

116TH CONGRESS
2^D SESSION

H. R. 5374

[Report No. 116-]

To establish and support advanced geothermal research and development programs at the Department of Energy, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

DECEMBER 10, 2019

Mr. LUCAS (for himself and Ms. JOHNSON of Texas) introduced the following bill; which was referred to the Committee on Science, Space, and Technology, and in addition to the Committee on Education and Labor, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

MARCH --, 2020

Reported from the Committee on Science, Space, and Technology with an amendment

[Strike out all after the enacting clause and insert the part printed in *italic*]

[For text of introduced bill, see copy of bill as introduced on December 10, 2019]

A BILL

To establish and support advanced geothermal research and development programs at the Department of Energy, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**

4 (a) *SHORT TITLE.*—*This Act may be cited as the “Ad-*
5 *vanced Geothermal Research and Development Act of*
6 *2019”.*

7 (b) *TABLE OF CONTENTS.*—*The table of contents for*
8 *this Act is as follows:*

Sec. 1. Short title; table of contents.

Sec. 2. Definitions.

Sec. 3. Hydrothermal research and development.

Sec. 4. General geothermal systems research and development.

Sec. 5. Enhanced geothermal systems research and development.

Sec. 6. Geothermal heat pumps and direct use.

Sec. 7. Cost sharing and proposal evaluation.

Sec. 8. Advanced geothermal computing and data science research and develop-
ment.

Sec. 9. Geothermal workforce development.

Sec. 10. Organization and administration of programs.

Sec. 11. Repeals.

Sec. 12. Authorization of appropriations.

Sec. 13. International geothermal energy development.

Sec. 14. Reauthorization of High Cost Region Geothermal Energy Grant Pro-
gram.

9 **SEC. 2. DEFINITIONS.**

10 *Section 612 of the Energy Independence and Security*
11 *Act of 2007 (42 U.S.C. 17191) is amended—*

12 (1) *by amending paragraph (1) to read as fol-*
13 *lows:*

14 “(1) *ENGINEERED.*—*When referring to enhanced*
15 *geothermal systems, the term ‘engineered’ means de-*
16 *signed to access subsurface heat, including stimula-*
17 *tion and nonstimulation technologies to address one*
18 *or more of the following issues:*

1 “(A) *Lack of effective permeability, porosity*
2 *or open fracture connectivity within the heat res-*
3 *ervoir.*

4 “(B) *Insufficient contained geofluid in the*
5 *heat reservoir.*

6 “(C) *A low average geothermal gradient*
7 *which necessitates deeper drilling, or the use of*
8 *alternative heat sources or heat generation proc-*
9 *esses.”;*

10 (2) *by redesignating paragraphs (2) through (7)*
11 *as paragraphs (3) through (8), respectively; and*

12 (3) *by adding after paragraph (1) the following:*

13 “(2) *ELIGIBLE ENTITY.—The term ‘eligible enti-*
14 *ty’ means any of the following entities:*

15 “(A) *An institution of higher education.*

16 “(B) *A National laboratory.*

17 “(C) *A Federal research agency.*

18 “(D) *A State research agency.*

19 “(E) *A nonprofit research organization.*

20 “(F) *An industrial entity.*

21 “(G) *A consortium of 2 or more entities de-*
22 *scribed in subparagraphs (A) through (F).”.*

1 **SEC. 3. HYDROTHERMAL RESEARCH AND DEVELOPMENT.**

2 *Section 613 of the Energy Independence and Security*
3 *Act of 2007 (42 U.S.C. 17192) is amended to read as fol-*
4 *lows:*

5 **“SEC. 613. HYDROTHERMAL RESEARCH AND DEVELOP-**
6 **MENT.**

7 *“(a) IN GENERAL.—The Secretary shall carry out a*
8 *program of research, development, demonstration, and com-*
9 *mercial application for geothermal energy production from*
10 *hydrothermal systems.*

11 *“(b) PROGRAMS.—The program authorized in sub-*
12 *section (a) shall include the following:*

