Next Generation Data Centers Workshop Report

Hosted by Winona Snapp-Childs, Indiana University
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February 25 - 26, 2025
The Campus Center, Indiana University Indianapolis

Prepared by:
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Next Generation Data Centers Affinity Group Workshop

February 25–26, 2025 | Indiana University Indianapolis

Organizing committee: Todd Shechter (University of Wisconsin, Madison), Winona Snapp-Childs (Indiana University), David Y. Hancock (Indiana University), Brock Palen (University of Michigan), Graham Allen (Minnesota Supercomputing Institute, University of Minnesota)

Executive Summary

The Midwest Research Computing and Data Consortium (Midwest RCD) hosted the inaugural Next Generation Data Centers Affinity Group workshop on February 25–26, 2025, at Indiana University Indianapolis. Over 1.5 days, 60 participants—including data center operators, research computing leaders, facilities engineers, sustainability professionals, and industry representatives—engaged in presentations, panels, breakout sessions, and networking.The workshop provided a timely forum for higher education and industry experts to discuss the challenges, emerging technologies, and future directions shaping data center operations in the context of rapidly growing computational and AI-driven workloads.

A growing number of researchers are using data-intensive AI applications to increase processing speed and efficiency in their work. While machine learning models can accelerate innovation, the computational power necessary also strains existing computing resources and data facilities. The anticipated power and cooling requirements of computing architecture on the near horizon will only further challenge data center capacity. Next generation data centers will need to adopt pioneering logistical and technological solutions to keep up with high-performance computing demands. To prepare for these present and future needs, stakeholders in higher education must collaborate closely with the technology sector to stay ahead of the requirements necessary to build and upgrade data centers.

The workshop gave participants the opportunity to hear from data center architects and vendor subject matter experts who not only provided an insider look at the future of data centers and chip requirements but also shared real-world industry stories from the trenches. Regardless of whether they represented higher education, data center operators, facilities managers or engineers, surveyed participants expressed gratitude for the connections the workshop fostered as well as a strong interest in continued collaboration. One participant cited these associations as their key takeaway from the conference: “I have the proper data, contacts and examples from other institutions and vendors to articulate a strategy for future planning thanks to this workshop.” Networking opportunities, such as the Next Generation Data Centers Workshop, are an important engine for driving research forward. Cultivating relationships between cyberinfrastructure professionals across the private and public sectors is a pivotal step in developing data centers capable of meeting growing AI-driven demands.

Workshop Goals

The workshop sought to:

- Assess the current state of data center operations in higher education institutions that engage in research computing.
- Identify key challenges in power density, cooling, sustainability, and staffing.
- Explore emerging technologies and strategies for future-proofing research data centers.
- Strengthen collaboration between academic and industry professionals.

Participants & Target Audience

Participants represented a cross-section of stakeholders:

- **Higher education professionals:** data center operators, architects, facilities managers, engineers, and research computing leaders.
- **Industry representatives:** subject matter experts from Intel, AMD, NVIDIA, and Dell.
- **Specialists:** sustainability professionals and change management leaders.

This diverse group fostered knowledge exchange and strengthened the professional network needed to address shared infrastructure challenges.

Results & Impacts

A wrap-up survey (62% response rate; n=37) indicated strong satisfaction and demand for future engagement:

- **Overall experience:** 75% “Excellent,” 25% “Very Good.”
- **Future engagement:** Overwhelming interest in continued collaboration and follow-up workshops.

Highlights:

- *Dell’s Cooling, Power, and Data Centers talk* provided actionable insights on liquid cooling, power density, and sustainability—topics directly tied to ongoing institutional planning.
- *The Sustainability and Power Density panel* offered practical strategies for managing higher rack densities.

Requested future topics:

- Case studies on retrofits, high-density upgrades, and migrations (including cost and risk).
- Workforce development (staffing models, skill gaps, training strategies).
- Demonstrations of monitoring tools and post-adoption results of emerging technologies.
- Partnerships with utilities to expand power capacity.

Discussion & Key Takeaways

The workshop underscored a critical need for ongoing dialogue in research data center planning.

