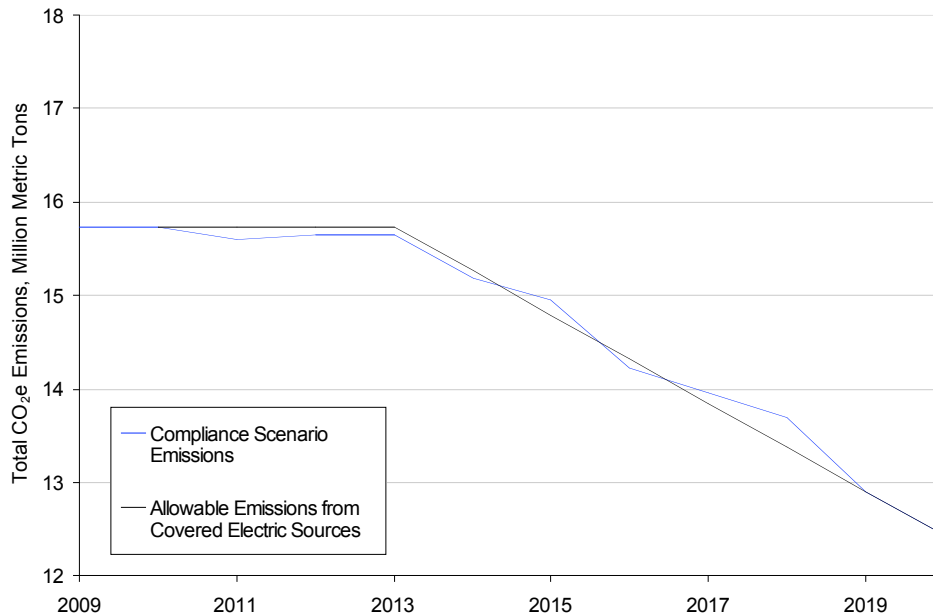


Figure 2. Compliance scenario greenhouse gas emissions from covered sources in the electric sector, relative to the declining allowable emissions curve under the rule.

In both the compliance and base case scenarios, we assumed that both coal and gas generating *capacity* would remain constant throughout the study period—that is, no new fossil-fired generating plants and no plant retirements. However, in the compliance scenario, we significantly reduced the *output* of coal-fired generating plants from 12.5 terawatt-hours (TWh) per year in 2010-2013 to 6.0 TWh in 2020. (In the base case we held coal generation constant at 12.5 TWh per year.)

For renewable generation in the compliance scenario, we began with New Mexico’s current capacity of approximately 700 MW of installed wind. We then assumed, we believe conservatively, that the state could add 200 additional MW of wind by 2020. Further, we incorporated the 46 MW of solar capacity for PNM approved by the New Mexico PRC in August 2010. Wind, PV, and CSP resources were assigned capacity factors of 29.6%, 22%, and 38% respectively. In both the compliance scenario and the base case we allowed the annual energy output of gas units to adjust as needed to meet the total generation requirement. In both scenarios this results in a net increase in the output of the gas units over time.

An important, cost-effective and job-creating aspect of the compliance scenario is the increased investment in energy efficiency in New Mexico. Starting with the 2009 retail sales in New Mexico (obtained from EIA Form 861), we projected the base-case retail sales through 2020 by applying the mid-level growth rate presented by PNM to the January 19, 2011 IRP Working Group Meeting.⁴ For the compliance scenario, we then reduced this total energy requirement by assuming that New Mexico utilities rely more heavily on demand-side resources. New Mexico's Energy Efficiency Rule requires utilities to reduce their retail sales by a minimum of 5% of 2005 levels by 2014. After this, we increase the annual energy efficiency levels from 1.05% per year in 2014 to 2.0% per year in 2017 and beyond, for a cumulative total load reduction (relative to the base case) of 15.75% in 2020. (This may be compared, for example, to PNM's goal of 10% total load reduction in 2020.) In our experience, 2% energy efficiency per year is a level consistent with "best practices", or what the leading states are achieving in this area. It is below the higher standard of "all cost-effective" energy efficiency. This is because the all-in cost of \$0.035/kWh saved, based on experience in numerous states, is well below the cost that would have been incurred to generate those kWh.

By offsetting the projected growth in load with these cumulative savings from energy efficiency, we were able to determine the new annual retail energy requirements that need to be met in the compliance scenario.

