

A black and white photograph of a city skyline at night. Several tall skyscrapers are illuminated, with their windows glowing. In the foreground, a multi-lane highway is shown with long, horizontal light trails from moving vehicles, creating a sense of motion. The sky is dark, and the overall scene is a composite of urban architecture and transportation.

POTENTIAL ECONOMIC IMPACTS OF A **STRICTER OZONE STANDARD**

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NATIONAL ASSOCIATION OF
Manufacturers



Overview

A new study by NERA Economic Consulting and commissioned by the National Association of Manufacturers (NAM) reveals that a new ozone regulation from the Obama Administration could cost \$270 billion per year and place millions of jobs at risk. This would be the most expensive regulation ever imposed on the American public.¹ In December 2014, the Environmental Protection Agency (EPA) will likely propose a more stringent National Ambient Air Quality Standard (NAAQS) for ground-level ozone, lowering the existing standard from 75 parts per billion (ppb) to as low as 60 ppb. To date, the EPA has only identified one-third of the controls needed to meet the possible new standard; the other two-thirds must come from controls the EPA has not identified. NERA's report looked at the types of controls needed to fill that unknown gap and found that they will be much more expensive. This is because they are likely to include the shutdown, scrappage or modification of power plants, factories, heavy-duty vehicles, off-road vehicles and even passenger cars. As a result, the negative impacts of a new NAAQS for ground-level ozone will reverberate throughout the entire economy. Total compliance costs could measure in the trillions of dollars, and barriers to energy production could severely limit economic growth and hinder the nation's manufacturing comeback.

The study found that a stricter new ozone regulation could:

- **Reduce U.S. GDP by \$270 billion per year and \$3.4 trillion from 2017 to 2040;**
- **Result in 2.9 million fewer job equivalents per year on average through 2040;**
- **Cost the average U.S. household \$1,570 per year in the form of lost consumption; and**
- **Increase natural gas and electricity costs for manufacturers and households across the country.**

In brief, such a rule could place tremendous cost and compliance burdens on states and their resources.

The study also found that the EPA has yet to adequately address two critical issues related to revising the existing ozone standard:

- There are major gaps in data on compliance technologies and their costs in the EPA's most recent analysis. Only about one-third of the emissions reductions necessary to get to the low end of the standards the EPA is contemplating can be achieved with known controls. This means that the agency has yet to identify what, if any, controls are available to achieve the majority of the necessary emissions reductions and adequately address what those controls might cost.
- New oil and natural gas production could be significantly restricted in parts of the country classified as "nonattainment" areas, limiting supplies of critical energy resources and potentially driving up costs for manufacturers and households. The EPA has yet to address the potential impacts tighter ozone standards could have on energy production and costs.

The study considered the potential implications of energy curtailment by estimating the economic impacts if limits to new natural gas development were added to compliance costs. The study found that restrictions to new natural gas production from tighter ozone regulations, in combination with the costs to reduce emissions, could:

- Reduce the present value of GDP by nearly \$4.5 trillion through 2040, result in a loss of 4.3 million job equivalents per year and cost households \$2,040 annually; and
- Increase industrial natural gas costs by an average of 52 percent and electricity costs by an average of 23 percent over what they would be if the ozone standard was unchanged.

Such cost impacts could crush the manufacturing comeback by removing our nation's energy advantage. The NAM urges the EPA and the Obama Administration to abandon plans to revise and tighten the NAAQS for ground-level ozone. The current standard of 75 ppb—the most stringent standard ever—has not even been implemented yet, while emissions are as low as they have been in decades, and air quality continues to improve.

¹ The NAM makes this statement based on compliance costs measured by NERA Economic Consulting and White House Office of Management and Budget reports to Congress assessing the costs of regulations back to 1988. http://www.whitehouse.gov/omb/inforeg_regpol_reports_congress



Background

What Is Ground-Level Ozone?

Ground-level ozone is formed through a chemical reaction when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) interact with sunlight. Emissions from power plants, industrial facilities, automobiles, gasoline vapors and solvents are all sources of NO_x and VOCs. Natural sources, such as plant life and fires, also contribute to the formation of ozone; today, given how much ozone levels in the United States have already been reduced, a significant portion of a given area's ozone concentration is made up of natural background ozone and ozone that has traveled from other states and, increasingly, from overseas.

What Are Ozone Regulations?

Under the Clean Air Act, the EPA is instructed to select a primary NAAQS for ground-level ozone that protects the nation's public health within an "adequate margin of safety."² In March 2008, the EPA lowered the primary NAAQS for ground-level ozone from 84 ppb³ to 75 ppb. The EPA is again considering tightening the NAAQS for ground-level ozone with its proposed regulation expected in December 2014 and final regulation in October 2015. The EPA has stated its intent to revise the existing standard and is contemplating tightening the standard to as low as 60 ppb in its most recent draft policy assessment for NAAQS for ground-level ozone.⁴

After the EPA establishes an NAAQS, it is the responsibility of each individual state to ensure that all counties and metropolitan areas in that state are in compliance with the standard. Areas that are above the standard (not in compliance with the NAAQS) are referred to as "nonattainment" areas. Areas below the standard (in compliance with the NAAQS) are referred to as "attainment" areas. While states have some flexibility in implementing regulations and other programs to meet the NAAQS for ground-level ozone, there are other federally mandated programs that states must adhere to if an area in the state is in nonattainment.

