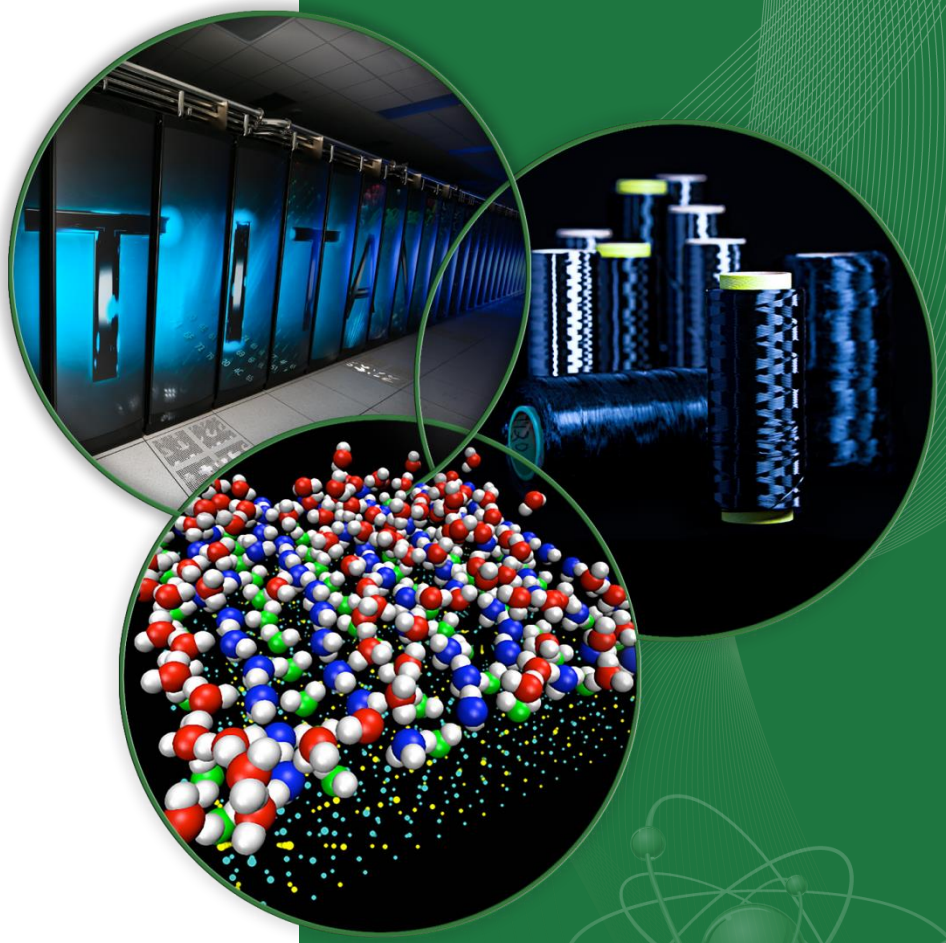
Operations at the OLCF

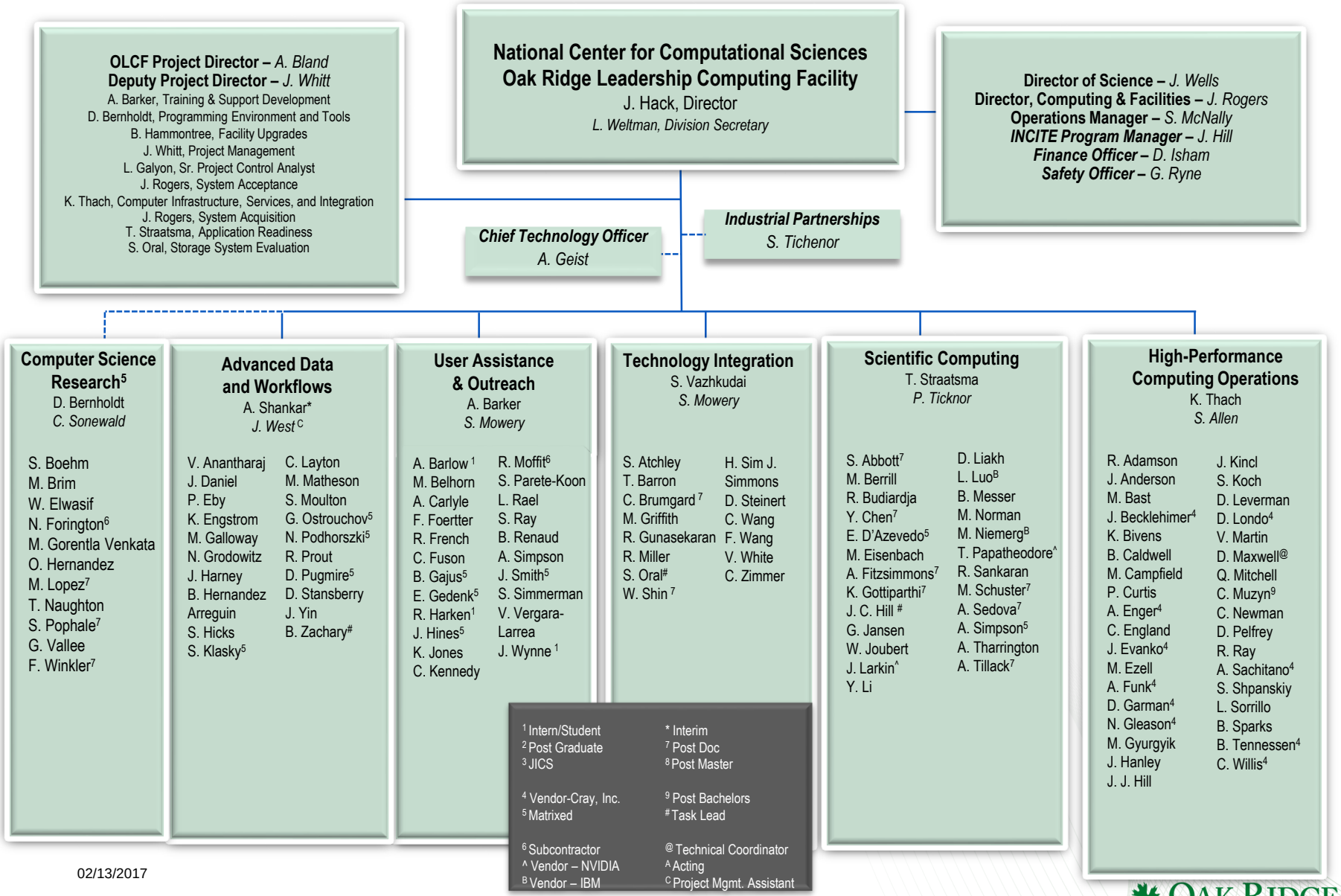


Stephen McNally
Operations Manager
National Center for Computational Sciences

March 30, 2017

ORNL is managed by UT-Battelle
for the US Department of Energy

OAK RIDGE National Laboratory



02/13/2017

OAK RIDGE National Laboratory

Resource Overview

TITAN
Cray XK7 Supercomputer

HPSS
High Performance Storage System

EVEREST
Exploratory Visualization Environment for Research in Science and Technology

COMPUTE

TITAN

A hybrid-architecture Cray XK7 system capable of 27 quadrillion calculations per second. Titan is the OLCF's flagship system for leadership-class scientific computing.

EOS

A Cray XC30 cluster composed of 736 nodes and more than 47 terabytes of memory. Eos handles small-scale jobs that prepare users for running on Titan.

STORAGE

HPSS

An archival file system consisting of disk and tape components for secure, long-term storage of scientific data.

SPIDER II

A center-wide parallel file system consisting of more than 30PB of disk space. Spider II offers high-performance data transfer and simultaneous access to the OLCF's major platforms.

VISUALIZATION & ANALYSIS

EVEREST

An analysis and visualization laboratory with 3-D capabilities for detailed visualization of simulation data.

RHEA

A 512-node data analysis cluster for scientific discovery. Rhea is dedicated to pre- and post-processing of simulation data generated on Titan.

SUPPORT SERVICES

DTN's

Data Transfer Nodes field wide-area and local-area data transfers to and from the OLCF network. In most cases, DTNs improve transfer speed and decrease the load on computing system's login and service nodes.

CADES

The Compute and Data Environment for Science is a fully integrated HPC ecosystem, offering compute and data services for ORNL researchers. Researchers can process, manage, and analyze large amounts of data using designated HPC resources, scalable storage, data analysis, and visualization tools.