13 *“(1) ADVANCED HYDROTHERMAL RESOURCE*
14 *TOOLS.—The research and development of advanced*
15 *geologic tools to assist in locating hydrothermal re-*
16 *sources, and to increase the reliability of site charac-*
17 *terization, including the development of new imaging*
18 *and sensing technologies and techniques to assist in*
19 *prioritization of targets for characterization;*

20 *“(2) EXPLORATORY DRILLING FOR GEOTHERMAL*
21 *RESOURCES.—The demonstration of advanced tech-*
22 *nologies and techniques of siting and exploratory*
23 *drilling for undiscovered resources in a variety of geo-*
24 *logic settings, carried out in collaboration with indus-*
25 *try partners that will assist in the acquisition of high*

1 *quality data sets relevant for hydrothermal subsurface*
2 *characterization activities”.*

3 **SEC. 4. GENERAL GEOTHERMAL SYSTEMS RESEARCH AND**
4 **DEVELOPMENT.**

5 *Section 614 of the Energy Independence and Security*
6 *Act of 2007 (42 U.S.C. 17193) is amended to read as fol-*
7 *lows:*

8 **“SEC. 614. GENERAL GEOTHERMAL SYSTEMS RESEARCH**
9 **AND DEVELOPMENT.**

10 *“(a) SUBSURFACE COMPONENTS AND SYSTEMS.—The*
11 *Secretary shall support a program of research, development,*
12 *demonstration, and commercial application of components*
13 *and systems capable of withstanding geothermal environ-*
14 *ments and necessary to develop, produce, and monitor geo-*
15 *thermal reservoirs and produce geothermal energy.*

16 *“(b) ENVIRONMENTAL IMPACTS.—The Secretary*
17 *shall—*

18 *“(1) support a program of research, development,*
19 *demonstration, and commercial application of tech-*
20 *nologies and practices designed to mitigate or pre-*
21 *clude potential adverse environmental impacts of geo-*
22 *thermal energy development, production or use; and*

23 *“(2) support a research program to identify po-*
24 *tential environmental impacts, including induced*
25 *seismicity, and environmental benefits of geothermal*

1 *energy development, production, and use, and ensure*
2 *that the program described in paragraph (1) address-*
3 *es such impacts, including water use and effects on*
4 *groundwater and local hydrology;*

5 *“(3) support a program of research to compare*
6 *the potential environmental impacts and environ-*
7 *mental benefits identified as part of the development,*
8 *production, and use of geothermal energy with the po-*
9 *tential emission reductions of greenhouse gases gained*
10 *by geothermal energy development, production, and*
11 *use; and*

12 *“(4) in carrying out this section, the Secretary*
13 *shall, to the maximum extent practicable, consult*
14 *with relevant federal agencies, including the Environ-*
15 *mental Protection Agency.*

16 *“(c) RESERVOIR THERMAL ENERGY STORAGE.—The*
17 *Secretary shall support a program of research, development,*
18 *and demonstration of reservoir thermal energy storage, em-*
19 *phasizing cost-effective improvements through deep direct*
20 *use engineering, design, and systems research.*

21 *“(d) OIL AND GAS TECHNOLOGY TRANSFER INITIA-*
22 *TIVE.—*

23 *“(1) IN GENERAL.—The Secretary shall support*
24 *an initiative among the Office of Fossil Energy, the*
25 *Office of Energy Efficiency and Renewable Energy,*

1 *and the private sector to research, develop, and dem-*
2 *onstrate relevant advanced technologies and operation*
3 *techniques used in the oil and gas sector for use in*
4 *geothermal energy development.*

5 *“(2) PRIORITIES.—In carrying out paragraph*
6 *(1), the Secretary shall prioritize technologies with the*
7 *greatest potential to significantly increase the use and*
8 *lower the cost of geothermal energy in the United*
9 *States, including the cost and speed of geothermal*
10 *drilling surface technologies, and well construction.*

