Part of a series on
CAP 2.0

Policy Brief

A Clean Energy Bargain:
More Jobs, Less Global Warming Pollution, and Greater Security

Economic recovery, environmental protection, job creation, and energy security are all benefits of comprehensive clean energy and climate legislation. According to new economic analysis, such legislation will protect the planet for less than 50 cents a day per household, and represents a great investment in America's future.

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To see more detailed results and assumptions, visit **www.nrdc.org/cap2.0**

Clean Energy and Climate Legislation is an Investment in Our Energy Future

Comprehensive legislation is a win-win for the economy and the environment. By capping global warming pollution while also investing in clean energy and energy efficiency, we can avert the most catastrophic effects of climate change. This approach will also encourage the use of emerging clean technologies, make us more energy efficient, reduce our reliance on foreign oil, and lessen our exposure to oil price volatility.

NRDC used two well-known national energy models (NEMS and MARKAL) to examine the impact of such legislation on the U.S. economy.[1]

Key findings of our analysis include:

- **Climate legislation will boost our economy and create jobs:** It would drive an estimated $300+ billion of investments (through 2030) toward clean energy, creating up to 1.9 million jobs in the process.
- **Protecting our planet is affordable:** The cost of proposed climate bills to American households is estimated to be less than 50 cents per day.
- **Climate legislation will make America more secure:** Clean energy and climate legislation can reduce oil imports by as much as 5 million barrels per day, cutting U.S. oil imports in half, improving our energy security, and reducing the risk of fuel price shocks. At today's prices, of around $70 per barrel, that means more than $2 trillion (through 2050) will not be sent overseas for imported oil.

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Model Overview

NRDC, working with consultants at OnLocation Inc. and International Resources Group, used versions of the National Energy Modeling System (NEMS-NRDC) and the Market Allocation (MARKAL) models to explore the impact that comprehensive climate legislation will have on our energy system and economy. NEMS-NRDC and MARKAL both simulate energy markets from the "bottom-up," but they differ in scope and how they model choices. NEMS-NRDC is a forecasting model that uses observed historical behavior to estimate how individual market participants will act in response to changing market conditions and specific constraints through 2030. It combines detailed energy markets with a macroeconomic model to estimate the impacts that changes in the energy system have on the economy as a whole. In contrast, MARKAL is a long-term, cost-optimization model, which uses perfect foresight to minimize total energy system costs through 2050. To read the detailed report of our findings, see www.nrdc.org/cap2.0.

COMPREHENSIVE CLEAN ENERGY AND CLIMATE LEGISLATION WILL BOOST OUR ECONOMY

An integrated climate and energy bill will drive approximately $300 billion toward clean energy

Renewables account for approximately 10 percent of electricity generation in the United States, with hydropower taking the largest share. Under business-as-usual (BAU), the Energy Information Administration (EIA) estimates that renewables will increase their market share to approximately 15 percent by 2020 and remain at that level through 2030.[2] Under comprehensive clean energy and climate legislation the NEMS-NRDC and MARKAL models (see sidebar) show that renewables could account for 17 to 22 percent of electricity generation in 2020 and 19 to 34 percent in 2030. According to NEMS-NRDC, climate legislation will drive an additional investment of $300 billion in low- or no-emissions electricity generation technologies between 2012 and 2030, which includes $100 billion redirected from conventional fossil-fuel generation.

Comprehensive legislation will create clean energy jobs for Americans

Clean energy investments create more jobs across all skill and education levels than comparable investments in fossil-fuel energy sources because clean energy employs U.S. workers to capture domestic energy efficiency and renewable energy opportunities. The Political Economy Research Institute (PERI), an independent unit of the University of Massachusetts, found that clean energy investments create 3.2 times as many jobs as fossil fuel investments.[3] The PERI study also found that clean energy investments create 5.5 times as many jobs for workers with few educational credentials or less work experience, and 75 percent of these jobs provide opportunities for advancement. In a separate analysis, researchers at the University of California, University of Illinois, and Yale University determined that comprehensive clean energy and climate legislation could create up to 1.9 million jobs in the U.S.[4] The reason is simple: energy efficiency reduces import dependence and the costs for transportation, heating, electricity, etc., saving households and businesses money—money they can spend on domestic goods and services, which will create jobs for Americans.

