



HYPERION RESEARCH

HPC Data Center Energy Challenges and Sustainable Solutions

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The Energy Challenge

Growing energy demand is heavily influencing global market

- **Data centers consumed 240-340 TWh in 2022 (IEA estimate)**
 - That's 1-1.3% of total global demand
 - This is expected to double by 2026
- **The US is seeing rapid growth in electricity demand**
- **Many European markets are shifting**
 - Ireland-halted new data center developments near Dublin until 2028 to ensure grid stability
 - Amsterdam maintains a similar moratorium to address environmental concerns
 - Shifting investments towards countries like Portugal, Spain, Sweden, and Finland
- **AI and HPC workloads drive higher power densities**

Energy Resource Program

Global initiatives powering sustainable HPC data centers

- **United States: COOLERCHIPS (2023)**
 - Program for energy-efficient cooling
 - Support for solar, wind, and battery storage projects
- **European Union: REPowerEU Plan (2022)**
 - Accelerating clean energy projects to reduce dependency on fossil fuels
- **China: Hydropower Investments for Hyperscale Centers (2023)**
 - Leveraging renewable energy for major data hubs
- **Japan: Cool Japan Initiative (2023)**
 - Encouraging the adoption of advanced cooling technologies in high-density data centers
 - Focuses on R&D funding for next-gen cooling solutions

Innovative Solutions for Efficiency

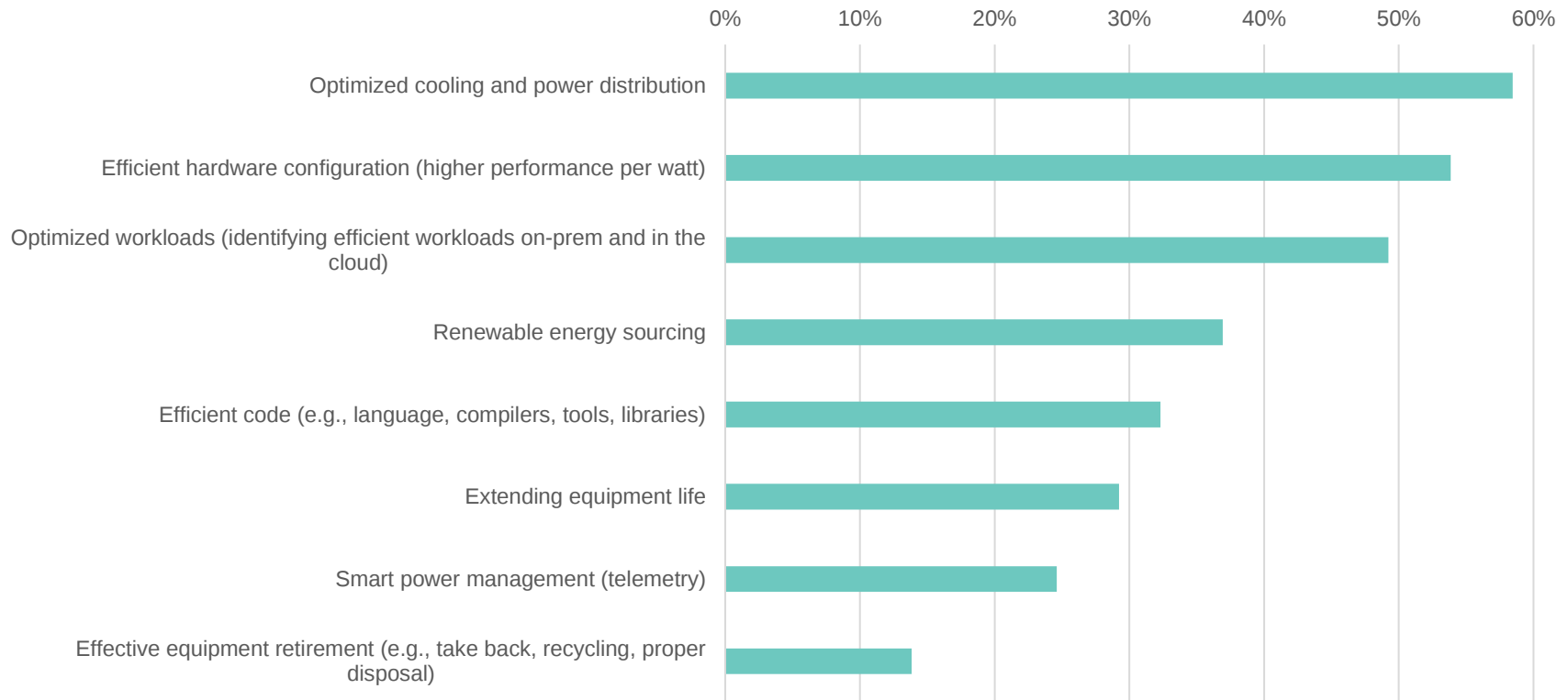
Liquid cooling, heat recovery, and innovative server solutions

