NWSC Facility
Successes & Lessons Learned

Aaron Andersen

iCAS 2015

CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

NWSC Recognition

- **National and International Recognition**
  - Uptime Institute Facility Design Innovation
  - US Green Building Council LEED Gold
  - DataCenter Dynamics Green Data Center of the Year
  - ASHRAE Regional Winner, National Honorable Mention
- **Invited Talks**
  - 24x7 Exchange
  - Supercomputing Conference
  - International Supercomputing Conference
  - Uptime Symposium
- **Corporate and Collaborative Visitors**
  - Microsoft, Intel, Verizon, HP, JP Morgan
  - ECMWF, ORNL, LBNL, LLNL, NREL,
  - KISTI, DKRZ, LRZ, DWD, Australia BoM, PNNL

Computational & Information Systems Laboratory

CISL

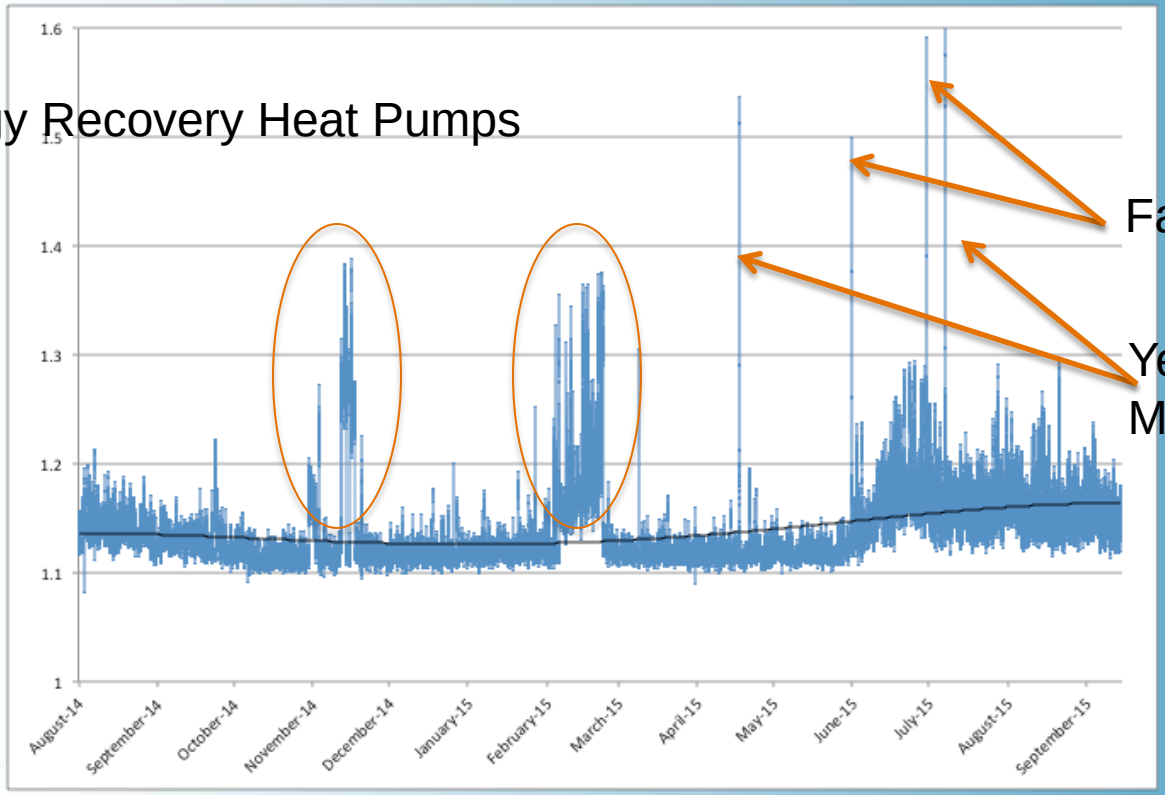
NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