Key themes included:

- Rising **power density and cooling demands** are major challenges, particularly for resource-constrained institutions.
- Many institutions face **shared funding and space limitations**, reinforcing the value of collaboration.
- The **growing influence of AI workloads** is reshaping data center requirements and planning horizons.
- **Future-proofing data centers** will require new procurement models, increased use of colocation facilities, and adoption of innovative technologies.

Implications and Next Steps

Intellectual Merit

The workshop advanced knowledge by:

- Bringing together technical experts from academia and industry to evaluate the state of next-generation data center design and operation.
- Identifying technical challenges in sustainability, power density, and infrastructure migration.
- Sharing case-based insights that will inform future research and operational strategies across institutions.

Broader Impacts

The workshop contributes to the national research ecosystem by:

- Building a professional network that connects higher education and industry experts.

- Supporting workforce development by identifying skill gaps and training needs in data center operations.
- Promoting sustainable approaches to infrastructure design, with implications for reducing environmental impact and improving energy efficiency.
- Providing a model for collaboration that other affinity groups can replicate in related technical areas.

Alignment with National Priorities

This workshop aligns with national goals:

- Advancing the **nation's cyberinfrastructure capacity** to support cutting-edge research.
- Addressing workforce development challenges, a central priority in maintaining U.S. leadership in science and engineering.
- Fostering cross-sector collaboration between academia and industry to accelerate innovation and technology adoption.
- Supporting **sustainable infrastructure planning**, in line with NSF's focus on climate and energy-aware research environments.

Next Steps:

The Next Generation Data Centers Affinity Group will continue as a forum for collaboration, with annual workshops planned to deepen discussion and broaden participation. Future workshops will emphasize:

- Applied case studies of institutional responses to infrastructure challenges.
- Workforce development initiatives tailored to emerging technical skill requirements. Expanded industry partnerships to ensure alignment with technology roadmaps.

The group will also explore mechanisms for sharing knowledge between workshops, ensuring that institutions of all sizes can benefit from collective expertise and shared strategies.

Acknowledgments

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Portions of this report were drafted and refined with the assistance of OpenAI's ChatGPT (Sept 22, 2025 version), which was used to improve clarity, tone, and readability.

Attachments

Agenda
Survey Results

Midwest RCD Next Gen Data Centers Workshop

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FEBRUARY 25 • TUESDAY

2:30pm – 5:00pm	D	**Registration/Welcome Table** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Committee: Esen Gokpinar-Shelton, Laura Pettit*
2:30pm – 5:00pm	S	**Coffee Service** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA)
3:00pm – 3:10pm	R	**Welcome and Opening Remarks** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Moderators: Winona Snapp-Childs* *Speakers: Rob Lowden*
3:10pm – 3:15pm	R	**Introduction** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Committee: Todd Shechter, Winona Snapp-Childs*
3:15pm – 3:30pm	R	**Dell: Accelerate from Ideas to Innovation** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Speakers: Steve Nowak*
3:30pm – 4:00pm	R	**Intel** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Speakers: Michael Simon*
4:00pm – 4:30pm	R	**AMD** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Speakers: Deep Grewal, Keith Kirkendall*
4:30pm – 5:00pm	R	**NVIDIA** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Speakers: Marc West*
5:00pm – 5:10pm	R	**Wrap-Up** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Committee: Todd Shechter, Winona Snapp-Childs*
5:45pm – 5:45pm		*****Share a Ride to Rathskeller*****
6:00pm – 8:00pm	S	**Networking Event (Informal)** The Rathskeller I 401 E Michigan St, Indianapolis, IN 46204 (401 E Michigan St, Indianapolis, IN 46204)