COMPREHENSIVE CLEAN ENERGY AND CLIMATE LEGISLATION IS AFFORDABLE

Comprehensive legislation will cost American households a few cents a day

The Congressional Budget Office (CBO), the Environmental Protection Agency (EPA), and the Department of Energy's EIA have each released assessments of how much House-passed legislation will cost American households. The CBO estimates the average annual household cost will be $160 in 2020.[5] The University of California study found that household income would increase by $487 to $1,175 in 2020 as a result of productivity gains driven by energy efficiency investments. The other analyses, including NEMS-NRDC, provide annual estimates through 2030, allowing for a direct comparison. Comparing EPA, EIA, and NEMS-NRDC results, the estimates for average annual household cost range from $52 to $92, as shown in Figure 1.[6] This translates to $0.14 to $0.25 per household per day. Meanwhile, median annual income levels per household over 2012-2030 are expected to be, on average, $4,700 to $5,500 higher than 2009 levels.[7]

Figure 1. Increase in average 2012-2030 median annual income per household from 2009 levels, and average annual cost per household vs. BAU over 2012-2030.

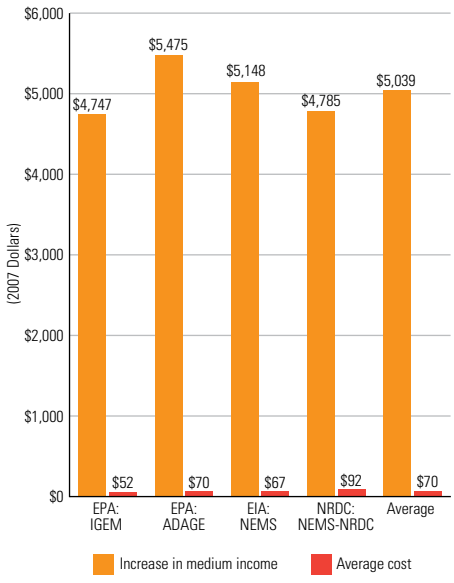
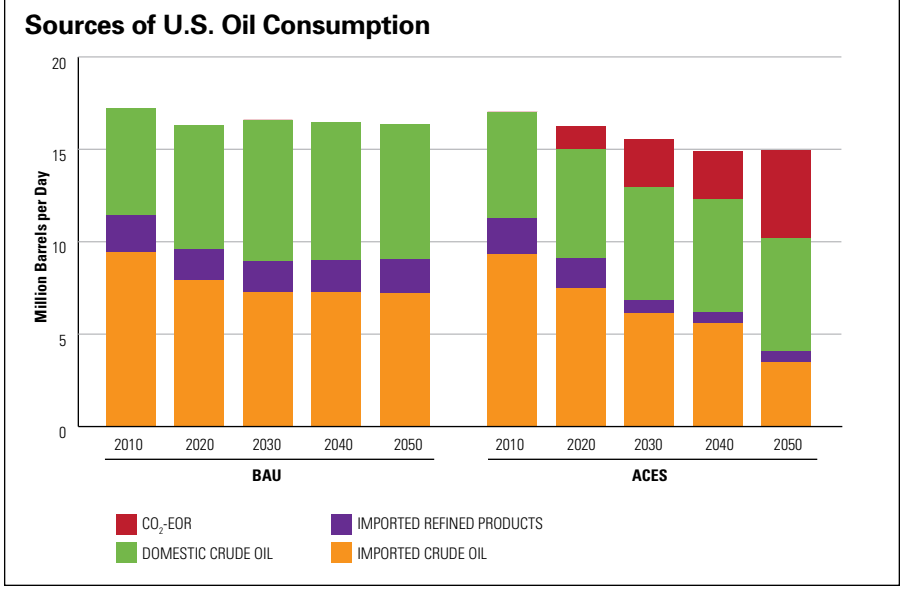


Figure 2. Carbon dioxide captured from electricity generation technologies with CSS in 2020 and 2030.

CAPTURED EMISSIONS FROM CSS ELECTRICITY GENERATION (million metric tons CO_2)					
	EPA: IGEM	EPA: ADAGE	EIA: NEMS	NRDC: NEMS-NRDC	NRDC: MARKAL
2020	152	152	85	76	124
2030	207	230	409	538	243

Figure 3. Domestic and imported crude oil and refined products consumption from 2010 to 2050, under MARKAL.



COMPREHENSIVE CLEAN ENERGY AND CLIMATE LEGISLATION WILL MAKE AMERICA MORE SECURE

A climate bill can reduce oil imports by 5 million barrels per day

Another benefit of a comprehensive legislation is that it will boost domestic oil production by capturing CO_2 from power plants and other industrial sources (known as carbon capture and storage or CCS), which can be used to enhance oil production in depleted oil fields.