Macroeconomic Analysis

Macroeconomic impacts (jobs, labor income, and value added) of both the base case and the compliance scenario were estimated using the IMPLAN model (IMpact analysis for PLANning). IMPLAN is a widely used input-output (I/O) economic model that simulates the interactions among the sectors of the regional economy. IMPLAN calculates direct employment and value-added impacts from infrastructure investments or other forms of spending in the regional economy; it also calculates indirect and induced effects, as money earned from the direct investments is re-spent throughout the economy, and as household spending power is affected by the costs and benefits of these investments.

An example of a direct investment might be a financing programs that result in consumer investments in energy efficient homes, which would create jobs for providers and installers of the necessary materials and equipment. Another source of direct benefits would stem from "softer" investments, such as energy audits. These lead to job creation and retention for auditors, as well as expected further investments by home and business owners based on the outcomes of the audits.

These direct purchases are made from specific industries, but those industries, in turn, make further purchases from other segments of the economy, producing the "indirect" benefits. In the examples above, the contractors would require the tools and materials; they would also need to maintain and fuel their vehicles, run their offices, and so forth. Each of the industries providing these secondary goods and services also makes further purchases to meet its needs. Not all of these expenditures will occur within the study region; however, IMPLAN is designed to calculate the fraction of all of those purchases that are made inside the local region, and to add the impact of these so-called "indirect purchases" to the direct impacts.

⁴ "Electric Integrated Resource Plan: Planning your Energy Future Together." January 19, 2011. http://www.pnm.com/regulatory/pdf_electricity/irp_011911_slides.pdf

Finally, the IMPLAN model can calculate the impact of changes in overall household spending power in the study region resulting from the direct and indirect economic activity described above—known as the “induced” benefits. Household spending power may increase as the result of the wages earned through direct and indirect investments; it may also decrease if new fees, costs, or levies are placed on consumers. In the scenario analyzed here, the induced impacts include effects flowing from re-spending of income earned by workers and businesses pursuant to compliance with the rule, as well as impacts associated with changes in household spending power (as a result of changes in spending on utility bills, taxes, or fees resulting from spending on the compliance with the rule.)

A basic premise of the input-output modeling approach is that all costs and saving eventually accrue to households. If households save money on their energy bills, this frees up funds for other spending and has a stimulating effect throughout the economy. Likewise, additional costs (such as higher taxes or utility bills) reduces spending on other goods and services. One important way the greenhouse gas rule should benefit the New Mexico economy is by counteracting the trend toward higher utility bills, as long as the utilities invest aggressively in energy efficiency as part of their compliance strategy. This will increase household spending power relative to the base case, and thus support expansion of the New Mexico economy.

Analysis of the New Mexico Greenhouse Gas Rule

Using the IMPLAN model, we analyzed the direct, indirect, and induced impact of both the base case and the compliance scenario on three macroeconomic factors - employment, value added and labor income – annually through 2020. The impact of new resource construction on the economy in the years 2010 through 2020 was estimated using Synapse assumptions on capital and operating costs (see Appendix) for each type of technology. Analyzing the impact of operation of new resources on the economy includes modeling changes in purchases of fossil fuels, new operation and maintenance (O&M) expense for new resources, changes in O&M for existing resources, and transfer payments between consumers and generators to cover these costs.

All of these costs and expenditures are designated into different IMPLAN model economic categories. For coal, gas, wind, photovoltaic and CSP projects, we allocated costs among economic categories using data from the JEDI models, developed by the Department of Energy’s National Renewable Energy Laboratory. Spending categorization for energy efficiency was approximated as the average of residential and non-residential cost vectors available from the U.S. Bureau of Economic Analysis.

Results

The cumulative employment, value added, and labor income impacts of the compliance scenario in 2020 relative to 2010 are shown in Figures 3 (a-c). These impacts are compared to the impacts of the base case scenario, in which projected load growth is met solely by increased use of gas-fired generation. The factor-specific bars reflect the impact of capital investments and spending on fuel, as well as electricity bills. (Although both the compliance scenario and the base case have increasing electricity costs to consumers, the compliance scenario costs to consumers are \$179 million *less* over the ten-year period as compared to the base case scenario, i.e., \$576 million in the compliance case over ten years vs. \$755 million in the base case, in 2010 dollars.) By 2020, the compliance scenario creates jobs, adds value and increases labor income through

increased generation from gas resources, and construction and operation of new renewable resources and energy efficiency measures. This results in substantially greater benefits in all three macroeconomic factors than the base case. In the base case the only source of macroeconomic benefits is increased gas-fired generation, and this benefit is more than lost through the increased cost of electricity for consumers.

