Response to:

Konsultationsprozess zur nationalen Rechenzentrumsstrategie

Bundesministerium für Digitales und Staatsmodernisierung

Prepared for:

Bundesministerium für Digitales und Staatsmodernisierung

Proposal date:

September 19th, 2025

Your business technologists. **Powering progress**

EVIDEN

Contacts at Bull GmbH

Bull GmbH
Von-der-Wettern-Str. 27
51149 Köln
Telefon: +49 (0) 211 399-0
https://eviden.com/solutions/high-performance-computing/

Sitz Köln, Amtsgericht Köln, HRB 8173

Dr. Martin Matzke

Geschäftsführer Bull GmbH / Vorstandvorsitzender science+computing AG

+49 211 399 - 23465

martin.b.matzke@eviden.com

Stefan Schulz

Specialized Sales Manager HPC, AI and Quantum

+49 171 558 0718

schulzstefan@eviden.com

Dr. Thomas Warschko

Technical Director Extreme Computing

+49 173 588 7652

thomas.warschko@eviden.com

Pierre Lemoine

Head of Presales HPC and AI

+33 763 197 158

pierre.lemoine@eviden.com

Enguerrand Petit

Senior Expert Analyst HPC and Quantum

enguerrand.petit@eviden.com

Contents

1 Introduction

We sincerely thank the German Ministry for the opportunity to contribute to the national **#Rechenzentrumsstrategie** — a forward-thinking initiative that will define Germany's role as a leader in digital infrastructure, AI innovation, and technological sovereignty. At Eviden, we are proud to bring our European expertise to this critical dialogue.

As a trusted partner with factories in France and a long-standing legacy in high-performance computing (HPC) and modular data center solutions, we offer proven capabilities to support Germany's ambitions:

1. **Unmatched Efficiency:** Ranked **first and second** in the TOP500 for energy-efficient supercomputing, our solutions deliver world-leading performance while minimizing environmental impact.
2. **Local & Global Experience:** From our recent success at the **Jülich Supercomputing Centre** to our adaptive, scalable designs, we understand the unique challenges and opportunities of building future-proof infrastructure.
3. **Collaborative Innovation:** We are committed to working alongside German stakeholders—operators, researchers, and policymakers—to ensure this strategy leverages the most advanced, sustainable, and sovereign technologies.

Germany's potential as Europe's digital hub is immense, and we are excited to help shape a roadmap that drives growth, resilience, and competitive advantage for years to come.

2 General remarks

The rapid advancement of AI technologies is driving fundamental changes across the computing infrastructure landscape, presenting both opportunities and significant challenges for organizations. This report examines four critical areas of transformation that require immediate strategic attention.

Accelerated Technology Lifecycle and Power Consumption

The emergence of AI as a primary technology driver has fundamentally altered the competitive landscape. Major solution providers are now operating on aggressive annual product development cycles, dramatically shortening technology lifespans. This acceleration forces organizations to develop more agile system renewal strategies to maintain competitive advantage.

Simultaneously, power consumption per technology unit has experienced dramatic growth over recent years, with projections indicating this trend will intensify. Current forecasts suggest power density will exceed 1MW per rack by 2030. This unprecedented power requirement necessitates the implementation of Direct Liquid Cooling (DLC) systems and demands achieving the lowest possible Total-Power Usage Effectiveness (TUE) ratios to meet climate commitments and operational efficiency goals.

Infrastructure Density and Physical Constraints

Modern data centers are experiencing unprecedented density requirements, with rack dis-aggregation becoming essential across power, cooling, and compute domains. The infrastructure must now support loads of 3 tons per square meter, requiring fundamental rethinking of facility design and structural engineering approaches.

Performance Architecture Shifts

A concerning trend is emerging in accelerator performance capabilities. Standard and historical precision (FP64 & FP32) performance, used in classical numerical simulation workloads, is declining in next-generation accelerators, with potential impacts extending to FP32 performance in future iterations. Since FP32 is not extensively utilized in AI workloads, this shift may catalyze a renewed focus on CPU computing or drive migration toward alternative accelerator providers, fundamentally altering the competitive hardware landscape.

At the same time, the number of companies and start-ups proposing their own dedicated accelerators for Artificial Intelligence is growing massively. This could change the market dynamics in the next decade. However, the maturity of these accelerators and the associated software stack is not yet at a production-ready level.

Software Infrastructure Modernization

The software stack requires comprehensive modernization, particularly in scheduler technologies. Organizations must implement multi-site capabilities and embrace cloudification strategies to effectively manage distributed computing resources and optimize performance across increasingly complex infrastructure environments.

These converging trends represent a critical inflection point for technology infrastructure planning. Organizations must simultaneously address power management, density optimization, performance architecture evolution, and software modernization to remain competitive in an AI-driven landscape.

