



Summary and Analysis of S. 1733 and Comparison with H.R. 2454: Electric Power and Natural Gas

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Summary

This report provides a summary and analysis of selected provisions of the chairman's mark of S. 1733, the Clean Energy Jobs and American Power Act. The topics covered include electric power and incentives for the development of natural gas technologies. The report also compares those provisions with H.R. 2454, the American Clean Energy and Security Act.

In S. 1733, Subtitle H of Division A has two sections dealing with the use of low carbon emitting energy technologies. Section 181, *Clean Energy and Accelerated Emission Reduction Program*, directs the EPA administrator to "establish a program to promote *dispatchable* power generation projects that can accelerate the reduction of power sector carbon dioxide and other greenhouse gas emissions" (emphasis added). The term "dispatchable" is not defined in the bill, but would normally refer to power generating units that can be run at-will by system operators, such as natural gas, nuclear, or coal units. Several features of Section 181 are unspecified or unclear, including the total dollar amount and form of the incentives, whether the emission reduction target for a specific project would change over time, and the deadline for making incentive awards. Section 182 of Subtitle H, *Advanced Natural Gas Technologies*, would establish two grant programs for accelerating the development of advanced natural gas technologies in the power generation, commercial, and residential sectors.

No parts of H.R. 2454 are directly comparable to sections 181 and 182 of S. 1733. Closest in intent is Section 175 of Subtitle H of H.R. 2454, which provides for a government program to help develop and demonstrate high efficiency natural gas burning combustion turbines, for use in combined cycle power plants.

H.R. 2454 has several provisions relating to electric power transmission that have no counterparts in S. 1733. These provisions of H.R. 2454 involve transmission planning and permitting; development and deployment of smart grid technologies; requirements for electric utilities to reduce peak demand; net metering for federal agencies; and incentives for transmission technology development. These elements of H.R. 2454 are summarized in this report and discussed in more detail in CRS Report R40643, *Greenhouse Gas Legislation: Summary and Analysis of H.R. 2454 as Passed by the House of Representatives*, coordinated by (name redacted) and (name redacted).

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Introduction

This report provides a summary and analysis of selected provisions of S. 1733, the Clean Energy Jobs and American Power Act. The topics covered include electric power and incentives for the development of natural gas technologies. The report also compares those provisions with counterparts, if any, in H.R. 2454, the American Clean Energy and Security Act.

Other aspects of S. 1733 and H.R. 2454 are covered in additional CRS reports. These reports are available in the climate change section of the CRS website, located at <http://crs.gov/Pages/subissue.aspx?cliid=2645&parentid=2522>.

The remainder of this report is divided into the following sections:

- Electric Power and Natural Gas Technologies.
- Electric Power Transmission and Related Technologies

Electric Power and Natural Gas Technologies

S. 1733

Subtitle H of Division A has two sections dealing with the use of low carbon emitting energy technologies. Section 181, *Clean Energy and Accelerated Emission Reduction Program*, directs the EPA administrator to “establish a program to promote *dispatchable* power generation projects that can accelerate the reduction of power sector carbon dioxide and other greenhouse gas emissions” (emphasis added). The term “dispatchable” is not defined in the bill, but would normally refer to power generating units that can be run at-will by system operators. In this sense a natural gas, nuclear, or coal unit is dispatchable while a wind or solar plant is not, because wind and solar generation is dependent on weather and diurnal conditions.¹

The EPA administrator is directed to establish rules within 90 days of enactment for providing incentives to dispatchable power projects that generate 300,000 gigawatt-hours (Gwh) of electricity annually. To put this generation target in context, a reasonably large power plant with a capacity of 500 megawatts (i.e., 0.5 gigawatts) that operates the equivalent of 85% of the time would generate 3,723 Gwh annually.² Therefore it would take about 81 of these 500 Mw plants to meet the goal of generating 300,000 Gwh annually under this program.