[A] Activity [D] Administration [P] Panel [R] Presentation [S] Sustenance

FEBRUARY 26 • WEDNESDAY

7:30am – 9:00am	S	**Breakfast** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA)
8:00am – 9:00am	D	**Registration/Welcome Table** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Committee: Esen Gokpinar-Shelton, Laura Pettit*
8:00am – 4:00pm	S	**Coffee Service** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA)
9:00am – 10:30am	R	**Cooling, Power, Data Center** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Speakers: Andrew Pack*
10:30am – 11:00am	S	**Networking Break** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA)
11:00am – 12:00pm	A	**Breakout Session - Modular Data Center** 307: 3rd Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Boulevard, Indianapolis, IN, USA) *Speakers: Andrew Pack, Michael Simon*
11:00am – 12:00pm	A	**Breakout Session - Story Telling** 308: 3rd Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Boulevard, Indianapolis, IN, USA) *Moderators: Graham Allan*
12:00pm – 1:00pm	S	**Lunch** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA)
1:00pm – 1:45pm	P	**Panel - Sustainability & Considerations for Power Dense** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Moderators: Brock Palen* *Speakers: Brian Rener, Eric Lakin*
1:45pm – 2:15pm	P	**Panel - Facility Operations & Capacity Planning** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Moderators: David Hancock* *Speakers: Tim Boerner, Brad Mahaffey, John O'Brien, Matthew Brazil*
2:15pm – 2:30pm	S	**Networking Break** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA)
2:30pm – 3:00pm	P	**Panel - RFI Project & Vendors (UW-Madison)** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Moderators: Todd Shechter* *Speakers: Tadd Smejkal, Nathan Royko Maurer*
3:00pm – 4:00pm	P	**Discussion - U Washington** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Speakers: Thomas White*
4:00pm – 4:10pm	R	**Closing Remarks & See You Next Time!** 409: 4th Floor - IU Indianapolis Campus Center - 420 University Blvd (420 University Blvd, Indianapolis, IN 46202, USA) *Committee: Todd Shechter, Winona Snapp-Childs*

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Next-Generation Data Centers Workshop Survey Results
February 25-26, 2025

A total of 37 participants responded to the survey (out of 60). Overall, the workshop was perceived as highly beneficial, with strong interest in continued collaboration and follow-up sessions. Below are my key insights. I have also inserted the raw results from Google Form in the Appendix.

1. **Participant Roles:**
   - **The majority of respondents were data center operators (37.8%),** followed by those in research computing & data leadership (18.9%) and those in various other roles including research computing & data professionals, facilities engineers, and sustainability professionals.

2. **Workshop Experience:**
   - An overwhelming **75.7% of attendees rated their overall experience as "Excellent"** (5), with an additional 24.3% rating it as "Very Good" (4).

3. **Interest in Follow-Up Workshop:**
   - The response was equally positive, with **73% expressing high interest in a follow-up workshop** (rated 5 - highly interested).

4. **Valuable Activities:**
   - The most valuable sessions were those related to **Cooling, Power, and Data Centers (Dell presentation) (n=31),** as well as the panels on **Sustainability & Power Density (n=24)** and **Facility Operations & Capacity Planning (n=22)** as well as **the RIF projects and Vendors (n=21)**.
   - **Breakouts on Modular Data Centers (n=13)** and **Storytelling (n=17)** were also appreciated by attendees, with many rating them highly**.** Networking events, such as the one at The Rathskeller, also received high praise (n=24).

5. **Favorite Session:**
   - The most favored session was **Cooling, Power, and Data Centers by Dell**, valued for its practical insights on liquid cooling, power density, and sustainability—topics directly relevant to attendees' data center planning. The panel on **sustainability and power density** also resonated, offering useful perspectives for managing higher rack densities.
   - Attendees appreciated the **RFI Projects & Vendors panel** for its behind-the-scenes look at university infrastructure projects and the **breakout storytelling sessions** for highlighting challenges unique to higher education.

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6. **Additional Topics Requested:**
   - Attendees expressed interest in **case studies on data center retrofits, high power density upgrades, and infrastructure migrations**, including costs and challenges. There was also interest in **workforce development**, such as **staffing models and skill gaps**, and a **vendor panel** to discuss cross-compatibility of equipment.
   - Other suggestions included **data center monitoring software demos**, **post-adoption technology results**, and insights on **collaborating with power utility operators** to expand capacity.

7. **Key Takeaways for Attendees:**
   - Attendees highlighted **rising power density** and **cooling demands** as major challenges, noting that **liquid cooling and OCP** are emerging solutions. They also pointed out that **many institutions face similar struggles** with **funding, space, and infrastructure**, emphasizing the need for collaboration and shared strategies. Additionally, attendees recognized **AI's growing impact on data centers** and valued the opportunity to connect with peers facing similar challenges.

8. **Most Important Takeaway for Institutions:**
   - Respondents identified the need for **future-proofing data centers** to meet growing demand for computational power and cooling capabilities. Several also noted that institutions need to adjust their procurement models to better utilize colocation facilities and **embrace innovative cooling solutions**.