The greatest costs to comply with ozone regulations generally occur in nonattainment areas. The consequences for nonattainment are severe and can include a loss of industry and economic development resulting from increased costs, delays and uncertainties from restrictive permitting requirements; loss of federal highway and transit funding; requirements that any new emissions in the area be offset or the facility cannot be built; and technical and formula changes for commercial and consumer products.

As is demonstrated in the orange and red portions of the map in Figure 1, if a 60 ppb ozone standard were in place today, the vast majority of the country would likely be in nonattainment.

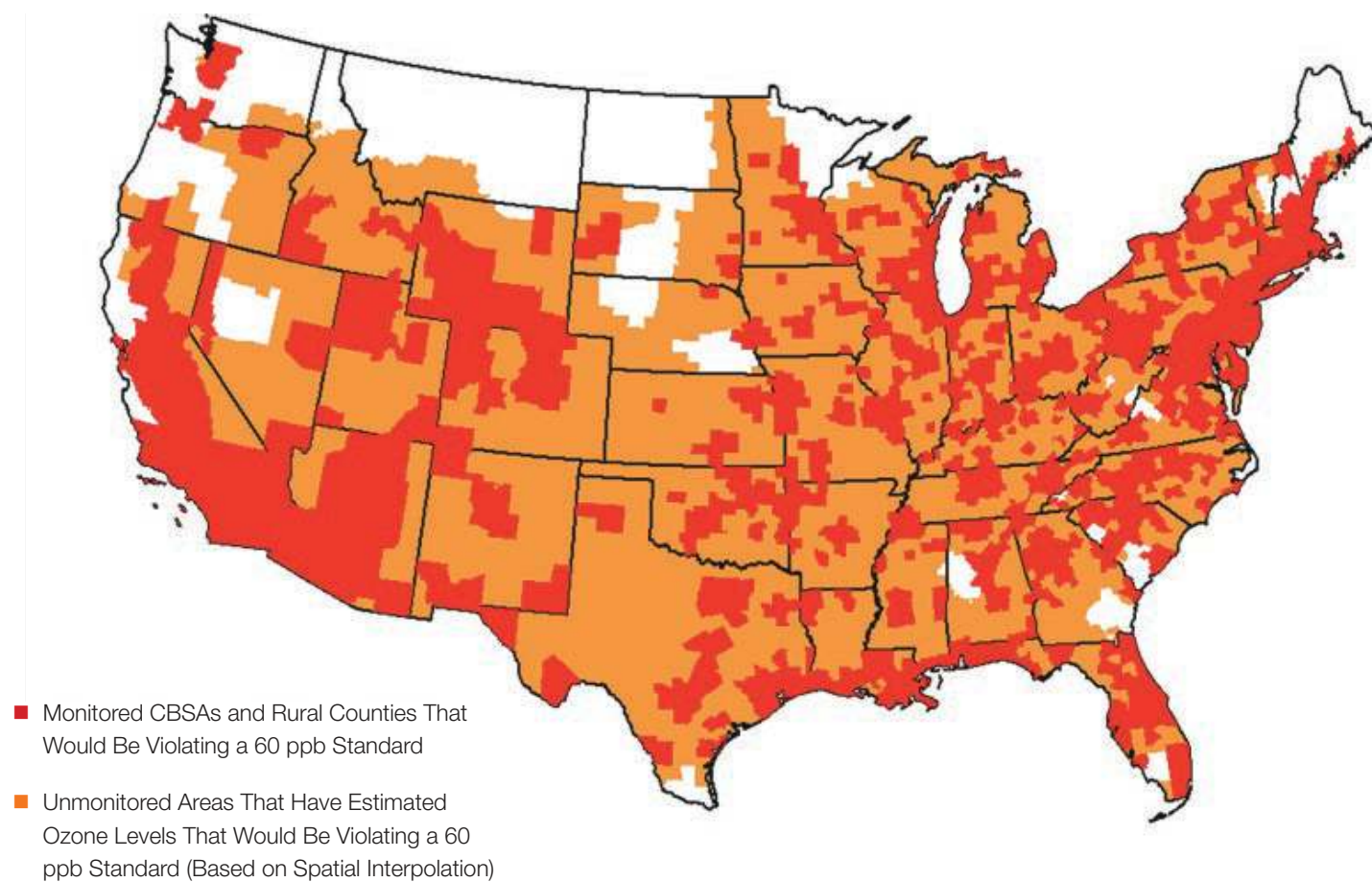
Unlike regulations that target specific sectors, a new ozone standard would directly affect virtually every sector of the economy because a wide range of stationary, mobile and area sources emit ozone precursors (NO_x and VOCs).

² The Clean Air Act, 42 USC § 7409.

³ The 1997 NAAQS for ground-level ozone was set at .08 parts per million. Using rounding conventions, the standard was effectively 84 ppb. The primary ozone standard is measured over an eight-hour period.

⁴ Environmental Protection Agency, *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards*, Second External Review Draft, ES-2, 2014. <http://www.epa.gov/ttn/naaqs/standards/ozone/data/20140131pa.pdf>

Figure 1: Core-Based Statistical Areas (CBSAs) and Rural Counties That Would Violate a 60 ppb Ozone Standard Based on 2011–2013 Data



Source: Based on 2011–2013 data accessed from <http://www.epa.gov/airtrends/> and <http://www.epa.gov/airdata/> on June 2, 2014.





