

Calendar No. 146

112TH CONGRESS }
1st Session }

SENATE

{ REPORT
{ 112-66

NUCLEAR ENERGY RESEARCH INITIATIVE IMPROVEMENT ACT

AUGUST 30 (legislative day, AUGUST 2), 2011.—Ordered to be printed

Filed under authority of the order of the Senate of August 2, 2011

Mr. BINGAMAN, from the Committee on Energy and Natural
Resources, submitted the following

R E P O R T

[To accompany S. 1067]

The Committee on Energy and Natural Resources, to which was referred the bill (S. 1067) to amend the Energy Policy Act of 2005 to require the Secretary of Energy to carry out a research and development and demonstration program to reduce manufacturing and construction costs relating to nuclear reactors, and for other purposes, having considered the same, reports favorably thereon with an amendment and recommends that the bill, as amended, do pass.

The amendment is as follows:

Strike out all after the enacting clause and insert in lieu thereof the following:

SECTION 1. SHORT TITLE.

This Act may be cited as the “Nuclear Energy Research Initiative Improvement Act of 2011”.

SEC. 2. NUCLEAR ENERGY RESEARCH INITIATIVE.

Section 952 of the Energy Policy Act of 2005 (42 U.S.C. 16272) is amended by striking subsection (a) and inserting the following:

“(a) NUCLEAR ENERGY RESEARCH INITIATIVE.—

“(1) IN GENERAL.—The Secretary shall conduct research to lower the cost of nuclear reactor systems while increasing the levels of safety and security of the systems, including research regarding—

“(A) modular and small-scale reactors;

“(B) balance-of-plant issues;

“(C) cost-efficient manufacturing and construction;

“(D) licensing issues; and

“(E) enhanced proliferation controls.

- “(2) CONSULTATION REQUIREMENT.—In carrying out initiatives under paragraph (1), the Secretary shall consult with—
- “(A) the Secretary of Commerce;
 - “(B) the Secretary of the Treasury;
 - “(C) the Nuclear Regulatory Commission; and
 - “(D) any other individual who the Secretary determines to be necessary.
- “(3) SCHEDULE.—
- “(A) IN GENERAL.—Not later than 180 days after the date of enactment of this paragraph, the Secretary shall develop and publish on the website of the Department of Energy a schedule that contains an outline of a 5-year strategy to lower effectively the costs of nuclear reactors.
 - “(B) PUBLIC WORKSHOPS.—In developing the schedule under subparagraph (A), the Secretary shall conduct public workshops to provide an opportunity for public comment.
 - “(C) REVIEW.—Before the date on which the Secretary publishes the schedule under subparagraph (A), the Nuclear Energy Advisory Committee shall conduct a review of the schedule.
 - “(D) ANNUAL UPDATES.—
 - “(i) IN GENERAL.—Not later than 180 days after the date on which the Secretary publishes the schedule under subparagraph (A) and annually thereafter, the Secretary shall update the schedule.
 - “(ii) PUBLIC WORKSHOPS.—In updating the schedule under clause (i), the Secretary shall conduct public workshops in accordance with subparagraph (B).
- “(4) COST SHARING.—Section 988 shall apply to initiatives carried out under this section.”.

PURPOSE

The purpose of S. 1067 is to require the Secretary of Energy to carry out a research and development and demonstration program to reduce manufacturing and construction costs relating to nuclear reactors while increasing their levels of safety and security.

BACKGROUND AND NEED

The 104 nuclear power plants currently operating in the United States generate roughly 20 percent of the nation’s electricity, and roughly 70 percent of the nation’s carbon-free electricity. New nuclear power plants will need to be built in the years ahead to replace existing plants as they age and are retired, to meet increased energy demand, and to help reduce carbon dioxide emissions.

The greatest challenge to the deployment of new nuclear power plants is their large capital cost. A new nuclear power plant is estimated to cost between \$6 billion and \$8 billion. Congress has previously sought to address this problem through loan guarantees in title XVII of the Energy Policy Act of 2005, insurance against regulatory delays in section 638 of the Energy Policy Act of 2005, production tax credits in section 1306 of the Energy Policy Act of 2005, and improvements in the licensing process in title XXVIII of the Energy Policy Act of 1992. In addition, section 952 of the Energy Policy Act of 2005 established a Nuclear Energy Research Initiative within the Department of Energy for research and development on nuclear energy systems.

