EPA Analysis of the Waxman-Markey Discussion Draft: The American Clean Energy and Security Act of 2009

Executive Summary
April 20, 2009

Summary

At the request of House Energy and Commerce Committee Chairman Waxman and Energy and Environment Subcommittee Chairman Markey, EPA has conducted a preliminary economic analysis of the Waxman-Markey Discussion Draft (the American Clean Energy and Security Act of 2009). The draft bill would establish a wide range of policies to promote the development and deployment of new clean energy technologies that would fundamentally change the way we produce, deliver, and use energy. The bill would: (1) advance energy efficiency and reduce reliance on oil; (2) stimulate innovation in clean coal technology to ensure that coal remains an important part of the U.S. energy portfolio by capturing harmful greenhouse gas emissions before they enter the atmosphere; (3) accelerate the use of renewable sources of energy, including biomass, wind, solar, and geothermal; (4) create strong demand for a domestic manufacturing market for these next generation technologies that will enable American workers to serve in a central role in our clean energy transformation; and (5) play a critical role in the American economic recovery and job growth – from retooling shuttered manufacturing plants to make wind turbines, to using equipment and expertise in drilling for oil to develop clean energy from underground geothermal sources, to tapping into American ingenuity to engineer coal-fired power plants that do not contribute to climate change.

The most effective way to drive this clean energy transformation is to make it cost-effective to invest in renewable energy, energy efficiency, and other home-grown, climate-friendly technologies. Title III of the discussion draft proposes a market-based policy approach that changes the incentives for investment by closing the carbon pollution loophole. This cap-and-trade program, which has been successfully used to dramatically reduce acid rain at a fraction of the expected costs, provides the incentives for new, clean energy technologies. This policy can drive the energy sector transformation and lower the emissions causing climate change at the minimum possible cost because it does not rely on government mandating every specific action, but instead rewards the creativity of those in the private sector – from scientists, to small business owners, to line workers – who can seek out and exploit the lowest cost opportunities for doing so.

Given time limitations, EPA's analysis focused on the Title III market-based emission reduction program and did not address all of its provisions. The key findings of the core analysis are highlighted below. However, EPA has not yet had time to conduct sensitivity analyses of key assumptions so the generality of these findings are unknown:

- The Waxman-Markey draft would drive the clean energy transformation of the U.S. economy. Major investments in energy efficiency would mean that

energy consumption levels that would be reached in 2015 without the policy are not reached until the middle of the century with the policy, reflecting more energy efficient manufacturing, residential, and transportation sectors.

- Renewable energy penetration accelerates by 150% percent over the next two decades, and would be expected to grow even faster under the draft bill's renewable electricity standard, which has not been modeled yet due to time limitations.

- Coal with carbon capture and storage technology that allows coal-fired power generation to play an important role in a carbon-constrained world comes online in 2015 as a result of significant incentives in the bill, and is deployed on both new and existing plants.

- Electric power supply and use represents the largest source of emissions abatement. That abatement is achieved through a combination of improved energy efficiency among electricity users and the movement to low- or zero-emitting technologies such as nuclear, renewables, and coal plants with carbon capture and storage.

- The energy price impacts reflect the price of emission allowances that provide the incentives to invest in clean energy technologies and lower energy consumption. In the two models used to analyze the core scenario for the discussion draft, allowance prices are estimated to be $13-$17 per metric ton carbon dioxide equivalent (tCO_2e) in 2015 and $17-$22/tCO_2e in 2020. These increase over time, which provides the long-term price signal to inform investments in long-lived energy capital.

- The lower allowance and energy price impacts found in this analysis relative to previous EPA analyses of domestic climate legislation reflects the importance of updating models to the latest economic and emission forecasts. This analysis compares the policy scenario to a baseline that already reflects the impacts on emissions of the 2007 Energy Independence and Security Act, state renewable electricity standards, and importantly, lower near-term economic activity as a result of the current recession and a lower projected GDP growth rate. With lower forecast emissions, the allowance prices necessary to achieve the goals set in the discussion draft are also reduced.