NWSC is Highly Efficient

PUE

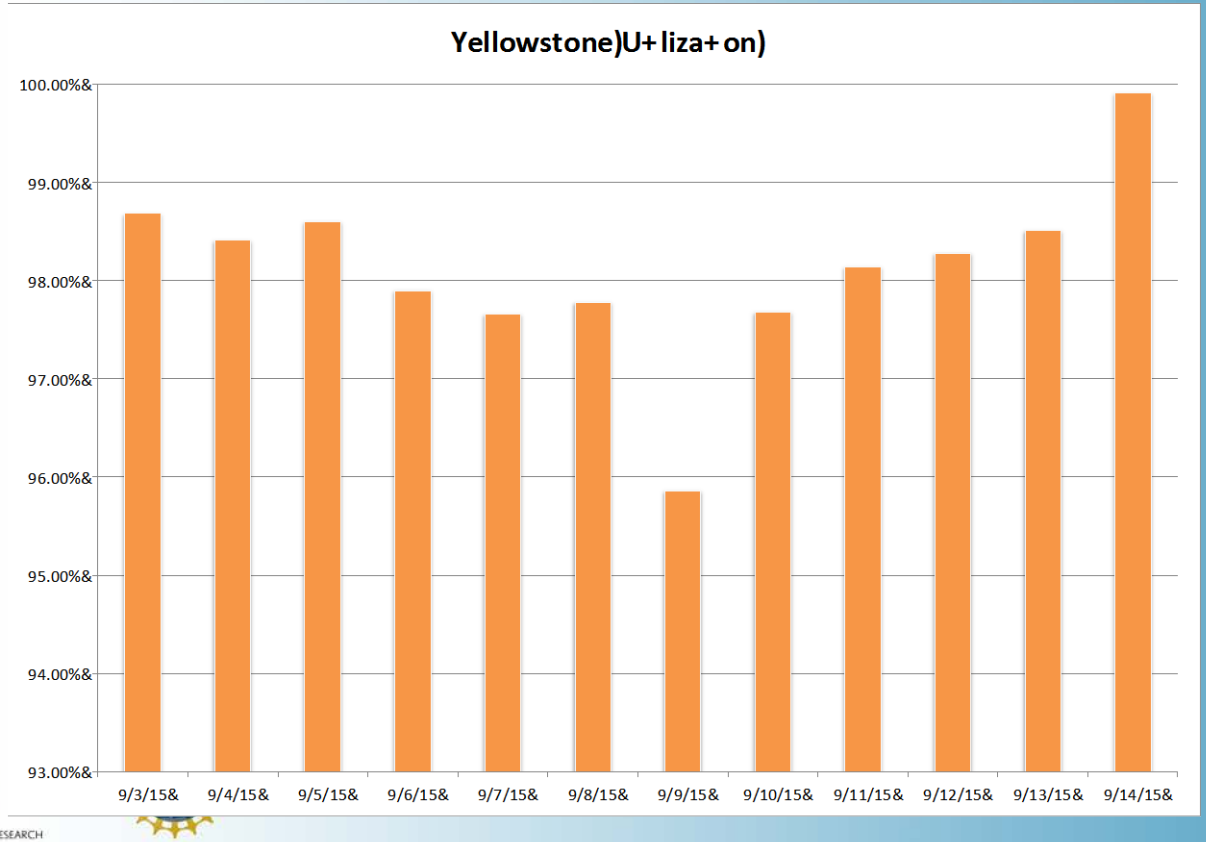
August 2014 – September 2015



CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Yellowstone is Well Utilized



CISL Computational & Information Systems Laboratory

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Facility has been Very Reliable

Year	Number of Events	Facility Uptime
2013	4 Events	99.63%
2014	3 Events	99.73%
2015	3 Events *	99.73%

* Only one event affected the entire facility all measured events did affect Yellowstone

CISL Computational & Information Systems Laboratory
NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
NSF

