# H.R.6

**Energy Independence and Security Act of 2007 (Enrolled as Agreed to or Passed by Both House and Senate)**

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### Subtitle B--Geothermal Energy

## SEC. 611. SHORT TITLE.

This subtitle may be cited as the `Advanced Geothermal Energy Research and Development Act of 2007'.

## SEC. 612. DEFINITIONS.

For purposes of this subtitle:

(1) ENGINEERED- When referring to enhanced geothermal systems, the term `engineered' means subjected to intervention, including intervention to address one or more of the following issues:

(A) Lack of effective permeability or porosity or open fracture connectivity within the reservoir.

(B) Insufficient contained geofluid in the reservoir.

(C) A low average geothermal gradient, which necessitates deeper drilling.

(2) ENHANCED GEOTHERMAL SYSTEMS- The term `enhanced geothermal systems' means geothermal reservoir systems that are engineered, as opposed to occurring naturally.

(3) GEOFLUID- The term `geofluid' means any fluid used to extract thermal energy from the Earth which is transported to the surface for direct use or electric power generation, except that such term shall not include oil or natural gas.

(4) GEOPRESSURED RESOURCES- The term `geopressured resources' mean geothermal deposits found in sedimentary rocks under higher than normal pressure and saturated with gas or methane.

(5) GEOTHERMAL- The term `geothermal' refers to heat energy stored in the Earth's crust that can be accessed for direct use or electric power generation.

(6) HYDROTHERMAL- The term `hydrothermal' refers to naturally occurring subsurface reservoirs of hot water or steam.

(7) SYSTEMS APPROACH- The term `systems approach' means an approach to solving problems or designing systems that attempts to optimize the performance of the overall system, rather than a particular component of the system.

## SEC. 613. HYDROTHERMAL RESEARCH AND DEVELOPMENT.

(a) In General- The Secretary shall support programs of research, development, demonstration, and commercial application to expand the use of geothermal energy production from hydrothermal systems, including the programs described in subsection (b).

(b) Programs-

(1) ADVANCED HYDROTHERMAL RESOURCE TOOLS- The Secretary, in consultation with other appropriate agencies, shall support a program to develop advanced geophysical, geochemical, and geologic tools to assist in locating hidden hydrothermal resources, and to increase the reliability of site characterization before, during, and after initial drilling. The program shall develop new prospecting techniques to assist in prioritization of targets for characterization. The program shall include a field component.

(2) INDUSTRY COUPLED EXPLORATORY DRILLING- The Secretary shall support a program of cost-shared field demonstration programs, to be pursued, simultaneously and independently, in collaboration with industry partners, for the demonstration of advanced technologies and techniques of siting and exploratory drilling for undiscovered resources in a variety of geologic settings. The program shall include incentives to encourage the use of advanced technologies and techniques.

## SEC. 614. GENERAL GEOTHERMAL SYSTEMS RESEARCH AND DEVELOPMENT.

(a) Subsurface Components and Systems- The Secretary shall support a program of research, development, demonstration, and commercial application of components and systems capable of withstanding extreme geothermal environments and necessary to cost-effectively develop, produce, and monitor geothermal reservoirs and produce geothermal energy. These components and systems shall include advanced casing systems (expandable tubular casing, low-clearance casing designs, and others), high-temperature cements, high-temperature submersible pumps, and high-temperature packers, as well as technologies for under-reaming, multilateral completions, high-temperature and high-pressure logging, logging while drilling, deep fracture stimulation, and reservoir system diagnostics.

(b) Reservoir Performance Modeling- The Secretary shall support a program of research, development, demonstration, and commercial application of models of geothermal reservoir performance, with an emphasis on accurately modeling performance over time. Models shall be developed to assist both in the development of geothermal reservoirs and to more accurately account for stress-related effects in

stimulated hydrothermal and enhanced geothermal systems production environments.

(c) Environmental Impacts- The Secretary shall--

(1) support a program of research, development, demonstration, and commercial application of technologies and practices designed to mitigate or preclude potential adverse environmental impacts of geothermal energy development, production or use, and seek to ensure that geothermal energy development is consistent with the highest practicable standards of environmental stewardship;

(2) in conjunction with the Assistant Administrator for Research and Development at the Environmental Protection Agency, support a research program to identify potential environmental impacts of geothermal energy development, production, and use, and ensure that the program described in paragraph (1) addresses such impacts, including effects on groundwater and local hydrology; and

(3) support a program of research to compare the potential environmental impacts identified as part of the development, production, and use of geothermal energy with the potential emission reductions of greenhouse gases gained by geothermal energy development, production, and use.

## SEC. 615. ENHANCED GEOTHERMAL SYSTEMS RESEARCH AND DEVELOPMENT.

(a) In General- The Secretary shall support a program of research, development, demonstration, and commercial application for enhanced geothermal systems, including the programs described in subsection (b).