The Department of Energy (DOE) estimates that over 60 percent of the oil discovered in the United States is considered "stranded" and uneconomical to recover conventionally. CO_2-enhanced oil recovery (CO_2-EOR) can yield up to 20 percent more of the original oil in place, extending the productive life of existing oil fields by 20 to 30 years. Oil field operators in western Texas, Mississippi, and Wyoming have been using this method for more than 30 years; they are currently producing more than 270 thousand barrels of oil per day. The DOE estimates that with ample supplies of CO_2, between 45 and 64 billion barrels of domestic oil could be economically recovered.

The market for CO_2-EOR, however, has been limited by available supplies of CO_2. Comprehensive clean energy and climate legislation will provide sufficient incentives to encourage capture of carbon dioxide on as much as 72 gigawatts of power generation capacity. As a result, the CO_2 supply from the electric power sector alone is projected to meet the potential economic demand for CO_2-EOR.[8]

NRDC worked with Advanced Resources International, a specialist in CO_2-EOR, to estimate the impact that carbon dioxide captured in the MARKAL model would have on EOR out to 2050. We estimate that 1.3 million barrels per day (MBD) of additional domestic oil production would result from EOR in 2020 under legislation, rising to 2.6 MBD in 2030 and 4.8 MBD in 2050.[9] With lower fuel demand and more oil produced domestically, we can cut oil imports in half and strengthen our energy security. While the MARKAL model shows that growth in CO_2-EOR partially substitutes for other forms of domestic oil production, a climate bill could result in a net reduction in oil imports of 2.1 MBD by 2030 and 5.0 MBD by 2050 (vs. BAU), with the United States eventually importing just 27 percent of the oil it needs (see Figure 3), down from importing more than 60 percent of our oil needs today. At today's oil prices, the cumulative value of these reduced imports through 2050 will be worth more than $2 trillion.

A comprehensive bill will lower oil prices and lead to less price volatility

We estimate that the additional oil production from enhanced oil recovery resulting from climate legislation would be enough to lower global oil prices. It would also leave America less vulnerable to energy price shocks.

THE SENATE MUST ACT NOW

Passage of comprehensive clean energy and climate protection legislation will help avert catastrophic climate disruption by requiring emission reductions which will redirect our resources toward cleaner, more energy-efficient technologies. As a result, we will lead the global clean energy economy, create millions of quality jobs here at home, and bolster our national security by reducing our dependence on oil imports.

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Please note that the organizational affiliations are listed for identification purposes only. The results presented here do not necessarily reflect the views of the Doris Duke Charitable Foundation, the listed advisors, or their organizations, and NRDC takes sole responsibility for the conclusions and recommendations drawn from the modeling effort.

[1] Based on House passed legislation, HR 2454, The American Clean Energy and Security Act.

[2] Energy Information Administration's Annual Energy Outlook 2009 Updated Release, April 2009.

[3] PERI, "The Economic Benefits of Investing in Clean Energy," americanprogress.org/issues/2009/06/clean_energy.html; "Green Prosperity: How Clean Energy Policies Can Fight Poverty and Raise Living Standards in the United States," nrdc.org/energy/greenjobs/.

[4] University of California, University of Illinois, Yale University, "Clean Energy and Climate Policy for U.S. Growth and Job Creation," http://are.berkeley.edu/~dwrh/CERES_Web/Docs/ES_DRHFK091025.pdf

[5] Congressional Budget Office. The economic Effects of Legislation to Reduce Greenhouse-Gas Emissions. September, 2009. The CBO's estimate is higher than the other estimates reviewed. This may be because the CBO focused on modeling Title III of the bill (the cap-and-trade mechanism), without fully incorporating the effects of other provisions such as energy efficiency. In contrast, we modeled all major provisions of ACES, including the energy efficiency provisions that result in significant cost reductions.

[6] Household cost refers to consumption loss per household, which represents the reduction in consumer spending for goods and services due to lower purchasing power. For the apples-to-apples comparison shown, we calculated the net present value of annual consumption loss per household from 2012 to 2030, in 2007 dollars, with 2009 as the base year and a 5 percent discount rate.

[7] To calculate income levels, we assumed that the 2007 U.S. median household income of $50,233 (in 2007 dollars) grew at the same rate as consumption per household under ACES (also in 2007 dollars).

[8] Except in Alaska, where CCS is not expected to be deployed.

[9] Oil production and carbon sequestration potential will be site specific. Responsible operations are essential and sound regulations can help minimize any surface or subsurface risks.