9. **Other Feedback:**
   - Attendees appreciated the workshop's **engagement opportunities** and the chance to network with peers. However, some suggested improvements such as providing **access to presentation slides** post-event.

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Appendix

Next Generation Data Center Workshop: Feedback Form

35 responses

1.

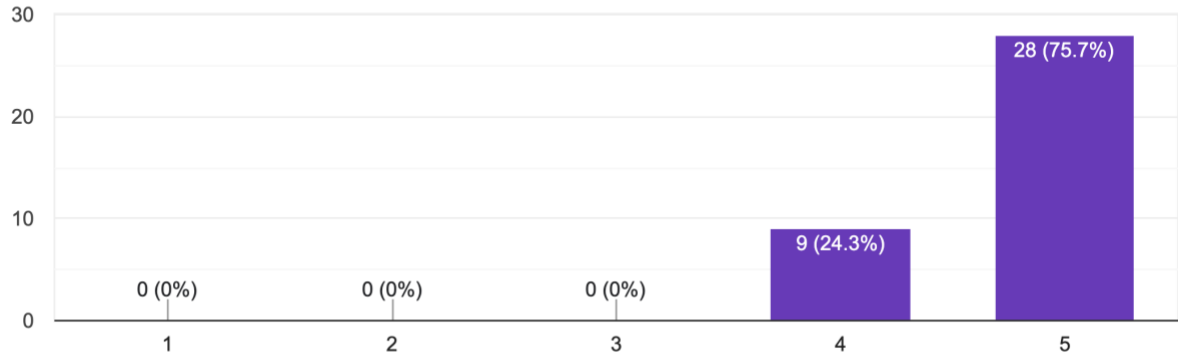
What is your primary role?

37 responses

2.

How would you rate your overall experience at this workshop?

37 responses



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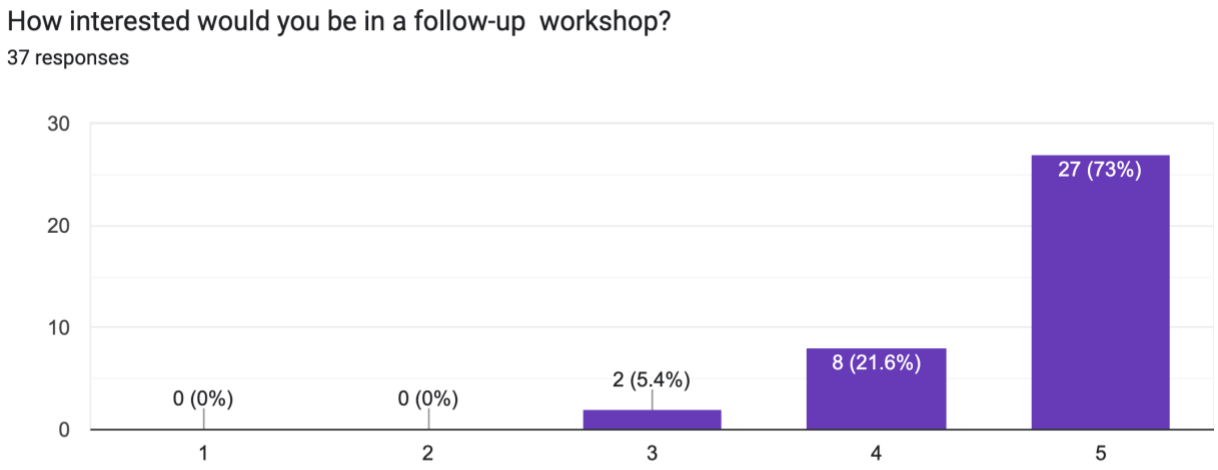
3.