- Because of time limitations, this analysis has not incorporated the effects of the American Recovery and Reinvestment Act on economic activity and greenhouse gas emissions. To the extent that it lowers emissions by advancing the use of renewables, energy efficiency, and coal with carbon capture and storage, the ARRA would facilitate the transition to the clean energy economy and ease attainment of the discussion draft's goals.

- A critical element in the design of the policy lies in the use of emission offsets – opportunities for companies covered by the emission reduction program to

invest in projects that lower emissions in activities that fall outside the emission cap. The use of domestic and international offsets, which serve as important ways to finance emission reductions in agriculture, forestry, and industry, significantly reduces the cost of achieving the discussion draft's goals. Excluding international offsets from the cap and trade program raises allowance prices 96%. This also illustrates the need to design institutions to ensure that sufficient volume of offsets can be used in this program in a way that does not undermine environmental integrity.

- Assuming that the bulk of the revenues from the program are returned to households, the cap-and-trade policy has a relatively modest impact on U.S. consumers. EPA's analysis shows that consumption is reduced by 0.02-0.11% in 2015 and 0.17-0.19% in 2020 and 0.37-0.39% in 2030, relative to the no policy case. However, EPA's analysis shows that household consumption under the policy still increases by 9-10% percent between 2010 and 2015, by 18-19% between 2010 and 2020, and by 36-40% by 2030. In comparison to the no policy case, the 5 and 10 year consumption growth under the WM Draft is only 0.1 and 0.2 percentage points lower for 2015 and 2020, respectively. This estimate reflects the assumption made in this analysis that most revenues from the program would be returned to consumers in a lump-sum rebate, enabling consumers to decide how best to use the value created in the program. Returning the revenues in this fashion could make the median household, and those living at lower ends of the income distribution, better off than they would be without the program. However, a policy that failed to return these revenues to consumers would lead to substantially larger losses in consumption.

- These initial findings reflect the results of two models calibrated to a common vision of the future energy economy without new policies. These should be considered illustrative of what could be expected under the discussion draft emission reduction program, while noting that significant uncertainties remain. The full report highlights some key uncertainties in predicted impacts and shows how results produced by EPA's models fall within the range of results by other models in the context of previous assessments, such as of last year's Lieberman-Warner bill. It is also important to recognize that an emission reduction program can be designed to be resilient to future unknowns.

More detail about the discussion draft, initial findings and scenario analysis, and key uncertainties is discussed below.

Background

On February 27, 2009, House Energy and Commerce Committee Chairman Waxman and Energy and Environment Subcommittee Chairman Markey requested that EPA estimate the economic impacts of the comprehensive climate legislation that they were developing. The Waxman-Markey Discussion Draft of the American Clean Energy and

Security Act of 2009 was publicly released on March 31, 2009. This document represents EPA's preliminary analysis of the Waxman-Markey Discussion Draft (hereafter referred to as the WM Draft).

While the WM Draft does have four specific titles, the preliminary EPA analysis has focused on Title III, "Reducing Global Warming Pollution," which establishes a cap-and-trade program for greenhouse gas (GHG) emissions. The short turnaround time for EPA's analysis has prevented analysis of other provisions, such as the renewable energy, energy efficiency standards, and transportation provisions.

The WM Draft would establish an emission cap that covers about 85% of total U.S. GHG emissions, and virtually all emissions from the combustion of fossil fuels. The cap starts in 2012 at an aggregate level equal to 3% below the 2005 level of covered entities' GHG emissions, and then gradually reduces emissions to 20% below 2005 levels by 2020, and 83% below 2005 levels by 2050. The Draft provides that, in aggregate, covered entities can offset up to 2 billion metric tons (bmt) of their annual emissions through projects to reduce emissions outside the scope of the cap (up to 1 bmt from domestic sources and 1 bmt from international sources). However, entities choosing to offset any of their emissions through such projects must reduce 1.25 tons of emissions outside the cap for every ton of emissions they offset under the cap.