- **Liquid cooling adoption in HPC centers**
 - Recent study finds 67% of sites use some form of liquid cooling today
 - Projected to increase to 80% in 12-18 months
 - Incremental cooling upgrades more commonly found in brownfield sites (L2A cooling)
- **Heat recovery systems**
 - Nebius – tripling the capacity of data center in Mäntsälä, Finland. Currently recovers 20,000MWh/yr
 - Microsoft data center cluster – Expected to supply heat for 40% of Espoo, Finland (100,000 homes)
- **More players in single-socket server market: doubling core count while reducing power usage**

Trends in Sustainability Strategies

On average, sites implement 3 priorities for sustainability goals

Which of these priorities are you implementing today to reach your sustainability goals? Please select all that apply.

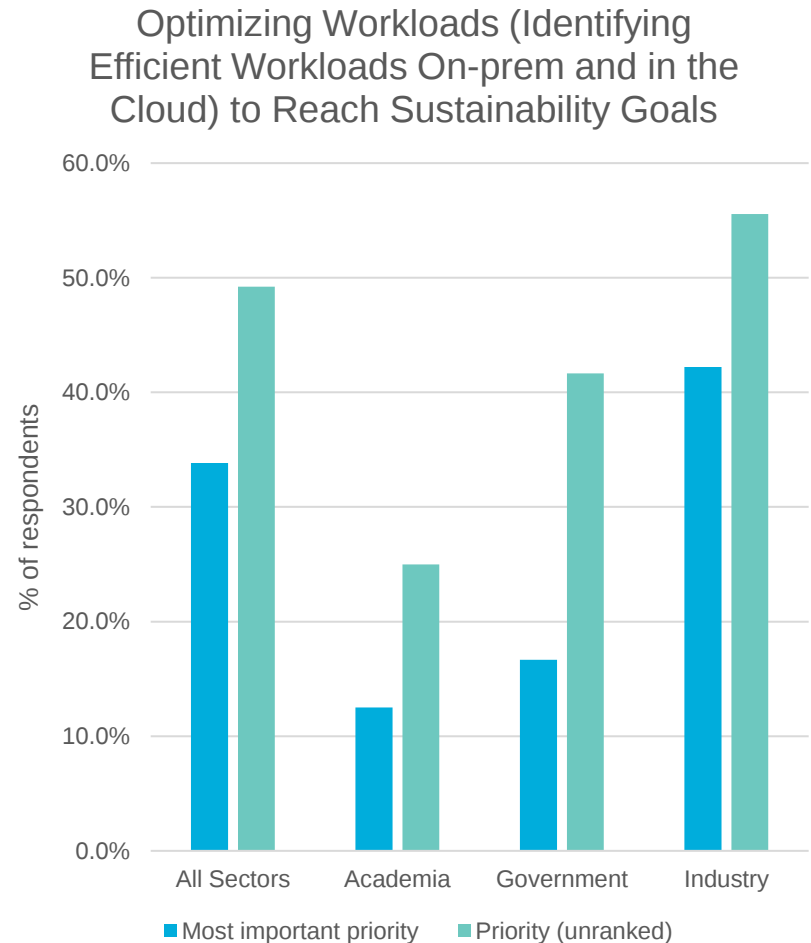


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Adding Cloud in Sustainability Strategies

Sites are using Cloud as another tool to reach ESG goals

- **“Neo-clouds” – avoiding costly upgrades while reducing carbon footprint**
- **Hyperscalers (AWS, Google, Microsoft) lead with 100% renewable energy goals**
 - NVIDIA’s Reno, NV facility (solar and hydroelectric)
 - Google’s Groningen, Netherlands center (renewable energy infrastructure)



Small Modular Reactors (SMRs)

Harnessing nuclear innovation for HPC energy needs

Movement Towards SMRs

- **Consistent, carbon-free power suitable for 24/7 HPC operations, in compact, near-site design**
- **Addresses energy demands of AI and HPC workloads**
- **Recent Initiatives:**
 - **Google-** Kairos Power
 - **Amazon-** Energy Northwest
- **DOE Support: \$900M in federal funding for next-gen nuclear**

Challenges

- **High initial costs: NuScale's Utah project failed due to cost escalation**
- **Regulatory hurdles: Complex permitting and compliance requirements**
- **Need for LARGE stable customer commitments to ensure project viability**

THANK YOU!



**Questions or comments are
welcome!**

**Please contact me:
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