



# **EPA Clean Power Plan: EIA's Forecast Shows Benefits Fall Well Short of Costs . . . Again**

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**Institute for 21st Century Energy  
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# EPA Clean Power Plan: EIA's Forecast Shows Benefits Fall Well Short of Costs . . . Again

## Summary

In May 2016, the U.S. Energy Information Administration (EIA) issued its *Annual Energy Outlook 2016*, which includes model runs with and without the Environmental Protection Agency's (EPA) Clean Power Plan (CPP) final rule. The EIA analysis provides an independent look of the impacts CPP will have on the economy and energy markets in the United States.

While there are many aspects of EIA's analysis worthy of review, this report focuses on four main areas:

1. EIA's assessment of CPP demonstrates that over the 2022 to 2030 compliance period the economic costs exceed the climate and monetized ancillary benefits by \$196 to \$529 billion—or from \$78 to \$210 per ton of carbon dioxide reduced—even when using the Obama Administration's own inflated benefits estimates;
2. EIA's assessment shows that, contrary to EPA's claim, both electricity prices and electricity expenditures will be higher under CPP, with total electricity expenditures increasing \$40.5 billion over the compliance period;
3. EIA's assessment shows that in 2030, employment will be 376,000 lower under CPP; and
4. EIA's assessment shows that, contrary to statements by EPA downplaying the impact of its rules on the coal industry, coal output will decline precipitously under CPP instead of rising.

EIA's analysis leaves little room for doubt that EPA's CPP is a bad deal for the American economy.

## Introduction

Since the Environmental Protection Agency (EPA) issued its Clean Power Plan (CPP) proposed rule<sup>i</sup> to regulate carbon dioxide emissions from electricity generating stations in June 2014, the agency has touted the alleged environmental and economic benefits of the rule based on its own analysis.<sup>ii</sup> As the 17th century French mathematician Blaise Pascal famously observed, however, “The justest man in the world is not allowed to be judge in his own cause,” and what goes for men and women should go for regulatory agencies, too.

In 2014, House Committee on Science, Space & Technology Chairman Lamar Smith tasked the Energy Information Administration (EIA) with taking an independent look at the economic and energy market effects of the proposed CPP using its National Energy Modeling System. We produced a detailed look at the results of the EIA’s analysis and found that its model runs showed economic costs greatly exceeding benefits under the rule,<sup>iii</sup> a very different story from EPA’s.

EPA’s story has not changed in the CPP final rule. In its “FACT SHEET: Clean Power Plan By The Numbers,” the agency contends that, “The Clean Power Plan has public health and climate benefits worth an estimated \$34 billion to \$54 billion per year in 2030, far outweighing the costs of \$8.4 billion.”<sup>iv</sup> Is this true?

In May of this year, EIA issued the 2016 edition of its *Annual Energy Outlook (AEO2016)*,<sup>v</sup> its yearly energy market forecast peering 25 years into the future (to 2040). *AEO2016* includes both a model run with the CPP final rule (the “CPP Case”) and one without it (the “No CPP Case”).<sup>vi</sup> Comparing these two forecast scenarios, it is possible to get an unbiased look at the economic and other impacts of EPA’s final rule.

EIA describes the CPP Case<sup>vii</sup> this way: “A business-as-usual trend estimate, given known technology and technological and demographic trends. The Reference case [*i.e.*, CPP Case] assumes Clean Power Plan (CPP) compliance through mass-based standards (emissions reduction in metric tons of carbon dioxide) modeled using allowances with cooperation across states at the regional level, with all allowance revenues rebated to ratepayers.” In other words, EIA has modeled what EPA views as the most cost-effective compliance option.

EIA describes the No CPP Case this way: “A business-as-usual trend estimate, but assumes that CPP is not implemented.”

The focus of this analysis will be on the comparison between EIA’s No CPP and CPP scenarios for the nine-year compliance period from 2022 to 2030.<sup>viii</sup> Also note that for consistency, all dollar figures have been converted into chained 2015 dollars. Also, all carbon dioxide emissions are from fossil fuel combustion only.