The Draft allows for banking and borrowing of allowances, and directs EPA to create a strategic reserve of about 2.5 billion allowances to address unexpected allowance price fluctuations. The Draft also provides a supplemental policy to prevent international deforestation, whereby 2020 global emissions are reduced by the equivalent of an additional 10% of U.S. 2005 levels. EPA's analysis of the economic impacts of the emission caps includes the assumptions that there is banking and borrowing, that covered entities can meet their emission reduction requirements by purchasing the allowed number of offsets, and that there are supplemental pollution reductions. The analysis does not account for the strategic allowance reserve (i.e., these allowances are assumed to be available for use and not held in reserve).

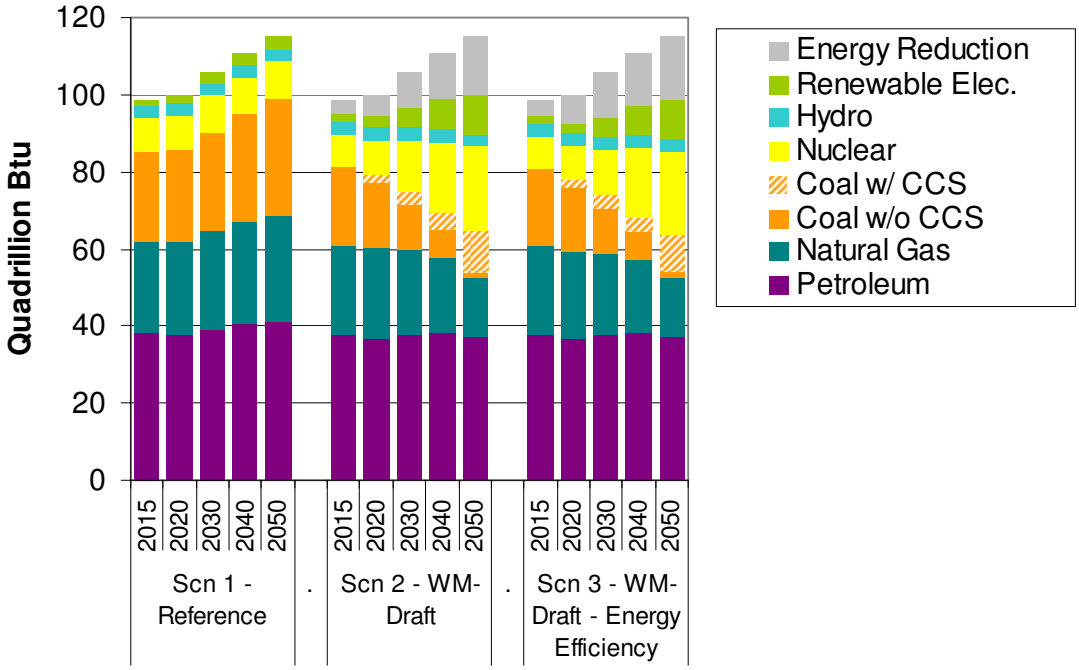
The discussion on the following pages highlights results in five areas of the analysis and presents information on alternative scenarios, and areas of uncertainty.

Detailed Findings

Energy Transformation. The WM Draft would drive the clean energy transformation of the U.S. economy by making it more economically attractive to invest in renewable energy, energy efficiency, and climate-friendly technologies. EPA estimates that improvements in energy efficiency and reduced demand for energy resulting from the policy mean that energy consumption levels that would be reached in 2015 without the policy would not be reached until the middle of the century with the policy. Additionally, Figure 1 shows that the share of low- or zero-carbon primary energy (such as nuclear, renewables, and CCS) rises substantially under the policy to 18% of primary energy by 2020, 26% by 2030, and to 46% by 2050, whereas without the policy the share would remain steady at 14%. Increased energy efficiency and reduced energy demand

simultaneously reduces primary energy needs by 6% in 2020, 9% in 2030, and 13% in 2050. Furthermore, EPA's analysis shows that renewable energy penetration accelerates by 150% over the next two decades. This figure is expected to grow even faster under the draft bill's renewable electricity standard, which has not been modeled yet due to time limitations.