11 *“(e) COPRODUCTION OF GEOTHERMAL ENERGY AND*
12 *MINERALS PRODUCTION RESEARCH AND DEVELOPMENT*
13 *INITIATIVE.—*

14 *“(1) IN GENERAL.—The Secretary shall carry*
15 *out a research and development initiative under*
16 *which the Secretary shall award grants to dem-*
17 *onstrate the coproduction of critical minerals from*
18 *geothermal resources.*

19 *“(2) REQUIREMENTS.—An award made under*
20 *paragraph (1) shall—*

21 *“(A) improve the cost effectiveness of remov-*
22 *ing minerals from geothermal brines as part of*
23 *the coproduction process;*

24 *“(B) increase recovery rates of the targeted*
25 *mineral commodity;*

1 “(C) decrease water use and other environ-
2 mental impacts, as determined by the Secretary;
3 and

4 “(D) demonstrate a path to commercial via-
5 bility.

6 “(f) *FLEXIBLE OPERATIONS.*—The Secretary shall
7 support a research initiative on flexible operation of geo-
8 thermal power plants.

9 “(g) *HYBRID ENERGY SYSTEMS.*—The Secretary shall
10 identify opportunities for joint research, development, and
11 demonstration programs between geothermal systems and
12 other energy generation or storage systems.”.

13 **SEC. 5. ENHANCED GEOTHERMAL SYSTEMS RESEARCH AND**
14 **DEVELOPMENT.**

15 Section 615 of the Energy Independence and Security
16 Act of 2007 (42 U.S.C. 17194) is amended to read as fol-
17 lows:

18 **“SEC. 615. ENHANCED GEOTHERMAL SYSTEMS RESEARCH**
19 **AND DEVELOPMENT.**

20 “(a) *IN GENERAL.*—The Secretary shall support a pro-
21 gram of research, development, demonstration, and commer-
22 cial application for enhanced geothermal systems, including
23 the programs described in subsection (b).

24 “(b) *ENHANCED GEOTHERMAL SYSTEMS TECH-*
25 *NOLOGIES.*—In collaboration with industry partners, insti-

1 *tutions of higher education, and the national laboratories,*
2 *the Secretary shall support a program of research, develop-*
3 *ment, demonstration, and commercial application of the*
4 *technologies to achieve higher efficiency and lower cost en-*
5 *hanced geothermal systems, including—*

6 “(1) *reservoir stimulation;*

7 “(2) *drilled, non-stimulated (e.g. closed-loop) res-*
8 *ervoir technologies;*

9 “(3) *reservoir characterization, monitoring, and*
10 *modeling and understanding of the surface area and*
11 *volume of fractures;*

12 “(4) *stress and fracture mapping including real*
13 *time monitoring and modeling;*

14 “(5) *tracer development;*

15 “(6) *three and four-dimensional seismic imaging*
16 *and tomography;*

17 “(7) *well placement and orientation;*

18 “(8) *long-term reservoir management;*

19 “(9) *drilling technologies, methods, and tools;*

20 “(10) *improved exploration tools;*

21 “(11) *zonal isolation; and*

22 “(12) *understanding induced seismicity risks*
23 *from reservoir engineering and stimulation.*

24 “(c) *FRONTIER OBSERVATORY FOR RESEARCH IN*
25 *GEOHERMAL ENERGY.—The Secretary shall support the*

1 *establishment and construction of up to 3 field research*
2 *sites, which shall each be known as a ‘Frontier Observatory*
3 *for Research in Geothermal Energy’ or ‘FORGE’ site to de-*
4 *velop, test, and enhance techniques and tools for enhanced*
5 *geothermal energy.*

6 “(1) *DUTIES.—The Secretary shall—*

7 “(A) *award grants in support of research*
8 *and development projects focused on advanced*
9 *monitoring technologies, new technologies and*
10 *approaches for implementing multi-zone stimula-*
11 *tions, nonstimulation techniques, and dynamic*
12 *reservoir modeling that incorporates all available*
13 *high-fidelity characterization data; and*

