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(Original Signature of Member)

116TH CONGRESS  
2D SESSION

# **H. R. 6084**

To provide for a program of hydropower, pumped storage, and marine energy research, development, demonstration, and commercial application, and for other purposes.

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## IN THE HOUSE OF REPRESENTATIVES

Ms. BONAMICI introduced the following bill; which was referred to the Committee on \_\_\_\_\_

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## **A BILL**

To provide for a program of hydropower, pumped storage, and marine energy research, development, demonstration, and commercial application, 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.**

4       This Act may be cited as the “Water Power Research  
5       and Development Act”.

1 **SEC. 2. WATER POWER RESEARCH AND DEVELOPMENT.**

2 (a) IN GENERAL.—Subtitle C of title VI of the En-  
3 ergy Independence and Security Act of 2007 (42 U.S.C.  
4 17211 et seq.) is amended to read as follows:

5 **“Subtitle C—Water Power**  
6 **Research and Development**

7 **“SEC. 631. SHORT TITLE.**

8 “This subtitle may be cited as the ‘Water Power Re-  
9 search and Development Act’.

10 **“SEC. 632. DEFINITIONS.**

11 “In this subtitle:

12 “(1) ELIGIBLE ENTITY.—The term ‘eligible en-  
13 tity’ means any of the following entities:

14 “(A) An institution of higher education.

15 “(B) A National Laboratory.

16 “(C) A Federal research agency.

17 “(D) A State research agency.

18 “(E) A nonprofit research organization.

19 “(F) An industrial entity or a multi-insti-  
20 tutional consortium thereof.

21 “(2) INSTITUTION OF HIGHER EDUCATION.—

22 The term ‘institution of higher education’ has the  
23 meaning given such term in section 101 of the High-  
24 er Education Act of 1965 (20 U.S.C. 1001).

25 “(3) MARINE ENERGY.—The term ‘marine en-  
26 ergy’ means energy from—



1           “(1) To promote research, development, dem-  
2           onstration, and commercial application of water  
3           power generation technologies in order to increase  
4           capacity and reduce the cost of those technologies.

5           “(2) To promote research and development to  
6           improve the environmental impact of water power  
7           technologies.

8           “(3) To provide grid reliability and resilience,  
9           including through technologies that facilitate new  
10          market opportunities, such as ancillary services, for  
11          water power.

12          “(4) To promote the development of water  
13          power technologies to improve economic growth in  
14          the water power sector, including in coastal commu-  
15          nities.

16       **“SEC. 634. HYDROPOWER RESEARCH, DEVELOPMENT, AND**  
17                               **DEMONSTRATION.**

18          “The Secretary shall conduct a program of research,  
19          development, demonstration, and commercial application  
20          for technologies that improve the capacity, efficiency, resil-  
21          ience, security, reliability, affordability, and environmental  
22          impact, including potential cumulative environmental im-  
23          pacts, of hydropower systems. In carrying out such pro-  
24          gram, the Secretary shall prioritize activities designed  
25          to—

1 “(1) develop technology for—

2 “(A) non-powered dams, including aging  
3 and potentially hazardous dams;

4 “(B) pumped storage;

5 “(C) constructed waterways

6 “(D) new stream-reach development;

7 “(E) modular and small dams;

8 “(F) increased operational flexibility; and

9 “(G) enhancement of relevant existing fa-  
10 cilities.

11 “(2) develop new strategies and technologies,  
12 including analytical methods, physical and numerical  
13 tools, and advanced computing, as well as methods  
14 to validate such methods and tools, in order to—

15 “(A) extend the operational lifetime of hy-  
16 dropower systems and their physical structures,  
17 while improving environmental impact, includ-  
18 ing potential cumulative environmental impacts;

19 “(B) assist in device and system design,  
20 installation, operation, and maintenance; and

21 “(C) reduce costs, limit outages, and in-  
22 crease unit and plant efficiencies, including by  
23 examining the impact of changing water and  
24 electricity demand on hydropower generation,  
25 flexibility, and provision of grid services;

1           “(3) study, in conjunction with other relevant  
2           Federal agencies as appropriate, methods to improve  
3           the hydropower licensing process, including by com-  
4           piling current and accepted best practices, public  
5           comments, and methodologies to assess the full  
6           range of potential environmental and economic im-  
7           pacts;