The compressed technology lifecycle demands more strategic agility, while the physical and performance constraints require innovative engineering solutions.

Success will depend on developing integrated approaches that address these challenges holistically rather than as isolated issues.

3 Infrastructure questions

In the following paragraph, we will set out our views on your questions. We have renamed the paragraph to make it easier to read.

3.1 Germany's Strategic Data Center Assets for 2030

Key question: *In your opinion, what characteristics and framework conditions characterize Germany as a "future-proof and high-performance" data center location in 2030?*

EVIDEN >

Germany's Strategic Data Center Leadership

Germany emerges as Europe's premier data center destination through comprehensive regulatory leadership, with the Energy Efficiency Act mandating 100% renewable energy for data centers by 2027, creating the continent's most sustainable ecosystem ahead of global competitors. The country's central European position provides optimal connectivity across DACH and Eastern Europe regions, serving a rapidly expanding market projected to grow from $7.71B (2024) to $12.84B (2030), attracting major new entrants including Bluestar Data Centre, Data4, Green Mountain, and STACK Infrastructure. Germany's advanced infrastructure capabilities, exemplified by three major HPC centers (FZJ, LRZ, HLRS), implement cutting-edge liquid cooling and free cooling technologies that enable hundred-kilowatt rack densities while leveraging natural cooling advantages 8-9 months annually. Key framework conditions include mandatory waste heat utilization that transforms data centers into integrated district heating energy hubs, geographic diversification beyond Frankfurt to Berlin and Rhineland for resilient distributed infrastructure, and colocation efficiency standards providing 70% of IT power through shared economies of scale. This comprehensive approach positions Germany to offer the unique combination of sub-1.1 PUE with 100% renewable certification, integrated waste heat systems reducing operational costs, AI-ready liquid cooling infrastructure, full EU digital sovereignty compliance, and premium ESG credentials, establishing Germany as Europe's definitive location for sustainable, high-performance, future-ready data center infrastructure.

3.2 Balancing Challenges and Growth Potential

Key question: *What key challenges and opportunities do you see for Germany as a data center location in the coming years?*

EVIDEN >

Critical Success Factors for 2030

Energy Security and Grid Stability represents the foundational requirement for Germany's data center leadership, demanding robust grid infrastructure capable of supporting 1MW+ rack densities while maintaining 99.99%+ uptime reliability standards. The integration of renewable energy storage systems becomes essential to manage the intermittency challenges of wind and solar power while ensuring continuous operations for critical AI and HPC workloads. Grid modernization must accommodate the dramatic increase in power density while maintaining stability across distributed data center locations.

Skilled Workforce Development addresses the critical human capital requirements for managing complex AI workloads, advanced cooling systems, and renewable energy integration that demand specialized technical expertise. Targeted education and training programs must be established to cultivate professionals capable of operating next-generation infrastructure that combines traditional data center management with emerging technologies. The workforce must be prepared to handle the sophisticated interplay between AI optimization, thermal management, and sustainable energy systems.

Digital Sovereignty Compliance leverages Germany's position within EU digital sovereignty frameworks to attract organizations requiring strict data residency controls while providing seamless access to European markets. This compliance advantage creates competitive differentiation for German facilities, ensuring they meet the highest standards for data protection and regulatory alignment. The framework provides confidence for European organizations and multinationals seeking to maintain data governance within EU jurisdiction.

Strategic Opportunities

Heat Integration capitalizes on mandatory waste heat utilization requirements to create substantial revenue opportunities through district heating network integration, transforming data centers from energy consumers into community energy providers. This dual-purpose approach generates additional revenue streams while contributing to municipal heating infrastructure, creating a competitive advantage that enhances both sustainability credentials and operational economics. The integration positions German data centers as essential components of smart city infrastructure.

Digital Sovereignty addresses the growing demand for high-security AI applications through Germany's robust data sovereignty capabilities, serving organizations that require strict data residency within Europe's unified digital market framework. The combination of stringent data protection regulations and advanced security infrastructure positions German facilities to capture premium market segments focused on sensitive AI workloads. This sovereignty advantage becomes increasingly valuable as AI applications handle more critical and regulated data types.

The connectivity an important part of a digital plan. Connectivity Leadership leverages Germany's optimal central European location to establish the continent's premier regional connectivity hub, providing unmatched access to both Western and Eastern European markets. This geographic advantage positions German facilities as the natural choice for organizations requiring low-latency connections across the broader European region. The strategic location creates network effects that attract additional infrastructure investments and strengthen Germany's position as Europe's digital backbone.

