

119TH CONGRESS  
1ST SESSION

# S. 3269

To direct the Comptroller General of the United States to conduct a technology assessment focused on liquid cooling systems for artificial intelligence compute clusters and high-performance computing facilities, and for other purposes.

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## IN THE SENATE OF THE UNITED STATES

NOVEMBER 20, 2025

Mr. McCORMICK (for himself, Mr. COONS, Mr. BUDD, and Mr. SCHIFF) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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## A BILL

To direct the Comptroller General of the United States to conduct a technology assessment focused on liquid cooling systems for artificial intelligence compute clusters and high-performance computing facilities, 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 AND PURPOSE.**

4 This Act may be cited as the “Liquid Cooling for AI  
5 Act of 2025”.

6 **SEC. 2. LIQUID COOLING DEPLOYMENT AND SCALABILITY.**

7 (a) FINDINGS.—Congress finds that—

1           (1) the 2024 United States Data Center En-  
2           ergy Usage Report published by Lawrence Berkeley  
3           National Laboratory—

4           (A) indicates that data centers accounted  
5           for 4.4 percent of total United States electricity  
6           consumption in 2023, up from 1.9 percent in  
7           2018; and

8           (B) projects that data centers could rep-  
9           resent between 6.7 percent and 12.8 percent of  
10          total electricity consumption by 2028, due to  
11          the rapid growth of AI, cloud computing, and  
12          other digital technologies;

13          (2) traditional air-cooled systems are reaching  
14          limits to effectively remove heat from AI chips and  
15          hardware, and liquid cooling-enhanced thermal per-  
16          formance is increasingly becoming a necessity for  
17          high-density AI servers and data centers due to the  
18          growing power consumption and heat generation of  
19          AI workloads;

20          (3) liquid cooling technologies, including direct-  
21          to-chip liquid cooling and single-phase or 2-phase  
22          immersion cooling, can improve thermal perform-  
23          ance, enable higher densities, and reduce cooling sys-  
24          tem load when properly engineered and maintained;

1           (4) effective liquid cooling deployments require  
2 interoperable components and engineered sub-  
3 systems, including coolant distribution units, sec-  
4 ondary loops, manifolds, hoses, quick-disconnects,  
5 valves, pumps, filters, leak detection and contain-  
6 ment, corrosion control, and appropriate instrumen-  
7 tation and controls;

8           (5) interfaces for heat-reuse are integral to liq-  
9 uid systems and can reduce thermal load on heat-re-  
10 jection equipment by transferring heat through plate  
11 heat exchangers or other devices to beneficial sec-  
12 ondary uses where technically appropriate;

13           (6) Federal agencies, including the Department  
14 of Energy, are considering the deployment of AI sys-  
15 tems across Government-owned facilities; and

16           (7) a comprehensive, independent assessment of  
17 emerging data center architectures and cooling tech-  
18 nologies is essential to inform efficient and cost-ef-  
19 fective deployment decisions across the Federal Gov-  
20 ernment.

21 (b) DEFINITIONS.—In this section:

22           (1) 2-PHASE.—The term “2-phase”, with re-  
23 spect to a cooling process, means a process that  
24 leverages the heat-absorbing phase change from liq-  
25 uid to gas during the cooling cycle.

1           (2) AI.—The term “AI” has the meaning given  
 2           the term “artificial intelligence” in section 5002 of  
 3           the National Artificial Intelligence Initiative Act of  
 4           2020 (15 U.S.C. 9401).

5           (3) APPROPRIATE CONGRESSIONAL COMMIT-  
 6           TEES.—The term “appropriate congressional com-  
 7           mittees” means—

8                   (A) the Committee on Energy and Natural  
 9                   Resources of the Senate;

10                   (B) the Committee on Science, Space, and  
 11                   Technology of the House of Representatives;  
 12                   and

13                   (C) the Committee on Energy and Com-  
 14                   merce of the House of Representatives.

15           (4) DIRECT-TO-CHIP LIQUID COOLING.—The  
 16           term “direct-to-chip liquid cooling” means a liquid  
 17           cooling method that involves circulating a coolant in  
 18           direct contact with applicable heat-generating com-  
 19           ponents, such as processors and memory modules, to  
 20           efficiently absorb and transfer heat away from those  
 21           heat-generating components.

22           (5) HEAT-REUSE.—The term “heat-reuse”  
 23           means the capture and transfer of waste heat from  
 24           liquid loops for beneficial secondary use through ap-  
 25           propriate interfaces and controls.

1           (6) IMMERSION COOLING.—The term “immer-  
2       sion cooling” means a cooling technique that in-  
3       volves a dielectric fluid (single-phase or 2-phase)  
4       coming into direct contact with information tech-  
5       nology components to capture and reject heat from  
6       an entire information technology system instead of a  
7       single component.

8           (7) LIQUID COOLING.—The term “liquid cool-  
9       ing” means utilization of liquids to remove heat effi-  
10      ciently from electronic components.

11          (8) NATIONAL LABORATORY.—The term “Na-  
12      tional Laboratory” has the meaning given the term  
13      in section 2 of the Energy Policy Act of 2005 (42  
14      U.S.C. 15801).

15          (9) SINGLE-PHASE.—The term “single-phase”,  
16      with respect to a cooling process, means a process  
17      in which the coolant remains in the same liquid state  
18      throughout the entire cooling cycle.

