



# GREEN COMPUTING

a cosn leadership initiative

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# Yes, We Care



U.S consumes 25% of world's energy

- Computer infrastructure accounts for 1.5% and growing
- E-Waste is becoming a major problem

Political, ethical and financial imperative for schools

- Set an example for students and the community



Think Globally



Act Locally



# Green Computing Defined



## Three areas of focus

### Purchase/Disposal

- Responsible computer purchase and disposal considerations

### Energy use

- Energy use and efficient approaches to computing

### Reducing waste

- Using computers to reduce the use of natural resources



# Purchase/Disposal



## Buy Green

- Minimal toxic content: [The Center for Clean Products and Clean Technologies](#)
- Energy saving features: [Energy Star](#)
- Check out your vendor: [EPEAT](#) (Electronic Product Environmental Assessment Tool)
  - [Green Electronics Council](#) selected by EPA as certification agency
  - Computer manufacturers submit products for independent evaluation





# Purchase/Disposal



## Responsible Disposal

- Vendor programs
  - Major vendors have programs and trade-ins
  - Consider lease
- Independent recycling programs
  - Got stuff with no vendor program?
- Responsible donations
  - If it still runs and has some life left, donate it



# Purchase/Disposal



## Getting Started

- When Purchasing:
  - Check EPEAT rating (if available)
  - Energy Star only (ability to standby and hibernate)
  - Contract for eventual disposal
  - Don't become an e-waste site for someone else
  - Minimize packaging & documentation copies for bulk purchases
- Disposal
  - Investigate and set up responsible vendor or independent disposal program
  - Donate good working computers and related equipment



# Purchase/Disposal



## References

- **Carnegie Mellon University**  
<http://www.ce.cmu.edu/GreenDesign/comprec/newreport.pdf>  
“Disposition and End-of-Life Options for Personal Computers” White Paper
- **EPEAT:** <http://www.epeat.net/>
- **EPA ENERGY STAR®:**  
[http://www.energystar.gov/index.cfm?c=prod\\_development.server\\_efficiency](http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency)
- **EPA e-cycling:** <http://www.epa.gov/epaoswer/hazwaste/recycle/ecycling/index.htm>
- **Technology Recycling Group (TRG):**  
<http://www.recyclegroup.net/5must4should.pdf>  
Disposing of Old Technology: Five “Musts” and Four “Shoulds”
- **TIA – E-Cycling Central:**  
<http://www.eiae.org/>  
Interactive map with locations and contact information for e-recyclers in every state.



# Energy Use



## Save Money and Our Environment

- Measure, adjust, measure again
  - CoSN Energy Use Calculator
- Energy Certificates
- Turn them off
- Energy efficient purchase strategy
- Datacenter costs
- Virtualization



# Energy Use



## Measure, Adjust, Measure Again -Track Progress

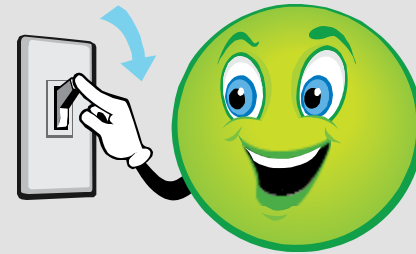
- Transfer a piece of savings to IT budget?
- Potential for Energy Efficiency Certificates
  - Check with your power utility or World Resources Institute: <http://www.wri.org/publication/>
  - [Neuwing Energy LLC](#) , and [Sterling Planet, Inc.](#)
- Measurement Tools
  - CoSN Energy Use Calculator
  - Network-based energy measurement and management tools



# Energy Use



## Turn Them Off



- A matter of discipline
  - Turn off power supply or power strip if possible
  - Encourage users to enable and use the existing power-management capabilities of their PCs
- Take control with management software
  - Have the IT department develop and deploy logon scripts that control power-management settings
  - Software to establish and implement a computer power-management policy locally or across the school LAN



# Energy Use



## Energy Efficient Purchase Strategy

- Energy Star® with standby/hibernate modes
  - Low power processors
- LCD vs. CRT displays
  - 30 vs. 80 watts
- Printers with power saving & duplex features
  - Standby mode
  - User training/discipline for duplex
- Storage purchase decisions
  - Fewer and larger