Digital Sovereignty is impossible without technology innovation. Technology Innovation establishes Germany as the premier testbed for next-generation infrastructure through leading innovations in cooling technologies, AI optimization systems, and sustainability solutions that set global standards for data center operations. German facilities serve as innovation laboratories where breakthrough technologies are developed, tested, and refined before global deployment. This leadership in technology innovation creates intellectual property advantages and positions German companies as preferred partners for organizations seeking cutting-edge infrastructure solutions.

3.3 Optimizing Policies for Investment and Innovation

Key question: *In your opinion, which framework conditions should be changed and how to promote data center investments and enable innovation?*

EVIDEN >

Investment and innovation could be optimized and reinforced by key actions

Innovation Sandboxes establish regulatory testing environments that provide temporary exemptions from standard requirements, enabling pilot projects to test quantum computing infrastructure, advanced AI architectures, and carbon-negative operations without regulatory constraints. These controlled environments accelerate innovation by allowing companies to experiment with breakthrough technologies while maintaining safety and compliance oversight. The sandbox approach positions Germany as the preferred location for testing next-generation data center technologies.

Public-Private Infrastructure Partnerships leverage government co-investment in grid upgrades, fiber connectivity, and district heating integration to reduce private sector infrastructure burden and investment risk. This collaborative approach enables faster deployment of critical infrastructure while sharing costs and benefits between public and private sectors. Government participation signals long-term commitment to data center development while ensuring infrastructure serves broader societal objectives.

Heat Infrastructure Incentives transform punitive waste heat mandates into positive incentive structures through tax credits for district heating integration, accelerated depreciation for heat recovery systems, and revenue-sharing models with municipal heating networks. This approach encourages voluntary adoption of heat recovery technologies while creating financial benefits for both data center operators and communities. The incentive structure makes Germany more attractive to investors while achieving sustainability objectives.

Digital Sovereignty Certification creates official "EU Data Sovereign" certification for facilities meeting strict data residency, security, and EU ownership requirements, providing premium positioning against US and Asian competitors. This certification framework establishes clear standards while creating market differentiation for compliant facilities. The certification becomes a valuable marketing tool that attracts organizations prioritizing data sovereignty and European values.

Carbon-Negative Pioneer Program provides first-mover advantages for facilities achieving net-negative carbon footprint through waste heat utilization, renewable energy excess, and carbon capture integration, combined with 200% R&D tax deductions for research into next-generation cooling, AI-optimized architectures, and energy efficiency technologies. This program incentivizes breakthrough sustainability innovations while providing significant financial benefits for pioneering companies. The combination of environmental leadership and fiscal incentives transforms Germany from a regulatory-constrained market into Europe's most attractive data center investment destination while maintaining leadership in sustainability and digital sovereignty.

3.4 Government Leadership in Digital Sovereignty

Key question: *What role should the government play in developing a sovereign and resilient computing infrastructure?*

EVIDEN >

The digital sovereignty needs to be address at country and European level.

Strategic Government Framework

The strategic government framework establishes a comprehensive approach to technological sovereignty through proactive government intervention in shaping digital futures. It operates on coordinated policies spanning procurement, R&D, and regulatory oversight to create sustainable innovation ecosystems. The framework prioritizes long-term strategic planning over short-term gains, recognizing that technological independence requires sustained commitment. It emphasizes collaboration between government agencies and private sector partners to meet both economic competitiveness and national security objectives.

European Champion Development

European Champion Development aims to create globally competitive technology companies while preserving European values and interests. The initiative centers on Computing Stack Sovereignty, requiring substantial investment in integrated European solutions across processors, systems, networking, and storage. Public Procurement Leverage mandates 50% European technology content in government contracts, creating guaranteed market demand for domestic champions. R&D Coordination through a "European Computing Alliance" with Germany and France as leaders would establish a continent-wide innovation network. This comprehensive approach reduces foreign dependency while building European companies capable of competing with American and Asian technology giants.

Modular Infrastructure National Program

The Modular Infrastructure National Program develops flexible, scalable, and rapidly deployable computing infrastructure to meet diverse national needs. Standardization Leadership positions Europe as the global leader in modular data center design through superior engineering expertise. Emergency Response Capability enables rapid deployment of computing resources during crises, disasters, or emergencies requiring immediate technological support. Edge Computing Sovereignty ensures critical AI and HPC workloads remain under national control while delivering required low-latency performance. The program creates strategic infrastructure that serves both routine operations and crisis response scenarios.

Regulatory and Financial Support

Regulatory and financial support provides the legal and economic foundation for implementing technological sovereignty initiatives effectively. Sovereign Cloud Certification ensures cloud infrastructure meets specific geographic and legal requirements, guaranteeing data residency and regulatory compliance. The certification framework establishes rigorous standards for data protection, creating market differentiators for European cloud providers. Public-Private Partnerships enable government co-investment in critical infrastructure while maintaining sovereignty compliance requirements. These partnerships balance public strategic objectives with private sector efficiency, ensuring public funding contributes to both strategic autonomy and economic returns.