Figure 1: U.S. Primary Energy (ADAGE)

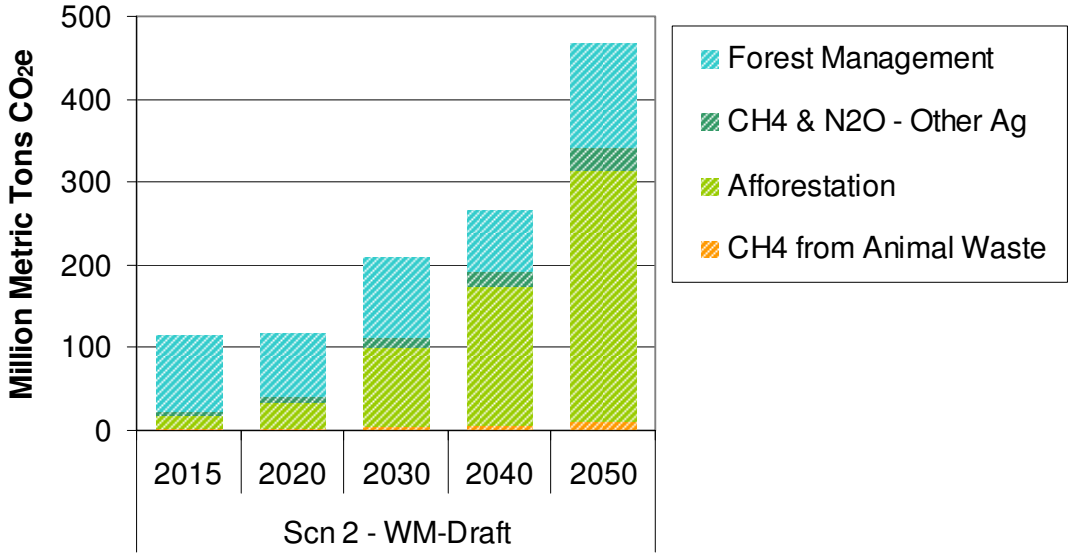


GHG Allowance and Offset Prices. In its core scenario, EPA estimates that allowance prices would range from $13 (IGEM) and $17 (ADAGE) in 2015, and increase at a rate of 5% per year. By 2020, allowance prices are estimated to range from $17 to $22/t$CO_2$e. Note that this range only reflects differences in the models and does not reflect the full range of possible allowance prices that would result from different assumptions about, for example, the cost and availability of key technologies and offsets. Because offsets are discounted to 80% of the value of allowances, the offsets price ranges from $10-$14/tCO_2e in 2015 and $13-$17/tCO_2e in 2020.

Offsets. The incentive provided by offsets stimulates a significant amount of domestic afforestation efforts, as shown in Figure 2, as well as methane (CH_4) capture from animal waste, improved forest management activities, and other agricultural projects that sequester CO_2. The program would also drive a significant improvement in the management of tropical forests by reducing deforestation. The offsets discounting provisions in the WM Draft require that 5 tons of offsets be turned in for every 4 offset credits used. Under this assumption, the EPA analysis found that the 1,000 million metric tons of CO_2-equivalent (MMtCO_2e) annual limits on the usage of domestic offsets is not reached in all years of the policy, while the 1 billion metric ton annual limit on international offsets is reached in every year. Eliminating the discounting requirement would decrease allowance prices by 7%, and increase the price received by offsets

suppliers by 16%. A non-discounted offsets program would also increase domestic offset supply by 11%. Eliminating the opportunity to use international offsets would nearly double the price of allowances ($25-$33 in 2015 and $33-$44 in 2020) and associated energy price impacts. This highlights the importance of designing an efficient, low-transaction cost process for ensuring that offset projects deliver real emission reductions and sequestration.

