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Cost of a Climate Policy: The Economic Impact of Obama's Climate Action Plan

David W. Kreutzer, PhD, Nicolas D. Loris, and Kevin D. Dayaratna

President Obama recently released his Climate Action Plan, which is a continuation of the costly, ineffective policies from his first four years in office: Solyndra-style loan guarantees, nice-sounding but too expensive efficiency mandates, and his war on coal. It is this war on coal that would prove the most costly, with hundreds of thousands of lost jobs and $1.47 trillion of lost national income by 2030.

Bankrupting Coal Hurts American Families. When Senator and presidential candidate Barack Obama pushed his cap-and-trade plan in 2008, he said that if "someone wants to build a coal-powered plant, they can. It's just that it will bankrupt them because they are going to be charged a huge sum for all that greenhouse gas that's being emitted."[1]

Congress rejected his and other cap-and-trade plans, but in his recent speech on climate change, President Obama vowed to go around Congress to reduce greenhouse gas emissions. In case anyone thinks the Administration has since backed off from the anti-coal agenda, Obama climate advisor Daniel Schrag just this week said that "a war on coal is exactly what's needed."[2]

In a speech on June 25, President Obama called on the Environmental Protection Agency (EPA) to reduce carbon dioxide emissions from new and existing power plants, which would adversely affect coal-fired plants the most. These regulations are part of a broader effort from the President to significantly reduce coal as an affordable, reliable energy source—the effect of which is to drive up prices for American families and businesses. The Heritage Foundation modeled the effects of significantly reducing coal-fired plants in America and found devastating economic effects.

Regulations Pile On. With 497 billion tons of recoverable coal in the United States—enough to provide electricity for 500 years at current consumption rates[3]—coal has the potential to be an important resource long into the future. The EPA's constant attacks on coal threaten to close off access to this dependable energy source.

In March 2012, the EPA proposed a rule that would prohibit new power plants from emitting more than 1,000 pounds of carbon dioxide per megawatt of electricity generated. Without the addition of carbon capture and sequestration, a prohibitively costly and technologically challenging requirement,[4] the regulation would effectively ban the construction of new coal-fired plants.[5] Whether the final rule reflects the proposed rule remains to be seen.

The President's recent announcement also threatens existing plants and would adversely affect the more than 1,100 coal-fired generators at nearly 600 plant locations that generate 40 percent of America's affordable, reliable energy.[6]

Last year, the EPA finalized new mercury and air toxics standards that will force utilities to use maximum achievable control technology standards to reduce mercury emissions and other hazardous air

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The Heritage Foundation
214 Massachusetts Avenue, NE
Washington, DC 20002
(202) 546-4400 | heritage.org

pollutants. By the agency's own admission, the rule will cost $10 billion by 2015 but have only $6 million in purported benefits from mercury reductions.[7] In addition, the EPA is also regulating coal combustion residues and cooling water intake structures and is considering more stringent smog standards, all of which make the use of coal power more expensive.

Most recently, the Supreme Court granted the EPA's request to review its cross-state air pollution rule, which would compel companies to retire three to seven gigawatts of electricity generation and retrofit up to 576 plants.[8] In the absence of these new regulations, U.S. air quality has improved significantly over the past several decades. Emission of toxic pollutants has dropped as much as 96 percent since 1980.[9]

The attack on coal reaches well beyond power plant construction and operation. Although not a new problem, regulations from the Office of Surface Mining Reclamation and Enforcement and the Mine Safety and Health Administration make building new coal mining operations or expanding existing operations increasingly difficult.[10] Coal mining operations are subject to 10 federal environmental laws as well as state requirements and regulations.

Climate Policy and Coal. While it may not be clear exactly which policies will be used, it seems clear that zeroing-out coal-fired electric power plants is a goal of this Administration's environmental team. This paper will analyze the economic impact of setting such a target. We look at the first 16 years of a 20-year phase-out of coal power: 2015–2030.