8           “(4) identify opportunities for joint research,  
9           development, and demonstration programs between  
10          hydropower systems, which may include—

11                  “(A) pumped storage systems and other  
12                  renewable energy systems;

13                  “(B) small hydro facilities and other en-  
14                  ergy storage systems;

15                  “(C) other hybrid energy systems;

16                  “(D) small hydro facilities and critical in-  
17                  frastructure, including water infrastructure;  
18                  and

19                  “(E) hydro facilities and responsive load  
20                  technologies, which may include smart buildings  
21                  and city systems;

22          “(5) improve the reliability of hydropower tech-  
23          nologies, including during extreme weather events;

24          “(6) develop methods and technologies to im-  
25          prove environmental impact, including potential cu-

1 cumulative environmental impacts, of hydropower and  
2 pumped storage technologies, including potential im-  
3 pacts on wildlife, such as—

4 “(A) fisheries;

5 “(B) aquatic life and resources;

6 “(C) navigation of waterways; and

7 “(D) upstream and downstream environ-  
8 mental conditions, including sediment move-  
9 ment, water quality, and flow volumes;

10 “(7) identify ways to increase power generation  
11 by—

12 “(A) diversifying plant configuration op-  
13 tions;

14 “(B) improving pump-back efficiencies;

15 “(C) investigating multi-phase systems;

16 “(D) developing, testing, and monitoring  
17 advanced generators with faster cycling times,  
18 variable speeds, and improved efficiencies;

19 “(E) developing, testing, and monitoring  
20 advanced turbines capable of improving environ-  
21 mental impact, including potential cumulative  
22 environmental impacts, including small turbine  
23 designs;

24 “(F) developing standardized powertrain  
25 components; and

1           “(G) developing components with advanced  
2 materials and manufacturing processes, includ-  
3 ing additive manufacturing; and

4           “(H) developing analytical tools that en-  
5 able hydropower to provide grid services that,  
6 amongst other services, improve grid integra-  
7 tion of other energy sources;

8           “(8) advance new pumped storage technologies,  
9 including—

10           “(A) systems with adjustable speed and  
11 other new pumping and generating equipment  
12 designs;

13           “(B) modular systems;

14           “(C) alternative closed-loop systems, in-  
15 cluding mines and quarries;

16           “(D) other innovative equipment and ma-  
17 terials as determined by the Secretary;

18           “(9) reduce civil works costs and construction  
19 times for hydropower and pumped storage systems,  
20 including comprehensive data and systems analysis  
21 of hydropower and pumped storage construction  
22 technologies and processes in order to identify areas  
23 for whole-system efficiency gains;



1           “(10) advance efficient and reliable integration  
2 of hydropower and pumped storage systems with the  
3 electric grid by—

4           “(A) improving methods for operational  
5 forecasting of renewable energy systems to  
6 identify opportunities for hydropower applica-  
7 tions in pumped storage and hybrid energy sys-  
8 tems, including forecasting of seasonal and an-  
9 nual energy storage;

10           “(B) considering aggregating small distrib-  
11 uted hydropower assets; and

12           “(C) identifying barriers to grid scale im-  
13 plementation of hydropower and pumped stor-  
14 age technologies;

15           “(11) improve computational fluid dynamic  
16 modeling methods;

17           “(12) improve flow measurement methods, in-  
18 cluding maintenance of continuous flow measure-  
19 ment equipment;

20           “(13) identify best methods for compiling data  
21 on all hydropower resources and assets, including  
22 identifying potential for increased capacity; and

23           “(14) identify mechanisms to test and validate  
24 performance of hydropower and pumped storage  
25 technologies.