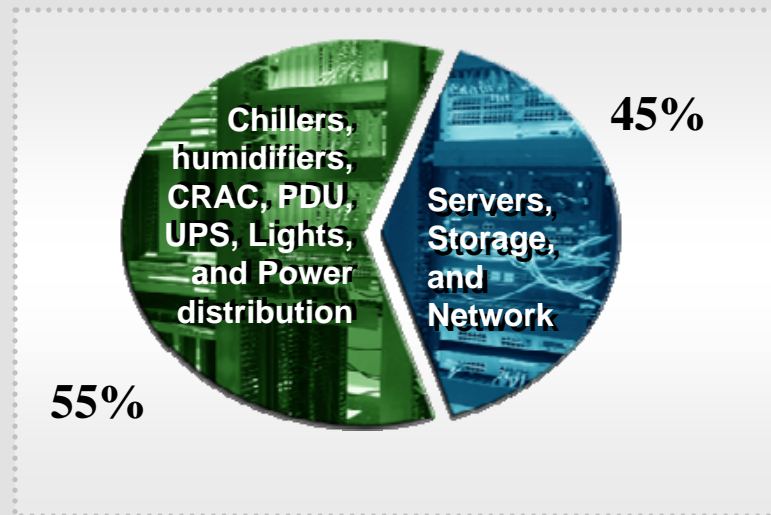


# Energy Use



## Datacenter Energy Use

- Servers, network gear, storage
  - Fewer larger, more powerful boxes



Datacenters consume 10 to 100 times more energy per square foot than typical office/classroom space

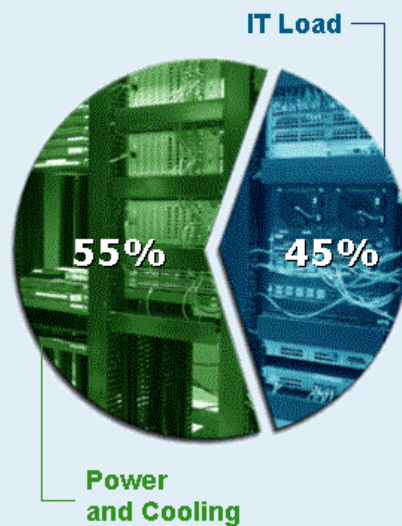


# Energy Use

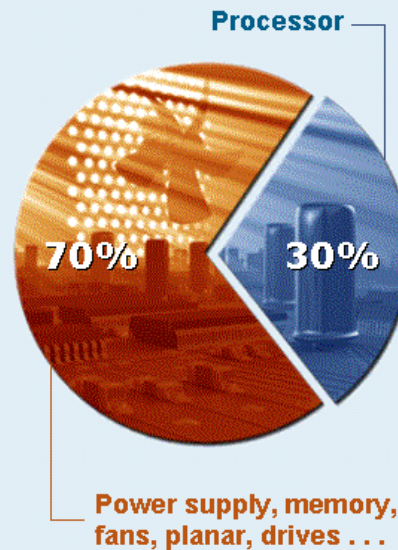


## How is Energy Used in a Data Center?

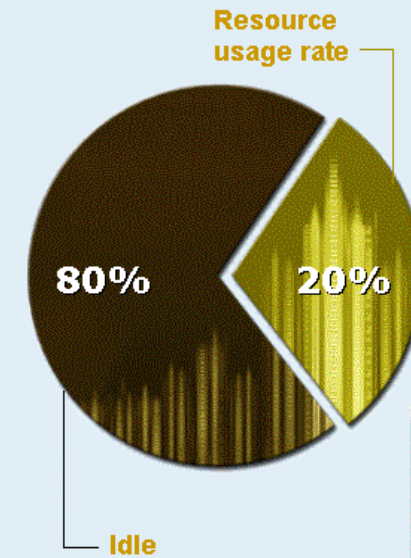
### Data center



### IT Resources



### Utilization

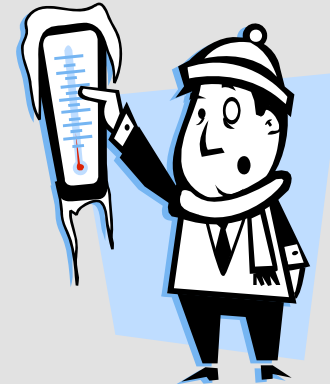


# Energy Use



## Datacenter Strategies

- HVAC
  - Hot/cold isles – focus cooling
  - Remove obstructions to air flow
  - Use outside air
  - Cool from above
  - Seal datacenter or server room
  - Too cool? Measure and adjust, focusing on hot spots
- HVAC and power supply efficiency
- Server consolidation and virtualization