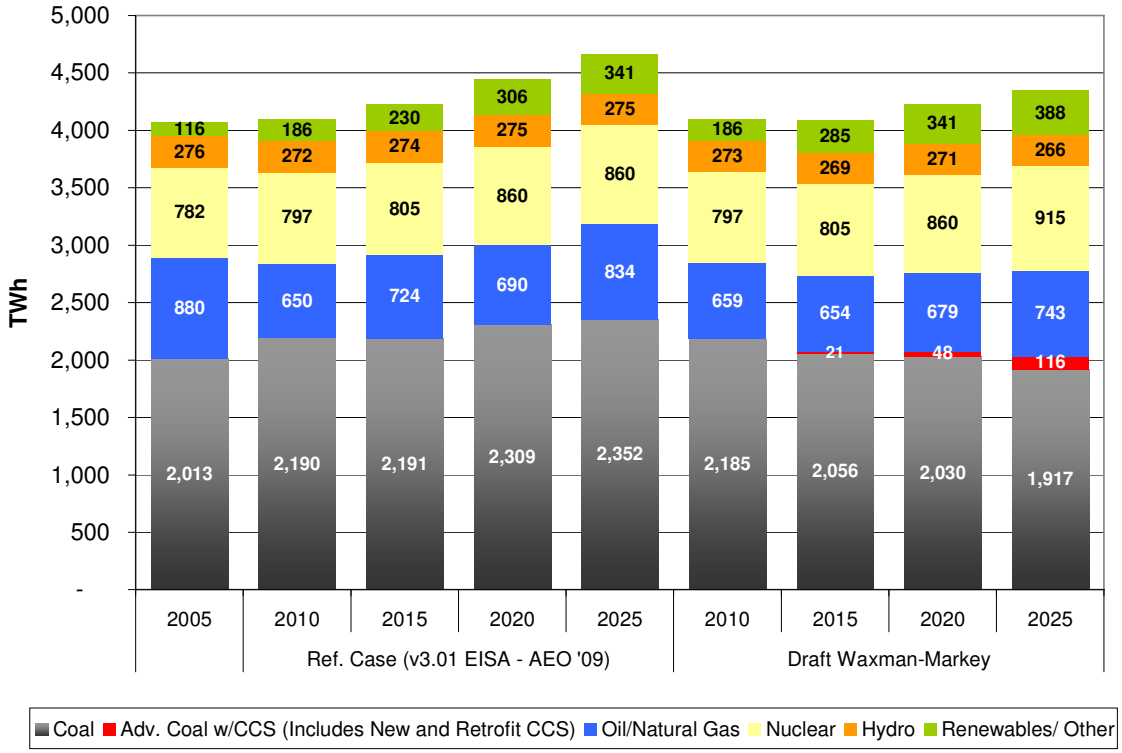
Figure 2: Sources of Domestic Offsets, 2010-2050 (IGEM)



EPA assumed that the WM Draft treats landfill and coal mine CH_4 under the Clean Air Act's New Source Performance Standards (NSPS), thus making them unavailable for offsets. EPA estimates that allowing landfill and coal mine CH_4 as offset projects instead of covering them under NSPS would increase cumulative domestic offsets usage by 45%, and decrease allowance prices by 9%.

Electricity Sector Impacts. Electric power supply and use provides a significant source of GHG abatement over the duration of the policy. The changes in the sector's emissions can be attributed to reduced demand for electricity and a movement to low- or zero-emitting electricity generation technologies. The mix of generation technologies shifts towards technologies with lower GHG intensity, like nuclear, renewables, and coal with carbon capture and sequestration technology. New advanced coal with CCS appears by 2015 with the help of financial incentives provided in the draft bill. Retrofits of CCS technology to the existing coal fleet – a new option in the modeling – are economic in later years with the bonus incentive (Figure 3). Compared to prior EPA analyses of Senate cap-and-trade legislation, lower allowance prices combined with higher costs to build new technology allow the existing coal fleet to remain cost-competitive in the short-term, and thus retirements of coal generation capacity are relatively modest. EPA estimates that the caps in the WM Draft will result in a 10% decline in U.S. GHG emissions from the electricity sector alone between 2010 and 2025, down to about 2,180 million metric tons CO_2e. That is in contrast to an increase in GHG emissions of around 9% without the policy over the same time period.

Figure 3: Power Generation Mix, 2010 – 2025 (IPM)



Household Consumption. With the assumption that the bulk of the allowance value is returned to households, the cost of this policy for U.S. households over the next 40 years is relatively modest, and average household consumption will continue to rise at a rate that is imperceptibly lower than in the absence of the bill. This is a key assumption, but the allocation of allowances and use of allowance value are not currently specified in the draft bill.