1 **“SEC. 635. MARINE ENERGY RESEARCH, DEVELOPMENT,**  
2 **AND DEMONSTRATION.**

3 “(a) IN GENERAL.—The Secretary, in consultation  
4 with the Department of Defense, Secretary of Commerce  
5 (acting through the Under Secretary of Commerce for  
6 Oceans and Atmosphere) and other relevant Federal agen-  
7 cies, shall conduct a program of research, development,  
8 demonstration, and commercial application of marine en-  
9 ergy technology, including activities to—

10 “(1) assist technology development to improve  
11 the components, processes, and systems used for  
12 power generation from marine energy resources at a  
13 variety of scales;

14 “(2) establish and expand critical testing infra-  
15 structure and facilities necessary to—

16 “(A) demonstrate and prove marine energy  
17 devices at a range of scales in a manner that  
18 is cost-effective and efficient; and

19 “(B) accelerate the technological readiness  
20 and commercial application of such devices;

21 “(3) address marine energy resource variability  
22 issues, including through the application of energy  
23 storage technologies;

24 “(4) advance efficient and reliable integration  
25 of marine energy with the electric grid, which may  
26 include smart building systems;

1           “(5) identify and study critical short-term and  
2 long-term needs to maintaining a sustainable marine  
3 energy supply chain based in the United States;

4           “(6) increase the reliability, security, and resil-  
5 ience of marine energy technologies;

6           “(7) validate the performance, reliability, main-  
7 tainability, and cost of marine energy device designs  
8 and system components in an operating environ-  
9 ment;

10           “(8) consider the protection of critical infra-  
11 structure, such as adequate separation between ma-  
12 rine energy devices and submarine telecommuni-  
13 cations cables, including through the development of  
14 voluntary, consensus-based standards for such pur-  
15 poses;

16           “(9) identify opportunities for crosscutting re-  
17 search, development, and demonstration programs  
18 between existing energy research programs;

19           “(10) identify and improve, in conjunction with  
20 the Secretary of Commerce, acting through the  
21 Under Secretary of Commerce for Oceans and At-  
22 mosphere, and other relevant Federal agencies as  
23 appropriate, the environmental impact, including po-  
24 tential cumulative environmental impacts, of marine  
25 energy technologies, including—

1           “(A) potential impacts on fisheries and  
2           other marine resources; and

3           “(B) developing technologies, including  
4           mechanisms for self-evaluation, and other  
5           means available for improving environmental  
6           impact, including potential cumulative environ-  
7           mental impacts;

8           “(11) identify, in consultation with relevant  
9           Federal agencies, potential navigational impacts of  
10          marine energy technologies and strategies to prevent  
11          possible adverse impacts, in addition to opportunities  
12          for marine energy systems to aid the United States  
13          Coast Guard, such as remote sensing for coastal bor-  
14          der security;

15          “(12) develop numerical and physical tools, in-  
16          cluding models and monitoring technologies, to as-  
17          sist industry in device and system design, installa-  
18          tion, operation, and maintenance, including methods  
19          to validate such tools;

20          “(13) support materials science as it relates to  
21          marine energy technology, such as the development  
22          of corrosive-resistant materials;

23          “(14) improve marine energy resource fore-  
24          casting and general understanding of aquatic system

1 behavior, including turbulence and extreme condi-  
2 tions;

3 “(15) develop metrics and voluntary, consensus-  
4 based standards, in coordination with the National  
5 Institute of Standards and Technology and appro-  
6 priate standard development organizations, for ma-  
7 rine energy components, systems, and their testing,  
8 including—

9 “(A) sensors and instrumentation used in  
10 measuring impacts and performance of marine  
11 energy technologies; and

12 “(B) sensors and instrumentation used to  
13 measure environmental conditions;

14 “(16) enhance integration with hybrid energy  
15 systems, including desalination;

16 “(17) identify opportunities to integrate marine  
17 energy technologies into new and existing infrastruc-  
18 ture; and

19 “(18) to develop technology necessary to sup-  
20 port the use of marine energy—

21 “(A) for the generation and storage of  
22 power at sea; and

23 “(B) for the generation and storage of  
24 power to promote the resilience of coastal com-  
25 munities, including in applications relating to—

1                   “(i) desalination;  
2                   “(ii) disaster recovery and resilience;  
3                   and  
4                   “(iii) community microgrids in iso-  
5                   lated power systems.