## Carbon Dioxide Emissions

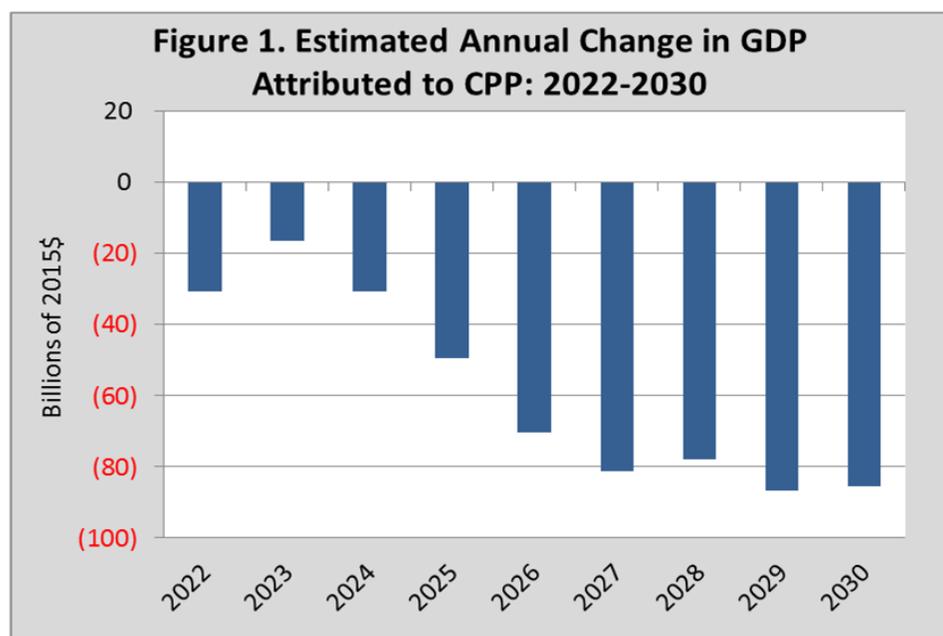
Under its CPP Case, EIA forecasts that U.S. power sector carbon dioxide emissions would plunge below the No CPP Case level by 12% in 2025 before settling in at about 20% lower in 2030. Small cuts also are recorded in other sectors of the economy. Compared to the No CPP Case, CPP is expected to lower total cumulative carbon dioxide emissions by 2.5 gigatons over the compliance period, an average of about 280 million metric tons each year.<sup>ix</sup> From 2022 on, each year sees progressively bigger annual emissions reductions, rising from 126 million metric tons in 2022 to 383 million metric tons in 2030.

EIA's CPP Case projection indicates that by 2030, carbon dioxide emissions from the power sector in the CPP Case will be 35% below 2005 emissions—three percentage points more than the 32% goal announced by the administration.

## Economic Costs vs. Global Social Cost of Carbon Benefits

EIA data show that cutting emissions so rapidly and deeply would come at a tremendous economic cost, both in total and in a relation to each ton of carbon dioxide reduced. When set against EIA's No CPP scenario, cumulative economic costs over CPP's 2022 to 2030 compliance period are an estimated \$529 billion in lost GDP. Annual losses range from \$16 billion in 2023 to \$87 billion in 2029 (Figure 1). The average GDP hit over the compliance period is \$59 billion. These values are considerably higher, in most cases by an order of magnitude, than EPA's estimated compliance costs of well less than \$10 billion per year.

It is often argued, however, that the value of the carbon dioxide emission reductions, as measured by the "Social Cost of Carbon" (SCC), would turn even GDP losses such as these into gains. The SCC represents an attempt to



Source: Annual Energy Outlook 2016.

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measure the health, property, agricultural, ecosystem, and other presumed impacts of emitting a ton of carbon dioxide. It is also important to note that because greenhouse gases are well mixed in the atmosphere, the impacts of carbon dioxide emissions are considered to be global in nature (unlike air pollutants, whose impacts largely are local). This means the climate costs or benefits would be felt primarily outside of the United States.

Whether it is even possible to measure the SCC with any precision remains a matter of controversy. Nevertheless, the president's Council of Economic Advisors asserts that estimating the SCC is a "critical step in formulating policy responses to climate change," and further that it "provides a benchmark that policymakers and the public can use to assess the net benefits of emissions reductions stemming from a proposed policy."<sup>x</sup>

SCC estimates were developed by the administration's Interagency Working Group on Social Cost of Carbon initially in November 2010<sup>xi</sup> and again in May 2013. The figures produced in the latter report were subsequently updated in July 2015. The Working Group generated a range of estimates using discount rates of 3.0%, 2.5%, and 5% discount rate. A series also was calculated representing the 95th percentile of the three SCC estimates using a 3% discount rate (3%/95<sup>th</sup> percentile).<sup>xii</sup>