To qualify for incentives, an eligible project must produce emissions of greenhouse gases (GHG) that are below the 2007 average emissions per megawatt-hour (Mwh) by the United States electric power sector, according to the following schedule (**Table 1**):

¹ This concept is sometimes presented by stating that while wind and solar plants are sources of electric *energy* to the power system, they are not sources of firm *capacity* because their availability is dependent on weather and diurnal factors outside the operator’s control.

² This is calculated as 0.5 gigawatts x 8,760 hours per year x 85% = 3,723 Gwh.

Table I. Emission Reduction Requirements for S. 1733, Sec. 181 Incentive Payments

Calendar Year	Percentage Below 2007 Average Greenhouse Gas Emissions per Mwh of the United States Electric Power Sector
2010 through 2020	25%
2021 through 2025	40%
2026 through 2030	65%

Source: S. 1733, Division A, sec. 181.

The bill speaks to reductions in the emissions of all GHG released by power plants, but information is readily available only for power plant carbon dioxide emissions (CO₂ is, in any event, the predominant GHG in the electric power sector).³ **Table 2**, below, shows average CO₂ emission per Mwh for the electric power sector as a whole in 2007, the 2007 values for several specific combustible fuel sources, and estimated emissions for new natural gas plants. These estimates, which include no carbon controls, show that only new high efficiency natural gas plants can meet the reduction targets of 25% for 2010 to 2020 and 40% for 2021 to 2025. It does not appear that any combustible fuel source can meet the 65% target which begins in 2026 without carbon controls.

Nuclear power is a dispatchable option which could meet these targets since carbon emissions are essentially zero. Geothermal power has very small emissions per Mwh (**Table 2**) and is dispatchable, but with current technology plants are limited to small installations in the western United States. Another alternative could be to link wind or solar power with electricity storage, creating a combined system which could be dispatched as needed. However, current electricity storage technologies are limited by cost, technical, and environmental factors.⁴

³ In 2007, electric power sector emissions totaled 2,433.4 million metric tons of CO₂ (MMTCO₂). In comparison, emissions of methane from all stationary combustion sources totaled only 11.4 million metric tons of CO₂ equivalent (MMTCO₂e) and emissions of nitrous oxides from the electric power sector were only 9.3 MMTCO₂e. EIA, *Emissions of Greenhouse Gases in the United States 2007*, pp. 20, 26, and 33.

⁴ For more information on this topic see CRS Report R40797, *Electric Power Storage*, by (name redacted).

Table 2. Electric Power Sector Carbon Dioxide Emissions, 2007

	Million Metric Tons Carbon Dioxide	Net Generation in Millions of Mwh	Metric Tons of Carbon Dioxide per Mwh	Percent Difference from U.S. Electric Power Sector Average
U.S. Electric Power Sector	2,433.40	4,005.3	0.608	0%
Coal	1,979.70	1,998.4	0.991	63%
Natural Gas	376.4	814.8	0.462	-24%
Residual Fuel Oil	37.1	37.9	0.979	61%
Distillate Fuel Oil	7.4	7.7	0.961	58%
Petroleum Coke	21.2	14.3	1.483	144%
Geothermal	0.4	14.6	0.027	-96%
High Efficiency New Natural Gas Plant, Current Technology	NA	NA	0.380	-37%
High Efficiency New Natural Gas Plant, Improved Technology	NA	NA	0.357	-41%

Source: EIA, *Emissions of Greenhouse Gases in the United States 2007*, p. 20; EIA, *Annual Energy Outlook 2008*, Table 8.2b; EIA, *Assumptions to the Annual Energy Outlook 2009*, Table 8.2.

Notes: The average heat rate for gas-fired generation in 2007 was 8,200 Btus per kwh (calculated from the EIA 906 survey data file for 2007, located at <http://www.eia.doe.gov/cneaf/electricity/page/data.html>). The estimated heat rates for high efficiency (i.e., combined cycle) new gas-fired plants using current and improved technology are, respectively, 6,752 and 6,333 Btus per kwh (from EIA, *Assumptions to the Annual Energy Outlook 2009*, Table 8.2.). NA = not applicable.

