



December 11, 2009

Honorable Henry A. Waxman
Chairman
Committee on Energy and Commerce
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

I am writing in response to your request for information about the Congressional Budget Office's (CBO's) analysis of H.R. 2454, the American Clean Energy and Security Act of 2009 (ACESA), as presented in testimony to the Senate Committee on Energy and Natural Resources on October 14, 2009.¹ This letter groups answers to your questions into four broad categories: the analytical approach behind the economic models used in CBO's analysis, the assumptions about the reference case in that analysis, the policy cases that CBO examined, and the presentation and interpretation of results.

CBO published estimates of the budgetary effect of ACESA for two versions of that bill, one as ordered reported by the House Committee on Energy and Commerce² and another as amended and reported by the House Committee on Rules.³ In addition to estimating the budgetary impacts of ACESA, CBO also reported this year on other aspects of a cap-and-trade program for greenhouse gases, like the program specified in ACESA, in the following publications: *The Estimated Costs to Households from the Cap-and-Trade Provisions of H.R. 2454* (June 19, 2009); *The Economic Effects of Legislation to Reduce Greenhouse-Gas Emissions* (September 2009); *The Use of Offsets to Reduce Greenhouse Gases* (August 3, 2009); *How Regulatory Standards Can Affect a Cap-and-Trade Program for Greenhouse Gases* (September 16, 2009); and *The Costs of Reducing Greenhouse-Gas Emissions* (November 23, 2009).⁴

¹ Statement of Douglas W. Elmendorf, Director, Congressional Budget Office, before the Senate Committee on Energy and Natural Resources, *The Economic Effects of Legislation to Reduce Greenhouse-Gas Emissions* (October 14, 2009).

² Congressional Budget Office, cost estimate for H.R. 2454, the American Clean Energy and Security Act of 2009, as ordered reported by the House Committee on Energy and Commerce on May 21, 2009 (June 5, 2009), available at www.cbo.gov/ftpdocs/102xx/doc10262/hr2454.pdf.

³ Congressional Budget Office, cost estimate for H.R. 2998, the American Clean Energy and Security Act of 2009, as amended and reported by the House Committee on Rules (June 26, 2009), available at www.cbo.gov/ftpdocs/103xx/doc10376/hr2998WaxmanLtr.pdf.

⁴ For a complete listing of those analyses, see CBO's special collection for climate issues, available at www.cbo.gov/publications/collections/collections.cfm?collect=9.

H.R. 2454 would make a number of changes in energy and environmental policies aimed at reducing emissions of gases that contribute to global warming. The bill would limit or cap the quantity of certain greenhouse gases (GHGs) emitted from facilities that generate electricity or engage in other industrial activities over the 2012–2050 period. The Environmental Protection Agency (EPA) would establish two separate regulatory initiatives known as cap-and-trade programs—one covering emissions of most types of GHGs and one covering hydrofluorocarbons. Under those programs, the EPA would issue allowances that limit the emissions of those gases; some of those allowances would be auctioned by the federal government, and the remainder would be distributed at no charge. Other major provisions of the legislation would provide energy tax credits or energy rebates to certain low-income families, require certain retail electricity suppliers to increase their use of qualifying renewable fuels or energy sources, support the development and deployment of technologies to capture and store carbon dioxide (CO₂), and establish new loan guarantee programs and increase lending authority for existing programs that help selected industries to reduce GHG emissions.

Analytical Approach

To provide context for the economic and budgetary effects of proposed climate legislation, CBO released, earlier this year, a summary of available information on the potential effects that an increasing concentration of GHGs in the atmosphere might have on the United States.⁵ However, CBO does not have the scientific capacity to independently analyze those effects.