Study Objectives

The study's two principal objectives were to:

- 1. Estimate the costs and economic impacts of a 60 ppb ozone standard using the best available information from the EPA and other sources; and**
- 2. Identify any gaps in existing EPA literature and analysis that would prevent the agency from accurately assessing the economic impacts of the regulation.**

One such informational gap in existing EPA material is a lack of analysis dedicated to the impacts nonattainment designations could have on new oil and natural gas production. Access to abundant and low-cost energy sources is helping to drive the manufacturing comeback in this country and has supported more than \$100 billion in investments⁵ in the form of new facilities and expanded operations. If new regulations significantly limit access to energy resources, costs could go up, and manufacturers will become less competitive.

Oil and natural gas producers in areas that become in nonattainment under a tighter ozone standard might face new requirements, such as the need to obtain air permits as well as emissions reduction credits ("offsets") for NO_x and/or VOCs, in order to develop new wells. Whether such permitting requirements will be applied to new oil and gas extraction nationally is a policy question that is in a state of flux at the present time. However, some areas of the country already have these requirements, and there are pressures for the EPA to make it a uniform requirement. Moreover, expansion of natural gas output will require additional gas processing facilities, which are already subject to the offsetting requirement if located in nonattainment areas. Obtaining offsets may be difficult and/or costly, particularly in relatively rural areas that are likely to face nonattainment issues that, until now, have mainly been an issue exclusive to urban areas. Such rural areas will have few industrial emissions sources to create offset supply, so that a potential requirement of new sources in nonattainment areas to purchase offsets may become a substantial hindrance to growth. If such barriers to new well development do emerge, the projected economic impacts of a 60 ppb ozone standard could be substantially increased.

To examine the potential economic impacts of natural gas production curtailment from tighter ozone regulations, the study performed a sensitivity case that includes constraints on new natural gas production as well as emissions control costs. The constrained natural gas production scenario assumes that production would be at or below projected 2020 levels throughout the study horizon, but this does not mean that the study assumes no new wells could be drilled. If no new wells could be drilled at all after 2020 due to nonattainment designations, U.S. natural gas production could actually start to decline rather than hold steady as this scenario assumes. The study provides the results of the sensitivity case.

⁵ American Chemistry Council, February 2014. <http://chemistrytoenergy.com/us-chemical-investment-linked-shale-gas-reaches-100-billion-1>



Results

The results of the findings, which are summarized below, indicate that a 60 ppb ozone standard could have enormous costs and negative effects on the U.S. economy, employment and households. These impacts are even greater in the sensitivity case, which considers nonattainment limits to natural gas production.

Effects on U.S. GDP and Household Consumption

The potential macroeconomic effects of a new ozone regulation as measured by GDP and household consumption are shown in Figure 2. The 60 ppb ozone standard is projected to reduce GDP from baseline levels by about \$3.4 trillion on a present value basis (as of 2014) and by \$270 billion per year on an annualized basis (spread evenly from 2017 to 2040 but retaining the same present value). Average annual household consumption could be reduced by about \$1,570 per household per year.

Figure 2: Potential Impacts of a 60 ppb Ozone Standard on U.S. GDP and Household Consumption

	Annualized	Present Value
GDP Loss (in Billions of 2013 Dollars)	\$270/year	\$3,390
Household Consumption Loss (in 2013 Dollars)	\$1,570/year	N/A

Notes: Present value is from 2017 to 2040, discounted at a 5 percent real discount rate. Household consumption is an annualized value calculated using a 5 percent real discount rate.

The loss of economic output and the impacts on household consumption are even more pronounced in the sensitivity case assuming constraints on new natural gas development as demonstrated in Figure 3. In this sensitivity case, GDP is reduced by nearly \$4.5 trillion across the study period, and average annual household consumption would be reduced by about \$2,040 per year.

Figure 3: Potential Impacts of a 60 ppb Ozone Standard on U.S. GDP and Household Consumption (Sensitivity Case)

	Annualized	Present Value
GDP Loss (in Billions of 2013 Dollars)	\$360/year	\$4,480
Household Consumption Loss (in 2013 Dollars)	\$2,040/year	N/A

Notes: Present value is from 2017 to 2040, discounted at a 5 percent real discount rate. Household consumption is an annualized value calculated using a 5 percent real discount rate.

Effects on Energy Costs

A 60 ppb ozone standard would likely have significant impacts on U.S. energy sectors, largely because the more stringent regulation is projected to include the substantial premature retirement of additional coal-fired power plants. The study estimates that 101 gigawatts of additional coal-fired capacity (34 percent of all coal-fired capacity in the baseline) would be forced into retirement as one element of a tighter ozone standard. These retirements would be more than double the substantial number of power plants that are already expected to shutter as a result of current EPA regulations and would threaten electric reliability in many already strained electricity markets across the country.⁶

Figure 4 shows average energy price projections under the baseline and the 60 ppb ozone standard, analyzed without possible gas development constraints. Residential electricity prices are projected to increase by 3.3 percent and industrial electricity prices by 5.5 percent from 2017 to 2040. Delivered residential natural gas prices could increase by 7.3 percent, while industrial natural gas prices could jump by 12.0 percent.

