IUB PHYSICAL PLANT
CATS

July 20, 2011
Electricity Load Mgt – Understanding IU’s Main Electric Bill

- More than ½ (52%) of IU’s electric bill is based on peak usage, 48% is based on total usage
- Peak Penalty costs $17.99 per kWh

% of Total Electric Bill

- Total Usage: 48%
- Peak Demand: 52%
Trends – Electricity

Electric rates have increased more than 74% from period FY03-04 to projected current FY.

In the current FY the campus is serving electricity to over 1 million more square feet more space than in FY 08-09.
The combination of all of these factors yields an increase in the total cost of electricity to IUB of 125% in less than 10 years. A continuation of current trends will result in electricity costs of $49,635,763 by 2020.
Jeff Honaker – Duke Energy
Doug Trueblood – IU Control Center
Control Center Activities

1. **Peak Load Shed** – attempts to minimize the peak demand of a billing period

2. **Chilled Water Reallocation** – attempts to reallocate chilled water to meet basic needs with available capacity
Peak Load Shed

- **Peak load shed**
  - Greatest opportunity during months where there is a period of unseasonably warm weather (non-cooling months especially)
  - 4,000 kW peak can cost upwards of $75,000 on a single month’s bill
  - When peaks in temperature/humidity combinations clearly exceed the average for the month (as was the case in January and February 2011) IU’s ability to manage electric loads during those peaks will have a substantial impact on peak demand, and consequently the bill

In the summer there is not as much difference between peak and non peak days

Jan '11 Dew point Chart

Feb '11 Dew point chart
Peak Load Shed

• Establish a target for the peak for the month
  – Look at same billing period over past two years and average the peak from those two years
  – Set a target of 2,000 kW below that average then start working to manage peak at 4,000 to 5,000 below the average

• Manage the Peak
  – Watch the weather forecast to anticipate demand
  – If demand is 4,000 to 4,500 below the previous average, do nothing
  – Nearing the target peak –
    1. Shut off re-heat systems on various facilities
    2. Begin to lower differential pressure set point on Central Chilled Water Plant (CCHP) until the building pumps begin to come on
    3. Back off chillers where possible (e.g. facilities with multiple chillers)
    4. Execute some Chilled Water reallocation steps

Building Systems weather page
http://electron.electronics.indiana.edu/weather/
To All:

Due to high electrical usage, we are asking for help from the Building Representatives and Building Services in turning off unused lights, computer monitors, printers, etc. today, Monday XX/XX/XX, and tomorrow, Tuesday XX/XX/XX; (especially between the hours of 11am and 5pm) and again before leaving for the day.

We will be coming close to establishing a new electrical peak demand and ask for your cooperation in our peak electrical demand shaving efforts towards energy efficiency, conservation, and savings.

Your assistance during this situation is greatly appreciated.

Thank you,
Doug Trueblood
Physical Plant
Chilled Water Reallocation

• Design day – Building system is designed to handle up to the load of a design day (up to dew point of 78 and temp 95 degrees)

• If we do nothing on a design day, because of the hydraulics of our chilled water system, some buildings will get chilled water and some get nothing at all

• Goal of chilled water reallocation is to keep all as comfortable as possible

• Buildings are grouped and prioritized
  – Some would experience research and equipment damage if temperature and humidity are not maintained
  – Of the building groups that can scale back, they alternate in the level of chilled water they receive
  – Leading supply water temperature indicates when we are exceeding capacity at CCWP
# COMMON CHILLED WATER PLANT

<table>
<thead>
<tr>
<th>FOR: 411 CENTRAL CHILLED WATER PLANT</th>
<th>OAT411 OUTDOOR AIR</th>
<th>61.38 DEG F</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS411 COMMON CHW SUPPLY</td>
<td>OAH411 OUTDOOR HUMIDITY</td>
<td>91.33 PCT RH</td>
</tr>
<tr>
<td>CLR411 COMMON CHW RETURN</td>
<td>ODP411 OUTDOOR DEW POINT</td>
<td>57.43 DEG F</td>
</tr>
<tr>
<td>CCR411 COMMON CHL R RETURN</td>
<td>LSP411 COMMON SUP PRESS</td>
<td>39.85 PSIG</td>
</tr>
<tr>
<td>NCR411 NORTH CHW RETURN</td>
<td>LRP411 COMMON RET PRESS</td>
<td>28.17 PSIG</td>
</tr>
<tr>
<td>SCR411 SOUTH CHW RETURN</td>
<td>LDP411 COMMON DIFF PRESS</td>
<td>12.18 PSIG</td>
</tr>
</tbody>
</table>

| RDP411 REMOTE DIFF PRESS             | 3.85 PSID |
| BPF411 BYP RET TO SUP FLOW           | -918 GPM |
| SP1411 SYSTEM PUMP 1                 | ON |
| SS1411 SYSTEM PUMP 1 SPEED           | 68.61 PERCNT |
| SA1411 SYSTEM PUMP 1 FAULT           | NORMAL |
| SP5411 SYSTEM PUMP 5                 | ON |
| SS5411 SYSTEM PUMP 5 SPEED           | 68.61 PERCNT |
| SA5411 SYSTEM PUMP 5 FAULT           | NORMAL |