6           “(b) STUDY OF NON-POWER SECTOR APPLICATIONS  
7 FOR ADVANCED MARINE ENERGY TECHNOLOGIES.—

8                   “(1) IN GENERAL.—The Secretary, in consulta-  
9                   tion with the Secretary of Transportation and the  
10                  Secretary of Commerce, shall conduct a study to ex-  
11                  amine opportunities for research and development in  
12                  advanced marine energy technologies for non-power  
13                  sector applications, including applications with re-  
14                  spect to—

15                         “(A) the maritime transportation sector;  
16                         “(B) associated maritime energy infra-  
17                         structure, including infrastructure that serves  
18                         ports, to improve system resilience and disaster  
19                         recovery; and  
20                         “(C) enabling scientific missions at sea  
21                         and in extreme environments, including the  
22                         Arctic.

23                   “(2) REPORT.—Not later than 1 year after the  
24                  date of enactment of this Act, the Secretary shall  
25                  submit to the Committee on Energy and Natural

1 Resources of the Senate and the Committee on  
2 Science, Space, and Technology of the House of  
3 Representatives a report that describes the results of  
4 the study conducted under paragraph (1).

5 **“SEC. 636. NATIONAL MARINE ENERGY CENTERS.**

6 “(a) IN GENERAL.—The Secretary shall award  
7 grants, each such grant up to \$10,000,000 per year, to  
8 institutions of higher education (or consortia thereof)  
9 for—

10 “(1) the continuation and expansion of the re-  
11 search, development, demonstration, testing, and  
12 commercial application activities at the National Ma-  
13 rine Energy Centers (referred to in this section as  
14 ‘Centers’) established as of January 1, 2020; and

15 “(2) the establishment of new National Marine  
16 Energy Centers.

17 “(b) LOCATION SELECTION.—In selecting institu-  
18 tions of higher education for new Centers, the Secretary  
19 shall consider the following criteria:

20 “(1) Whether the institution hosts an existing  
21 marine energy research and development program.

22 “(2) Whether the institution has proven tech-  
23 nical expertise to support marine energy research.  
24 and

1           “(3) Whether the institution has access to ma-  
2           rine resources.

3           “(c) PURPOSES.—The Centers shall coordinate  
4 among themselves, the Department, and National Labora-  
5 tories to—

6           “(1) advance research, development, demonstra-  
7 tion, and commercial application of marine energy  
8 technologies in response to industry and commercial  
9 needs;

10           “(2) support in-water testing and demonstra-  
11 tion of marine energy technologies, including facili-  
12 ties capable of testing—

13           “(A) marine energy systems of various  
14 technology readiness levels and scales;

15           “(B) a variety of technologies in multiple  
16 test berths at a single location;

17           “(C) arrays of technology devices; and

18           “(D) interconnectivity to an electrical grid,  
19 including microgrids; and

20           “(3) collect and disseminate information on  
21 best practices in all areas relating to developing and  
22 managing marine energy resources and energy sys-  
23 tems;

24           “(d) COORDINATION.—To the extent practicable, the  
25 Centers shall coordinate their activities with the Secretary



1 of Commerce, acting through the Undersecretary of Com-  
2 merce for Oceans and Atmosphere, and other relevant  
3 Federal agencies.

4 “(e) TERMINATION.—To the extent otherwise author-  
5 ized by law, the Secretary may terminate funding for a  
6 Center described in paragraph (a) if such Center is under-  
7 performing.

8 **“SEC. 637. ORGANIZATION AND ADMINISTRATION OF PRO-**  
9 **GRAMS.**

10 “(a) COORDINATION.—In carrying out this subtitle,  
11 the Secretary shall coordinate activities, and effectively  
12 manage cross-cutting research priorities across programs  
13 of the Department and other relevant Federal agencies,  
14 including the National Laboratories and the National Ma-  
15 rine Energy Centers.

16 “(b) COLLABORATION.—

17 “(1) IN GENERAL.—In carrying out this sub-  
18 title, the Secretary shall collaborate with industry,  
19 National Laboratories, other relevant Federal agen-  
20 cies, institutions of higher education, including Mi-  
21 nority Serving Institutions, National Marine Energy  
22 Centers, Tribal entities, including Alaska Native  
23 Corporations, and international bodies with relevant  
24 scientific and technical expertise.

1           “(2) PARTICIPATION.—To the extent prac-  
2           ticable, the Secretary shall encourage research  
3           projects that promote collaboration between entities  
4           specified in paragraph (1) and include entities not  
5           historically associated with National Marine Energy  
6           Centers, such as Minority Serving Institutions.