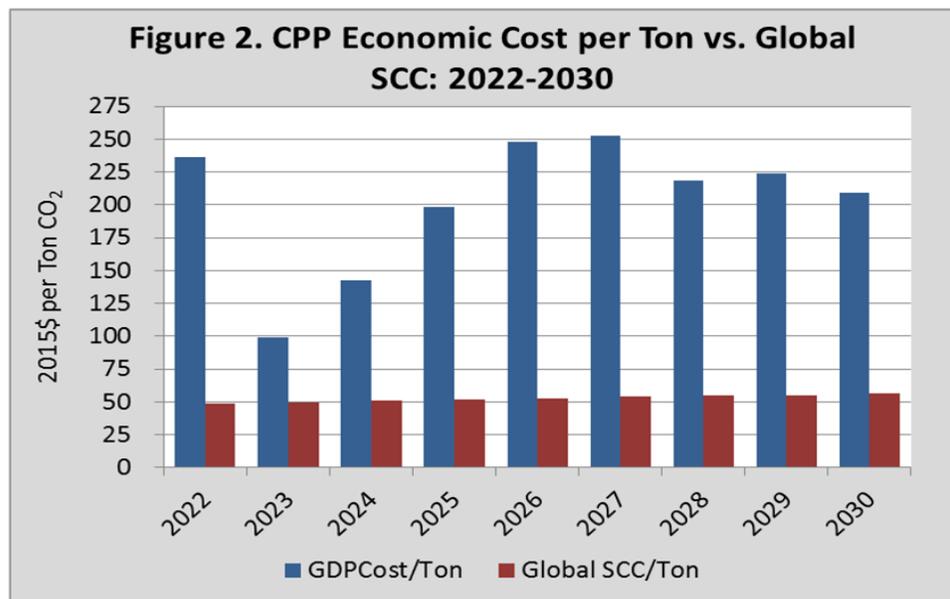
Using these SCC values as a major tool in justifying regulation is an unprecedented departure from how the federal government develops and employs these kinds of metrics. While the SCC has been referenced in the cost-benefit analyses of some rulemakings, including EPA's CPP, it is far from clear that the use of such a metric to defend regulatory action is authorized by any law. Moreover, none of the SCC calculations have gone through any rulemaking process of the type one would normally expect for this kind of far-reaching analytical tool, nor have they been subject to the rigors of notice, public comment, and data quality. They also have never been subject to any kind of Congressional review or approval.

This is exactly the kind of kind of openness and transparency that is required under the Administrative Procedures Act and Executive Order 12866 when using scientific and technical data. As a consequence of these procedural failures, not to mention the questionable accuracy of the SCC values themselves,<sup>xiii</sup> the SCC calculation should be subject to greater transparency, notice, public comment, data quality, and accountability to Congress.

Nevertheless, for the purposes of this analysis any lingering doubts about its SCC's value as an analytical tool will be set aside, and it will be stipulated that the Interagency Working Group's central SCC estimates using a 3% discount rate are spot on. Given this assumption, are the claimed SCC benefits are large enough to offset the economic losses EIA forecasts?

Figure 2 shows the annual economic cost per ton of carbon dioxide calculated for 2022 through 2030 and the administration's Global SCC estimate for that year. As the chart shows, the cost for each ton of carbon dioxide reduction under EPA's plan far outstrips the benefits. Cost per tons average an extraordinarily high \$210 over the 2022 to 2030 period, ranging from a low of

\$99 (in 2023 (to a high of \$253 (in 2027). To produce a *net* climate benefit, the SCC must be greater than the economic cost of each ton of carbon dioxide cut. But as Figure 2 shows, this is certainly not the case here. Indeed, over the compliance period, the average per-ton economic loss is almost four times greater than the SCC benefit.



Sources: EIA Annual Energy Outlook 2016; Interagency Working Group on SCC.

Taking into account these SCC estimates, contentious as they are, the net loss to the economy over the compliance period falls by \$135 billion to a still large \$394 billion. That equates to an average net loss of about \$44 billion per year<sup>xiv</sup> and a net cost per ton of carbon dioxide reduced of \$157. In other words, even by the Administration’s own highly controversial standard, the economic costs of the CPP exceed the climate benefits.

### Economic Costs vs. Domestic Social Cost of Carbon Benefits

Most of the claimed climate benefits from decreasing emissions would occur beyond U.S. borders, which means that the SCC benefits claimed for the United States must be smaller than those claimed globally.

Although the Interagency Working Group tasked with developing the SCC hesitated to create a “domestic SCC,” for reasons that are not entirely clear, it admitted in its 2010 report that the domestic SCC would be a small fraction of the Global SCC, concluding: “[W]ith a 2.5 or 3 percent discount rate, the U.S. benefit is about 7-10 percent of the global benefit, on average, across the scenarios analyzed. Alternatively, if the fraction of GDP lost due to climate change is assumed to be similar across countries, the domestic benefit would be proportional to the U.S. share of global GDP.”

Figure 3 shows what the Global SCC looks like after it has been adjusted using the GDP-share method described above, clearly is more charitable option for EPA’s case. To calculate the U.S. share of global GDP, the Department of Agriculture Economic Research Service’s International Macroeconomic Data Set was used.<sup>xv</sup> As is clear from the chart, the GDP-share method yields a Domestic SCC within a range of about \$10 to \$12 per ton of carbon dioxide reduced over 2022 to 2030. So for each ton of carbon dioxide reduced, the economic cost is about 19 times greater than the societal benefit.

Applying this Domestic SCC to revise the cost and benefit figures calculated earlier, the cumulative net economic losses decreases little, from \$529 billion to \$501 billion for an average of net annual loss of \$56 billion and an average per-ton emissions reduction cost of \$199.