The analysis shows significant economic losses extend beyond the obvious areas of coal mining and power generation. In particular, we find that by 2030:

- Employment falls by more than 500,000 jobs;
- Manufacturing loses over 280,000 jobs;
- A family of four's annual income drops more than $1,000 per year, and its total income drops by $16,500 over the period of analysis;
- Aggregate gross domestic product (GDP) decreases by $1.47 trillion;
- Electricity prices rise by 20 percent;
- Coal-mining jobs drop 43 percent; and
- Natural gas prices rise 42 percent.

The Energy Markets Respond. The analysis was carried out using the Heritage Energy Model (HEM).[11] As coal-fired power generation is ratcheted

1. Senator Barack Obama (D–IL), interview with the *San Francisco Chronicle editorial board*, January 17, 2008, http://www.youtube.com/watch?v=DpTIhyMa-Nw (accessed June 26, 2013).
2. Aaron Blake, "Obama Science Adviser Calls for 'War on Coal,'" *The Washington Post*, June 25, 2013, http://www.washingtonpost.com/blogs/post-politics/wp/2013/06/25/obama-science-adviser-calls-for-war-on-coal/ (accessed June 26, 2013).
3. Institute for Energy Research, "North American Energy Inventory," December 2011, http://www.energyforamerica.org/wp-content/uploads/2012/06/Energy-InventoryFINAL.pdf (accessed June 24, 2013).
4. To date, no one has successfully operated a utility-scale carbon-capture power plant. Perhaps even more problematic is how to dispose of the 15–20 super tankers' worth of liquid carbon dioxide that widespread carbon capture would create.
5. Under the proposed rule, those plants already in the permitting process would not be included.
6. U.S. Department of Energy, Energy Information Administration, "What Is the Role of Coal in the United States?" July 18, 2012, http://www.eia.gov/energy_in_brief/article/role_coal_us.cfm (accessed June 24, 2013).
7. Anne E. Smith, "Technical Comments on the Regulatory Impact Analysis Supporting EPA's Proposed Rule for Utility MACT and Revised NSPS (76 FR 24976)," NERA Economic Consulting, August 3, 2011, http://www.nera.com/nera-files/PUB_Smith_EPA_report_0811.pdf (accessed June 24, 2013).
8. North American Electric Reliability Corporation, "2010 Special Reliability Scenario Assessment: Resource Adequacy Impact of Potential U.S. Environmental Regulations," October 2010, http://www.nerc.com/files/EPA_Scenario_Final_v2.pdf (accessed June 24, 2013).
9. Steven F. Hayward, *2011 Almanac of Environmental Trends*, American Enterprise Institute, April 2011, p. 34, http://www.aei.org/files/2011/04/20/Hayward-almanac2011.pdf (accessed June 25, 2013).
10. Nicolas D. Loris, "The Assault on Coal and the American Consumer," Heritage Foundation *Backgrounder* No. 2709, July 23, 2012, http://www.heritage.org/research/reports/2012/07/the-assault-on-coal-and-american-consumers.
11. See the appendix for a description of the HEM and the methodology used in this paper.

down, HEM creates the least-cost adjustment to the lost power generation. This adjustment includes increases in natural-gas power and renewable electricity along with conservation as consumers respond to the higher energy prices.

However, the adjustments do not fully compensate for the lost coal power and result in higher energy prices. By 2030, the higher electricity prices induce a 42 percent increase in the amount of wind and solar power, but this increase is from a very small base compared to coal power. The increase in all renewable power generation replaces only 4.5 percent of the lost coal power.[12] An increase in natural gas production and a diversion of natural gas from other uses replaces 74 percent of the lost coal power. Increases in nuclear power close the gap about 3 percent, but that leaves about 19 percent of the lost coal power with no replacement.

In addition, there is a surprisingly large increase in natural gas prices as this resource is shifted away from other uses (such as manufacturing) to power generation.

The net loss in production and the associated higher prices for electricity force consumers to reduce usage. The higher cost of electricity and natural gas increases the cost of production across most of the economy. At the same time, consumers have less to spend on non-energy items. This combination reduces employment and national income.