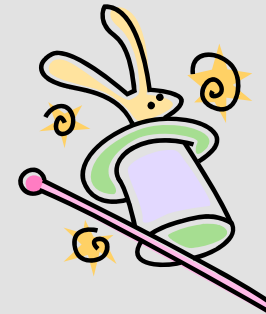


# Energy Use



## Virtualization

- Datacenter server consolidation and virtualization
  - 2x leverage
  - Hypervisor overhead cuts some of advantage
- Desktop and software virtualization
  - Server resident applications
  - Thin client
  - Desktop consolidation



# Energy Use



## Getting Started

- Get a baseline measurement/estimate of power consumption
  - Measure, implement and measure again
  - [CoSN Energy Usage Calculator](#)
- Implement computer, storage, printer purchase policy
- Set user power down policy and set standby/hibernate parameters
- Develop consolidation/virtualization plan
- Look into energy certificates



# Energy Use



## Resources

- **EdTech magazine - Save Green by Going Green**  
[http://www.edtechmag.com/k12/index2.php?option=com\\_content&task=view&id=625&p...](http://www.edtechmag.com/k12/index2.php?option=com_content&task=view&id=625&p...)  
Mini school district case studies
- **The Potential for Energy Savings Certificates (ESC) as a Major Tool in Greenhouse Gas Reduction Programs - White Paper**  
[http://www.resource-solutions.org/lib/librarypdfs/Draft\\_Report\\_ESC\\_V12\\_cleanFINAL\\_5-24-07.pdf](http://www.resource-solutions.org/lib/librarypdfs/Draft_Report_ESC_V12_cleanFINAL_5-24-07.pdf)
- **EPA ENERGY STAR®**  
[http://www.energystar.gov/index.cfm?c=prod\\_development.server\\_efficiency](http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency)  
EPA is working with interested parties to identify ways in which energy efficiency can be measured, documented, and implemented
- **CIO Asia - 10 ways to make your data center more efficient**  
<http://www.cio-asia.com/showpage.aspx?pagetype=2&articleid=7699&issueid=129>  
Practical guide for building new, or just reorganizing your datacenter ( server room)
- **Virtualization: Energy Efficiency vs Energy Sustainability**  
<http://voidreflections.blogspot.com/2008/07/virtualization-friend-or-foe-or-how-to.html>



# Reduce Waste



## Use of computer technology to reduce waste

- Measuring and controlling building energy use
- Save paper and ink
  - Duplex printing and copying
  - Electronic communications
  - Digital text books
- Save travel with online meetings, classes and centralized network management
  - Virtual field trips
  - Student registration



# Reduce Waste



## Getting Started

- Develop a printer/copier purchase and use policy
  - Evaluate what is being printed and on-line electronic communications options
  - Duplex printing where possible
- Work with facilities on ways to measure and manage building environmental controls
- Investigate video conferencing for meetings and virtual field trips
- Investigate streaming video for virtual field trips
- Consider centralized management tools for remote user support
- Investigate online registration and learning to reduce student travel



# Reduce Waste



## Resources

- **e-School News – Surviving Soaring Energy Costs**  
<http://www.eschoolnews.com/news/top-news/index.cfm?i=36617&page=1>  
Approaches schools can take as energy costs increase
- **eSchoolNews – Virtual Field Trips**  
[http://www.eschoolnews.com/news/top-news/?i=54518;\\_hbguid=2701c8c3-1e61-4fbe-a9a2-f7c4eb6df200](http://www.eschoolnews.com/news/top-news/?i=54518;_hbguid=2701c8c3-1e61-4fbe-a9a2-f7c4eb6df200)
- **Education World - Get Outta Class With Virtual Field Trips**  
[http://www.educationworld.com/a\\_tech/tech/tech071.shtml](http://www.educationworld.com/a_tech/tech/tech071.shtml)
- **Web-based Student/Home Communications Solutions**
  - Windsor Unified School District, <http://www.wusd.org/>
  - Poway USD, <https://www.learningpoint.org/webapps/portal/frameset.jsp>





“Hey, it **is** easy  
being green!”

*Kermit*

- CoSN-EPEAT Green Computing Certification
- Submit your case study brief

[www.cosn.org/greencomputing](http://www.cosn.org/greencomputing)



# Discussion



What are you doing to go green?

What more should CoSN do?

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CoSN: [www.cosn.org](http://www.cosn.org)

Green Computing:  
[www.cosn.org/greencomputing](http://www.cosn.org/greencomputing)



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