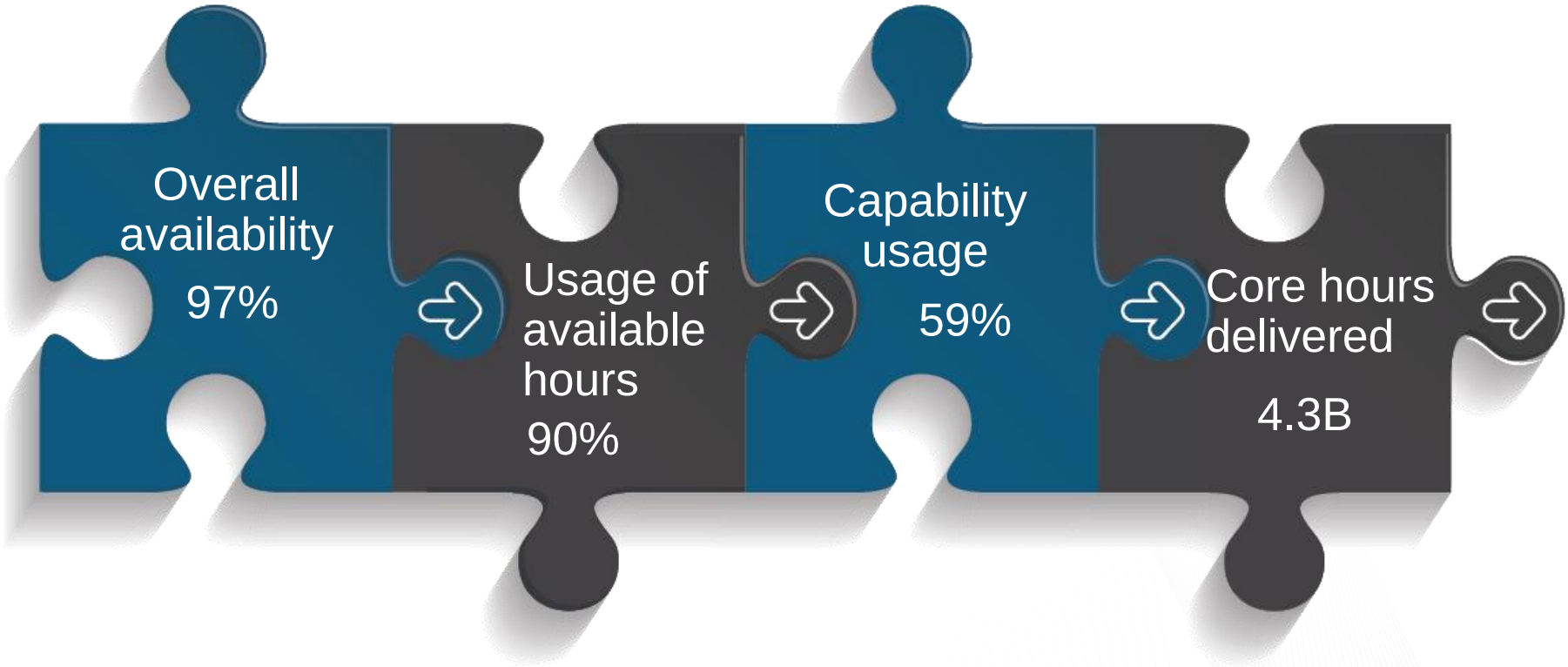
ORNL is a World Leader in HPC

- Titan – World's fastest computer in 2012
  27.1 PetaFLOPS
  (27.1 x 10^{15} calculations per second)

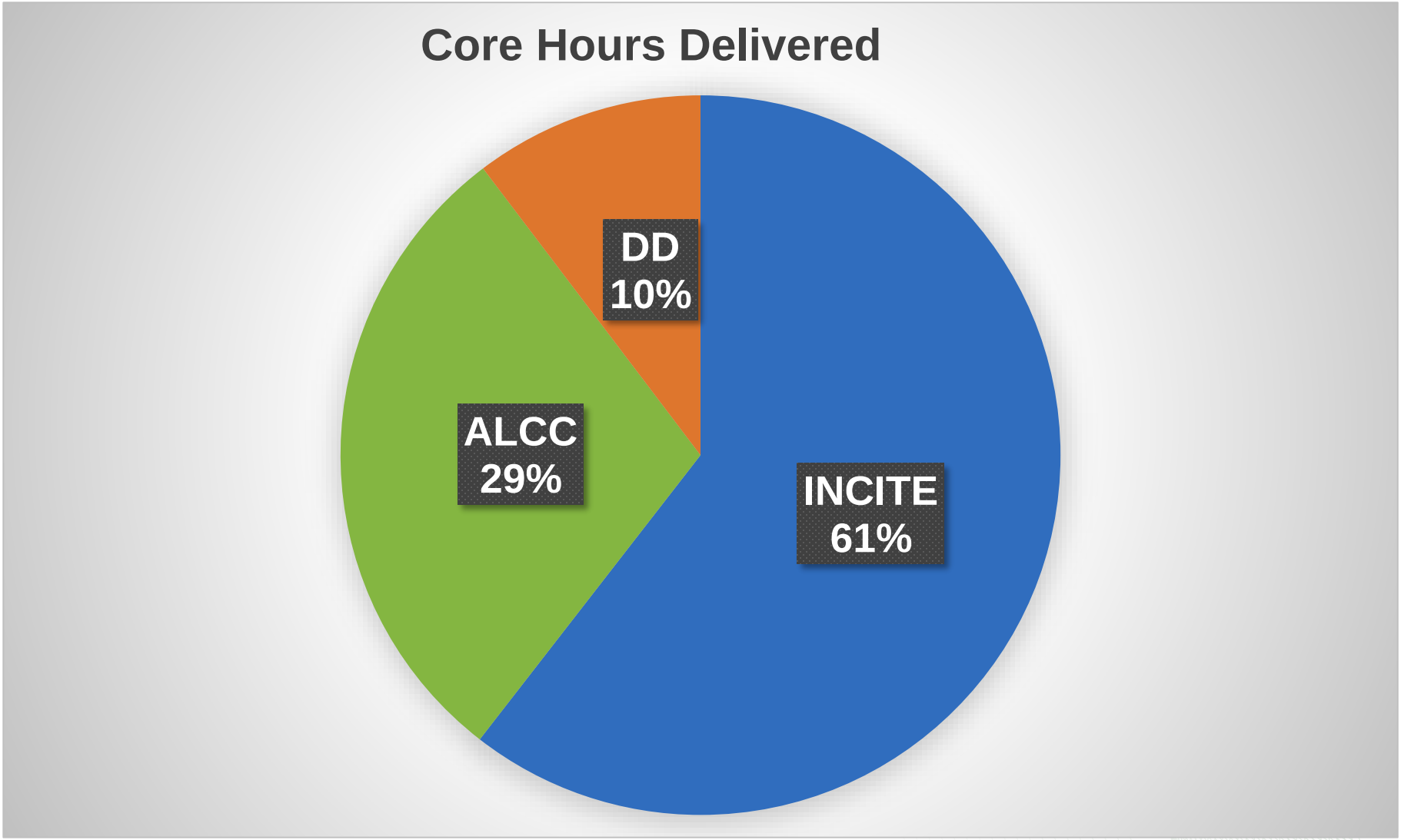
- Jaguar – World's fastest computer in 2009
  2.33 PetaFLOPS