To provide information on the economic and budgetary effects of ACESA, CBO drew on information from various studies prepared by government agencies and private analysts to identify the responsiveness of GHG emissions to changes in the price of those emissions. Understanding that responsiveness is important because it determines whether a given change in the price is sufficient to drive development and deployment of new technologies, to shift demand and production away from sectors of the economy that are carbon-energy-intensive and toward sectors that are not, and to generate sufficient conservation to achieve the emission caps in the legislation.⁶

CBO's estimates of the responsiveness of emissions to changes in allowance prices over time were constructed from the results of various models, with the objective of producing estimates that are in the middle of the distribution of estimated outcomes. Those models differ considerably in their implicit estimates of the responsiveness of emissions to changes in

⁵ Congressional Budget Office, *Potential Impacts of Climate Change in the United States* (May 2009).

⁶ The models analyzed include the EIA's National Energy Modeling System (NEMS), the Emissions Prediction and Policy Analysis (EPPA) model used by climate researchers at the Massachusetts Institute of Technology, the Applied Dynamic Analysis of the Global Economy (ADAGE) model developed at RTI International and used by EPA, the Second Generation Model (SGM) and MiniCAM models developed and used by the Joint Global Change Research Institute, the Model for Evaluating the Regional and Global Effects of GHG Reduction Policies (MERGE) developed by Stanford University and EPRI, and the Multi-region National-North American Electricity and Environment (MRN-NEEM) model developed and used by CRA International. See the discussion in Congressional Budget Office, *How CBO Estimates the Costs of Reducing Greenhouse-Gas Emissions* (April 2009).

allowance prices because they make different assumptions about several factors: the long-run sensitivity of energy usage to higher energy prices; the long-run ability of businesses to switch from carbon-intensive fuels to low-carbon fuels and more efficient technology; and the speed at which those responses unfold. The economy's response to higher allowance prices is projected to rise substantially over time as firms and households replace existing vehicles, equipment, structures, and electricity-generating capacity with newer items that use less energy or emit smaller quantities of GHGs.

Each model, on which CBO draws, yields different combinations of ways to reduce emissions; indeed, in some cases, a given model may yield a range of ways (and a range of estimates of the cost) to achieve a specific goal for emissions, depending on assumptions about what technologies might be available at what cost and at what point in time. Each model projects significant reductions from fuel-switching in the electricity sector, with coal-fired generation being replaced by some type of low- to zero-emission generation or (after 2020 or so) by technologies designed to capture CO₂ emissions from coal-fired power plants and store those emissions underground. However, the mix of replacement technologies and consequently the mix of fuels used to generate electricity vary significantly among models, as do the pace of vehicle replacement in the transportation sector and the adoption of more energy-efficient technologies and conservation practices in other sectors.

Therefore, while CBO's analyses of H.R. 2454 incorporated the effects of expected changes in the efficiency of energy use throughout the economy and in the mix of fuels used to generate electricity, the technical changes that would alter energy efficiency and fuel mix were not modeled directly. CBO's approach does not require an explicit choice of (or provide explicit conclusions about) which technologies would be used to achieve the emission reductions implied by the estimated responsiveness of the U.S. economy to placing a price on GHG emissions. As such, CBO's approach does not provide insight into the exact ways in which producers and consumers of energy would meet caps on emissions, or into the mix of technological developments that might contribute to the increasing responsiveness over time.

CBO's estimates of the effects of H.R. 2454 incorporated an expectation that other developed countries would undertake actions comparable to those required by H.R. 2454. Those estimates also included estimates of emission reductions that would be undertaken in developing countries (for example, those stemming from changes in forestry practices) and then purchased and used as offsets by entities that would be required to hold allowances under cap-and-trade programs in developed countries.

CBO did not analyze the economic impacts of H.R. 2454 at the state or regional level. However, CBO did release a summary of two external studies that estimated regional differences in the change in purchasing power that households would experience as a consequence of the cap-and-trade program established by H.R. 2454.⁷

⁷ Congressional Budget Office, *Two Recent Studies of Regional Differences in the Effects of Policies That Would Price Carbon Dioxide Emissions*, letter to the Honorable James M. Inhofe (July 9, 2009).