14 “(B) *seek opportunities to coordinate efforts*
15 *and share information with domestic and inter-*
16 *national partners engaged in research and devel-*
17 *opment of geothermal systems and related tech-*
18 *nology, including coordination between FORGE*
19 *sites.*

20 “(2) *SITE SELECTION.—Of the FORGE sites re-*
21 *ferred to in paragraph (1), the Secretary shall—*

22 “(A) *consider applications through a com-*
23 *petitive, merit-reviewed process, from National*
24 *Laboratories, multi-institutional collaborations,*
25 *institutes of higher education and other appro-*

1 *priate entities best suited to provide national*
2 *leadership on geothermal related issues and per-*
3 *form the duties enumerated under this sub-*
4 *section; and*

5 *“(B) prioritize existing field sites and fa-*
6 *cilities with capabilities relevant to the duties*
7 *enumerated under this subsection.*

8 *“(3) EXISTING FORGE SITES.—A FORGE site*
9 *already in existence on the date of enactment of this*
10 *Act may continue to receive support.*

11 *“(4) FUNDING.—Out of funds authorized to be*
12 *appropriated under section 12 of the ‘Advanced Geo-*
13 *thermal Research and Development Act of 2019’, there*
14 *shall be made available to the Secretary to carry out*
15 *the FORGE activities under this paragraph—*

16 *“(A) \$45,000,000 for fiscal year 2021;*

17 *“(B) \$55,000,000 for fiscal year 2022;*

18 *“(C) \$65,000,000 for fiscal year 2023;*

19 *“(D) \$70,000,000 for fiscal year 2024; and*

20 *“(E) \$70,000,000 for fiscal year 2025.*

21 *In carrying out this section, the Secretary shall con-*
22 *sider the balance between funds dedicated to construc-*
23 *tion and operations and research activities to reflect*
24 *the state of site development.*

1 “(d) *ENHANCED GEOTHERMAL SYSTEMS DEMONSTRATIONS.—*
2 *TIONS.—*

3 “(1) *IN GENERAL.—Beginning on the date of enactment of the ‘Advanced Geothermal Research and*
4 *Development Act of 2019’, the Secretary, in collaboration with industry partners, institutions of higher*
5 *education, and the national laboratories, shall support an initiative for demonstration of enhanced geothermal systems for power production or direct use.*

6 “(2) *PROJECTS.—*

7 “(A) *IN GENERAL.—Under the initiative described in paragraph (1), demonstration projects shall be carried out in locations that are commercially viable for enhanced geothermal systems development, while also considering environmental impacts to the maximum extent practicable, as determined by the Secretary.*

8 “(B) *REQUIREMENTS.—Demonstration projects under subparagraph (A) shall—*

9 “(i) *collectively demonstrate—*

10 “(I) *different geologic settings, such as hot sedimentary aquifers, layered geologic systems, supercritical systems, and basement rock systems; and*

1 “(II) a variety of development
2 techniques, including open hole and
3 cased hole completions, differing well
4 orientations, and stimulation and non-
5 stimulation mechanisms; and

6 “(ii) to the extent practicable, use ex-
7 isting sites where subsurface characteriza-
8 tion or geothermal energy integration anal-
9 ysis has been conducted.

10 “(C) *EASTERN DEMONSTRATION.*—Not fewer
11 than 1 of the demonstration projects carried out
12 under subparagraph (A) shall be located an area
13 east of the Mississippi that is suitable for en-
14 hanced geothermal demonstration for power,
15 heat, or a combination of power and heat.”.