ORNL has had a Top 10 supercomputer in every year since the Leadership Computing Facility was founded in 2005.

Titan 2016 Operational Highlights



2016 OLCF User Programs



2016 Problem Resolution Metrics of Success

2404

RESOLVED TICKETS

Percent of problems addressed in 3 business days

Target
80%

Actual
92%

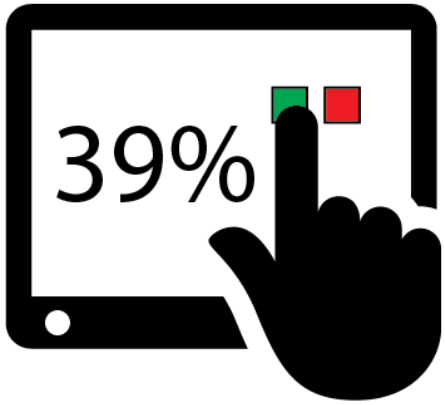
Average of problem resolution ratings

Target
3.5/5.0

Actual
4.6/5.0

2016 User Survey Results

USER SURVEY RESPONSE RATE



USER SURVEY RESULTS

Question	Mean rating
Overall satisfaction with the OLCF	4.6/5.0 ✓
Overall satisfaction with support services	4.5/5.0 ✓
Overall satisfaction with compute resources	4.5/5.0 ✓
Overall satisfaction with website	4.4/5.0 ✓
Overall satisfaction with user guides	4.4/5.0 ✓

Mean Time To Interrupt

$$MTTI = \left(\frac{time\ in\ period - (duration\ of\ scheduled\ outages + duration\ of\ unscheduled\ outages)}{number\ of\ scheduled\ outages + number\ of\ unscheduled\ outages + 1} \right)$$

	System	2015 actual	2016 actual
MTTI (h)	Titan	326.86	473.52
	Eos	476.47	661.97
	HPSS	343.40	376.33
	/atlas1	618.84	616.12
	/atlas2	481.23	718.81

Mean Time To Failure

$$MTTF = \frac{time\ in\ period - \left(duration\ of\ unscheduled\ outages\right)}{number\ of\ unscheduled\ outages + 1}$$

	System	2015 actual	2016 actual
MTTF (h)	Titan	1,088.67	1,750.73
	Eos	2,182.9	2,924.91
	HPSS	1,459.13	974.93
	/atlas1	1,456.69	1,462.79
	/atlas2	1,092.44	2,194.18

ORNL's Data Center: Designed for Efficiency

13,800 volt power into the building saves on transmission losses

480 volt power to computers saves $1M in installation costs and reduce losses

Liquid Cooling is 1,000 times more efficient than air cooling

Vapor barriers and positive air pressure keep humidity out of computer center

Variable Speed Chillers save energy

More to come: Summit will use warm water cooling to save more energy

Flywheel based UPS for highest efficiency

Questions?