Additional legislation is needed to make lowering the cost of nuclear reactor systems a primary objective of the Department of Energy’s Nuclear Energy Research Initiative.

LEGISLATIVE HISTORY

S. 1067 was introduced by Senator Mark Udall on May 25, 2011. Senators Bingaman, Murkowski and Klobuchar are cosponsors. The

Committee on Energy and Natural Resources held a legislative hearing on S. 1067 on June 7, 2011.

Similar legislation was introduced by Senator Mark Udall in the 111th Congress as S. 2052 on October 29, 2009. Senators Bingaman, Murkowski, Crapo, Landrieu, Risch, and Klobuchar were cosponsors. A companion bill, H.R. 5163, was introduced in the House of Representatives on April 28, 2010.

The Committee on Energy and Natural Resources held a legislative hearing on S. 2052 on December 15, 2009. S. Hrg. 111–375. In addition, the Committee held an oversight hearing on nuclear energy development on March 18, 2009. S. Hrg. 111–21. The Committee ordered S. 2052 favorably reported at its business meeting on September 27, 2010.

The Committee ordered S. 1067 favorably reported, with an amendment in the nature of a substitute, at its business meeting on July 14, 2011.

COMMITTEE RECOMMENDATION

The Senate Committee on Energy and Natural Resources, in open business session on July 14, 2011, by voice vote of a quorum present recommends that the Senate pass S. 1067.

Senator Sanders asked to be recorded as voting no.

COMMITTEE AMENDMENTS

During its consideration of S. 1067, the Committee adopted an amendment in the nature of a substitute, which makes a number of changes to the bill as introduced. The substitute amendment replaces the existing general authority for nuclear energy research and development under the heading “Nuclear Energy Research Initiative” in section 952(a) of the Energy Policy Act of 2005, and replaces it with the more specific authority of S. 1067. The substitute also adds new language to section 952(a)(1) that directs the Secretary shall conduct research that increases the levels of safety and security, as well as lowers the cost, of nuclear reactor systems, and strikes the authorization of appropriations.

SECTION-BY-SECTION ANALYSIS

Section 1 provides a short title.

Section 2 amends section 952(a) of the Energy Policy Act of 2005 (42 U.S.C. 16272(a)), “Nuclear Energy Research Initiative,” by striking that section and replacing it with the text of S. 1067, as amended.

Paragraph (1) of section 952(a), as amended, requires the Secretary of Energy to conduct research to lower the cost of nuclear reactor systems as part of the Nuclear Energy Research Initiative while increasing levels of safety and security, and identifies research on modular and small-scale reactors, balance-of-plant issues, cost-efficient manufacturing and construction, licensing issues, and enhanced proliferation controls as types of research included within the initiative.

Paragraph (2) directs the Secretary of Energy, in carrying out research under paragraph (1), to consult with the Secretary of Commerce, the Secretary of the Treasury, the Nuclear Regulatory Com-

mission, and any other individual who the Secretary determines to be necessary.

Paragraph (3) directs the Secretary of Energy to develop and post on the Department of Energy's website a schedule outlining a five-year strategy to lower effectively the costs of nuclear reactors. Subparagraphs require the Nuclear Energy Advisory Committee to review the schedule, and the Secretary to update it annually. The Secretary is also required to solicit public comment through public workshops when developing and updating the schedule.

Paragraph (4) applies the cost-sharing requirements of section 988 of the Energy Policy Act of 2005 to the Nuclear Energy Research Initiative.

COST AND BUDGETARY CONSIDERATIONS

The following estimate of costs of this measure has been provided by the Congressional Budget Office.

S. 1067—Nuclear Energy Research Initiative Improvement Act of 2011

Summary: S. 1067 would authorize the Department of Energy (DOE) to conduct research related to nuclear reactor systems. Assuming appropriation of the necessary amounts, CBO estimates that implementing S. 1067 would cost \$231 million over the 2012–2016 period. Enacting S. 1067 would not affect direct spending or revenues; therefore, pay-as-you-go procedures do not apply.

S. 1067 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA) and would impose no costs on state, local, or tribal governments.

Estimated cost to the federal government: The estimated budgetary impact of S. 1067 is shown in the following table. The costs of this legislation fall within budget function 270 (energy).