In allocating incentives the administrator is to give priority to projects with one or more of the following characteristics:

- Power generation and energy storage projects intended to integrate variable renewable electricity sources, such as solar and wind power, into the grid.
- Power generation projects with carbon capture and sequestration that do not qualify for other aid under S. 1733.
- Projects that achieve the greatest reduction in GHG emissions per dollar of incentive payment.

Several features of Section 181 are unspecified or unclear. These include:

- The total dollar amount and form of the incentives.
- By what point in time projects must enter service to qualify for incentives.

- Whether the emission reduction target varies for a project over time. For example, assume a project enters service in 2010 and must therefore meet the 25 percent reduction in GHG emission goal (**Table 1**). If the project is still operating in 2021 to 2025, does it have to further reduce emissions to meet the 40% reduction target that begins in that period in order to continue to receive incentives, or does the higher target only apply to new units that enter service during that period?
- The bill states that “Not later than 3 years after the date of enactment of this Act, the Administrator shall provide incentives for eligible projects that generate 300,000 gigawatt-hours of electricity per year.” It is not clear from this language if the Administrator must make *all* awards within three years of enactment, or must merely begin making awards by that deadline.

Section 182 of Subtitle H, *Advanced Natural Gas Technologies*, would establish two programs for accelerating the deployment of advanced natural gas technologies. Under one program, for “Natural Gas Electricity Generation Grants,” the EPA Administrator “may provide” (but apparently is not *required* to provide) research and development grants “to support the deployment of low greenhouse-gas-emitting end-use technologies, including carbon capture and sequestration technologies, for natural gas electricity generation.” Under the second program, for “Natural Gas Residential and Commercial Technology Grants,” the Administrator is directed to establish a grant program for research, development, demonstration, and deployment of low GHG emitting end-use technologies for the commercial and residential sectors.

Grants can be made to private or municipal utilities, research and development establishments, and other types of businesses. Although these programs are under the direction of the EPA, the Secretary of Energy is the official directed to report to the Congress every 180 days on the status and results achieved by these programs.

H.R. 2454

There are no directly comparable provisions in H.R. 2454. Section 175 of Subtitle H of H.R. 2454 does provide for a government program to help develop and demonstrate high efficiency natural gas burning combustion turbines, for use in combined cycle power plants. The section directs the Secretary of Energy to carry out a multiyear, multiphase program of research, development, and technology demonstration that ultimately will lead to gas turbine combined cycle efficiency of 65%.⁵

⁵ The combined cycle is a modern generating technology that generally uses natural gas as its fuel, and which is built around combustion turbine prime movers (for more information see CRS Report RL34746, *Power Plants: Characteristics and Costs*, by (name redacted)). Current technology operates at an efficiency of about 51% to 54% (i.e., percent of fuel heat input converted to electricity). Higher efficiency plants would be more economical and would release less CO₂ and other pollutants per unit of electricity produced.

Electric Power Transmission and Related Technologies

H.R. 2454 contains several provisions relating to electric power transmission that have no counterparts in S. 1733. These provisions are briefly summarized below. For more detail see CRS Report R40643, *Greenhouse Gas Legislation: Summary and Analysis of H.R. 2454 as Passed by the House of Representatives*, coordinated by (name redacted) and (name redacted).

Transmission

Subtitle F of Title I of H.R. 2454 deals with transmission planning and permitting. The subtitle provides for the following in respect to transmission planning:

- Establishes a national transmission planning policy, which states that transmission planning “should facilitate the deployment of renewable and other zero-carbon and low-carbon energy sources for generating electricity to reduce greenhouse gas emissions while ensuring reliability, reducing congestion, ensuring cyber-security, minimizing environmental harm, and providing for cost-effective electricity services throughout the United States....”
- Directs the Federal Energy Regulatory Commission to define electric transmission planning principles, based on the national policy, which can be used by planning entities.
- FERC is to facilitate coordination between state, regional, and industry transmission planning entities.