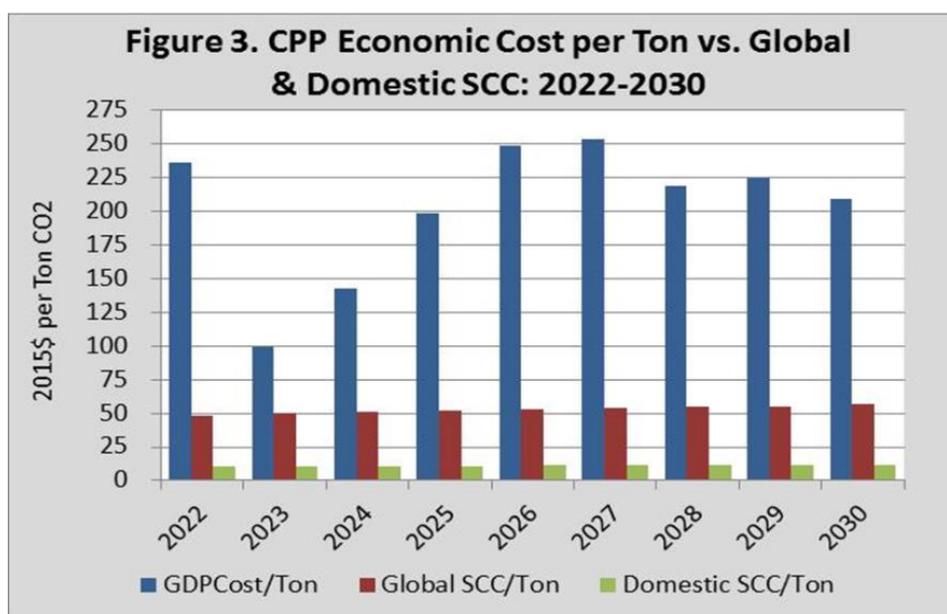
### Co-Benefits

One of the unusual things about the CPP final rule is how little emphasis EPA places on climate benefits to support its—and given the results detailed above, maybe that should not be surprising. EPA instead rests practically its entire economic

justification for the rule on the monetized ancillary benefits of pollution reduction.

We will leave aside the debate on how accurate measurements of these benefits really are and accept the values EPA used in its Regulatory Impact Analysis for final rule.<sup>xvi</sup> EPA provides a low and a high “benefit per ton” estimate for a range of pollutants in 2020, 2025, and 2030 based on EPA’s own air-quality modeling. For the purposes of this analysis, the midrange of the two extremes (using the 3% discount rate) were used to calculate total co-benefits for these three years using EIA’s AEO2016 output.

In general, our estimates for co-benefits are larger than EPA’s. Our 2020 average is \$1.9 billion against EPA’s average of \$0.8 to \$3.8 billion; our 2025 average is \$17.7 billion against EPA’s



Sources: EIA AEO2016; Interagency Working Group on SCC; U.S. Department of Agriculture Economic Research Service International Macroeconomic Data Set; and EPA CPP Final Rule Regulatory Impact Analysis.

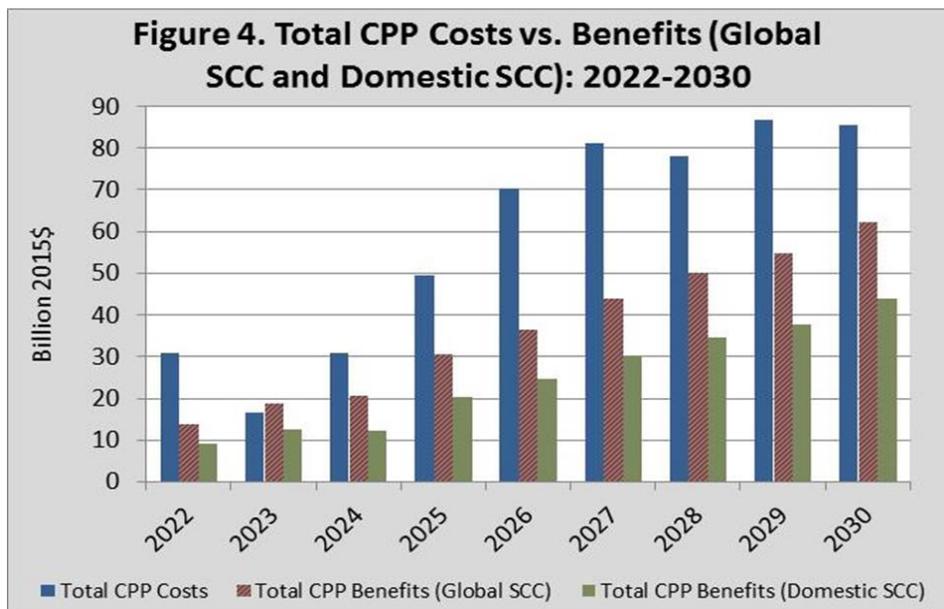
average of \$12.4 to \$13.5 billion; and our 2030 average is \$39.2 billion against EPA’s average of \$22.6 to \$27.1 billion.<sup>xvii</sup>

Interpolation then was used to calculate per ton co-benefits and, using *AEO2016* output, total co-benefits for the intervening compliance years. These values were added to the Global and Domestic SCC values to derive total annual climate plus co-benefit figures for 2022 to 2030 that could be set against the GDP losses. The results for each compliance year are presented in Figure 4.