⁶ Electric Reliability Coordinating Council, *What the Cold Snap Tells Us About EPA Carbon Rules*, February 24, 2014. <http://docs.house.gov/meetings/IF/IF03/20140227/101797/HHRG-113-IF03-20140227-SD006.pdf>

Figure 4: Potential Impacts of a 60 ppb Ozone Standard on Energy Prices

		Average Baseline	Average 60 ppb	Change	Percent Change
Natural Gas Delivered (Residential)	\$/MMBtu	\$13.77	\$14.79	\$1.02	7.3%
Natural Gas Delivered (Industrial)	\$/MMBtu	\$8.43	\$9.49	\$1.06	12.0%
Electricity (Residential)	¢/kWh	14.5¢	14.9¢	0.5¢	3.3%
Electricity (Industrial)	¢/kWh	9.4¢	9.9¢	0.5¢	5.5%

Notes: Average is the simple average from 2017 to 2040. MMBtu stands for Million British Thermal Units, and kWh stands for kilowatt hour.

Energy costs skyrocketed in the sensitivity case in which potential constraints of natural gas production are included in the analysis. As shown in Figure 5, residential electricity prices could increase, on average, by 15 percent and industrial electricity prices by 23 percent from 2017 to 2040. Delivered natural gas prices could increase by 32 percent for the residential sector and 52 percent for the industrial sector. For manufacturers, particularly those in energy-intensive sectors, such as iron and steel, cement, aluminum, pulp and paper and chemicals, energy cost increases at these levels would be devastating in their ability to compete internationally.

Figure 5: Potential Impacts of a 60 ppb Ozone Standard on Energy Prices (Sensitivity Case)

		Average Baseline	Average 60 ppb	Change	Percent Change
Natural Gas Delivered (Residential)	\$/MMBtu	\$13.77	\$18.16	\$4.39	32%
Natural Gas Delivered (Industrial)	\$/MMBtu	\$8.43	\$12.79	\$4.36	52%
Electricity (Residential)	¢/kWh	14.5¢	16.6¢	2.1¢	15%
Electricity (Industrial)	¢/kWh	9.4¢	11.6¢	2.2¢	23%

Note: Average is the simple average from 2017 to 2040.

Effects on Employment

The impacts of a 60 ppb ozone standard on employment are substantial, as companies would have higher costs and lower labor productivity. To assess the effects on employment from new ozone regulations, the study expresses results in terms of job equivalents. A job equivalent is a metric that economists use to reflect the fact that impacts to labor from regulatory costs and burdens can come in the form of fewer hours worked, lower pay and lost jobs—and usually a combination of all three. Figure 6 shows that a 60 ppb ozone standard would result in lower wage earnings from 2017 to the end of the study period, with an average loss of 2.9 million job equivalents per year.

Figure 6: Potential Impacts of a 60 ppb Ozone Standard on Employment

	Average	2017	2020	2023	2026	2029	2032	2035	2038
Job Equivalents (Change from Baseline, in Millions)	-2.9	-0.9	-3.2	-3.0	-3.0	-3.3	-3.4	-3.3	-3.2

Note: Average is the simple average from 2017 to 2040.

The loss to workers is even greater in the sensitivity case with an average of 4.3 million fewer job equivalents per year. As demonstrated in Figure 7, job-equivalent losses exceed 5 million in the later years of the study, highlighting just how important domestic energy production and a low-cost energy supply are to employment now and in the future.

Figure 7: Potential Impacts of a 60 ppb Ozone Standard on Employment (Sensitivity Case)

	Average	2017	2020	2023	2026	2029	2032	2035	2038
Job Equivalents (Change from Baseline, in Millions)	-4.3	-1.1	-3.4	-4.1	-4.8	-5.1	-5.3	-5.4	-5.2

Note: Average is the simple average from 2017 to 2040.

Why Would New Ozone Regulations Be So Expensive?

Attaining a 60 ppb ozone standard will require large reductions in NO_x and VOC emissions from power plants, manufacturing facilities and mobile sources, such as cars, trucks and off-road vehicles. These reductions come at a high cost per ton because significant investments have already been made to reduce emissions, leaving few low-cost control options as the ozone standard tightens. Efforts to control NO_x emissions drive the majority of the costs in the study. An explanation of why costs associated with reducing NO_x emissions to levels necessary to meet a 60 ppb ozone standard are so high is provided below.

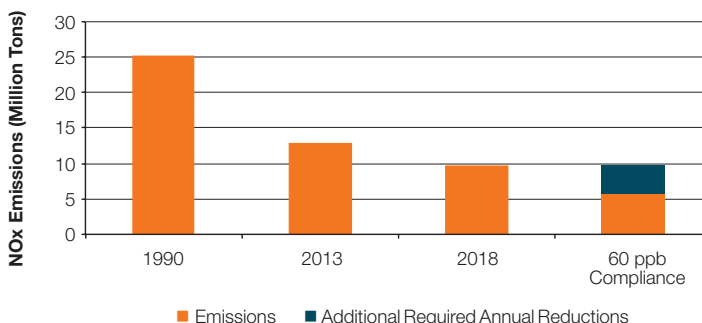
1. Despite Significant Emissions Reductions, Substantially More Would Be Required to Comply with a New Standard

NO_x emissions have declined substantially in recent years, from 25.2 million tons in 1990 to 12.9 million tons in 2013.⁷ In part due to other regulations already on the books, such as the Cross-State Air Pollution Rule and new air emission standards for passenger cars and light-duty trucks, the EPA projects that, in the absence of new ozone regulations, NO_x emissions will be reduced further to 9.7 million tons by 2018. Some of these regulations have not yet been fully implemented and will carry with them additional compliance costs on top of any that are estimated in this study.⁸

Based on information in the 2008–2010 EPA ozone review, NO_x emissions would have to be reduced even *further*—to about 5.8 million tons—to meet a 60 ppb ozone standard.⁹ Figure 8 shows declining NO_x emissions since 1990 and represents the further estimated reductions needed to achieve a 60 ppb ozone standard.