Mandates Do Not Help. The President's Climate Action Plan employs the same wishful thinking on efficiency mandates as previous climate policies. The fallacy here is assuming that efficiency standards for buildings, appliances, and vehicles would reduce the cost of meeting the energy cuts necessitated by the carbon policy. The logic of efficiency mandates assumes consumer indifference to energy efficiency. However, there is already a robust demand for cost-effective energy efficiency. Indeed, the energy used per real dollar of GDP has dropped by 48 percent since 1980.[13]

The attempt to soften the impact of energy cuts with efficiency mandates is like an employer trying to soften the impact of a 30 percent pay cut by telling employees that they have to shop at discount stores. Employees already shop at discount stores when it makes sense. Likewise, manufacturers make the costly efficiency improvements when the energy savings justify the additional expense. Efficiency mandates actually increase the cost of meeting carbon reduction targets by forcing technologies whose cost is not fully offset by savings. This perverse impact is known to both liberal and conservative economists.[14]

A Salvo in the War on Coal. The President's recently released Climate Action Plan continues his Administration's war on coal. Though other aspects of the plan would add even more costs, our analysis shows that the war on coal would cut GDP by $1.47 trillion, raise electricity prices by 20 percent, cut employment by over 500,000 jobs, and decimate the coal industry. A family of four would lose more than $1,000 per year on average for the years 2015 to 2030.

*—**David W. Kreutzer, PhD**, is a Research Fellow for Energy Economics and Climate Change in the Center for Data Analysis, **Nicolas D. Loris** is Herbert and Joyce Morgan Fellow in the Thomas A. Roe Institute for Economic Policy Studies, and **Kevin D. Dayaratna** is Research Programmer and Policy Analyst in the Center for Data Analysis at The Heritage Foundation.*

12. Natural gas replaces more coal power than renewables do because gas is a generally cheaper option. For an explanation of wind power's high cost, see George Taylor and Thomas Tanton, "The Hidden Costs of Wind Electricity: Why the Full Cost of Wind Generation Is Unlikely to Match the Cost of Natural Gas, Coal or Nuclear Generation," American Tradition Institute, December 2012, http://www.atinstitute.org/wp-content/uploads/2012/12/Hidden-Cost.pdf (accessed June 25, 2013).
13. U.S. Department of Energy, Energy Information Administration, "Monthly Energy Review," June 25, 2013, Table 1.7, http://www.eia.gov/totalenergy/data/monthly/pdf/sec1_16.pdf (accessed June 26, 2013).
14. For instance, see Adele Morris, "Fuel Efficiency Standards: A Detour from the Cheapest Climate Protection," Brookings Institution, February 3, 2009, http://www.brookings.edu/opinions/2009/0203_climate_change_morris.aspx (accessed June 24, 2013).

Appendix: Methodology

Overview of Heritage Energy Model. This analysis uses the Heritage Energy Model (HEM), a derivative of the National Energy Model System (NEMS).[15] NEMS is used by the Energy Information Administration of the Department of Energy as well as various nongovernmental organizations for a variety of purposes, including forecasting the effects of energy policy changes on a plethora of leading economic indicators. The methodologies, assumptions, conclusions, and opinions in this report are entirely the work of statisticians and economists at The Heritage Foundation's Center for Data Analysis and have not been endorsed by and do not necessarily reflect the views of the developers of NEMS.

HEM is based on well-established economic theory as well as historical data and contains a variety of modules that interact with each other for long-term forecasting. In particular, HEM focuses on the interactions among (1) the supply, conversion, and demand of energy in its various forms; (2) American energy and the overall American economy; (3) the American energy market and the world petroleum market; and (4) current production and consumption decisions as well as expectations about the future.[16] These modules include:

- A Macroeconomic Activity Module,[17]
- A Transportation Demand Module,
- A Residential Demand Module,
- An Industrial Demand Module,
- A Commercial Demand Module,
- A Coal Market Module,
- An Electricity Market Module,
- A Petroleum Market Module,
- An Oil and Gas Supply Module,
- A Renewable Fuels Module,
- An International Energy Activity Module, and
- A Natural Gas Transmission and Distribution Module.