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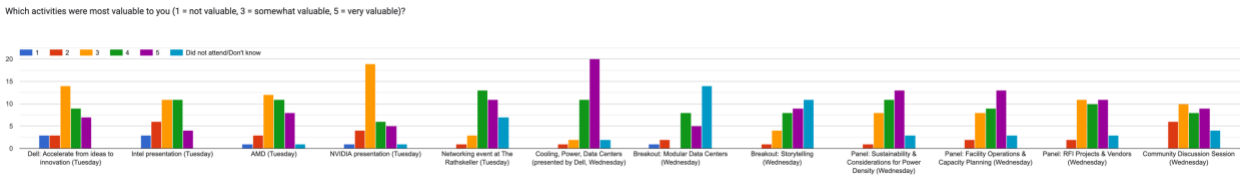

5. What was your favorite session and why?

- Cooling, Power, Data Centers
- Cooling, Power Data Centers by Dell. Great refresher on things to consider for moving to liquid cooling.
- Dell Power
- Sustainability and considerations for power density. As our organization plans for higher rack densities, hearing how others have navigated through these challenges was very interesting view point I plan to take back to my own organization as we plan our future data center needs.

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- Modular data center was excellent in presentation, engaging visuals, and concise information.
- Andrew from Dell had so much new information
- Panel: RFI Projects & Vendors - showed me the difficult that Universities have when trying to build new things
- Cooling power Dell
- "Cooling, Power, Data Center" We currently do not implement water cooling so this one covered the types and pros and cons. Then the feed back from the audience was also helpful. The Story session is probably a close second.
- The Breakout storytelling. Very helpful to understand Higher Ed issues as they are very different then the commercial world i come from.
- I really enjoyed listening to the panel regarding Power Density. It was very informative and gave my a better insight into how I should feature proof our Data Center.
- Dell Cooling Power Data Centers
- Cooling, Power, Data Centers (presented by Dell, Wednesday). Excellent mix and approachable presentation on data center operations and coming technologies.
- Networking and learning from peers
- RFI Projects & Vendors. It was helpful to see behind the curtain of an in-progress project that doesn't know quite yet where it would land. Understand the decisions already made, which ones were being punted for later and why.
- Dell cooling power - lots of detail
- Intel. Great to see the roadmap.
- All of the community discussions were valuable. The panels seemed too small in focus on particular participants to be helpful to us
- All equally valuable. The scale of computing is quite different from my place of work, but the topics were are relevant and valuable.
- Networking with people outside of sessions
- cooling and power specific breakout because it most closely applied to my work
- Cooling, Power, Data Centers: Understanding and solving the power, cooling equation are central to the intensification of HPC/AI computing.
- Panel: Sustainability & Considerations for Power Density, simply aligns best with our own challenges.
- Cooling power Data Centers and the Sustainability for power density panels.
- Cooling, Power and Data Centers was my favorite as it covered practical examples, current practices and sufficient details to be useful without being a full design course.

6. **Were there any sessions or topics you wish had been covered?**

- How groups are navigating through these challenges with power utility operators to deliver more capacity to their facilities.
- I believe all sessions were targeted appropriately for the audience.
- People from ex-industry meetup - it would be good to know about peoples experiences who have been working in enterprise setups who then went to Academia
- Impact of funding cuts to the infrastructure of HPC's and the long term effect on research leadership for institutions
- More detailed breakdowns of migrations from one density to another density. What was required. What worked and what did not work.
- N/A
- Data Center org charts and staffing mix would have been appreciated. Workforce development - how are institutions adapting to staffing shortages and skill limitations?
- Actual results of pre/post adoption of technologies
- It would have been nice for the vendors to have some standards agreed on. A panel of different vendors to be asked "How do I use their server in your rack?" "Can I put their rack next to your rack in the data center?"
- No.
- Nothing in particular
- Given the time constraint I think there could have been more discussion or presentation for each topic on day 2.
- How we can work together to solve some of our shared challenges
- Any available case studies regarding data center retrofits. Costs, challenges etc.
- I would be interested in seeing some datacenter monitoring software demos
- Retrofitting data centers for high power density
- Design and purchasing process - how the computing and associated specialized cooling system(s) are designed and acquired given existing practices.