(b) Programs-

(1) ENHANCED GEOTHERMAL SYSTEMS TECHNOLOGIES- The Secretary shall support a program of research, development, demonstration, and commercial application of the technologies and knowledge necessary for enhanced geothermal systems to advance to a state of commercial readiness, including advances in--

(A) reservoir stimulation;

(B) reservoir characterization, monitoring, and modeling;

(C) stress mapping;

(D) tracer development;

(E) three-dimensional tomography; and

(F) understanding seismic effects of reservoir engineering and stimulation.

(2) ENHANCED GEOTHERMAL SYSTEMS RESERVOIR STIMULATION-

(A) PROGRAM- In collaboration with industry partners, the Secretary shall support a program of research, development, and demonstration of enhanced geothermal systems reservoir stimulation technologies and techniques. A minimum of 4 sites shall be selected in locations that show particular promise for enhanced geothermal systems development. Each site shall--

(i) represent a different class of subsurface geologic environments; and

(ii) take advantage of an existing site where subsurface characterization has been conducted or existing drill holes can be utilized, if possible.

(B) CONSIDERATION OF EXISTING SITE- The Desert Peak, Nevada, site, where a Department of Energy and industry cooperative enhanced geothermal systems project is already underway, may be considered for inclusion among the sites selected under subparagraph (A).

## SEC. 616. GEOTHERMAL ENERGY PRODUCTION FROM OIL AND GAS FIELDS AND RECOVERY AND PRODUCTION OF GEOPRESSURED GAS RESOURCES.

(a) In General- The Secretary shall establish a program of research, development, demonstration, and commercial application to support development of geothermal energy production from oil and gas fields and production and recovery of energy, including electricity, from geopressured resources. In addition, the Secretary shall conduct such supporting activities including research, resource characterization, and technology development as necessary.

(b) Geothermal Energy Production From Oil and Gas Fields- The Secretary shall implement a grant program in support of geothermal energy production from oil and gas fields. The program shall include grants for a total of not less than three demonstration projects of the use of geothermal techniques such as advanced organic rankine cycle systems at marginal, unproductive, and productive oil and gas wells. The Secretary shall, to the extent practicable and in the public interest, make awards that--

(1) include not less than five oil or gas well sites per project award;

(2) use a range of oil or gas well hot water source temperatures from 150 degrees Fahrenheit to 300 degrees Fahrenheit;

(3) cover a range of sizes up to one megawatt;

(4) are located at a range of sites;

(5) can be replicated at a wide range of sites;

(6) facilitate identification of optimum techniques among competing alternatives;

(7) include business commercialization plans that have the potential for production of equipment at high volumes and operation and support at a large number of sites; and
(8) satisfy other criteria that the Secretary determines are necessary to carry out the program and collect necessary data and information.

The Secretary shall give preference to assessments that address multiple elements contained in paragraphs (1) through (8).

(c) Grant Awards- Each grant award for demonstration of geothermal technology such as advanced organic rankine cycle systems at oil and gas wells made by the Secretary under subsection (b) shall include--

(1) necessary and appropriate site engineering study;
(2) detailed economic assessment of site specific conditions;
(3) appropriate feasibility studies to determine whether the demonstration can be replicated;
(4) design or adaptation of existing technology for site specific circumstances or conditions;
(5) installation of equipment, service, and support;
(6) operation for a minimum of 1 year and monitoring for the duration of the demonstration; and
(7) validation of technical and economic assumptions and documentation of lessons learned.

(d) Geopressured Gas Resource Recovery and Production- (1) The Secretary shall implement a program to support the research, development, demonstration, and commercial application of cost-effective techniques to produce energy from geopressured resources.

(2) The Secretary shall solicit preliminary engineering designs for geopressured resources production and recovery facilities.

(3) Based upon a review of the preliminary designs, the Secretary shall award grants, which may be cost-shared, to support the detailed development and completion of engineering, architectural and technical plans needed to support construction of new designs.

(4) Based upon a review of the final design plans above, the Secretary shall award cost-shared development and construction grants for demonstration geopressured production facilities that show potential for economic recovery of the heat, kinetic energy and gas resources from geopressured resources.

(e) Competitive Grant Selection- Not less than 90 days after the date of the enactment of this Act, the Secretary shall conduct a national solicitation for applications for grants under the programs outlined in subsections (b) and (d). Grant recipients shall be selected on a competitive basis based on criteria in the respective subsection.

(f) Well Drilling- No funds may be used under this section for the purpose of drilling new wells.

## SEC. 617. COST SHARING AND PROPOSAL EVALUATION.

(a) Federal Share- The Federal share of costs of projects funded under this subtitle shall be in accordance with section 988 of the Energy Policy Act of 2005.
(b) Organization and Administration of Programs- Programs under this subtitle shall incorporate the following elements:

(1) The Secretary shall coordinate with, and where appropriate may provide funds in furtherance of the purposes of this subtitle to, other Department of Energy research and development programs focused on drilling, subsurface characterization, and other related technologies.
(2) In evaluating proposals, the Secretary shall give priority to proposals that demonstrate clear evidence of employing a systems approach.
(3) The Secretary shall coordinate and consult with the appropriate Federal land management agencies in selecting proposals for funding under this subtitle.
(4) Nothing in this subtitle shall be construed to alter or affect any law relating to the management or protection of Federal lands.