HEM is identical to NEMS with the exception of the Commercial Demand Module. Unlike NEMS, HEM's module does not make projections regarding commercial floor-space data of pertinent commercial buildings.

Overarching the above modules is an Integrating Module that consistently cycles, iteratively executing and allowing the various modules to interact with each other. Unknown variables that are related (such as if they are a component of a particular module) are grouped together, and a pertinent subsystem of equations and inequalities corresponding to each group is solved via a variety of commonly used numerical analytic techniques, using approximate values for the other unknowns. Once these group's values are computed, the next group is solved similarly, and the process iterates. Convergence checks are performed for each price and quantity statistic to determine whether subsequent changes in that particular statistic fall within a given tolerance. After all group values for the current cycle are determined, the next cycle begins. For example, at cycle *j*, a variety of *n* pertinent statistics represented by the vector $(x_1^j, x_2^j, ..., x_n^j) \epsilon R^n$ is obtained.[18] HEM provides a number of diagnostic measures, based on differences

15. U.S. Department of Energy, Energy Information Administration, "The National Energy Modeling System: An Overview," http://www.eia.gov/oiaf/aeo/overview/pdf/0581(2009).pdf (accessed April 3, 2013).
16. Ibid., pp. 3–4.
17. HEM's Macroeconomic Activity Module makes use of the IHS Global Insight model, which is used by government agencies and *Fortune* 500 organizations to forecast the manifestations of economic events and policy changes on notable economic indicators. As with NEMS, the methodologies, assumptions, conclusions, and opinions in this report are entirely the work of CDA statisticians and economists and have not been endorsed by and do not necessarily reflect the views of the owners of the IHS Global Insight model.
18. S. A. Gabriel, A. S. Kydes, and P. Whitman, "The National Energy Modeling System: A Large-Scale Energy-Economic Equilibrium Model," *Operations Research*, Vol. 49 (2001), pp. 14–25.

between cycles, to indicate whether a stable solution has been achieved.

Coal Plant Shutdown Simulations and Diagnostics. We used HEM to analyze the economic effects of shutting down coal plants over time. HEM is appropriate for this analysis, as similar models have been used in the past to understand the economic effects of other energy policy proposals.[19] In particular, we conducted simulations shutting down all coal plants that were to remain open indefinitely. Our baseline scenario had 1,441 such plants. We took these coal plants and chose to retire them between 2015 and 2035 in a year drawn from a discrete uniform probability distribution based around these years.

Due to the nature of the associated probability mass function, plants were proportionally shut down each year. For example, by the end of 2020, slightly more than 25 percent of all coal plants were shut down; by the end of 2025, slightly more than 50 percent of all coal plants were shut down; and by the end of 2030, slightly more than 75 percent of all coal plants were shut down.

We also prevented the model from introducing new coal plants over this time horizon. We ran HEM for 10 cycles to get consistent feedback into the Macroeconomic Activity Module, which provided us with the figures presented in this study. The diagnostic tests, based on differences between cycles, at the end of the 10 runs suggested that the forecasts provided by the model had stabilized. The 10 cycles were therefore sufficient to attain meaningful convergence, thus providing us with macroeconomic statistics from which we can make informative inferences. We compared these results with the baseline scenario used in a previous study that had been run for 12 cycles.[20]

We also tried shutting down coal plants over a shorter time horizon, such as from 2015 to 2025. HEM could not handle these simulations, however, as they resulted in infeasible linear programs that could not be solved, probably due to the devastating nature of such dramatic shutdown scenarios.

19. The Department of Energy, for example, has used NEMS to evaluate some policy proposals. See, for example, U.S. Department of Energy, Energy Information Administration, "AEO Table Browser," http://www.eia.gov/oiaf/aeo/tablebrowser/ (accessed June 5, 2013).
20. See David W. Kreutzer and Kevin Dayaratna, "Boxer–Sanders Carbon Tax: Economic Impact," Heritage Foundation *Issue Brief* No. 3905, April 11, 2013, http://www.heritage.org/research/reports/2013/04/boxer-sanders-carbon-tax-economic-impact.