7. What are your key takeaways from attending this workshop?

- Need to be prepared for heavier racks on our raised floor.
- More knowledge of options around high power and cooling
- We are not alone in the increase data center demands. Some are well ahead and some are far n the early stages of planning for increasing their data center capabilities.
- Shared challenges and new connections

- As our institutions are already losing ground, the products will continue to explosively grow and create even further gaps of our capabilities against cutting edge advancements. Something will have to give.
- My people are out there, I am not alone in this world of the Datacenter. We've all experienced the same things and have dealt with the politics of academia
- Idea to prepare for what I need to prepare for what is coming for design. I am not making a new data center but what I need to keep my current one on track for tomorrow's needs.
- Density is going up. OCP is really paving the way on a number of the challenges that will be faced industry wide as we get more dense.
- How to better fit our Data Center with the increasing demands of power requirements. Also that it seemed that most facilities are actually having the same density problems that we have. It was a great way to understand everyone's mindsets.
- The industry is moving exponentially and the costs are prohibitive. Our peers are having similar experiences and facing similar challenges.
- Liquid is here to stay and DC costs to higher are challenging both cost and politically
- There is not an end in sight for the demand for power. More power means more heat. There is no way to handle this growth with current methods.
- Great workshop – right length
- Great networking and AI is going to drive new uses in DC's in ways we may not be prepared for.
- Connections with peers
- We are have similar struggles.
- Every institution is facing more or less the same challenges. Some community efforts will tremendously help all institutions.
- University data centers have even more problems then all the world's other data centers
- we are all fighting similar battles
- Understanding the data center impacts and break-points associated with HPC/AI intensification.
- Good to meet with peers and understand how we all face similar challenges, and share approaches to solving
- Lot of universities are dealing with the same funding/space/power/cooling issues which will only increase as the HPC/AI loads are becoming denser.
- Change is coming to the computing landscape!

8. **What is the most important thing you will take back to your institution?**

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- There is no slowing down. We need to plan for scaling power and cooling capabilities. We need to have an ongoing data center strategy to stay ahead of the computer demand that is ever evolving.
- Priorities for future data center changes
- Information from this session is relevant to other conversations about forming multi-institutional solutions to the genAI systems problem.
- Distributes data centers are doomed!
- That we can run everything better and more aligned and structured.
- We will need liquid cooling in some form in the near future.
- From a colo perspective. The economics of how a University or research site solves problems is going to take a lot more understanding for the universities to take advantage of the value Colo's provide. There are a number of 8hallengin cost's that the research sites do not realise or are able to obscure that makes the value proposition of using a colo hard to quantify, negating the easy ability of a university to take advantage of economies of scale. The procurement cycle of a university is going to be a challenge to overcome for a colo to be able to offer a university all the benefits a colo could provide. Higher Ed has a preference for CapEx over OpEx in stark difference from the normal colocation type customer base. The collaboration a Colo can provide is a 8hallengin benefit the universities could use a lot but the procurement paths negate that's ability and is likely resulting in Colo cost's being inflated because there is not a collaboration from the onset in the design and construction of suitable space.
- In-rack DLC (Direct Liquid Cooling) may be a better/safer option than I realized. May look into our current facility for possible upgrades for better density gains.
- The state of the industry and what's on the horizon.
- Planning and coordination is critical between enterprise IT and research IT
- We are all challenged!
- I have the proper data, contacts and examples from other institutions and vendors to articulate a strategy for future planning thanks to this workshop.
- Shared challenges
- New Relationships
- Connections to peers
- The scale of computing at universities is quite different.
- DLC experience
- Helping university datacenters will be 8hallenging
- good information about the future of chips and where things are currently headed
- Perspective building related to data center investments.
- We're not alone and should continue this collaboration.
- Networking possibilities and learning of vendor roadmaps.

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9. **Is there anything that we did not ask about that you would like to tell us?**

- Lunch Wednesday could have been better. More drink options for sure.
- It would have been great to do a lighting talk discussion on what each organization is challenged with and how they are addressing those issues.
- This is the type of workshop that does not get enough support for engineers and operators
- I greatly appreciate this opportunity to attend. I don't know that anyone from our campus had attended previously, and I believe this is a group our campus should be much more involved in than it historically has. Thank you for hosting, sponsoring, and hospitality during this event.
- I think this was great. I loved jhow open people were, and I think they would benefit from some of the Data Center industry events that focus on Design and Construction more then just leaning on a MEP firm with "experience". And nobody asked us if we would like a tour of their data center, I would love that.
- N/A
- Thank you. Well run! And comfortable opportunities for engagement.
- No
- This was very well run, and I appreciated it.
- Would encourage a full day 1 and full day 2, I think there were enough topics there to have more discussion.
- no
- Would be wonderful to get access to the slide decks that were presented at the conference.
- Thank you for the extensive work and care taken in putting together this workshop.