7           “(3) INTERNATIONAL COLLABORATION.—The  
8           Secretary of Energy, in coordination with other ap-  
9           propriate Federal and multilateral agencies (includ-  
10          ing the United States Agency for International De-  
11          velopment) shall support collaborative efforts with  
12          international partners to promote the research, de-  
13          velopment, and demonstration of water power tech-  
14          nologies used to develop hydropower, pump storage,  
15          and marine energy resources.

16          “(c) DISSEMINATION OF RESULTS AND PUBLIC  
17          AVAILABILITY.—The Secretary shall—

18                 “(1) publish the results of projects supported  
19                 under this subtitle through Department websites, re-  
20                 ports, databases, training materials, and industry  
21                 conferences, including information discovered after  
22                 the completion of such projects, withholding any in-  
23                 dustrial proprietary information; and

24                 “(2) share results of such projects with the  
25                 public except to the extent that the information is

1       protected from disclosure under section 552(b) of  
2       title 5, United States Code.

3       “(d) AWARD FREQUENCY.—The Secretary shall so-  
4       licit applications for awards under this subtitle no less fre-  
5       quently than once per fiscal year.

6       “(e) EDUCATION AND OUTREACH.—In carrying out  
7       the activities described in this subtitle, the Secretary shall  
8       support education and outreach activities to disseminate  
9       information and promote public understanding of water  
10      power technologies and the water power workforce, includ-  
11      ing activities at the National Marine Energy Centers.

12      “(f) TECHNICAL ASSISTANCE AND WORKFORCE DE-  
13      VELOPMENT.—In carrying out this subtitle, the Secretary  
14      may also conduct, for purposes of supporting technical,  
15      non-hardware, and information-based advances in water  
16      power systems development and operations—

17              “(1) technical assistance and analysis activities  
18              with eligible entities, including activities that sup-  
19              port expanding access to advanced water power tech-  
20              nologies for rural, Tribal, and low-income commu-  
21              nities; and

22              “(2) workforce development and training activi-  
23              ties, including to support the dissemination of stand-  
24              ards and best practices for enabling water power  
25              production.

1 “(g) STRATEGIC PLAN.—In carrying out the activi-  
2 ties described in this subtitle, the Secretary shall—

3 “(1) not later than one year after the date of  
4 the enactment of the Water Power Research and  
5 Development Act, draft a plan, considering input  
6 from relevant stakeholders such as industry and aca-  
7 demia, to implement the programs described in this  
8 subtitle and update the plan on an annual basis; and

9 “(2) the plan shall address near-term (up to 2  
10 years), mid-term (up to 7 years), and long-term (up  
11 to 15 years) challenges to the advancement of water  
12 power systems.

13 “(h) REPORT TO CONGRESS.—Not later than 1 year  
14 after the date of the enactment of the Water Power Re-  
15 search and Development Act, and at least once every 2  
16 years thereafter, the Secretary shall provide, and make  
17 available to the public and the relevant authorizing and  
18 appropriations committees of Congress, a report on the  
19 findings of research conducted and activities carried out  
20 pursuant to this subtitle, including the most current stra-  
21 tegic plan under subsection (g) and the progress made in  
22 implementing such plan.

23 **“SEC. 638. APPLICABILITY OF OTHER LAWS.**

24 “Nothing in this subtitle shall be construed as  
25 waiving, modifying, or superseding the applicability of any

1 requirement under any environmental or other Federal or  
2 State law.

3 **“SEC. 639. AUTHORIZATION OF APPROPRIATIONS.**

4 “There are authorized to be appropriated to the Sec-  
5 retary to carry out this subtitle—

6 “(1) \$152,750,000 for fiscal year 2021, includ-  
7 ing \$112,580,000 for marine energy and  
8 \$40,170,000 for hydropower research, development,  
9 and demonstration activities;

10 “(2) \$157,678,300 for fiscal year 2022, includ-  
11 ing \$116,303,200 for marine energy and  
12 \$41,375,100 for hydropower research, development,  
13 and demonstration activities;

14 “(3) \$162,791,915 for fiscal year 2023, includ-  
15 ing \$120,175,562 for marine energy and  
16 \$42,616,353 for hydropower research, development,  
17 and demonstration activities;

18 “(4) \$168,098,139 for fiscal year 2024, includ-  
19 ing \$124,203,295 for marine energy and  
20 \$43,894,844 for hydropower research, development,  
21 and demonstration activities; and

22 “(5) \$173,604,558 for fiscal year 2025, includ-  
23 ing \$128,392,869 for marine energy and  
24 \$45,211,689 for hydropower research, development,  
25 and demonstration activities.”.