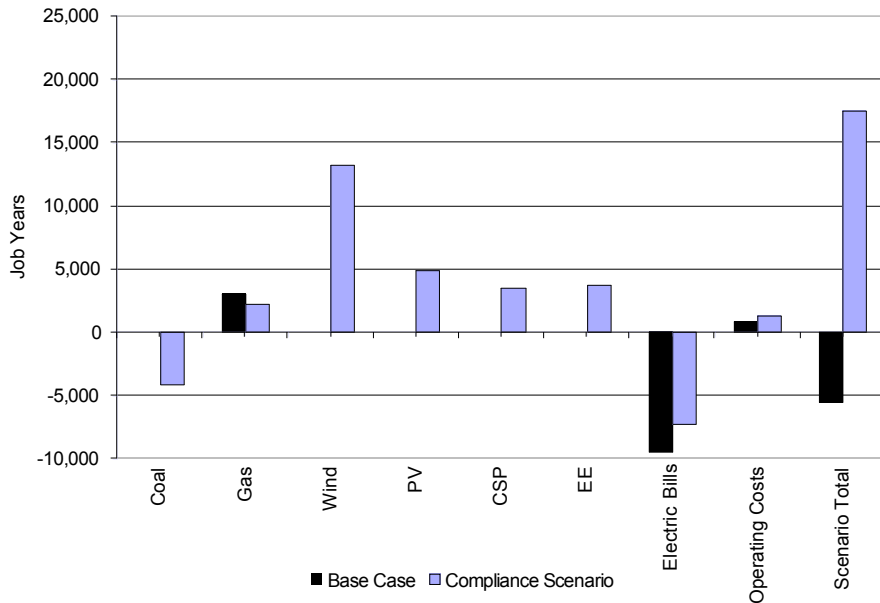


Figure 3. (a) Cumulative employment impacts by electric sector factor, 2010-2020, base case and compliance scenario.

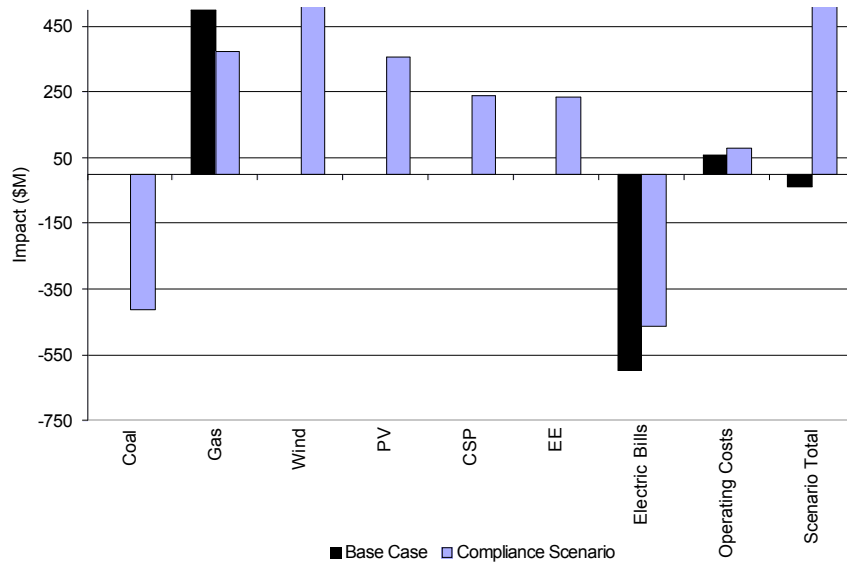


Figure 3. (b) Cumulative value added impacts by electric sector factor, 2010-2020, base case and compliance scenarios. Values are in 2010 dollars.

