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.

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.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE AND PURPOSE.

This Act may be cited as the ''Liquid Cooling for AI Act of 2025''.

SEC. 2. LIQUID COOLING DEPLOYMENT AND SCALABILITY.

(a) FINDINGS.—Congress finds that—

(1) the 2024 United States Data Center Energy Usage Report published by Lawrence Berkeley National Laboratory—

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

(B) projects that data centers could represent between 6.7 percent and 12.8 percent of total electricity consumption by 2028, due to the rapid growth of AI, cloud computing, and other digital technologies;

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

(3) liquid cooling technologies, including direct-to-chip liquid cooling and single-phase or 2-phase immersion cooling, can improve thermal performance, enable higher densities, and reduce cooling system load when properly engineered and maintained;

(4) effective liquid cooling deployments require interoperable components and engineered subsystems, including coolant distribution units, secondary loops, manifolds, hoses, quick-disconnects, valves, pumps, filters, leak detection and containment, corrosion control, and appropriate instrumentation and controls;

(5) interfaces for heat-reuse are integral to liquid systems and can reduce thermal load on heat-rejection equipment by transferring heat through plate heat exchangers or other devices to beneficial secondary uses where technically appropriate;

(6) Federal agencies, including the Department of Energy, are considering the deployment of AI systems across Government-owned facilities; and

(7) a comprehensive, independent assessment of emerging data center architectures and cooling technologies is essential to inform efficient and cost-effective deployment decisions across the Federal Government.

(b) DEFINITIONS.—In this section:

(1) 2-PHASE.—The term ''2-phase'', with respect to a cooling process, means a process that leverages the heat-absorbing phase change from liquid to gas during the cooling cycle.

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

(3) APPROPRIATE CONGRESSIONAL COMMITTEES.—The term ''appropriate congressional committees'' means—

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

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

(C) the Committee on Energy and Commerce of the House of Representatives.

(4) DIRECT-TO-CHIP LIQUID COOLING.—The term ''direct-to-chip liquid cooling'' means a liquid cooling method that involves circulating a coolant in direct contact with applicable heat-generating components, such as processors and memory modules, to efficiently absorb and transfer heat away from those heat-generating components.

(5) HEAT-REUSE.—The term ''heat-reuse'' means the capture and transfer of waste heat from liquid loops for beneficial secondary use through appropriate interfaces and controls.

(6) IMMERSION COOLING.—The term ''immersion cooling'' means a cooling technique that involves a dielectric fluid (single-phase or 2-phase) coming into direct contact with information technology components to capture and reject heat from an entire information technology system instead of a single component.

(7) LIQUID COOLING.—The term ''liquid cooling'' means utilization of liquids to remove heat efficiently from electronic components.

(8) NATIONAL LABORATORY.—The term ''National Laboratory'' has the meaning given the term in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801).

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

(c) GAO REVIEW.—

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

(A) the research and development needs relating to liquid cooling utilization by data centers; and

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

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

(A) An evaluation of liquid cooling research and development needs, and the costs and benefits for high-performance computing.

(B) A description of avoided costs of energy, including deferred and avoided new electric transmission and infrastructure upgrades and associated costs.

(C) A description of increased compute capacity through the enabling of more use of energy for computing workloads rather than cooling.

(D) A survey and analysis of existing research on the positive and negative effects of liquid cooling on computing performance, resiliency, and cybersecurity.

(E) An assessment of market trends and adoption rates of liquid cooling in United States 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.

(H) Development of reference architectures and layouts for rack, row, and room-level liquid distribution by density band and cooling approach.

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

(J) An evaluation of failure scenarios (such as pump failures or fluid leaks) and mitigation strategies, especially in shared colocation environments.

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

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

(ii) the utilization and ongoing research by the Federal Government of liquid cooling technologies;

(iii) best practices and industry standards for the design and operation of liquid 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-

ment, operation, and functionality of AI factories or data centers, information technology equipment, or software; and

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

(ii) representatives of hardware manufacturers, data center operators, fluid producers, or AI factory development.

(C) CONSULTATION.—The advisory committee established under subparagraph (A) shall consult with relevant stakeholders, including the Department of Energy, the National Laboratories, and any college, university, research institution, industry association, company, or public interest group with applicable expertise in any of the subject matters areas described in subparagraph (C).

(D) TERMINATION.—The advisory committee established under subparagraph (A) shall terminate on the date on which the Secretary of Energy submits a report and any recommendations under subsection (e).

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

United States shall submit to the Secretary of Energy and the appropriate congressional committees a report containing the results, findings, and any associated recommendations of the review required under subsection (c).

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

(1) relevant considerations for Congress regarding the importance of liquid cooling for the United States to maintain its global lead in AI technologies; and

(2) recommendations for research and development on liquid cooling and heat-reuse.

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