In respect to permitting, the bill grants FERC new federal siting and permitting authority within the Western Interconnection.⁶ This authority to supersede state permitting decisions applies only to proposed transmission projects that meet certain criteria, including interstate projects “identified as needed in significant measure to meet demand for renewable energy.”

Smart Grid

H.R. 2454 includes several provisions aimed at supporting development and installation of smart grid⁷ technologies (see Title I, Subtitle E). The bill would direct the Department of Energy and Environmental Protection Agency to identify products that could be cost-effectively equipped with smart grid capability. The legislation would also direct the Federal Trade Commission to

⁶ The transmission grid for the contiguous 48 states consists of three, for the most part electrically independent, “interconnections.” These are the ERCOT Interconnection, which covers most of Texas; the Eastern Interconnection, which extends from the eastern seaboard to the eastern front of the Rockies; and the Western Interconnection, which covers the balance of the country. For more information and maps, see CRS Report R40511, *Electric Power Transmission: Background and Policy Issues*, by (name redacted).

⁷ The “smart grid” is intended to give the power grid some of the characteristics of a computer network, in which information concerning, and control of, power supply and demand will flow between and be shared by individual customers and utility control centers. The smart grid primarily involves the development of software and small-scale technology (e.g., smart meters for homes and businesses that would interface with grid controls) rather than construction of new transmission lines.

initiate a rulemaking to determine whether smart grid information, such as potential dollar savings to the consumer, should be added to ENERGY GUIDE product labels. (ENERGY GUIDE is an existing federal program for labeling energy efficient products.)

The legislation would establish requirements for electric power retailers to reduce their peak loads using smart grid and other energy efficient technologies; and would modify an energy efficiency public information program authorized by the Energy Policy Act of 2005 (EPACT05) to make it into a smart grid and energy efficiency information program. H.R. 2454 would also modify an EPACT05 energy efficiency appliance rebate program to add appliances with smart grid capabilities. Additionally, H.R. 2454 would require state regulatory authorities and self-regulating power suppliers (such as municipal utilities) to consider implementing standards intended to ensure that utility smart grid systems would be compatible with plug-in electric drive vehicles.

Net Metering for Federal Agencies

Section 152 of Subtitle F of H.R. 2454 provides for net metering of federal agencies. Net metering is a ratemaking concept intended to encourage the development of “distributed generation” (i.e., electricity generated at the customer’s site, possibly, but not necessarily, using renewable energy). Net metering is intended to make distributed generation more economical by requiring the utility that supplies electricity to a facility to also take any electricity generated by that facility, such as from rooftop solar panels or an on-site diesel generator. The ultimate utility bill to the facility is reduced by the amount of electricity supplied to the power company.

Section 152 amends the Public Utility Regulatory Policies Act of 1978 to require state regulatory authorities to consider ordering utilities under their jurisdiction to implement net metering for federal facilities. It also requires non-regulated utilities (such as many municipal utilities) to make the same evaluation. The net metering standard must be adopted if it is consistent with state law and is found by the controlling regulatory authority to be “appropriate.”

Incentives for Transmission Technology Development

Section 153 of Subtitle F would amend EPACT05 to provide for incentives for the development and construction of transmission lines and related facilities using currently non-commercial technology. The categories of technology include “advanced electric transmission property” (essentially high-efficiency underground transmission lines and associated equipment), “advanced electric transmission manufacturing plant” (plants that manufacture the “advanced electric transmission property”), and “high efficiency transmission property” (essentially high-efficiency overhead transmission lines and associated equipment).

All three categories of technology would be added to the list of technologies qualifying for the new loan guarantee program added to EPACT05 by the American Recovery and Reinvestment Act of 2009. Additionally, “advanced electric transmission property” and “advanced electric transmission manufacturing plant” only would be added to the original loan guarantee program included in EPACT05. This program was originally created to support the development of low carbon and other advanced energy technologies.

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