CBO's estimates of allowance prices under H.R. 2454 were reported in nominal dollars. CBO's estimates of gains and losses in households' purchasing power were reported in 2010 dollars and were calculated to be the same proportion of projected household income in 2010 that CBO expects households to experience in certain future years under H.R. 2454.

Reference-Case Assumptions

To estimate the effects of H.R. 2454 on the federal budget, CBO projected the prices of the allowances that would be created under the cap-and-trade program included in the bill. Such projections require projections of economic output, energy prices, and GHG emissions. CBO relied primarily on reference-case projections from the Energy Information Administration (EIA)—specifically, EIA's reference-case projections in its *Annual Energy Outlook*—but adjusted the emission projections to be consistent with EPA's historical emission data.⁸ CBO also adjusted projected emissions of non-CO₂ greenhouse gases to be consistent with updated carbon-dioxide-equivalent measures of the global warming potential of those gases that are reported in the *Fourth Assessment Report of the Intergovernmental Panel on Climate Change*.⁹

EIA's reference-case projections represent comprehensive long-term projections of energy markets through 2030. Those projections include estimates of the supply of, demand for, trade in, and prices of different types of energy commodities and services throughout the United States and, in less detail, the rest of the world. EIA's projections include the effects of existing federal and state energy policies, such as those that require automobile manufacturers to meet corporate average fuel economy standards and require various industries to comply with provisions of the Energy Independence and Security Act of 2007. Those policies are thus implicitly incorporated in CBO's analyses of H.R. 2454. However, policies that were not included in the most recent EIA baseline, such as potential EPA regulations for stationary-source emissions and new fuel economy standards for mobile sources of GHGs, are not reflected in CBO's analyses. CBO extended EIA's projections from 2030 to 2050 using CBO's long-term projections of inflation-adjusted GDP and an extrapolation of the growth of each type of greenhouse gas per unit of inflation-adjusted GDP based on the growth rate between 2020 and 2030 projected by EIA.

Policy-Case Assumptions

The cap-and-trade program for most GHGs that would be put in place by H.R. 2454 would have long-term and far-reaching effects on the economy. The central mechanism through which the program would affect the economy is by increasing the price paid to emit GHGs and thereby raising the prices of goods and services whose production or consumption emits GHGs. The price paid to emit GHGs would depend on the emission targets in the legislation, the detailed provisions determining the operation of the cap-and-trade program, and the responsiveness of emissions to the price (as described above). Key provisions of H.R. 2454 include banking, offsets, distribution of allowances, and various regulatory standards.

⁸ Additional information about EIA's reference-case projections is available at <http://www.eia.doe.gov/oiaf/aeo/index.html>.

⁹ For additional discussion, see Congressional Budget Office, *How CBO Estimates the Costs of Reducing Greenhouse-Gas Emissions*.

Banking. Under H.R. 2454, firms would have an incentive to exceed their emission-reduction requirements in the initial years of the program, when the cost of meeting the annual caps would be relatively low, and to bank their excess allowances to use in future years, when the cost of meeting the caps would be much higher. The banking of allowances would, therefore, tend to reduce the rate of increase in the price of allowances by boosting the demand for allowances in the early years (pushing up the allowance price) and increasing the supply of allowances in later years (pushing down the allowance price). Because firms would be allowed to bank as many allowances as they chose, their profit-maximizing behavior would cause the price of an allowance to increase at the same rate as the return that firms expected to receive on comparably risky alternative investments. CBO concluded that the risk characteristics of holding allowances as an investment were similar to those of typical investments in the U.S. nonfinancial corporate sector, for which CBO projects the long-run after-tax inflation-adjusted rate of return to be approximately 5.6 percent; therefore, allowance prices would rise at about that rate.

CBO estimated that covered entities would bank about 2 billion allowances by 2019, thereby raising the allowance price by 13 percent in that year compared with the outcome under a policy that prohibited banking but was otherwise comparable to the policy under H.R. 2454.