Outcome: Transform Germany into the coordination hub for European digital sovereignty while leveraging modular infrastructure for rapid, resilient, and sovereign computing deployment across the continent.

3.5 Field-Tested Strategies for Success

Key question: Are there any specific measures or best practices from your practice/experience that should be included in the strategy?

EVIDEN >

We see 5 major approaches that can be included:

Modular Data Center Implementation Framework

The Modular Data Center Implementation Framework revolutionizes traditional infrastructure deployment by embracing standardized, pre-engineered components that can be rapidly assembled and scaled. This approach fundamentally transforms the economics and timeline of data center construction, moving from lengthy custom builds to efficient modular assembly processes. The framework prioritizes interoperability and standardization, ensuring that individual modules can seamlessly integrate regardless of deployment location or timing. By establishing clear technical specifications and interface standards, organizations can achieve unprecedented flexibility in capacity planning and technology refresh cycles.

Phased Deployment Strategy

The Phased Deployment Strategy implements a "Building Block" approach using standardized 1-2MW modular units that can be rapidly deployed and interconnected to meet evolving capacity demands. This methodology enables seamless scaling from initial 5MW installations to expansive 50MW+ facilities without requiring fundamental infrastructure redesign, dramatically reducing time-to-production and capital risk. Each deployment phase builds upon previous modules while maintaining full operational capability, allowing organizations to match capacity growth with actual demand rather than over-provisioning based on uncertain projections. The strategy incorporates technology refresh opportunities at each phase, ensuring that expanding facilities can integrate the latest innovations without disrupting existing operations. Following successful implementations like the FZJ (Forschungszentrum Jülich) model, this approach demonstrates how modular data center architectures can achieve both rapid deployment timelines and seamless technology evolution, making it particularly valuable for organizations requiring agile infrastructure scaling in dynamic computing environments.

Agile Multi-Phase RFP Strategy

The Agile Multi-Phase RFP Strategy addresses the challenge of rapid technological evolution through flexible procurement frameworks that adapt to changing requirements without complete infra-structure replacement. Technology Evolution-Ready Procurement structures contracts with 3-year base terms and 2-year technology refresh options, enabling infrastructure to seamlessly integrate emerging AI and compute technologies while maintaining operational continuity. Implementation follows a phased approach: Phase 1 (Years 1-3) deploys current generation CPU/GPU systems, while Phase 2 (Years 3-5) introduces next-generation AI accelerators with liquid cooling upgrades, ensuring

continuous technology advancement. European Technology Prioritization integrates sovereignty objectives directly into procurement decisions through weighted evaluation criteria: 40% technical capability and performance, 25% European technology content (minimum 50% requirement), 20% sovereignty compliance and data residency, and 15% total cost of ownership including energy efficiency. This framework ensures that procurement decisions balance performance requirements with strategic autonomy objectives while encouraging European technology development.

European Integration

European Integration leverages the continent's existing industrial capabilities to create a fully sovereign technology stack that reduces dependency on non-European suppliers while strengthening domestic competitiveness. This approach capitalizes on Europe's established strengths in power systems engineering, advanced cooling infrastructure technologies, and precision manufacturing to build world-class modular data center solutions. Strategic partnerships with emerging European chip manufacturers enable the integration of sovereign compute modules, ensuring that even the most critical components remain under European control and governance. By coordinating these diverse industrial capabilities across national boundaries, Europe can develop integrated solutions that compete globally while maintaining technological independence. This integration model transforms Europe's fragmented technology landscape into a cohesive ecosystem where German engineering excellence, French industrial capabilities, and other national strengths combine to create comprehensive data center solutions that serve both European sovereignty objectives and global market opportunities.

Public-Private Co-Development Model

The Public-Private Co-Development Model implements a Risk-Sharing Investment Structure where government provides 30-40% upfront infrastructure investment while private sector handles operations and technology integration, creating a revenue-sharing framework that enables government investment recovery while driving private sector innovation. Following the German Model, federal and state governments co-invest in modular facility shells and power infrastructure, while private partners contribute compute, cooling, and operational expertise, optimizing risk distribution and leveraging complementary strengths. Joint Innovation Labs establish Public-Private Computing Innovation Centers where government agencies, universities, and European technology companies collaborate to co-develop next-generation infrastructure solutions across critical focus areas. These centers concentrate on liquid cooling integration with district heating networks, AI-optimized power management systems, quantum computing preparation infrastructure, and sustainable materials for modular construction. This collaborative approach accelerates innovation cycles while ensuring that technological advances serve both commercial viability and public strategic objectives, creating a sustainable framework for continuous infrastructure evolution.