## SEC. 618. CENTER FOR GEOTHERMAL TECHNOLOGY TRANSFER.

(a) In General- The Secretary shall award to an institution of higher education (or consortium thereof) a grant to establish a Center for Geothermal Technology Transfer (referred to in this section as the `Center').
(b) Duties- The Center shall--

(1) serve as an information clearinghouse for the geothermal industry by collecting and disseminating information on best practices in all areas relating to developing and utilizing geothermal resources;
(2) make data collected by the Center available to the public; and
(3) seek opportunities to coordinate efforts and share information with domestic and international partners engaged in research and development of geothermal systems and related technology.

(c) Selection Criteria- In awarding the grant under subsection (a) the Secretary shall select an institution of higher education (or consortium thereof) best suited to provide national leadership on geothermal related issues and perform the duties enumerated under subsection (b).
(d) Duration of Grant- A grant made under subsection (a)--

(1) shall be for an initial period of 5 years; and
(2) may be renewed for additional 5-year periods on the basis of--

(A) satisfactory performance in meeting the duties outlined in subsection (b); and
(B) any other requirements specified by the Secretary.

## SEC. 619. GEOPOWERING AMERICA.

The Secretary shall expand the Department of Energy's GeoPowering the West program to extend its geothermal technology transfer activities throughout the entire United States. The program shall be renamed `GeoPowering America'. The program shall continue to be based in the Department of Energy office in Golden, Colorado.

## SEC. 620. EDUCATIONAL PILOT PROGRAM.

The Secretary shall seek to award grant funding, on a competitive basis, to an institution of higher education for a geothermal-powered energy generation facility on the institution's campus. The purpose of the facility shall be to provide electricity and space heating. The facility shall also serve as an educational resource to students in relevant fields of study, and the data generated by the facility shall be available to students and the general public. The total funding award shall not exceed $2,000,000.

## SEC. 621. REPORTS.

(a) Reports on Advanced Uses of Geothermal Energy- Not later than 3 years and 5 years after the date of enactment of this Act, the Secretary shall report to the Committee on Science and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate on advanced concepts and technologies to maximize the geothermal resource potential of the United States. The reports shall include--

(1) the use of carbon dioxide as an alternative geofluid with potential carbon sequestration benefits;
(2) mineral recovery from geofluids;
(3) use of geothermal energy to produce hydrogen;
(4) use of geothermal energy to produce biofuels;
(5) use of geothermal heat for oil recovery from oil shales and tar sands; and
(6) other advanced geothermal technologies, including advanced drilling technologies and advanced power conversion technologies.

(b) Progress Reports- (1) Not later than 36 months after the date of enactment of this Act, the Secretary shall submit to the Committee on Science and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate an interim report describing the progress made under this subtitle. At the end of

60 months, the Secretary shall submit to Congress a report on the results of projects undertaken under this subtitle and other such information the Secretary considers appropriate.
(2) As necessary, the Secretary shall report to the Congress on any legal, regulatory, or other barriers encountered that hinder economic development of these resources, and provide recommendations on legislative or other actions needed to address such impediments.

## SEC. 622. APPLICABILITY OF OTHER LAWS.

Nothing in this subtitle shall be construed as waiving, modifying, or superseding the applicability of any requirement under any environmental or other Federal or State law. To the extent that activities authorized in this subtitle take place in coastal and ocean areas, the Secretary shall consult with the Secretary of Commerce, acting through the Under Secretary of Commerce for Oceans and Atmosphere, regarding the potential marine environmental impacts and measures to address such impacts.

## SEC. 623. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Secretary to carry out this subtitle $90,000,000 for each of the fiscal years 2008 through 2012, of which $10,000,000 for each fiscal year shall be for carrying out section 616. There are also authorized to be appropriated to the Secretary for the Intermountain West Geothermal Consortium $5,000,000 for each of the fiscal years 2008 through 2012.

## SEC. 624. INTERNATIONAL GEOTHERMAL ENERGY DEVELOPMENT.

(a) In General- The Secretary of Energy, in coordination with other appropriate Federal and multilateral agencies (including the United States Agency for International Development) shall support international collaborative efforts to promote the research, development, and deployment of geothermal technologies used to develop hydrothermal and enhanced geothermal system resources, including as partners (as appropriate) the African Rift Geothermal Development Facility, Australia, China, France, the Republic of Iceland, India, Japan, and the United Kingdom.
(b) United States Trade and Development Agency- The Director of the United States Trade and Development Agency may--

(1) encourage participation by United States firms in actions taken to carry out subsection (a); and
(2) provide grants and other financial support for feasibility and resource assessment studies conducted in, or intended to benefit, less developed countries.

(c) Authorization of Appropriations- There are authorized to be appropriated to carry out this section $5,000,000 for each of fiscal years 2008 through 2012.