Offsets. H.R. 2454 would allow covered entities to substitute offsets—reductions in GHG emissions undertaken by domestic and foreign entities that would not be required to control emissions under the legislation—for up to 2 billion GHG allowances each year. Covered entities would purchase offsets if doing so allowed them to meet their compliance obligations more cheaply than purchasing allowances or reducing emissions. By CBO's estimate, covered entities would find this to be true in many cases, so permitting offsets would reduce the overall cost of the program. CBO estimated that covered entities would purchase about 400 million international and domestic offsets in 2012. The amount of offsets purchased would increase over time until the maximum annual amount of 2 billion was reached sometime after 2030. In general, the use of offsets could be expected to reduce allowance prices by about 70 percent compared with what the price would have been without the use of offsets.¹⁰ Because H.R. 2454 permits allowances to be banked, the price of allowances in every year is affected by factors affecting the expected demand for allowances in any year, including the availability and cost of offsets in each year.

There are many potential types of offsets. Offsets can be generated in forestry; for example, foresters can change forest management practices and plant trees to increase carbon storage. Emissions of greenhouse gases other than carbon dioxide, such as methane and nitrous oxide, can be reduced through changes in livestock management and crop production; for example, farmers can decrease the use of fertilizers or adopt no- or low-till farming practices to reduce the amount of nitrous oxide produced and released naturally by soils. In developing countries, important potential sources of offsets include reducing deforestation and changing forest management practices, planting trees, and reducing methane and nitrous oxide emissions from livestock, cropland, and rice paddies.

¹⁰ See Congressional Budget Office, *The Use of Offsets to Reduce Greenhouse Gases* (August 3, 2009).

To calculate the supply of offsets from domestic sources, CBO used data from the EPA on the potential supply of domestic offsets at different prices and adjusted those data to account for the transaction costs associated with creating and verifying those offsets. To calculate the supply of offsets from international sources, CBO used information from the EPA and made adjustments on the basis of provisions in the legislation, expectations about demand from other countries, and an estimate of the transaction costs associated with creating and verifying offsets. On the basis of information from the Department of State, the EPA, and outside experts, CBO concluded that the agreements necessary to generate offsets with certain countries would take significant time to negotiate and that the number of agreements and the scope of their coverage would gradually increase over the period covered by H.R. 2454. CBO also concluded that other developed countries, such as those in the European Union, would seek offsets for their own emission-reduction programs, thereby decreasing the supply available at any given price to entities in the United States.

Distribution of Compensation to Households. CBO developed an estimate of households' change in purchasing power as a rough indication of the direct effect that the cap-and-trade program established in H.R. 2454 would have on households. Under CBO's approach, the change in purchasing power equals the costs of complying with the policy minus the compensation that would be received as a result of the policy.¹¹ Compliance costs include the costs of reducing emissions as well as the costs of purchasing allowances and offsets—costs businesses would generally pass along to households in the form of higher prices. Compensation includes the free allocation of allowances, receipt of proceeds from the sale of allowances, and profits earned from producing offsets; that compensation would be received directly by households or passed on to them by businesses and governments. For some households, compensation would exceed compliance costs, so they would gain purchasing power rather than suffering a loss.

All of the allowance value would ultimately benefit households, although the manner in which that occurred and which households benefited would depend on how policymakers directed the allowance value. For example, allowances given to businesses would often benefit shareholders, while household rebates would tend to be more evenly distributed among households. The manner in which allowance value would accrue to households in their various roles as shareholders, workers, consumers, citizens with social security numbers, and so on is a key factor in determining how the change in purchasing power would vary across households in different income quintiles (or fifths of the income distribution).