1 (b) CONFORMING TABLE OF CONTENTS AMEND-  
2 MENT.—The table of contents for the Energy Independ-  
3 ence and Security Act of 2007 is amended by striking the  
4 items relating to subtitle C of title VI and inserting the  
5 following:

“Subtitle C—Water Power Research and Development

“Sec. 631. Short title.

“Sec. 632. Definitions.

“Sec. 633. Water power technology research, development, testing, and evaluation.

“Sec. 634. Hydropower research, development, and demonstration.

“Sec. 635. Marine energy research, development, and demonstration.

“Sec. 636. National Marine Energy Centers.

“Sec. 637. Organization and administration of programs.

“Sec. 638. Applicability of other laws.

“Sec. 639. Authorization of appropriations.”.

## 6 **SEC. 3. CONFORMING AMENDMENTS.**

7 (a) ENERGY POLICY ACT OF 2005.—The Energy  
8 Policy Act of 2005 (42 U.S.C. 15801 et seq.) is amend-  
9 ed—

10 (1) in section 201(a), by striking “ocean (in-  
11 cluding tidal, wave, current, and thermal)” and in-  
12 serting “marine”;

13 (2) in section 203(b)(2)—

14 (A) by striking “ocean (including tidal,  
15 wave, current, and thermal)” and inserting  
16 “marine”; and

17 (B) by adding at the end the following:

18 “For purposes of this Act, the term ‘marine’  
19 has the meaning given the term ‘marine energy’

1 in section 632 of the Water Power Research  
2 and Development Act.”;

3 (3) in section 931(a)(2)(E)(i), by striking  
4 “ocean energy, including wave energy” and inserting  
5 “marine energy (as defined in section 632 of the  
6 Water Power Research and Development Act)”;

7 (4) in section 1833(a), by striking “ocean en-  
8 ergy resources (including tidal, wave, and thermal  
9 energy)” and inserting “marine energy resources”;

10 (b) ENERGY POLICY ACT OF 1992.—Section 1212 of  
11 the Energy Policy Act of 1992 (42 U.S.C. 13317) is  
12 amended—

13 (1) in subsection (a)(4)(A)(i), by striking  
14 “ocean (including tidal, wave, current, and ther-  
15 mal)” and inserting “marine (as defined in section  
16 632 of the Water Power Research and Development  
17 Act”;

18 (2) in subsection (b), in the matter preceding  
19 paragraph (1), by striking “ocean (including tidal,  
20 wave, current, and thermal)” and inserting “marine  
21 (as defined in section 632 of the Water Power Re-  
22 search and Development Act)”;

23 (3) in subsection (e)(1), in the first sentence, by  
24 striking “ocean (including tidal, wave, current, and  
25 thermal)” and inserting “marine (as defined in sec-

1           tion 632 of the Water Power Research and Develop-  
2           ment Act)”.

3           (c) RENEWABLE ENERGY AND ENERGY EFFICIENCY  
4   TECHNOLOGY COMPETITIVENESS ACT OF 1989.—The Re-  
5   newable Energy and Energy Efficiency Technology Com-  
6   petitiveness Act of 1989 (42 U.S.C. 12001 et seq.) is  
7   amended—

8           (1) in section 9(c) (42 U.S.C. 12006(c)), by  
9           striking “ocean,” and inserting “marine,”;

10          (2) in section 4 (42 U.S.C. 12003)—

11           (A) in subsection (a)(5), by striking  
12           “Ocean” and inserting “Marine”; and

13           (B) in subsection (c), in the matter pre-  
14           ceding paragraph (1), by striking “Ocean” and  
15           inserting “Marine”.