Looking at the chart, it is clear that the addition of co-benefits to the SCC estimates is not enough to outweigh the GDP losses linked to CPP. We reckon that total GDP losses over the period from 2022 to 2030 amount to \$196 billion when ancillary benefits are combined with a Global SCC and \$303 billion when ancillary benefits are combined with a Domestic SCC (Table 1).

These results use the administration’s central SCC estimate at the 3% discount rate and EPA’s midrange estimate of ancillary benefits estimates also using a 3% discount rate. It was noted above, however, that the Interagency Working Group on the SCC developed other SCC estimates using different discount rates and that EPA had low and high estimates of co-benefits at the 3% discount rate.

Total benefits also were calculated using these in different combinations. In only two cases—the 3%/95<sup>th</sup> percentile Global SCC combined with the high co-benefits and the 3%/95<sup>th</sup> percentile Global SCC combined with the average co-benefits—yielded benefits that



Sources: EIA AEO2016; Interagency Working Group on SCC; U.S. Department of Agriculture Economic Research Service International Macroeconomic Data Set; and EPA CPP Final Rule Regulatory Impact Analysis.

outweighed costs over the compliance period (more because of the extraordinarily high 3%/95<sup>th</sup> percentile SCC estimates than the high ancillary benefits). The 3%/95<sup>th</sup> percentile SCC estimates represent the worst case scenario and are widely believed

**Table 1. Cost & Benefits of Clean Power Plan Summary: 2022-2030**

Carbon Dioxide Emissions	Total	Annual Average
	(Million Metric Tons)	
Power Sector	(2,366)	(263)
Total	(2,517)	(280)
Costs & Benefits	Total	Average Cost or Benefits per Ton CO <sub>2</sub>
	(Billion Chained 2015\$)	(Chained 2015\$)
GDP	(529)	(210)
Global SCC	135	54
GDP with Global SCC	(394)	(157)
Co-Benefits	198	79
GDP With Global SCC & Co-Benefits	(196)	(78)
Domestic SCC	28	11
GDP with Domestic SCC	(501)	(199)
Co-Benefits	198	79
GDP With Domestic SCC & Co-Benefits	(303)	(120)

Sources: EPA Clean Power Plan Regulatory Impact Analysis; EIA Annual Energy Outlook 2016.

to be unreasonably high. All other combinations of Global and Domestic SCC and high and low ancillary benefits showed net losses during the compliance period.

In our 2015 analysis of EIA’s examination of the CPP proposed rule, we concluded that, “No matter how one slices and dices the data, EIA’s analysis leaves little room for doubt that EPA’s Clean Power Plan *flops badly as a climate policy*, even on the administration’s own terms and using the administration’s own methods, data, and exaggerated SCC.” There is nothing in

the EIA’s AEO2016 or in EPA’s CPP final rule that would alter this conclusion in any way.

## Electricity Prices and Expenditures

When EPA proposed CPP back in June 2014, its Regulatory Impact Analysis boasted that while the price consumers pay for electricity may increase under CPP, their electricity bills would decrease because of lower demand driven by enhanced demand-side energy management—energy efficiency. So while you might be paying a higher rate, you would be using less and thus paying less.

We noted back then how EPA’s target of a 1.5% annual energy efficiency improvement would be incredibly difficult to achieve—something 17 states brought to the attention of EPA in their comments on the rule.<sup>xviii</sup> In our earlier look at EIA’s assessment of the proposed EPA rule,<sup>xix</sup> we found that not only did electricity costs rise in EIA’s forecast, but electricity bills did, too.

When EPA issued its final rule last August, it persisted with the same claim. Its *Regulatory Impact Analysis* for the final rule contends that under EPA’s preferred Mass-Based approach, the average electricity bill, after rising initially, will be about 7.7% *smaller* than otherwise in 2030. “These reduced electricity bills,” argues EPA, “reflect the combined effects of changes in both average retail rates (driven by compliance approaches taken to achieve the state goals) and lower electricity demand (driven by demand-side energy efficiency).”

EIA’s *AEO2016* shows that EPA got it wrong again.

**Table 2. Change in Electricity Demand, Prices & Expenditures: CPP vs. No CPP**

Metric	EPA Regulatory Impact Analysis (Mass Based)	EIA Analysis of CPP
	(Percent Change from No CPP Case)	
Electricity Generation in:		
2020	(1)	(0.2)
2025	(5)	(1.0)
2030	(8)	(2.5)
Electricity Prices in:		
2020	3.0	0.3
2025	2.0	1.5
2030	0.0	4.9
Electricity Expenditures in:		
2020	2.4	0.2
2025	(2.7)	0.5
2030	(7.7)	2.4

*Sources: EIA Annual Energy Outlook 2016; EPA Clean Power Plan Regulatory Impact Analysis.*

While EIA estimates that electricity sales will decline in the CPP Case compared to the No CPP Case, the electricity price increases CPP will deliver are expected to overwhelm the declines in sales, leaving consumers with bigger, not smaller, electricity bills (Table 2). Calculations based on EIA’s data suggest that by 2030 electricity expenditures over all sectors will be on average 2.4% *greater* in the CPP Case versus the No CPP Case (1.8% for residences, 2.3% for commercial buildings, 3.6% for industry, and 5.0% for transportation). For 2030, this represents a not insignificant 10-percentage point average difference of opinion between EPA and EIA.