Despite the extensive controls already expected to occur through 2018 from other regulations and measures, another 3.9 million tons would need to be reduced to achieve a 60 ppb ozone standard nationally. This reduction is equivalent to about 40 percent of the EPA's baseline NO_x emissions for 2018, a 55 percent reduction from current NO_x emissions levels and a 77 percent reduction from 1990. Accounting for the effects of economic growth on emissions, this represents a 90 percent reduction in the emission rate.

Figure 8: Historical NO_x Emissions and Estimated Reductions Needed to Achieve a 60 ppb Ozone Standard



2. As Emissions Decline, Costs for Additional Reductions Increase

Traditionally, when ozone standards or other regulations have called for a reduction in NO_x emissions, regulators have looked first to large sources like power plants, requiring them to install control equipment. Large power plants, because of their size, historically have been a relatively cost-efficient way to achieve NO_x reductions in terms of dollars spent per ton of NO_x reduced. However, overall, the power sector has reduced its NO_x emissions by 73 percent from 1990 to 2013.¹⁰ With the majority of existing coal-fired power plant capacity equipped with some form of NO_x controls¹¹ and further controls expected to be installed because of other EPA regulations, the opportunity for further NO_x reductions from power plant retrofits is diminishing.

Thus, as the EPA has identified in its own analysis, to achieve a 60 ppb ozone standard, several other sectors, such as manufacturing and agriculture, and commercial and residential buildings will have to pay for controls or replace equipment, often at a very high cost. These expensive known controls only achieve about one-third of the necessary NO_x reductions.

⁷ Environmental Protection Agency, "National Emissions Inventory Air Pollutant Emissions Trends Data," 2014b. http://www.epa.gov/ttn/chieftrends/trends06/national_tier1_caps.xlsx

⁸ Environmental Protection Agency, "2018 Emission Projections by State and Source Sector," 2014a.

⁹ The EPA's 2008–2010 ozone review refers to information in the EPA's 2008 regulatory impact analysis for NAAQS for ground-level ozone, including information on baseline future conditions and ozone standards of 84 ppb and 75 ppb (EPA 2008); the EPA's 2010 supplemental regulatory impact analysis, including information on an ozone standard of 60 ppb (EPA 2010); and data files in Docket No. EPA-HQ-OAR-2007-0225.

¹⁰ Environmental Protection Agency, Clean Air Markets Division. <http://ampd.epa.gov/ampd/QueryToolie.html>

¹¹ Environmental Protection Agency, Coal Unit Characteristics Summary, 2013. http://www.epa.gov/airmarkets/images/CoalUnitCharacteristics2013_summary.pdf

Figure 9 provides a national summary of the EPA's known NO_x controls from sectors other than power plants that would be needed for compliance with a new ozone standard of 60 ppb.¹² The table shows the specific types of technologies and measures for each emission source category.

Figure 9: National Summary of EPA Known NO_x Controls (Tons of Reduction)

	Reductions (Tons)
Point – Manufacturing and Other Industrial	825,400
Selective catalytic reduction (SCR) without low NO _x burner (LNB)	466,800
Low emission combustion (for internal combustion engines)	82,000
Selective catalytic reduction (SCR) and low NO _x burner (LNB)	80,800
Nonselective catalytic reduction (NSCR)	70,300
Selective non-catalytic reduction (SNCR)	61,400
OXY-firing (for glass manufacturers)	33,800
Low NO _x burner (LNB) without selective catalytic reduction (SCR)	20,700
Biosolid injection (for cement kilns)	8,200
Other	1,300
Area – Commercial and Residential	27,800
Low NO _x water and space heaters (for commercial buildings)	14,000
Low NO _x burner (LNB)	12,800
Switch to low sulfur fuel (for residential buildings)	1,000
Onroad Mobile – Cars, Trucks and Other Sources	256,100
Retrofit heavy-duty diesel with selective catalytic reduction (SCR)	137,700
Continuous inspection and maintenance	27,800
Elimination of long-duration idling	10,500
Commuting programs	4,400
Low Reid Vapor Pressure	1,000
Unspecified	74,800
Nonroad Mobile – Agriculture, Construction and Other Sources	45,000
Retrofit heavy-duty diesel with selective catalytic reduction (SCR)	45,000
No Details (Some Omissions in EPA Data for California and Texas)	130,100
Total	1,284,400

Note: All numbers are rounded to the nearest hundred.

“Point” sources include large stationary equipment, such as boilers and kilns at manufacturing and other industrial facilities. Of the NO_x reductions from known controls that the EPA identifies in its existing analysis, about half come from point sources. Many of these controls require retrofitting existing plants and equipment with expensive additional technologies.