In estimating households' gain or loss in purchasing power, CBO lacked sufficient information to allocate across households in different income brackets the benefits from some proposed government spending programs. In addition, the agency was not able to allocate across households the costs that federal, state, and local governments would face as a result of the program (including the added expense associated with paying higher prices for the goods and

¹¹ Once the compensation received by U.S. households is deducted from the compliance costs, the remaining loss in purchasing power stems from the cost of reducing emissions and producing domestic offsets, expenditures on international offsets, and the value of allowances that would be directed overseas.

services that the government purchases). That problem arises because governments could finance additional expenditures in various ways, such as by increasing taxes or reducing other spending, and different approaches could have very different effects on households at different points in the income spectrum.

In 2020, the aggregate amount of benefits that households would incur that CBO was not able to distribute among households in different income quintiles roughly equaled the aggregate amount of costs that CBO was not able to distribute across households. As a result, the gains and losses in purchasing power that CBO distributed across households in different income brackets was nearly the same as the total change in purchasing power experienced by all households.

In 2050, the aggregate amount of costs that CBO was unable to allocate across households exceeded the aggregate amount of unallocated benefits, primarily because the bill would require the government to provide compensation to specific households (compensation that CBO was able to allocate among households in different income brackets) without indicating where the funding for that compensation was to come from (which meant that CBO was unable to allocate the cost of funding those benefits). As a result, the gains and losses in purchasing power distributed across households in different income brackets was only about 60 percent of the total change in purchasing power.

Other Programs and Regulations. Other programs or regulatory standards that influence GHG emissions would affect the price of allowances by altering the magnitude of the emission reductions that would need to be achieved through the cap-and-trade program. For example, recently mandated fuel economy standards for passenger vehicles will tend to restrain the amount of GHGs emitted in the atmosphere. Consequently, fewer reductions from all other sectors would be necessary to meet any given cap; the price of allowances under H.R. 2454 would be lower than the price of those allowances in the absence of those standards; but the overall economic costs of meeting the cap would probably be higher.

The effects that such programs and standards would have on emissions and allowance prices would vary with the base prices of allowances and the stringency of the standards or strength of the programs. For the principal programs and standards included in H.R. 2454, CBO formed the following assessments:

- H.R. 2454 would require electric utilities to supply a specific percentage of their markets with power generated from qualifying renewable sources (for example, wind, solar, or biomass). Utilities could meet that requirement by generating that power themselves, or by purchasing credits from another utility that generated power from renewable energy in excess of their requirement, or by making alternative compliance payments to the states in which they operate.¹² CBO projected that the price of allowances in H.R. 2454's cap-

¹² Alternative compliance payments would be \$25 per megawatt hour of renewable electricity necessary to comply with the standard. See the discussion in Congressional Budget Office, cost estimate for H.R. 2454, the American Clean Energy and Security Act of 2009, as ordered reported by the House Committee on Energy and Commerce on May 21, 2009.

and-trade program would provide a sufficiently strong incentive to generate enough electricity from renewable sources to satisfy the federal standard. That is, electricity suppliers, in total, would turn to those fuels and sources as a consequence of the market incentives provided by the cap on emissions, even without the renewable-source standard. Correspondingly, the provision requiring the use of renewable fuels or energy sources probably would not affect the behavior of electric utilities or the prices of allowances.

- CBO projected that distributing allowances to electricity generators that invest in technologies to capture and store carbon would spark additional investments in those efforts and would result in greater reductions in greenhouse-gas emissions than otherwise would occur. CBO estimated that, all else held constant, the provision in H.R. 2454 that would allocate allowances to electricity generators that invested in such technologies would lower allowance prices by about 9 percent.
- CBO projected that H.R. 2454's investments in energy efficiency and new building code standards would slightly reduce allowance prices by decreasing the overall emission reductions required in other sectors of the economy.
- CBO projected that H.R. 2454's output-based rebates allocated to trade-exposed industries and domestic petroleum refiners would dampen the signal those entities would receive from the increase in the carbon price. As a consequence, emissions from those sectors would not fall by as much as they might have, and other sectors of the economy would have to reduce emissions by a higher amount. That shift would increase the overall price on emissions slightly and increase the overall cost of reducing emissions by the specified amounts.
- CBO projected that H.R. 2454's allocation of allowances to electricity and natural gas distribution companies for the purpose of rebates to residential energy consumers would dampen the carbon-price signal for those consumers. As a consequence, residential energy consumption would not fall by as much as it might have, and other sectors of the economy would have to reduce emissions by a higher amount. That shift would increase the overall price on emissions slightly and increase the overall cost of reducing emissions by the specified amounts.
- H.R. 2454 would allow covered entities to submit an unlimited number of emission allowances obtained from other cap-and-trade markets of "comparable stringency" instead of GHG allowances issued by the EPA. CBO expected that a market of "comparable stringency" would be a market in which allowances sold for comparable prices to the prices in the United States and that the provision would therefore have no effect on the prices of domestic allowances.