16 **SEC. 6. GEOTHERMAL HEAT PUMPS AND DIRECT USE.**

17 (a) *IN GENERAL.*—Title VI of the Energy Independ-
18 ence and Security Act of 2007 is amended by inserting after
19 section 616 (42 U.S.C. 17195) the following:

20 **“SEC. 616A. GEOTHERMAL HEAT PUMPS AND DIRECT USE**
21 **RESEARCH AND DEVELOPMENT.**

22 “(a) *PURPOSES.*—The purposes of this section are—
23 “(1) to improve the understanding of related
24 earth sciences, components, processes, and systems

1 *used for geothermal heat pumps and the direct use of*
2 *geothermal energy; and*

3 “(2) *to increase the energy efficiency, lower the*
4 *cost, increase the use, and improve and demonstrate*
5 *the effectiveness of geothermal heat pumps and the di-*
6 *rect use of geothermal energy.*

7 “(b) *DEFINITIONS.—In this section:*

8 “(1) *DIRECT USE OF GEOTHERMAL ENERGY.—*
9 *The term ‘direct use of geothermal energy’ means geo-*
10 *thermal systems that use water directly or through a*
11 *heat exchanger to provide—*

12 “(A) *heating and cooling to buildings, com-*
13 *mercial districts, residential communities, and*
14 *large municipal, or industrial projects; or*

15 “(B) *heat required for industrial processes,*
16 *agriculture, aquaculture, and other facilities.*

17 “(2) *ECONOMICALLY DISTRESSED AREA.—The*
18 *term ‘economically distressed area’ means an area de-*
19 *scribed in section 301(a) of the Public Works and*
20 *Economic Development Act of 1965 (42 U.S.C.*
21 *3161(a)).*

22 “(3) *GEOTHERMAL HEAT PUMP.—The term ‘geo-*
23 *thermal heat pump’ means a system that provides*
24 *heating and cooling by exchanging heat from shallow*
25 *geology, groundwater, or surface water using—*

1 “(A) a closed loop system, which transfers
2 heat by way of buried or immersed pipes that
3 contain a mix of water and working fluid; or

4 “(B) an open loop system, which circulates
5 ground or surface water directly into the build-
6 ing and returns the water to the same aquifer or
7 surface water source.

8 “(c) PROGRAM.—

9 “(1) IN GENERAL.—The Secretary shall support
10 within the Geothermal Technologies Office a program
11 of research, development, and demonstration for geo-
12 thermal heat pumps and the direct use of geothermal
13 energy.

14 “(2) AREAS.—The program under paragraph (1)
15 may include research, development, demonstration,
16 and commercial application of—

17 “(A) geothermal ground loop efficiency im-
18 provements, cost reductions, and improved in-
19 stallation and operations methods;

20 “(B) the use of geothermal energy for build-
21 ing-scale energy storage;

22 “(C) the use of geothermal energy as a grid
23 management resource or seasonal energy storage;

24 “(D) geothermal heat pump efficiency im-
25 provements;

1 “(E) the use of alternative fluids as a heat
2 exchange medium, such as hot water found in
3 mines and mine shafts, graywater, or other
4 fluids that may improve the economics of geo-
5 thermal heat pumps;

6 “(F) heating of districts, neighborhoods,
7 communities, large commercial or public build-
8 ings, and industrial and manufacturing facili-
9 ties;

10 “(G) the use of low temperature ground-
11 water for direct use; and

12 “(H) system integration of direct use with
13 geothermal electricity production.

14 “(3) ENVIRONMENTAL IMPACTS.—In carrying
15 out the program, the Secretary shall identify and
16 mitigate potential environmental impacts in accord-
17 ance with section 614(c).

18 “(d) GRANTS.—

19 “(1) IN GENERAL.—The Secretary shall carry
20 out the program established in subsection (c) by mak-
21 ing grants available to State, local, and Tribal gov-
22 ernments, institutions of higher education, nonprofit
23 entities, National Laboratories, utilities, and for-prof-
24 it companies.