Rate increases such as those being forecast by EIA will have real economic consequences. EIA’s forecast indicates that consumers across all economic sectors will pay an additional \$40.5 billion more for electricity over the 2022 to 2030 period (Table 3), an entirely needless burden on families—especially low-income families—and businesses.

## Employment

It was reported last April that EPA Administrator Gina McCarthy, at a meeting of the Environmental Council of the States, said, “I can’t find one single bit of evidence that we have destroyed an industry or significantly impacted jobs other than in a positive way.”<sup>xx</sup>

**Table 3. Cumulative Increases in Electricity Expenditures Under Clean Power Plan**

Sector	2022 - 2030 (Billion 2015\$)
<b>U.S. Total</b>	40.5
Residential	15.8
Commercial	13.9
Industrial	10.0
Transportation	0.8

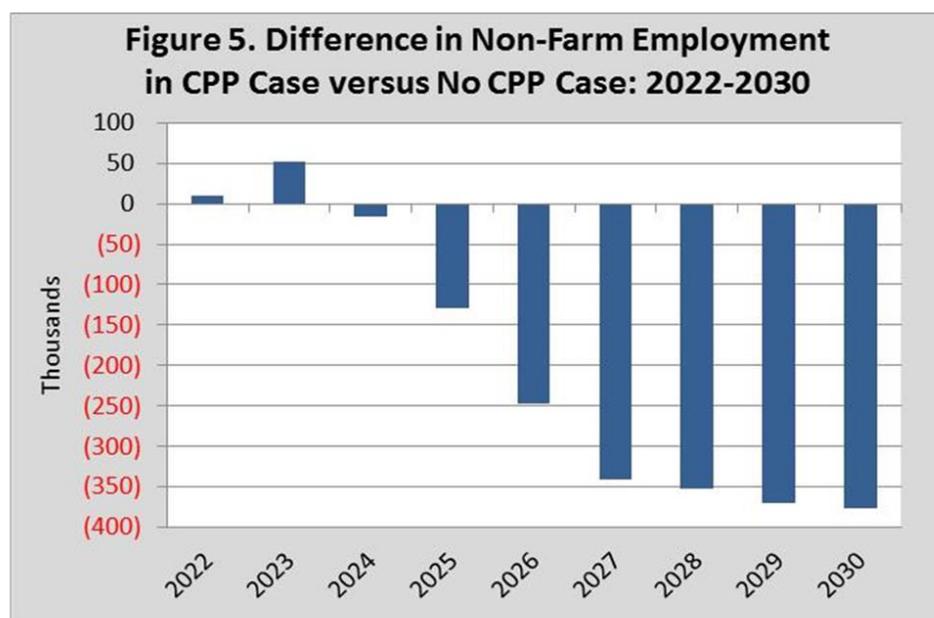
Source: EIA Annual Energy Outlook 2016.

EPA’s Regulatory Impact Analysis doesn’t draw any conclusions about the overall impact of CPP on employment. EIA’s AEO2016 is more conclusive. It indicates that CPP will cost hundreds of thousands of jobs over the 2022 through 2030 compliance period.. Its AEO2016 indicates that CPP will cost hundreds of thousands of jobs over the 2022 through 2030 compliance period.

As Figure 5 shows, after an initial and short-lived bump in 2023, jobs losses mount rapidly. By 2030, EIA forecasts that under the CPP Case there would be about 376,000 fewer non-farm jobs than under No CPP Case. This projection from the Obama Administration’s own energy experts hardly heralds the “positive way” CPP will affect jobs, as asserted by EPA’s administrator.

## Impact on Coal Industry

EPA also is fond of arguing that woes in the coal industry are the result of market conditions that have little to do with EPA regulation. During an April 2016 Senate hearing, Administrator McCarthy averred,



Source: EIA Annual Energy Outlook 2016.