- Several mandates on the private sector that are included in H.R. 2454 would require manufacturers and other entities to reduce greenhouse-gas emissions through performance standards. In some cases, because of a lack of information about future regulations, CBO had no basis for estimating the effects of those mandates on allowance prices or economic costs. For example, it is not clear to what extent businesses would demand energy-efficient furnaces because of the higher energy prices that will result from a cap-and-trade program or whether such furnaces would be produced only because of the performance standards specified in H.R. 2454. Similarly, it is unclear to what extent rising energy prices would lead consumers to demand more efficient outdoor lighting fixtures, and whether that increase in efficiency would meet or exceed the progressively tighter performance standards for energy efficiency specified in H.R. 2454. If, in fact, the standards forced technological changes that would not otherwise have occurred because of the overall cap on emissions, then the standards would lead to a lower price of allowances than CBO estimated but result in a generally *higher* cost to the economy.¹³

Details on the Interpretation and Presentation of CBO's Results

CBO's analyses of H.R. 2454 provide information on the effects of that legislation relative to CBO's 2010–2019 budget baseline and long-term budget projections. However, CBO did not compare the effects of H.R. 2454 with alternative policy scenarios or proposals. As discussed earlier, CBO's analyses of H.R. 2454 used EIA's reference-case projections and incorporated estimates from other models of the U.S. economy's responsiveness to carbon prices over time.

In its cost estimate for H.R. 2454, CBO did not model changes in gross domestic product (GDP) resulting either from climate change or from economic responses to the legislation over time. However, on the basis of a review of other studies and its own analysis, CBO concluded that H.R. 2454 would slightly reduce real GDP—by roughly 0.25 percent to 0.75 percent in 2020 and by between 1.0 percent and 3.5 percent in 2050.¹⁴ Had those impacts been included in CBO's cost analyses of H.R. 2454, it is likely that overall allowance prices would have been slightly lower and budgetary impacts would have been smaller. Those differences would have arisen because lower GDP would imply lower emissions of greenhouse gases; as a result, the amount of

¹³ See Congressional Budget Office, *How Regulatory Standards Can Affect a Cap-and-Trade Program for Greenhouse Gases* (September 16, 2009).

¹⁴ There are multiple federal and private-sector analyses of the economic impacts of H.R. 2454, but several do not model all of the key aspects of the cap-and-trade program in the bill (such as banking of allowances, use of international offsets, and a complete coverage of greenhouse-gas emissions). The studies reviewed by CBO to compare potential effects of the legislation on GDP included Sergey Paltsev and others, *The Cost of Climate Policy in the United States*, Report No. 173 (Cambridge, Mass.: Massachusetts Institute of Technology, Joint Program on the Science and Policy of Global Change, April 2009), "Appendix C: Analysis of the Waxman-Markey American Clean Energy and Security Act of 2009 (H.R. 2454)"; Department of Energy, Energy Information Administration, Office of Integrated Analysis and Forecasting, *Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009*, SR/OIAF/2009-05 (August 2009); Environmental Protection Agency, Office of Atmospheric Programs, *EPA Analysis of the American Clean Energy and Security Act of 2009, H.R. 2454 in the 111th Congress* (June 23, 2009); and CRA International, *Impact on the Economy of the American Clean Energy and Security Act of 2009 (H.R. 2454)* (prepared for the National Black Chamber of Commerce, May 2009). See the additional discussion in Congressional Budget Office, *The Costs of Reducing Greenhouse-Gas Emissions* (November 23, 2009).

emission reductions necessary to meet the cap in the legislation would be smaller, which would translate to lower allowance prices and smaller budgetary impacts.