Owners of smaller stationary sources, such as commercial and residential water heaters—referred to as “area” sources—would be expected to incur costs according to the EPA's analysis of known controls. Owners of area sources may have to replace their existing equipment altogether or switch to different—likely more expensive—fuels.

“Onroad mobile” sources, such as cars and heavy-duty trucks, would also be targeted for reductions, according to the EPA. Many states would likely have to put more resources into inspection and commuting programs. According to the agency, some heavy-duty truck owners would have to retrofit their vehicles with additional expensive controls.

Other sources have been targeted as well, such as agricultural and construction equipment (referred to as “nonroad mobile” in Figure 9).

¹² Environmental Protection Agency, “Final Ozone NAAQS Regulatory Impact Analysis,” March 2008. http://www.epa.gov/ttn/ecas/regdata/RIAs/452_R_08_003.pdf

3. The Majority of Reductions Come from Unknown Controls

The EPA has identified only one-third of the controls needed to reduce the 3.9 million tons of NO_x to achieve a 60 ppb ozone standard. As demonstrated in Figure 10, the remaining 2.6 million tons would need to come from unknown controls, or controls and measures that the EPA has yet to identify.

Unknown controls are expected to be substantially more expensive than known control options. In fact, in the EPA's 2010 analysis, the total costs for unknown controls were greater than the costs for known controls by a ratio of 19 to 1.¹³ The study estimates that the difference in costs between known and unknown controls could be even higher. Figure 11 illustrates this concept. Whereas the cost per ton for reductions from known controls may cost tens of thousands of dollars, costs for unknown controls could cost hundreds of thousands of dollars.

The steeply sloped marginal cost curve is explained, in part, by the expectation that to achieve a 60 ppb ozone standard, some power plants, manufacturing facilities and vehicles, along with other industrial, commercial, agricultural and even residential equipment, will have to be shut down or scrapped. For example, even after new ozone regulations force the shutdown of another 101 gigawatts¹⁴ of capacity, or nearly 9 percent of the entire U.S. power plant fleet, NO_x emissions would still be too high to achieve a 60 ppb ozone standard. Thus, as the study suggests, older cars, farm equipment and capital-intensive manufacturing equipment may have to be scrapped altogether. NERA has estimated that early retirement and scrapping of these types of equipment are much more costly per ton removed than the retrofits that largely comprise the known controls. Although NERA only analyzed a 60 ppb NAAQS for ground-level ozone, the same need to estimate costs for unknown controls would arise for other ozone standards within the range the EPA is considering.