EPA's analysis shows that household consumption would increase by 9-10% under the WM Draft policy between 2010 and 2015 and by 18-19% between 2010 and 2020. In comparison to the no policy case, the 5 and 10 year consumption growth under the WM Draft is only 0.1 and 0.2 percentage points lower for 2015 and 2020, respectively. EPA did not model the benefits of avoided climate change for this analysis; however the above estimates can be considered the cost to the average household for achieving the benefits from the GHG mitigation associated with this bill.

The relatively modest changes in consumption as a result of the policy reflect the assumption made in this analysis that the bulk of the allowance value from the program would be returned to the people as a lump-sum rebate. Returning the auction revenues to households enables consumers to decide how best to use the value created in the program, for example, to buy more energy efficient light bulbs, to pay for electricity bills, or to use on the consumption of other goods and services. Furthermore, while the bill does not specify a particular method for using the value of allowances, returning the revenues in this fashion could make the median household, and those living at lower ends of the income distribution, better off than

they would be without the program. However, a policy that failed to return these revenues to consumers would lead to substantially larger losses in consumption.

Scenario Analysis

EPA analyzed 5 different scenarios in this preliminary report: the no policy (reference) case, the WM Draft scenario, and three sensitivity cases. The reference scenario is benchmarked to the revised AEO 2009 forecast and reflects enactment in 2007 of the Energy Independence and Security Act, yet it does not include any additional domestic or international climate policies or measures to reduce international GHG emissions. Specifically, it does not reflect the impacts of the American Recovery and Reinvestment Act on the penetration of new, clean energy technologies. The WM Draft scenario follows the specific caps and some of the provisions specified in the bill's text. It also assumes that developed nations (minus Russia) match U.S. action, and that developing nations (plus Russia) start considerably later and more slowly than the United States.

The three other alternatives modeled in this analysis are, (1) the WM Draft scenario with energy efficiency allowance allocations; (2) the WM Draft scenario with output-based rebates, and; (3) the WM Draft scenario with no international offsets. Those sensitivity cases have varying impacts on the marginal cost of GHG abatement.

The energy efficiency provisions reduce GHG allowance prices by 9%, although it should be noted that the methodology used to model this scenario does not allow the model to capture all of the costs associated with the electricity demand reduction from the energy efficiency provisions. Consumption in this scenario is reduced by 0.12% in 2015 and 0.19% in 2020 and 0.36% in 2030, relative to the no policy case (compared to reductions of 0.19% in 2015 and 0.19% in 2020 and 0.37% in 2030 in the same model's core scenario).

The output-based rebate would increase allowance prices by 2% while reducing job loss and production declines in energy-intensive and trade-exposed industries. The output-based rebate would also reduce emission leakage to countries without similar climate change policies. The slight change in allowance prices does not significantly alter the consumption impacts compared to the core policy scenario.

The no international offset case would increase allowance prices by 96%. Consumption in this scenario is reduced by 0.05% in 2015 and 0.32% in 2020 and 0.70% in 2030, relative to the no policy case (compared to reductions of 0.03% in 2015 and 0.17% in 2020 and 0.39% in 2030 in the same model's core scenario).

Key Uncertainties

There are a range of uncertainties that can affect the economic impacts of the WM Draft. This analysis contains a set of scenarios that cover some of the most important uncertainties, including: (1) the impact of leakage provisions designed to address the extent and stringency of international actions to reduce GHG emissions by developed and developing countries; (2) the availability of foreign credits and international offset

projects; and (3) the amount of GHG emissions reductions achieved by the energy efficiency provisions in the WM Draft. Additional uncertainties include, but are not limited to: the availability of domestic offset projects, the degree to which nuclear power is technically and politically feasible, whether or not carbon capture and storage technology will be available at a cost that allows for its employment at a large scale, more generally the long-run cost of achieving substantial GHG abatement, the pace of economic and emissions growth in the absence of climate policy, and other parameter uncertainty in the models.