	By fiscal year, in millions of dollars					
	2012	2013	2014	2015	2016	2012–2016
CHANGES IN SPENDING SUBJECT TO APPROPRIATION						
Estimated Authorization Level	50	51	52	52	53	258
Estimated Outlays	30	45	51	52	53	231

Basis of estimate: S. 1067 would authorize DOE to conduct research aimed at reducing the costs of deploying new commercial nuclear reactors and increasing levels of safety and security of such systems. Under the bill, those efforts would be aimed particularly at developing modular and small-scale nuclear reactors and technologies to enhance the sustainability, cost-effectiveness, and security of nuclear reactors.

Based on information from DOE about the level of effort required to make appreciable progress toward those objectives, CBO estimates that fully funding S. 1057 would require appropriations totalling \$50 million in 2012 and \$258 million over the 2012–2016 period. Assuming appropriation of those amounts, CBO estimates that resulting spending would total \$231 million over the 2012–2016 period, with additional spending occurring in later years. Those estimated outlays are based on historical spending patterns for DOE's nuclear programs.

Pay-as-you-go considerations: None.

Intergovernmental and private-sector impact: S. 1067 contains no intergovernmental or private-sector mandates as defined in UMRA and would impose no costs on state, local, or tribal governments.

Estimate prepared by: Federal Costs: Megan Carroll; Impact on State, Local, and Tribal Governments: Ryan Miller; Impact on the Private Sector: Amy Petz.

Estimate approved by: Theresa Gullo, Deputy Assistant Director for Budget Analysis.

REGULATORY IMPACT EVALUATION

In compliance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee makes the following evaluation of the regulatory impact which would be incurred in carrying out S. 1067.

The bill is not a regulatory measure in the sense of imposing Government established standards or significant economic responsibilities on private individuals and businesses.

No personal information would be collected in administering the program. Therefore, there would be no impact on personal privacy.

Little, if any, additional paperwork would result from the enactment of S. 1067.

CONGRESSIONALLY DIRECTED SPENDING

S. 1067, as ordered reported, does not contain any congressionally directed spending items, limited tax benefits, or limited tariff benefits as defined in rule XLIV of the Standing Rules of the Senate.

EXECUTIVE COMMUNICATIONS

The testimony on S. 1067 given by the Deputy Assistant Secretary for Reactor Technologies, Office of Nuclear Energy, The U.S. Department of Energy at the Committee's June 7, 2011 hearing as follows:

STATEMENT OF JOHN E. KELLY, DEPUTY ASSISTANT SECRETARY FOR REACTOR TECHNOLOGIES, OFFICE OF NUCLEAR ENERGY, DEPARTMENT OF ENERGY

INTRODUCTION

Thank you, Chairman Bingaman, Ranking Member Murkowski, and Members of the Committee. This is my first testimony before Congress and it is a particular pleasure to be discussing small modular reactors (SMRs) with you, as they have been an area of great interest to me for some time.

Before joining the Department of Energy, I co-chaired an American Nuclear Society special committee that was developing solutions to generic licensing issues for small modular reactors. Over the course of the last 18 months, this special committee, together with the Nuclear Energy Institute, the Nuclear Regulatory Commission and the nuclear industry, has made great progress in forging the blueprint for the regulatory framework for small modular

reactors. This progress demonstrates an increased interest in the licensing and commercialization of SMRs.

The Administration continues to view nuclear power as an important clean energy option. Small modular reactors, specifically reactors that have an electrical output of less than 300 megawatts, are a promising and innovative technology. We see these smaller reactors as giving our utilities additional clean energy options and allowing nuclear power to penetrate the energy market more broadly. Secretary Chu has written that, "if we can develop this technology in the U.S. and build these reactors with American workers, we will have a key competitive edge". SMRs are already inspiring American innovation and have the potential to significantly enhance U.S. competitiveness.

Since former Assistant Secretary Dr. Pete Miller testified to this Committee in 2009 on the two bills we are discussing today, several developments have taken place. A little over a year ago, we released our fiscal year 2011 budget request, which proposed a small modular reactor program with \$40 million of funding. The proposal was to spend half of that funding on R&D efforts and half to initiate a competitive selection process to establish public-private partnerships to cost-share design certification and licensing efforts with the selected winners.

Earlier this year, the Department released its fiscal year 2012 budget request, which included an expanded version of the small modular reactor program. The request for FY 2012 is \$29 million for R&D and \$67 million for design certification and licensing activities. The DOE request outlines a multi-year, \$452 million program that would use cost-shared arrangements with industry partners to complete design certification activities for up to two light water small modular reactor designs. There are several potential SMR vendors pursuing both LWR designs and more advanced concepts. Many utilities are interested in this technology to replace aging fossil plants.