Figure 10: Estimating U.S. Compliance Emissions

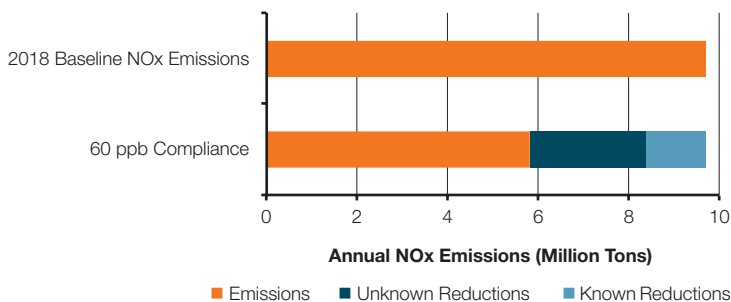
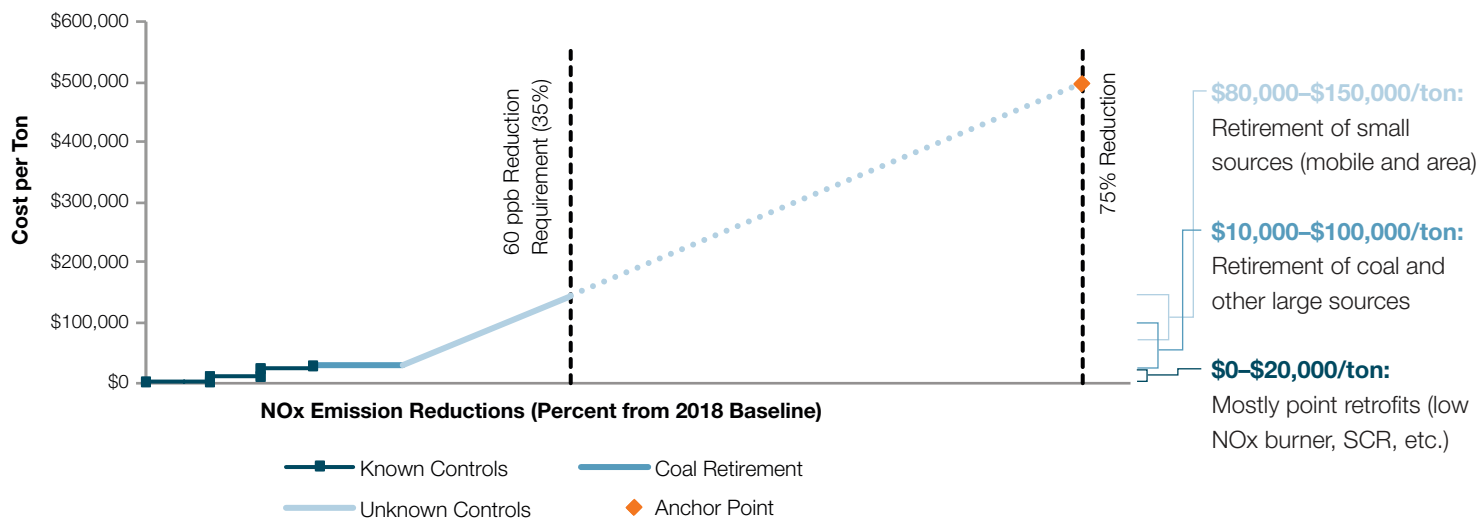
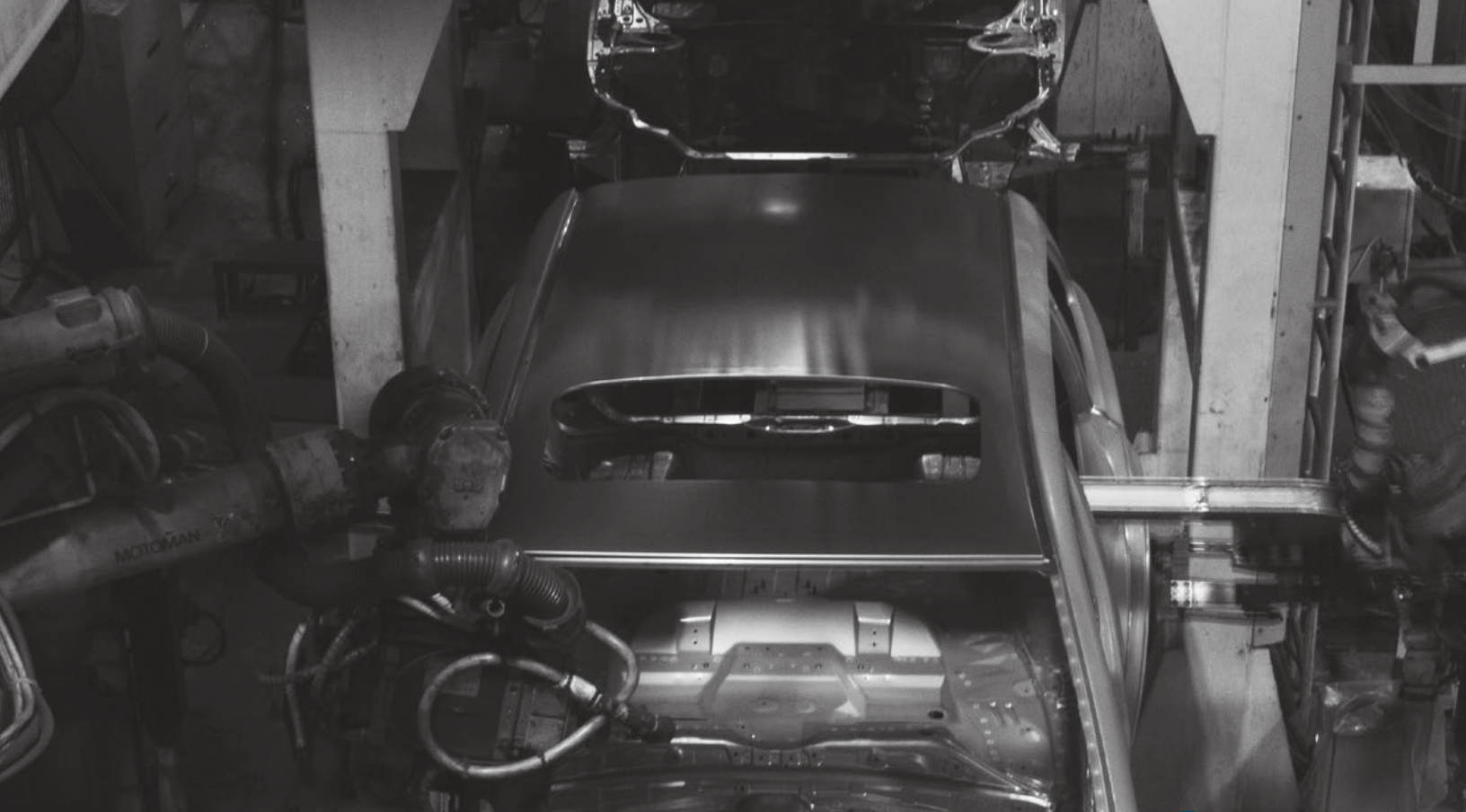


Figure 11: Illustration of a State NO_x Marginal Cost Curve Showing Known and Unknown Controls