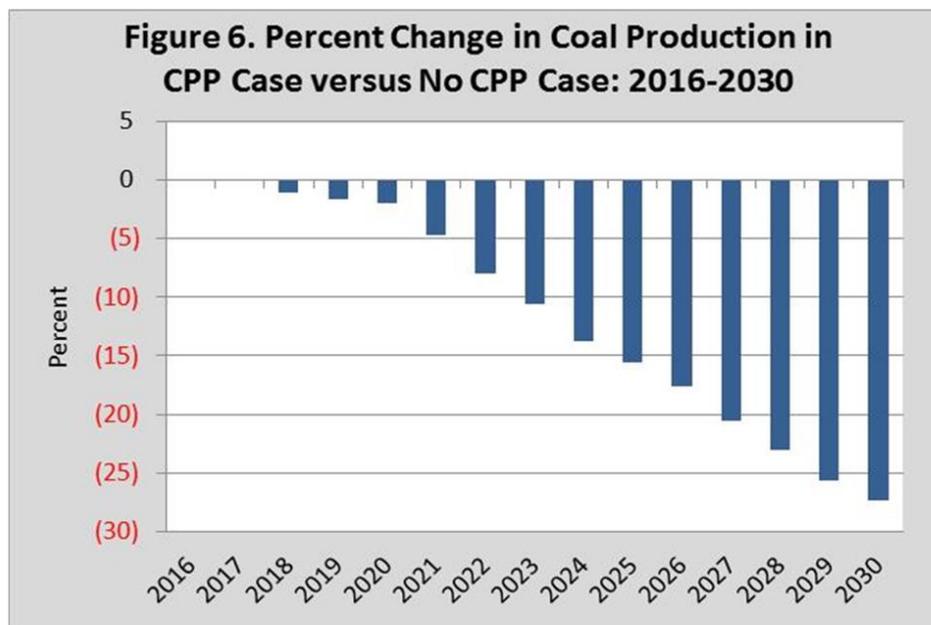
“There are challenges in those [coal] communities, without question, but the vast majority of that is related directly to the market shift, not to EPA regulation.”<sup>xxi</sup> While it is undeniable that competition from inexpensive natural gas—the next fuel on EPA’s hit list—has taken a bite out of coal demand, EPA has not been an innocent bystander.

Take EPA’s Mercury and Air Toxics (MATS) rule, which the U.S. Supreme Court found to be in violation of the Clean Air Act (a ruling all but ignored by EPA).<sup>xxii</sup> EIA recently noted how low-cost natural gas has lowered coal’s share of electricity generation, but it also added this about the impact of EPA’s MATS requirements:

*About 30% of the coal capacity that retired in 2015 occurred in April, which is when the U.S. Environmental Protection Agency’s Mercury and Air Toxics Standards (MATS) rule went into effect. Some coal plants applied for and received one-year extensions, meaning that many of the coal retirements expected in 2016 will likely also occur in April. Several plants have received additional one-year extensions beyond April 2016 based on their role in ensuring regional system reliability.*<sup>xxiii</sup>

But as damaging as the impact of MATS was, EIA’s model run suggests the damage of CPP will be even more severe and will be felt almost instantly. EIA forecasts that with CPP in place, coal production would decline rapidly, from nearly 848 million short tons in 2016 to just 664 million short tons in 2030, the end of the CPP compliance period. That’s a drop of 22%. EIA’s No CPP Case, in contrast, projects that over the same period coal production would *rise* almost 8% to 913 million short tons in 2030.

Put differently, EIA projects that 2030 coal output would be 27% lower in the CPP Case versus the No CPP Case (Figure 6). *Pace* the EPA administrator’s comment cited earlier, a drop of this magnitude may not amount technically to “destroy[ing] an industry,” but it comes perilously close.



Source: EIA Annual Energy Outlook 2016.

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## Conclusion

EIA's independent analysis of EPA's CPP final rule shows that under CPP, the economy will suffer net economic losses averaging from \$22 to \$59 billion per year over the 2022 to 2030 compliance period, rising electricity rates (4.9% in 2030) and bills (2.4% in 2030), and fewer jobs (376,000 in 2030). CPP also poses a direct risk to the coal sector. The results out-lined here even obtain when taking into account the inflated benefits the administration has used to support its new rule.

In addition to the economic grounds for opposing CPP laid out above, CPP has serious legal vulnerabilities. EPA's CPP final rule is based on authorities the agency claims under a rarely-used section, 111(d), of the Clean Air Act. In its *Utility Air Regulatory Group v. EPA* ruling, the Supreme Court warned EPA:

*When an agency claims to discover in a long-extant statute an unheralded power to regulate "a significant portion of the American economy," we typically greet its announcement with a measure of skepticism. We expect Congress to speak clearly if it wishes to assign to an agency decisions of vast "economic and political significance" [citations omitted].<sup>xxiv</sup>*

In using a little-used 300-word provision of the Clean Air Act to redesign fundamentally the nation's electricity markets, EPA has gone far beyond the bounds of the regulatory authority granted to it by Congress. It is no wonder, then, that the Supreme Court took the unprecedented step of CPP staying EPA's final rule until all legal challenges have been resolved.

CPP also faces unprecedented opposition, with lawsuits filed by 28 states, 24 national trade associations (including a coalition of 16 trade groups led by the U.S. Chamber), 37 rural electric cooperatives, 10 major companies, and three labor unions all objecting to the plan. Perhaps the best demonstration of the incredible breadth of business opposition to the rule, however, comes in the form of an amicus brief filed by 166 state and local Chambers in support of the petitioners.<sup>xxv</sup>

The Energy Institute believes that the Clean Air Act is the wrong vehicle for regulating greenhouse gas emissions, both from an economic and a legal perspective. EIA's *AEO2016* analysis goes a long way to making the economic case for opposing EPA's power grab.

## Endnotes

<sup>i</sup> EPA. 2014. *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule*. Federal Register Vol. 79, No. 117. Available at: <https://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13726.pdf>.