1 **“SEC. 618. ADVANCED GEOTHERMAL COMPUTING AND DATA**
2 **SCIENCE RESEARCH AND DEVELOPMENT.**

3 *“(a) IN GENERAL.—The Secretary shall carry out a*
4 *program of research and development of advanced com-*
5 *puting and data science tools for geothermal energy.*

6 *“(b) PROGRAMS.—The program authorized in sub-*
7 *section (a) shall include the following:*

8 *“(1) ADVANCED COMPUTING FOR GEOTHERMAL*
9 *SYSTEMS TECHNOLOGIES.—Research, development,*
10 *and demonstration of technologies to develop advanced*
11 *data, machine learning, artificial intelligence, and re-*
12 *lated computing tools to assist in locating geothermal*
13 *resources, to increase the reliability of site character-*
14 *ization, to increase the rate and efficiency of drilling,*
15 *to improve induced seismicity mitigation, and to sup-*
16 *port enhanced geothermal systems technologies.*

17 *“(2) GEOTHERMAL SYSTEMS RESERVOIR MOD-*
18 *ELING.—Research, development, and demonstration of*
19 *models of geothermal reservoir performance and en-*
20 *hanced geothermal systems reservoir stimulation tech-*
21 *nologies and techniques, with an emphasis on accu-*
22 *rately modeling fluid and heat flow, permeability evo-*
23 *lution, geomechanics, geochemistry, seismicity, and*
24 *operational performance over time, including collabo-*
25 *ration with industry and field validation.*

1 “(c) *COORDINATION.*—*In carrying out these programs,*
2 *the Secretary shall ensure coordination and consultation*
3 *with the Department of Energy’s Office of Science. The Sec-*
4 *retary shall ensure, to the maximum extent practicable, co-*
5 *ordination of these activities with the Department of En-*
6 *ergy National Laboratories, institutes of higher education,*
7 *and the private sector.”.*

8 (b) *CONFORMING AMENDMENT.*—*Section 1(b) of the*
9 *Energy Independence and Security Act of 2007 (42 U.S.C.*
10 *17001 note) is amended in the table of contents by amend-*
11 *ing the item related to section 618 to read as follows:*

“Sec. 618. Advanced geothermal computing and data science research and devel-
opment.”.

12 **SEC. 9. GEOTHERMAL WORKFORCE DEVELOPMENT.**

13 (a) *IN GENERAL.*—*Section 619 of the Energy Inde-*
14 *pendence and Security Act of 2007 (42 U.S.C. 17198) is*
15 *amended to read as follows:*

16 **“SEC. 619. GEOTHERMAL WORKFORCE DEVELOPMENT.**

17 *“The Secretary shall support the development of a geo-*
18 *thermal energy workforce through a program that—*

19 “(1) *facilitates collaboration between university*
20 *students and researchers at the national laboratories;*
21 *and*

22 “(2) *prioritizes science in areas relevant to the*
23 *mission of the Department through the application of*
24 *geothermal energy tools and technologies.”.*

1 (b) *CONFORMING AMENDMENT.*—Section 1(b) of the
2 *Energy Independence and Security Act of 2007 (42 U.S.C.*
3 *17001 note)* is amended in the table of contents by amend-
4 *ing the item related to section 619 to read as follows:*

 “Sec. 619. *Geothermal workforce development.*”.

5 **SEC. 10. ORGANIZATION AND ADMINISTRATION OF PRO-**
6 **GRAMS.**

7 Section 621 of the *Energy Independence and Security*
8 *Act of 2007 (42 U.S.C. 17200)* is amended to read as fol-
9 *lows:*

10 **“SEC. 621. ORGANIZATION AND ADMINISTRATION OF PRO-**
11 **GRAMS.**

12 “(a) *EDUCATION AND OUTREACH.*—In carrying out
13 *the activities described in this subtitle, the Secretary shall*
14 *support education and outreach activities to disseminate*
15 *information on geothermal energy technologies and the geo-*
16 *thermal energy workforce, including activities at the Fron-*
17 *tier Observatory for Research in Geothermal Energy site(s).*

18 “(b) *TECHNICAL ASSISTANCE.*—In carrying out this
19 *subtitle, the Secretary shall also conduct technical assist-*
20 *ance and analysis activities with eligible entities for the*
21 *purpose of supporting the commercial application of ad-*
22 *vances in geothermal energy systems development and oper-*
23 *ations, which may include activities that support expand-*
24 *ing access to advanced geothermal energy technologies for*
25 *rural, Tribal, and low-income communities.*