CISL Computational & Information Systems Laboratory

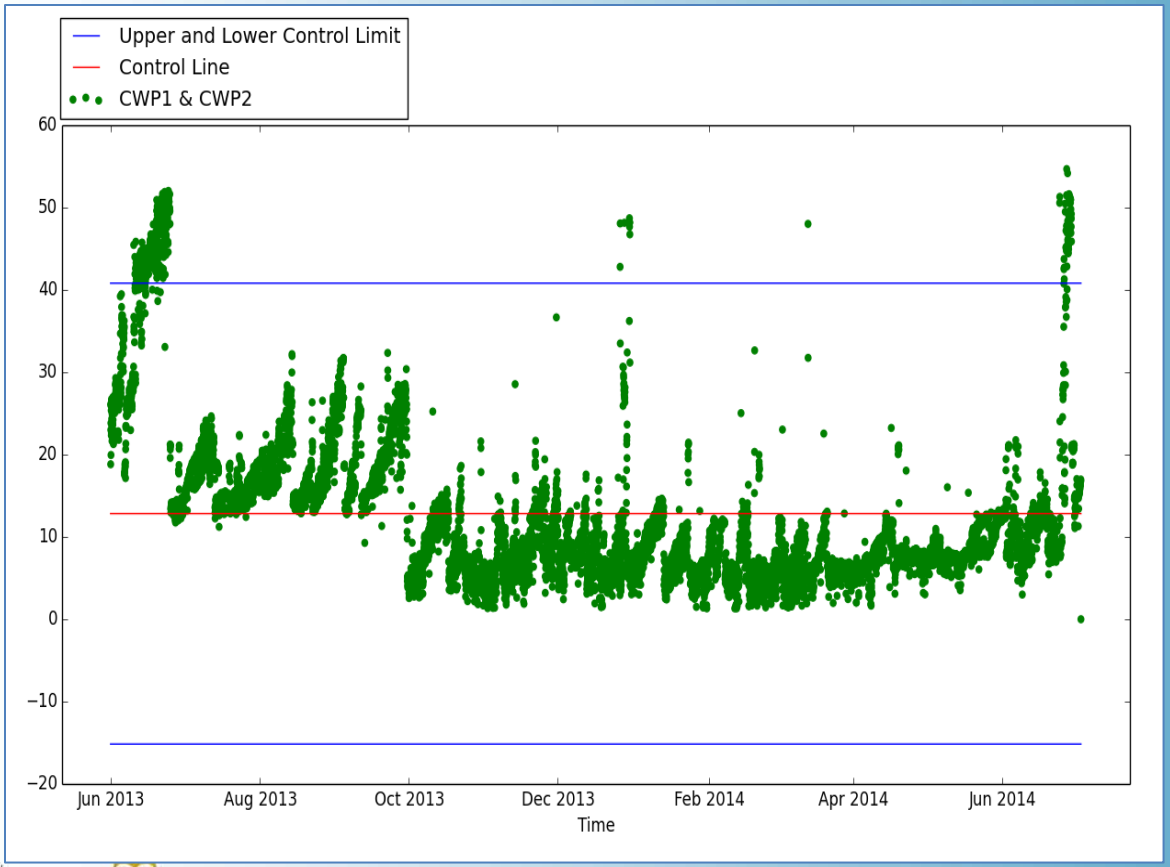
Internal Lessons Learned

Issues That We Have Some Control Over

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

Electrical Consumption Condensing Water Pump vs. Time



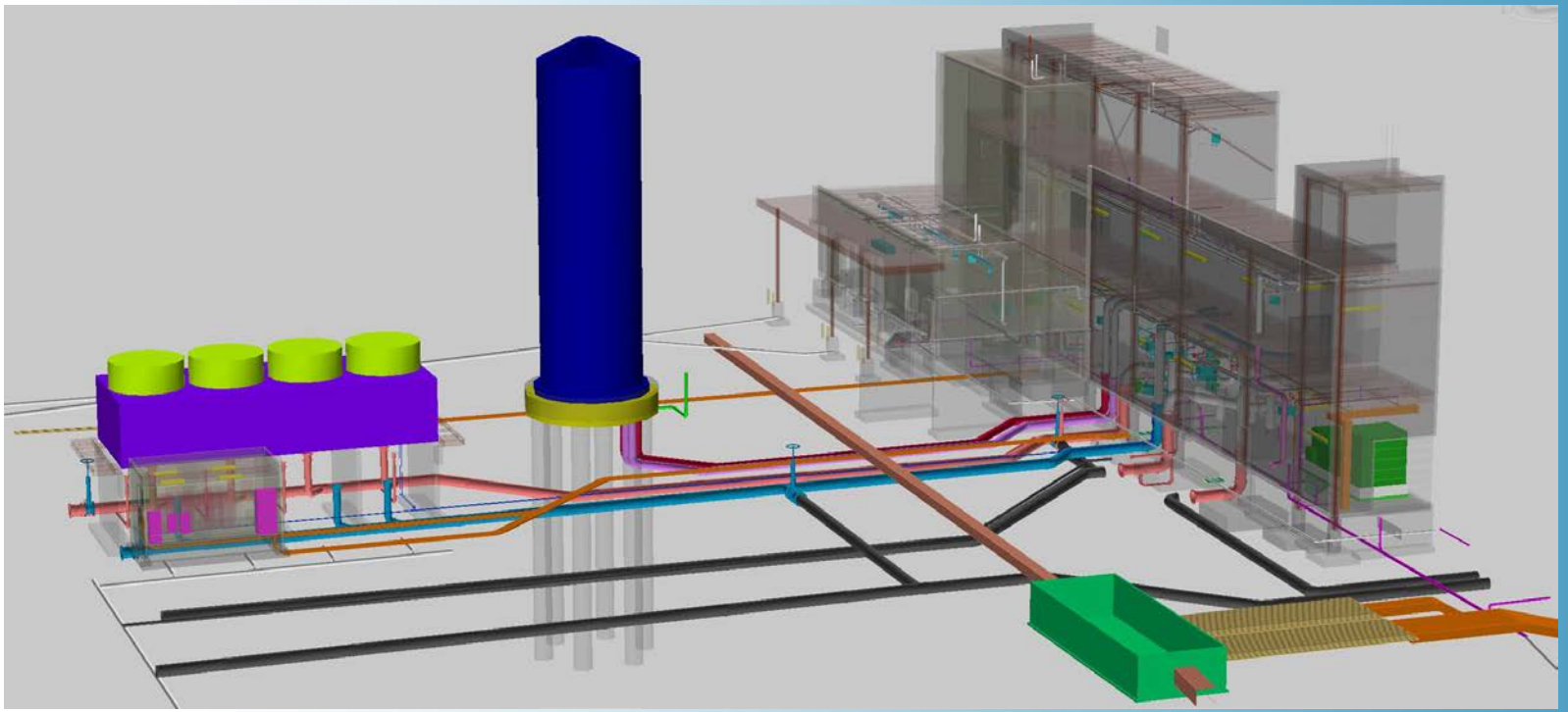
Computational & Information Systems Laboratory

CISL

NCAR

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Pipe Geometry Issues & Air Infiltration



CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

Air Infiltration

- **Design is focused on very low pressure drop and minimizing both drag and pump energy**
- **Green Filtration System**
- **Problem - too much of a good thing**
  - Air bubbles absorbed easily in cooling towers
  - Minimal height difference between tower and pump
  - Filter system requires service roughly 4~7 days
- **Solution**
  - Refill & bleed process when cleaning filters

CISL Computational & Information Systems Laboratory
NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
NSF

Fire Alarm System

- **Required to have two fire alarm tests per year**
- **Must exercise the alarm system proving that it is working correctly**
- **Problem – Emergency Power Off**
  - Test Sequence
  - Method of Procedure
  - Infrequency of testing
- **Solution**
  - Added Two Person MOP Walkthrough
  - Added a physical “keyed” EPO bypass switch