<sup>ii</sup> EPA. 2014. *Regulatory Impact Analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants*. Available at: <https://www.epa.gov/sites/production/files/2014-06/documents/20140602ria-clean-power-plan.pdf>.

<sup>iii</sup> Institute for 21st Century Energy. 2014. *EIA Analysis Shows EPA's Carbon Regulations All Economic Pain for No Climate Gain*. Available at: <http://www.energyxxi.org/eia-analysis-shows-epas-carbon-regulations-all-economic-pain-no-climate-gain>.

<sup>iv</sup> EPA. 2015. "FACT SHEET: Clean Power Plan by the Numbers." Available at: <https://www.epa.gov/sites/production/files/2015-08/documents/fs-cpp-by-the-numbers.pdf>.

<sup>v</sup> EIA. 2016. *Annual Energy Outlook 2016 (Early Release)*. Available at: <http://www.eia.gov/forecasts/aeo/er/>.

<sup>vi</sup> Like with EPA's CPP proposed rule, this comparative analysis was requested by House Science Committee Chairman Smith.

<sup>vii</sup> EIA's CPP Case is actually its "Reference" case. We have labeled it the CPP Case for this report for clarity.

<sup>viii</sup> EIA's assumes the CPP goal of a 32% reduction in power sector carbon dioxide emissions in 2030 from the 2005 level is not increased after 2030, an unrealistic—but given what is known, a not unreasonable—assumption if EPA's rule survives political and legal challenges.

<sup>ix</sup> For the power sector alone, the figures are nearly 2.4 gigatons and 263 million metric tons.

<sup>x</sup> White House Council of Economic Advisors. 2013. *Economic Report of the President*. Chapter 6: Climate Change and the Path Toward Sustainable Energy Sources. Available at: [https://www.whitehouse.gov/sites/default/files/docs/erp2013/ERP2013\\_Chapter\\_6.pdf](https://www.whitehouse.gov/sites/default/files/docs/erp2013/ERP2013_Chapter_6.pdf).

<sup>xi</sup> Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. Available at: <https://www3.epa.gov/otaq/climate/regulations/scc-tsd.pdf>.

<sup>xii</sup> Interagency Working Group on Social Cost of Carbon, United States Government. 2015. *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. [May 2013, Revised July 2015]. Available at: <https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf>.

<sup>xiii</sup> See for example: Dayaratna, K. *et al.* 2016. "Empirically-Constrained Climate Sensitivity and the Social Cost of Carbon". *Social Science Research Network*. Available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2759505](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2759505).

<sup>xiv</sup> Applying the other SCC estimates developed by the Interagency Working Group also leads in each case to a net economic loss over the compliance period ranging from \$123 billion to \$488 billion.

<sup>xv</sup> Available at: <http://www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx>.

<sup>xvi</sup> EPA. 2015. *Regulatory Impact Analysis for the Clean Power Plan Final Rule*. Available at: <https://www.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule-ria.pdf>.

<sup>xvii</sup> The range of EPA values is because of difference in results from modeling using the Rate-Based and the Mass-Based compliance approaches.

<sup>xviii</sup> Institute for 21st Century Energy. 2015. *In Their Own Words: A Guide to States' Concerns Regarding the Environmental Protection Agency's Proposed Greenhouse Gas Regulations for Existing Power Plants*. Available at: <http://www.energyxxi.org/sites/default/files/FINAL%20EPA%20CPP%20Report%20FINAL.pdf>.

<sup>xix</sup> Eule, S.D. 2015. Testimony Before the U.S. House of Representatives Committee on Science, Space, & Technology, Subcommittee on Environment and Subcommittee on Energy Hearing on "U.S. Energy Information Administration Report: Analysis of the Impacts of the EPA's Clean Power Plan." Available at: [http://www.energyxxi.org/sites/default/files/150624\\_SteveEule\\_Testimony\\_EIA%20Analysis%20of%20EPA%20Clean%20Power%20Plan\\_House%20Science%20sbcm.pdf](http://www.energyxxi.org/sites/default/files/150624_SteveEule_Testimony_EIA%20Analysis%20of%20EPA%20Clean%20Power%20Plan_House%20Science%20sbcm.pdf).

<sup>xx</sup> Harball, E. 2016. "McCarthy: Not 'one single bit of evidence' climate rule hurt jobs." *ClimateWire*. Available at: <http://www.eenews.net/climatewire/stories/1060035572/>.

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<sup>xxi</sup> Harball, E. 2016. "Lawmakers, McCarthy spar over coal job losses." *ClimateWire*. Available at: <http://www.eenews.net/stories/1060035909>.

<sup>xxii</sup> Supreme Court of the United States. 2014. Opinion of the Court. Michigan *et al.* v. Environmental Protection Agency *et al.* Available at: [http://www.supremecourt.gov/opinions/14pdf/14-46\\_10n2.pdf](http://www.supremecourt.gov/opinions/14pdf/14-46_10n2.pdf).

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