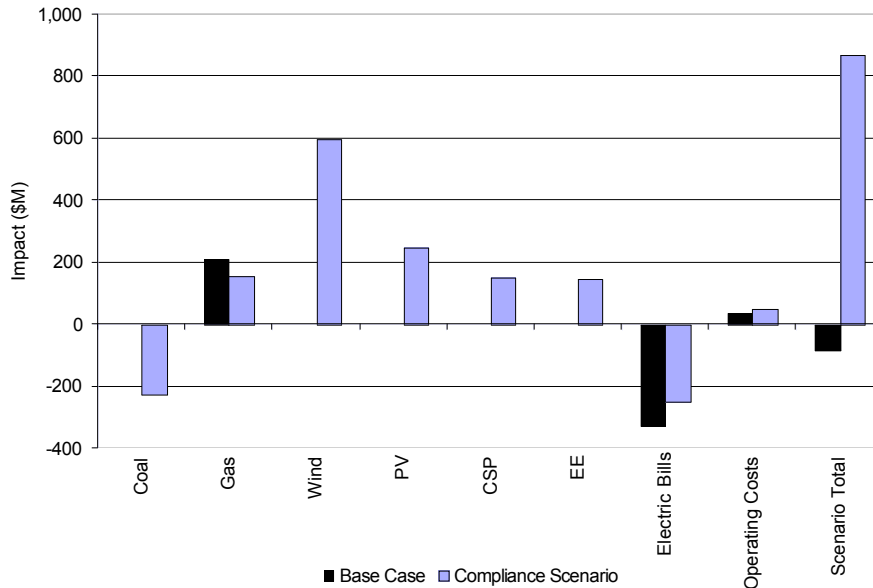


Figure 3. (c) Cumulative labor income impacts by electric sector factor, 2010-2020, base case and compliance scenarios. Values are in 2010 dollars.

As noted earlier (and shown in **Figure 2**) the compliance scenario analyzed here meets the electric sector target emissions requirements of the greenhouse gas rule through 2020. It does so without reliance on any offsets, and with a level of energy efficiency investment consistent with best practices in this area, and only slightly greater than the minimum already required by New Mexico law. This compliance scenario assumes a moderate level of investment in renewable energy resources. No fossil fuel-fired generating plants have been added or retired under either the base or compliance scenario considered here; however, in the compliance scenario generation from coal has been reduced significantly by 2020. This scenario not only meets the requirements of the rule and reduces pollution; it does so while creating jobs and economic value for New Mexico.

Of course, a wide range of other compliance scenarios is possible. For example, witness Ron Collings testified before the EIB (Docket EIB 08-19(R)) that there are numerous opportunities in the oil and gas sector to reduce emissions that are already cost-effective, if only marginally so, and many more that would require a modest payment from the electric utilities to make them cost effective. In fact, we note that in the final version of the rule the covered emissions from the oil and gas sector was reduced from 14 million metric tons per year to 8 million—meaning that there are abundant opportunities for reductions that would not otherwise be required under the rule, and would thus qualify as offsets. It is also likely that additional reductions in non-covered resources in the electric sector could provide cost-effective offsets. It is possible that it would be most cost-effective to generate “offsets” within the utilities’ own fleets by retiring the least efficient coal or gas steam units. If any such alternative compliance scenario relied upon such offsets, the required investments would generate economic activity and produce jobs, and would also entail some cost to consumers. Whether this would have a positive or negative overall economic impact is difficult to determine without knowing the specific nature of the offsets.

The overall conclusion of our analysis is clear and robust: far from being costly for consumers and for the New Mexico economy, we find that compliance with the New Mexico greenhouse gas rule can create jobs and save money for electricity consumers while reducing greenhouse gas and other pollutant emissions in New Mexico. Compliance with the rule can help to mitigate future increases in electricity bills in New Mexico, result in cleaner air and water from decreased coal-fired generation, reduce demand on the state's water supplies, and produce better-performing homes and buildings. In short, the requirements of the rule can be met largely through actions that would be in New Mexico electricity consumers' interest even in the absence of the rule. With the right compliance strategy, New Mexico can become a national leader in the effort to curb greenhouse gases and create jobs for New Mexicans at the same time.

Appendix: Resource Cost Assumptions

Table A1: Fixed and variable cost assumptions and capital recovery factor by resource type used to analyze costs and savings associated with the New Mexico greenhouse gas rule. All costs are constant U.S. dollars.

Resource Type	Capital Costs (\$/kW)	Fuel (\$/MWh)	Variable O&M (\$/MWh)	Fixed O&M (\$/kW-yr)	Capital Recovery Factor
Coal	N/A	\$18.23	\$4.74	\$28.43	N/A
Gas	N/A	\$44.23	\$4.74	\$28.43	N/A
Wind	\$2,305	\$0.00	\$5.35	\$12.19	7.8%
Solar (Distributed)	\$6,035	\$0.00	\$0.00	\$41.26	7.8%
Solar (Utility)	\$4,757	\$0.00	\$15.00	\$67.00	7.8%
Load Reduction			\$35.00		