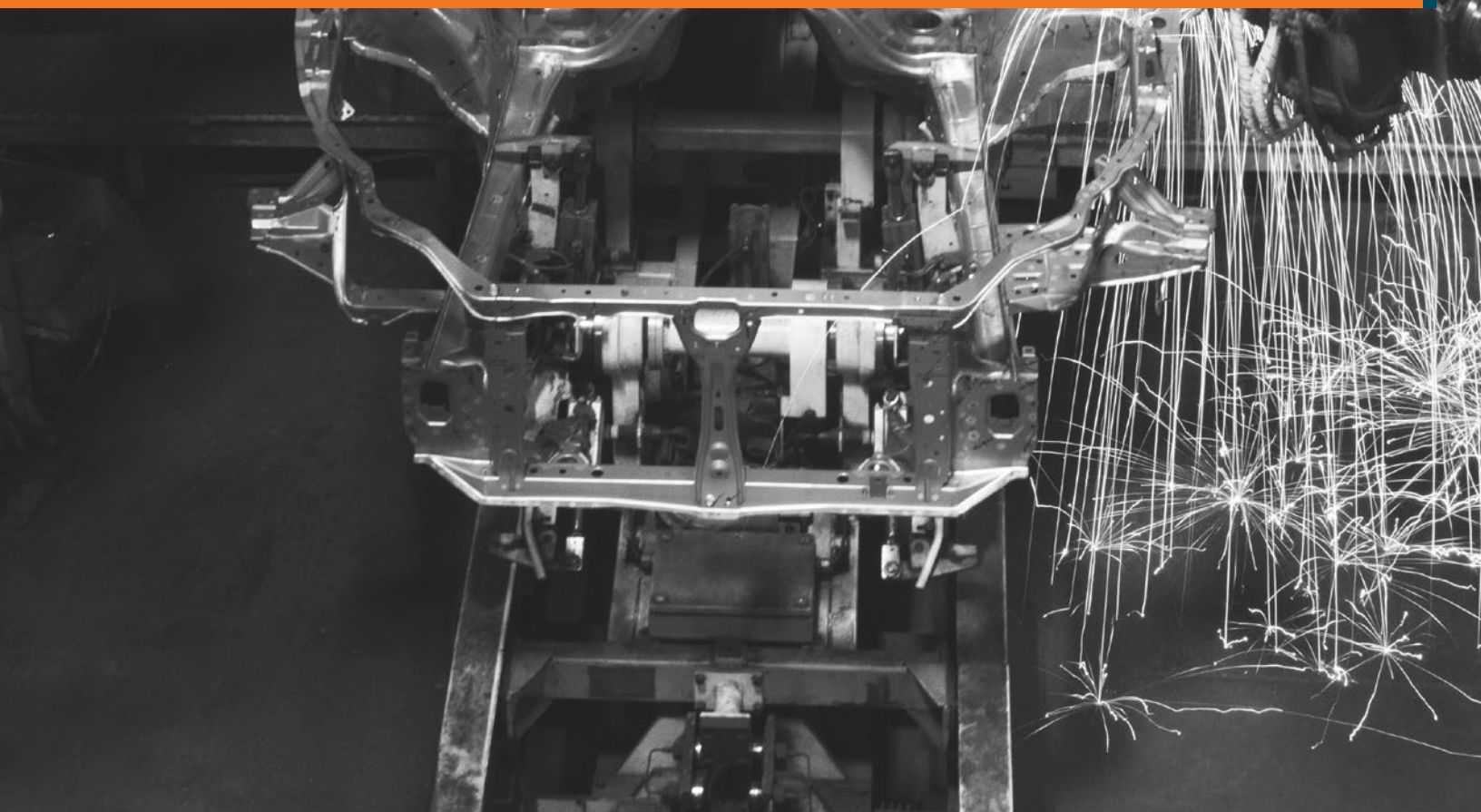


¹³ Environmental Protection Agency, "Summary of the Updated Regulatory Impact Analysis (RIA) for the Reconsideration of the 2008 Ozone National Ambient Air Quality Standard (NAAQS)," p. S2-19, 2010. http://www.epa.gov/ttn/ecas/regdata/RIAs/s1-supplemental_analysis_full.pdf

¹⁴ The 101 gigawatts of coal retirements are in addition to expected coal retirements in the baseline scenario, which accounts for regulations already in place, such as the Utility MATS Rule.



Conclusion and Recommendations



While this study is the latest to estimate the potential costs of new ozone regulations, it is certainly not the first. In the EPA's most recent analysis of a 60 ppb ozone standard, the agency estimated the costs of new ozone regulations could exceed \$100 billion per year in 2013. As this study explains, the EPA's analysis was incomplete in a number of key areas, and the actual costs would likely be substantially higher than the agency's estimates. A substantial portion of the costs in all of the analyses performed to date is driven by controls that the EPA has not yet identified, technologies that must be invented or the shutdown, scrappage and/or modification of existing facilities, equipment and vehicles.

In light of the findings of this study, manufacturers strongly recommend that the EPA rethink its approach to the NAAQS for ground-level ozone. It is not clear that a stricter new standard could even be achieved, resulting in prolonged nonattainment. Even if it could be achieved, a stricter standard could have enormous economic consequences. The existing 75 ppb ozone standard has not even been implemented, meaning society has neither borne the costs nor determined whether there are discernible benefits of that standard. Before the EPA initiates a process that could cost as many as 4.3 million job equivalents per year and threaten manufacturers' competitiveness, a more complete analysis is needed.

Manufacturers also strongly urge Congress to reevaluate the provisions of the Clean Air Act that govern NAAQS for ground-level ozone. In the four decades since its enactment, the Clean Air Act has driven major reductions in ozone. However, it is increasingly clear that most, if not all, of the low-hanging fruit has been picked, and further reductions will cost exponentially more while accomplishing less. Based on the way the EPA interprets the Clean Air Act, it is virtually ensured that the agency will recommend a stricter standard every five years. Yet, ozone levels are getting so low that a rapidly growing share of even urban areas' ozone concentrations now comes from either naturally occurring ozone or from ozone that has been transported from other states or countries. We have reached the point at which significant further reductions simply cannot be accomplished in any cost-effective manner. Absent recognition of this fact from the EPA, it is time for Congress to modernize the Clean Air Act.



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