CISL Computational & Information Systems Laboratory
NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
NSF

CISL Computational & Information Systems Laboratory

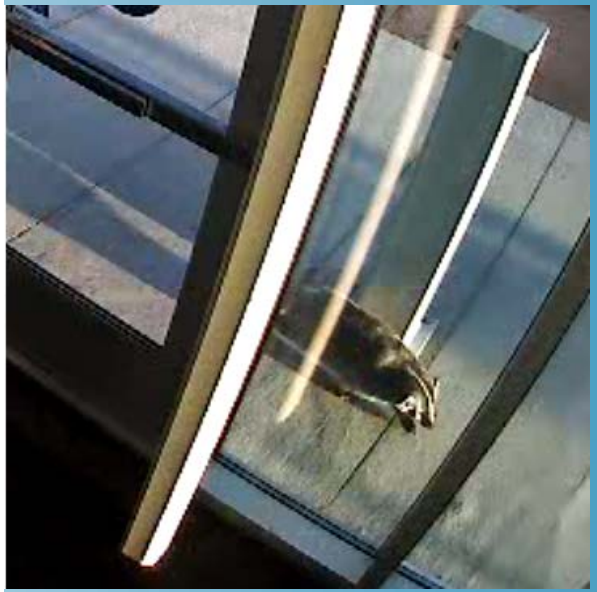
External Lessons Learned

Issues That We Wave Little Control Over

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

Invasions of the Animal Kind



CISL Computational & Information Systems Laboratory
NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Why This is Significant

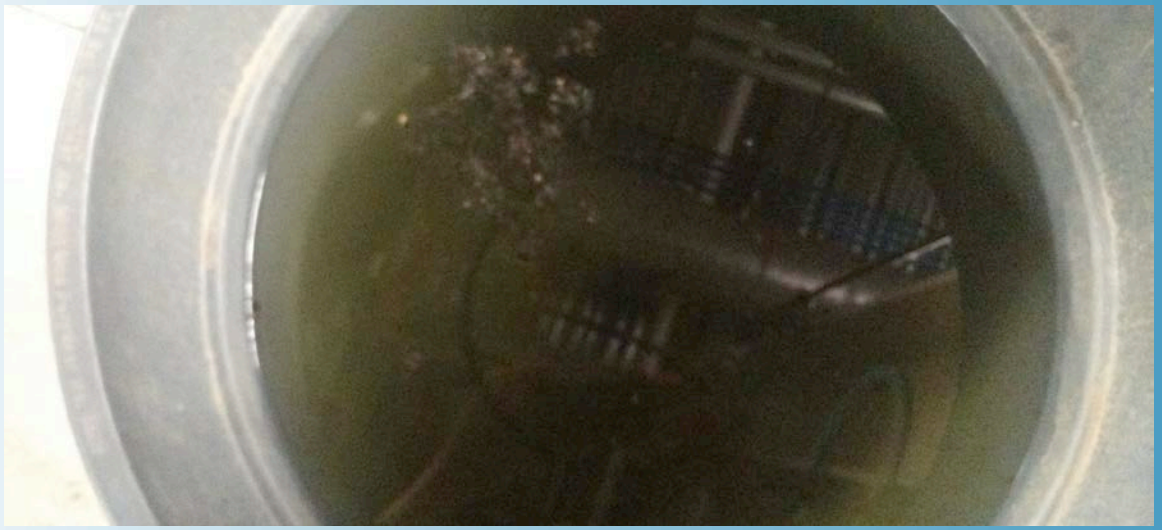
CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

Facilities Can Have Bugs Just Like Software

Miller Moth (Army Cutworms) & Strainer



CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

Impacts from Weather

CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

There is a Little Wind at Times

CISL Computational & Information Systems Laboratory

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF

Three Victims

Questions ?

CISL Computational & Information Systems Laboratory

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NSF