NWSC – Derecho High Performance Computer Installation

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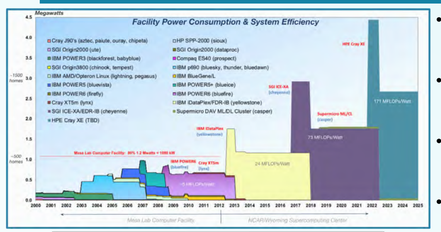
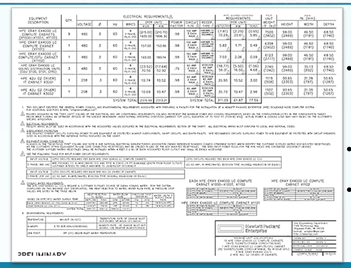
Abstract:

The NCAR - Wyoming Supercomputing Center (NWSC) in Cheyenne WY operated under the guidance of the University Corporation for Atmospheric Research (UCAR) has recently completed the installation of the Derecho High Performance Computer. The poster will cover the planning mitigation strategies used during the COVID-19 pandemic, a high-level review of the facility upgrades needed to support the large cluster, installation of the HPC system, and processes used to commission and move the system into production..

Planning

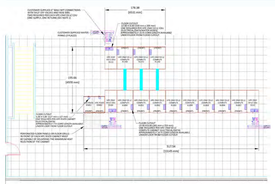


- Anticipated 4.3 MW total load during system overlap
- 2.7 MW sustained load after overlap = 30% power increase
- 171 MFLOPs/Watt= 2.3 times scientific output
- Initiated the needed Capacity Construction Project SOW

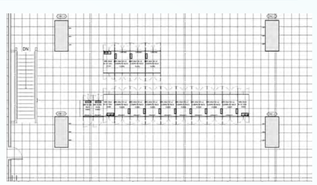


- A Machine Unit Specification (MUS) Is provided by the awarded HPC vendor
- Identified Derecho to have a 2.5MW peak
- Initiated the needed Fit-up Construction Project SOW

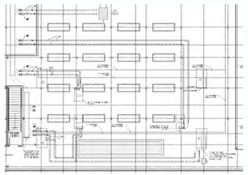
Engineering



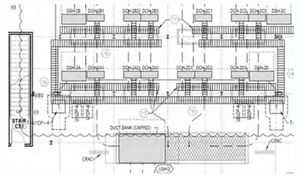
HPC Layout Drawing



System Layout with Mech Support



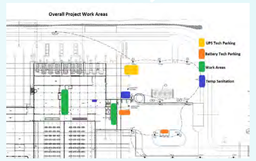
Underfloor Mechanical Configuration

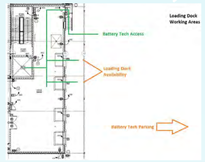


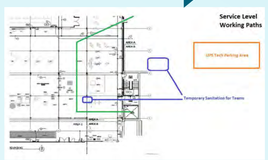
Underfloor Electrical Configuration

COVID-19 Mitigation Strategies

Risk Assessment → Parking and Site Entrance Diagram → Facility Walking path Diagrams → Sanitation Location Diagram







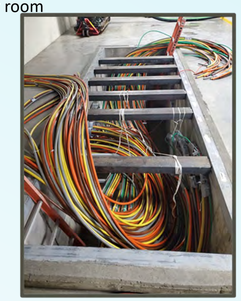
Construction Activities

Mechanical Capacity Augmentations – Module A Computer Room

- 18” 65 deg Chilled Water Piping Header
- Installation of Flow Meter, Pressure Devices, and New Control Scheme

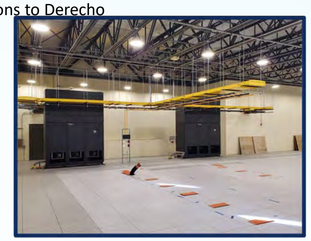
Electrical Capacity Augmentations – Module A Computer Room

- 3MW 24.9kV to 480v Transformer and Substation
- Expand UPS Source Capacities into computer room



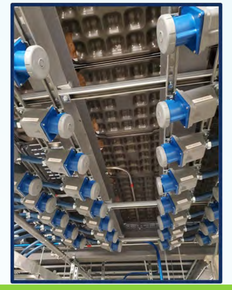
Mechanical Fit-up Augmentations – Derecho HPC

- 6” Chilled Water Branch Line Installation for Cooling Distribution Units (CDUs) and Computer Room Air Conditioners (CRACs)
- Installation of CRACs and 4” Hose connections to Derecho



Electrical Fit-up Augmentations – Derecho HPC

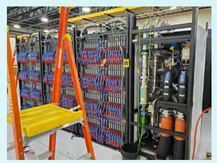
- Receptacles for Storage, CDUs, and Critical Head-end Equipment
- Fuse cabinet installation and Derecho Rack Electrical Connections



Facility Integration / Installation

Facility Integration:

- 2 MW of load banks use to stress test the new Electrical Distribution
- Bridal loops were installed between supply and return piping so flow could be verified
- Commissioning activities completed before Derecho delivery
- Current HPC uptime was maintained and verified



Installation:

- Two Deliveries
- 2 Days for equipment placement
- 8 days for mechanical and electrical connection completion
- 10 Day total install
- 20-person team

Derecho By The Numbers

System Power Requirements

*(33) 150 Amp 480v Circuits
*(6) 60 Amp 480v Circuits
*(20) 60 Amp 208v Circuits
*2.32 MW (Compute)
*60 kW (Storage)

System Cooling Requirements

*(6) 4 Inch 65 deg F Chilled Water Connections
*(8) 2 Inch 65 deg F Chilled Water Connections
*366 kBTU / HR
*650 - 800 Gallons Per Min Chilled Water Flow

Hardware Components

*5,072 CPU sockets across >2,500 nodes with 323,712 processor cores total
*332 NVIDIA A100 GPUs with 6912 CUDA cores each, 2,294,784 CUDA cores total
*>22,500 hard disks in GLADE, Campaign Storage, and Derecho Scratch
*5.565 miles of network cables

Floor Weight / Dimension Requirements

*100,467 Pounds - Derecho Compute System (within 800 sq feet)
*10,320 Pounds - Derecho Storage System (within 225 sq feet)

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