1 “(c) *REPORT.*—Every 5 years after the date of enact-
2 *ment of Advanced Geothermal Research and Development*
3 *Act of 2019*, the Secretary shall report to the Committee
4 *on Science and Technology of the House of Representatives*
5 *and the Committee on Energy and Natural Resources of*
6 *the Senate on advanced concepts and technologies to maxi-*
7 *mize the geothermal resource potential of the United States.*

8 “(d) *PROGRESS REPORTS.*—Not later than 1 year
9 *after the date of enactment of the ‘Advanced Geothermal Re-*
10 *search and Development Act of 2019’, and every 2 years*
11 *thereafter, the Secretary shall submit to the Committee on*
12 *Science and Technology of the House of Representatives and*
13 *the Committee on Energy and Natural Resources of the Sen-*
14 *ate a report on the results of projects undertaken under this*
15 *part and other such information the Secretary considers ap-*
16 *propriate.”.*

17 **SEC. 11. REPEALS.**

18 (a) *IN GENERAL.*—Subtitle B of title VI of the *Energy*
19 *Independence and Security Act of 2007 (42 U.S.C. 17191*
20 *et seq.) is amended by striking section 620.*

21 (b) *CONFORMING AMENDMENT.*—Section 1(b) of the
22 *Energy Independence and Security Act of 2007 (42 U.S.C.*
23 *17001 note) is amended in the table of contents by striking*
24 *the item related to section 620.*

1 **SEC. 12. AUTHORIZATION OF APPROPRIATIONS.**

2 *Section 623 of the Energy Independence and Security*
3 *Act of 2007 (42 U.S.C. 17202) is amended to read as fol-*
4 *lows:*

5 **“SEC. 623. AUTHORIZATION OF APPROPRIATIONS.**

6 *“There are authorized to be appropriated to the Sec-*
7 *retary to carry out the programs under the ‘Advanced Geo-*
8 *thermal Research and Development Act of 2019’—*

9 *“(1) \$121,375,000 for fiscal year 2021;*

10 *“(2) \$132,750,000 for fiscal year 2022;*

11 *“(3) \$144,125,000 for fiscal year 2023;*

12 *“(4) \$150,500,000 for fiscal year 2024; and*

13 *“(5) \$151,875,000 for fiscal year 2025.”.*

14 **SEC. 13. INTERNATIONAL GEOTHERMAL ENERGY DEVELOP-**
15 **MENT.**

16 *Section 624 of the Energy Independence and Security*
17 *Act of 2007 (42 U.S.C. 17203) is amended—*

18 *(1) by amending subsection (a) to read as fol-*
19 *lows:*

20 *“(a) IN GENERAL.—The Secretary of Energy, in co-*
21 *ordination with other appropriate Federal and multilateral*
22 *agencies (including the United States Agency for Inter-*
23 *national Development) shall support collaborative efforts*
24 *with international partners to promote the research, devel-*
25 *opment, and demonstration of geothermal technologies used*

1 *to develop hydrothermal and enhanced geothermal system*
2 *resources.”; and*

3 *(2) by striking subsection (c).*

4 **SEC. 14. REAUTHORIZATION OF HIGH COST REGION GEO-**
5 **THERMAL ENERGY GRANT PROGRAM.**

6 *Section 625 of the Energy Independence and Security*
7 *Act of 2007 (42 U.S.C. 17204) is amended—*

8 *(1) in subsection (a)(2), by inserting “ or heat”*
9 *after “electrical power”; and*

10 *(2) by amending subsection (e) to read as fol-*
11 *lows:*

12 *“(e) AUTHORIZATION OF APPROPRIATIONS.—Out of*
13 *funds authorized under section 12 of the ‘Advanced Geo-*
14 *thermal Research and Development Act of 2019’, there is*
15 *authorized to be appropriated to carry out this section*
16 *\$5,000,000 for each of fiscal years 2021 through 2025.”.*