| CL1411 CH1 LOAD 85 PERCENT           | CE1411 CH1 ENABLE | ENABLE |
| CL2411 CH2 LOAD 0 PERCENT            | CE2411 CH2 ENABLE | DISABLE |
| CL3411 CH3 LOAD 0 PERCENT            | CE3411 CH3 ENABLE | DISABLE |
| CL4411 CH4 LOAD 0 PERCENT            | CE4411 CH4 ENABLE | DISABLE |
| CL5411 CH5 LOAD 0 PERCENT            | CE5411 CH5 ENABLE | DISABLE |
| CL6411 CH6 LOAD 88 PERCENT           | CE6411 CH6 ENABLE | ENABLE |
| CL7411 CH7 LOAD 72 PERCENT           | CE7411 CH7 ENABLE | ENABLE |
| CL8411 CH8 LOAD 77 PERCENT           | CH8411 CH8 STATUS | ON |

<table>
<thead>
<tr>
<th>MAIN MENU</th>
<th>CHW PLANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOWER 1</td>
<td>TOWER 2</td>
</tr>
</tbody>
</table>

| SP2411 SYSTEM PUMP 2                 | OFF |
| SS2411 SYSTEM PUMP 2 SPEED           | 20.00 PERCNT |
| SA2411 SYSTEM PUMP 2 FAULT           | NORMAL |
| SP3411 SYSTEM PUMP 3                 | OFF |
| SP4411 SYSTEM PUMP 4                 | OFF |

| CS1411 CH1 SUPPLY | 39.41 DEG F | TO CH1 |
| CS2411 CH2 SUPPLY | 52.94 DEG F | TO CH2 |
| CS3411 CH3 SUPPLY | 63.39 DEG F | TO CH3 |
| CS4411 CH4 SUPPLY | 60.55 DEG F | TO CH4 |
| CS5411 CH5 SUPPLY | 42.52 DEG F | TO CH5 |
| CS6411 CH6 SUPPLY | 39.94 DEG F | TO CH6 |
| CS7411 CH7 SUPPLY | 39.85 DEG F | TO CH7 |
| CS8411 CH8 SUPPLY | 39.94 DEG F | TO CH8 |
E-mail Used When Reallocating Chilled Water

To All:

Today, Monday XX/XX/XX, and tomorrow, Tuesday XX/XX/XX; due to anticipated excessive heat, humidity, and dew-point, our cooling capacity at the Central Chilled Water Plant will likely be exceeded. To try and obtain comfort for facilities and staff served by the Campus Chilled Water Loop, we need to curtail chilled water to facilities on the Campus Chilled Water Loop for hopefully no longer than 1 hour, followed by 2 hours of normal availability; and repeated as necessary.

Your assistance during this situation is greatly appreciated.

Thank you,
Doug Trueblood
Physical Plant
Dennis Cromwell
Go Green Gadget & Reporting
Service Goals

- Change behaviors
- Make progress visible
- Leverage the technology and talent we have to develop creative solutions
- Save big money with incremental change
Making It Personal

• Bring the information to the desktop by way of GoGreen Gadget

• Communicate what we’re doing
How do we do it?

- IT Staff
  Do maintenance during the day
  It’s OK to turn off the computers
  - It doesn’t reduce the life of the computer
  - It’s not all the inconvenient for us

- End Users
  It’s OK to turn off computers
  - You can get to your computer if needed
Current Status

• GoGreen Gadget
  – XP, Vista, Windows 7 desktop

• New Wake On LAN service
  – Centrally hosted
  – Allow “magic packet” to flow throughout the IU network
Server Virtualization
Examples of Services

Overview

IU Intelligent Infrastructure (IUII) is a suite of services provided by the University Information Technology Services (IITS) Enterprise Infrastructure Division. It offers you remote access to the same high-performance and high-availability hardware and security devices IITS uses to deliver mission-critical university applications and services.

A strategic, reusable infrastructure such as IUII provides tremendous value. It secures substantial cost benefits and allows for continuous innovation, refinement, and adaptation for evolving operational needs.

There are two principle components to the Intelligent Infrastructure service package – you pay only for what you need now and adjust your service levels as your needs change.

- **Virtual systems** supply the infrastructure and network capacity necessary to host your applications, while optional disk storage on IITS enterprise-class SANs (storage area networks) ensures your files are extremely secure and always available.

- **Backup solutions** provide cross-site backups and cross-campus failover options, which isolate you from potential disasters by hosting your applications within hardened data centers.

This service model reduces hardware and maintenance expenses, frees up space, and prevents you from over- or under-committing based on future hardware and backup predictions.

You can start with a single virtual machine or simply with backups, then add disk storage or additional system resources when you’re ready. In any case, you get the security and reliability of a IITS-hosted computing environment, and you maintain full control of your operating system.

SaaS

IaaS

SaaS