19      (c) GAO REVIEW.—

20          (1) IN GENERAL.—Not later than 30 days after  
21      the date of enactment of this Act, the Comptroller  
22      General of the United States shall initiate a review  
23      of—

1 (A) the research and development needs  
2 relating to liquid cooling utilization by data cen-  
3 ters; and

4 (B) the related market, technological, and  
5 regulatory conditions affecting that utilization.

6 (2) ELEMENTS.—The review required under  
7 paragraph (1) shall include the following:

8 (A) An evaluation of liquid cooling re-  
9 search and development needs, and the costs  
10 and benefits for high-performance computing.

11 (B) A description of avoided costs of en-  
12 ergy, including deferred and avoided new elec-  
13 tric transmission and infrastructure upgrades  
14 and associated costs.

15 (C) A description of increased compute ca-  
16 pacity through the enabling of more use of en-  
17 ergy for computing workloads rather than cool-  
18 ing.

19 (D) A survey and analysis of existing re-  
20 search on the positive and negative effects of  
21 liquid cooling on computing performance, resil-  
22 iency, and cybersecurity.

23 (E) An assessment of market trends and  
24 adoption rates of liquid cooling in United States  
25 data centers over the past 5 years and projec-

tions of future trends to account for the rapidly evolving industry and potential market outlook.

(F) A comparison of single-phase and 2-phase direct-to-chip to single-phase and 2-phase immersion cooling across density bands, including relating to thermal performance, maintainability, interoperability, safety, failure modes, and lifecycle cost.

(G) An evaluation of—

(i) coolant options, including water, water-glycol, and engineered fluids;

(ii) materials compatibility;

(iii) corrosion control;

(iv) biogrowth mitigation;

(v) filtration;

(vi) de-aeration;

(vii) fluid monitoring and management;

(viii) single-phase and 2-phase engineered fluids;

(ix) testing for total thermal performance;

(x) heat transfer capacity; and

(xi) energy efficiency.

1           (H) Development of reference architectures  
 2           and layouts for rack, row, and room-level liquid  
 3           distribution by density band and cooling ap-  
 4           proach.

5           (I) A survey of existing opportunities for  
 6           reusing waste heat produced by data centers.

7           (J) An evaluation of failure scenarios (such  
 8           as pump failures or fluid leaks) and mitigation  
 9           strategies, especially in shared colocation envi-  
 10          ronments.

11          (K) Recommendations of the Comptroller  
 12          General of the United States relating to—

13               (i) whether liquid cooling should be  
 14               considered as a primary cooling option over  
 15               air cooling due to the thermal conditions of  
 16               computing components in servers within  
 17               data centers;

18               (ii) the utilization and ongoing re-  
 19               search by the Federal Government of liq-  
 20               uid cooling technologies;

21               (iii) best practices and industry stand-  
 22               ards for the design and operation of liquid  
 23               cooling technologies;

(iv) methods to enhance the security, reliability, and resilience of computing equipment and data centers; and

(v) methods to accelerate education on operational best practices.

(3) STAKEHOLDER INPUT.—For purposes of recommending the best practices and industry standards described in paragraph (2)(K)(iii), the Comptroller General of the United States shall consult with stakeholders from Federal, State, and local governments, the private sector, academia, and National Laboratories.

(4) LIQUID COOLING ADVISORY ORGANIZATION.—

(A) IN GENERAL.—The Secretary of Energy and the Comptroller General of the United States shall establish an advisory committee to consult and coordinate with in the preparation of the review under paragraph (2).

(B) MEMBERS.—The advisory committee established under subparagraph (A) shall consist of—

(i) interested parties who—

(I) have expertise in liquid cooling system applications in the develop-

1                   ment, operation, and functionality of  
 2                   AI factories or data centers, informa-  
 3                   tion technology equipment, or soft-  
 4                   ware; and

5                   (II) may be members of liquid  
 6                   cooling industry organizations; and

7                   (ii) representatives of hardware manu-  
 8                   facturers, data center operators, fluid pro-  
 9                   ducers, or AI factory development.

10                  (C) CONSULTATION.—The advisory com-  
 11                  mittee established under subparagraph (A) shall  
 12                  consult with relevant stakeholders, including the  
 13                  Department of Energy, the National Labora-  
 14                  tories, and any college, university, research in-  
 15                  stitution, industry association, company, or  
 16                  public interest group with applicable expertise  
 17                  in any of the subject matters areas described in  
 18                  subparagraph (C).

19                  (D) TERMINATION.—The advisory com-  
 20                  mittee established under subparagraph (A) shall  
 21                  terminate on the date on which the Secretary of  
 22                  Energy submits a report and any recommenda-  
 23                  tions under subsection (e).

24                  (d) REPORT.—Not later than 90 days after the date  
 25                  of enactment of this Act, the Comptroller General of the

1 United States shall submit to the Secretary of Energy and  
2 the appropriate congressional committees a report con-  
3 taining the results, findings, and any associated rec-  
4 ommendations of the review required under subsection (c).

5 (e) DEPARTMENT OF ENERGY REVIEW.—Not later  
6 than 180 days after receiving the report from the Comp-  
7 troller General of the United States under subsection (d),  
8 the Secretary of Energy shall submit to the appropriate  
9 congressional committees an assessment of the report and  
10 any associated recommendations, including—

11 (1) relevant considerations for Congress regard-  
12 ing the importance of liquid cooling for the United  
13 States to maintain its global lead in AI technologies;  
14 and

15 (2) recommendations for research and develop-  
16 ment on liquid cooling and heat-reuse.

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