The events at the Fukushima nuclear power plants have led the Nuclear Regulatory Commission to launch a 90-day review to see what lessons can be learned from the Japanese experience and applied to U.S. nuclear plants. I want to note that designers of light water SMRs have already placed major emphasis on the inherent safety of these reactors. Because of their lower power level, SMRs have a much lower level of decay heat and therefore may require less cooling after reactor shutdown. Several designs incorporate passive safety features that utilize gravity-driven systems rather than engineered, pump-driven systems to supply backup cooling in unusual circumstances. Some concepts use natural circulation for normal operations, requiring no primary system pumps and providing an even more robust safety case. In addition, many SMR designs utilize integral designs for which all major primary components are located in a single pressure vessel. That feature results in a much lower susceptibility to certain potential events, such as a loss of coolant accident, because there is

no large external primary piping. Lastly, most SMRs can be sited underground, which should improve their security profile and may enhance seismic safety.

COMMENTS ON S. 512 AND S. 1067

Turning to the two bills under consideration by the Committee, the Department has a few comments.

S. 1067 gives broad authority to conduct research into small modular reactors, as well as other connected issues.

S. 512, the Nuclear Power 2021 Act, would require the Department of Energy to carry out a program to develop and demonstrate two small modular reactor designs. If passed, several factors would be important to consider:

- The requirement that at least one of the designs be less than 50 MW is too restrictive; simply having an upper bound of approximately 300 MW_e would be more appropriate. Cost-shared design development and licensing should be based on competitive procurements and the market place should establish the appropriate design parameters.
- The licensing effort should include two different designs.
- The program should initially be focused on light water reactor technology based on the large amount of experience—both design and licensing—with such reactors.

CONCLUSION

That concludes my formal remarks. Thank you for the opportunity to testify and I look forward to answering your questions and working with the Committee to achieve the administration's goals of energy security and reducing the nation's carbon emissions.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill S. 1067, as ordered reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

ENERGY POLICY ACT OF 2005

Public Law 109–58

AN ACT To ensure jobs for our future with secure, affordable, and reliable energy.

* * * * *

TITLE IX—RESEARCH AND DEVELOPMENT

* * * * *

Subtitle E—Nuclear Energy

* * * * *

SEC. 952. NUCLEAR ENERGY RESEARCH PROGRAMS.

[(a) NUCLEAR ENERGY RESEARCH INITIATIVE.—The Secretary shall carry out a Nuclear Energy Research Initiative for research and development related to nuclear energy.]

(a) NUCLEAR ENERGY RESEARCH INITIATIVE.—

(1) *IN GENERAL.*—The Secretary shall conduct research to lower the cost of nuclear reactor systems while increasing the levels of safety and security of the systems, including research regarding—

- (A) modular and small-scale reactors;
- (B) balance-of-plant issues;
- (C) cost-efficient manufacturing and construction;
- (D) licensing issues; and
- (E) enhanced proliferation controls.

(2) *CONSULTATION REQUIREMENT.*—In carrying out initiatives under paragraph (1), the Secretary shall consult with—

- (A) the Secretary of Commerce;
- (B) the Secretary of the Treasury;
- (C) the Nuclear Regulatory Commission; and
- (D) any other individual who the Secretary determines to be necessary.

(3) *SCHEDULE.*—

(A) *IN GENERAL.*—Not later than 180 days after the date of enactment of this paragraph, the Secretary shall develop and publish on the website of the Department of Energy a schedule that contains an outline of a 5-year strategy to lower effectively the costs of nuclear reactors.

(B) *PUBLIC WORKSHOPS.*—In developing the schedule under subparagraph (A), the Secretary shall conduct public workshops to provide an opportunity for public comment.

(C) *REVIEW.*—Before the date on which the Secretary publishes the schedule under subparagraph (A), the Nuclear Energy Advisory Committee shall conduct a review of the schedule.

(D) *ANNUAL UPDATES.*—

(i) *IN GENERAL.*—Not later than 180 days after the date on which the Secretary publishes the schedule under subparagraph (A) and annually thereafter, the Secretary shall update the schedule.

(ii) *PUBLIC WORKSHOPS.*—In updating the schedule under clause (i), the Secretary shall conduct public workshops in accordance with subparagraph (B).

(4) *COST SHARING.*—Section 988 shall apply to initiatives carried out under this section.

* * * * *