

119TH CONGRESS
1ST SESSION

S. _____

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.

IN THE SENATE OF THE UNITED STATES

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 _____

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;

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

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

6 (3) STAKEHOLDER INPUT.—For purposes of
7 recommending the best practices and industry stand-
8 ards described in paragraph (2)(K)(iii), the Comp-
9 troller General of the United States shall consult
10 with stakeholders from Federal, State, and local gov-
11 ernments, the private sector, academia, and National
12 Laboratories.

13 (4) LIQUID COOLING ADVISORY ORGANIZA-
14 TION.—

15 (A) IN GENERAL.—The Secretary of En-
16 ergy and the Comptroller General of the United
17 States shall establish an advisory committee to
18 consult and coordinate with in the preparation
19 of the review under paragraph (2).

20 (B) MEMBERS.—The advisory committee
21 established under subparagraph (A) shall con-
22 sist of—

23 (i) interested parties who—

24 (I) have expertise in liquid cool-
25 ing 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.