In its cost estimate for H.R. 2454, CBO also did not model changes in employment. However, CBO concluded that H.R. 2454 would probably have only a small effect on total employment in the long run, although it would probably cause a significant shift in the composition of employment over time.¹⁵ Production and employment would shift away from industries related to the production of carbon-based energy and energy-intensive goods and services and toward the production of alternative and lower-emission energy sources, goods that use energy more efficiently, and non-energy-intensive goods and services. Those shifts in employment would occur gradually over a long period, as the cap on emissions became progressively more stringent and the allowance price became progressively higher. The experience of the U.S. economy over the last half-century in adjusting to a sustained decline in manufacturing employment strongly suggests that the economy can absorb such long-term changes and maintain high levels of overall employment.

Nevertheless, the employment effects of H.R. 2454 could be substantial for some workers, families, and communities. Labor markets would take time to adjust to shifts in demand. Job losses would be concentrated in particular industries and in particular geographic regions. Some workers would probably end up working fewer hours or at lower wages than they did previously, and some might leave the labor force entirely. Involuntary job losses could significantly reduce the lifetime earnings of some affected workers. Several provisions of H.R. 2454 would subsidize the development and deployment of technologies that reduced emissions or would subsidize production by specific industries and firms, tending to dampen the bill's effects on employment—especially in industries and areas where they are expected to be most severe.

As discussed earlier, CBO developed an estimate of households' change in purchasing power as a rough indication of the direct effect that the cap-and-trade program established in H.R. 2454 would have on households. That loss in purchasing power equals the costs of complying with the policy minus the compensation that would be received as a result of the policy. CBO's estimates of such losses were reported in 2010 dollars and measured in the context of 2010 income levels. For example, CBO estimated that the loss in purchasing power stemming from the provisions of H.R. 2454 would account for 1.2 percent of households' after-tax income in 2050, or \$925 per household measured at 2010 income levels.

CBO estimated aggregate compliance costs of the policy on the basis of its own estimate of allowance prices and the extent to which firms would comply by reducing emissions or purchasing offsets. CBO distributed those compliance costs (including the costs of reducing emissions and purchasing allowances and offsets) across households in different income quintiles on the basis of the CO₂ emissions that were associated with the goods and services

¹⁵ See Congressional Budget Office, *The Costs of Reducing Greenhouse-Gas Emissions*.

Honorable Henry A. Waxman

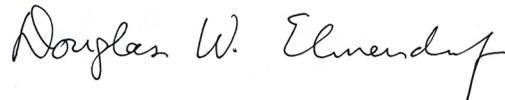
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those households consumed (as reported in the Consumer Expenditure Survey from the Bureau of Labor Statistics). Therefore, CBO's method of distributing compliance costs among households does not depend on an initial set of prices for goods and services.

Estimates of the gains and losses in purchasing power in a given year depended on CBO's estimates of the allowance price for that year. Because improvements in energy efficiency lowered the allowance price, those improvements indirectly affected CBO's estimates of households' gains or losses in purchasing power (see the above description of how energy efficiency is incorporated into CBO's allowance price estimate).

I hope this analysis is helpful to you. If you have any questions, please contact me or CBO staff. The primary staff contact for this analysis is Rob Johansson.

Sincerely,

A handwritten signature in cursive script that reads "Douglas W. Elmendorf".

Douglas W. Elmendorf
Director

cc: Honorable Joe Barton
Ranking Member

Identical letter sent to the Honorable Edward J. Markey.