

# CEE Data Centers Committee: Addressing IT Energy Use in Data Centers

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CEE Program Meeting  
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Figure 1 The National Energy Research Scientific Computing Center (NERSC) operated by LBNL

# Agenda

- Introduction
- Overview of the Data Center Opportunity & Activities
- Program Experiences to Date
  - Austin Energy's Data Center Efficiency Rebate Program, Michelle Noriega
  - BC Hydro's Data Centers Program, David Rogers
- Discussion on Current Program Approaches, Challenges & Collective Actions

# Session Objectives

- To understand and discuss emerging data center program approaches
- To identify and understand program considerations and challenges to offering program incentives for data center IT projects
- To identify and discuss program information needs and collective strategies that will help further program efforts to address energy consumption in data centers

# Data Center Energy Efficiency Opportunities

- Data centers are energy intensive facilities
  - Server racks now designed to carry 25 kW load
  - Surging demand for data storage
  - Typical facility ~ 1MW, can be > 20 MW
  - Nationally 1.5% of U.S. Electricity consumption in 2006, growing
- Recent research shows DC energy consumption growing 20-30% annually in 2006 and 2007
  - Exceeds EPA's prediction of 9% growth from 2006 to 2010

*Sources: EPA Report to Congress (2007); Uptime Institute growth estimate (2008)*



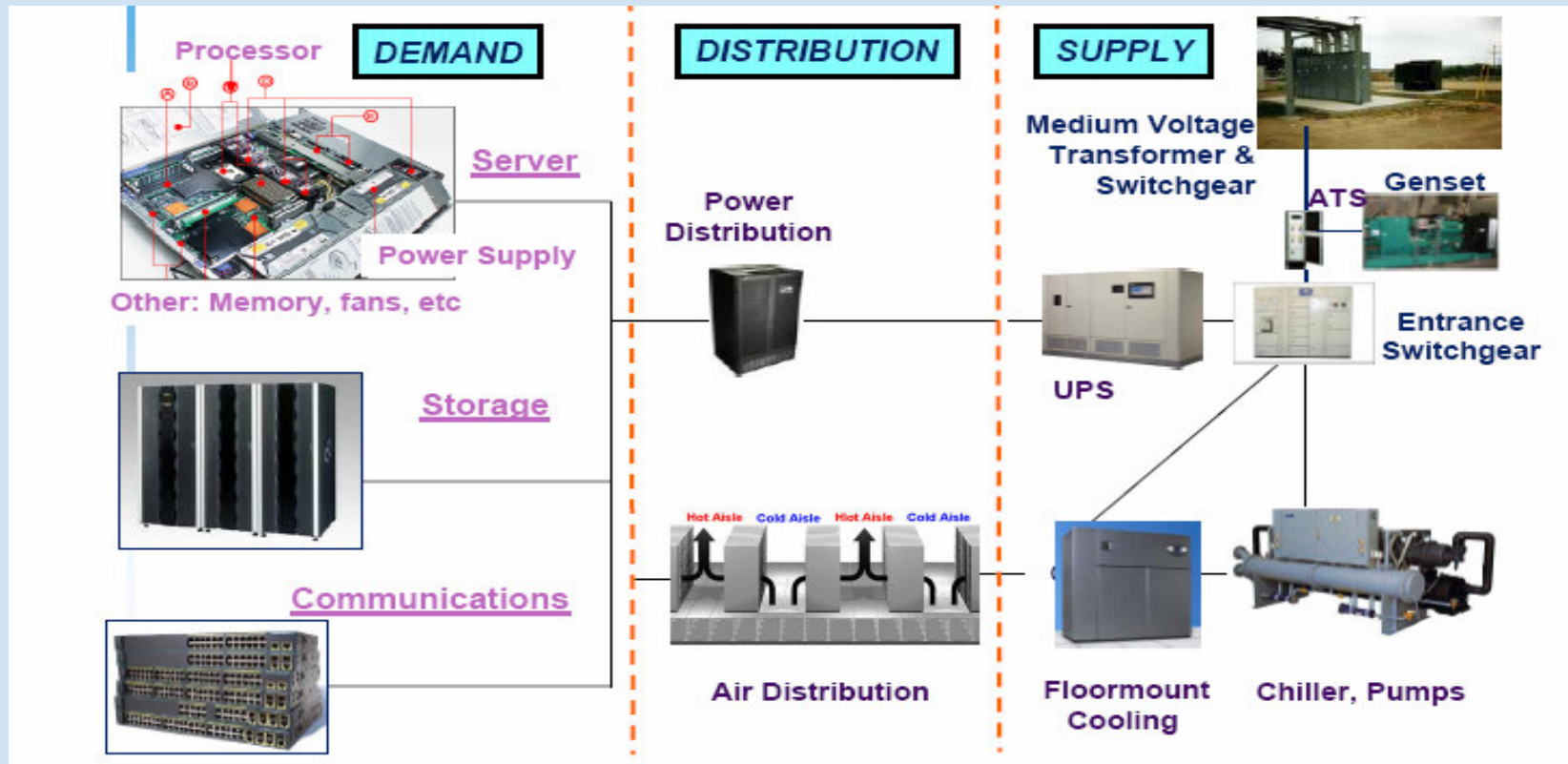
**Working Together, Advancing Efficiency**

# Data Center Energy Efficiency Opportunities

IT: 30-50%

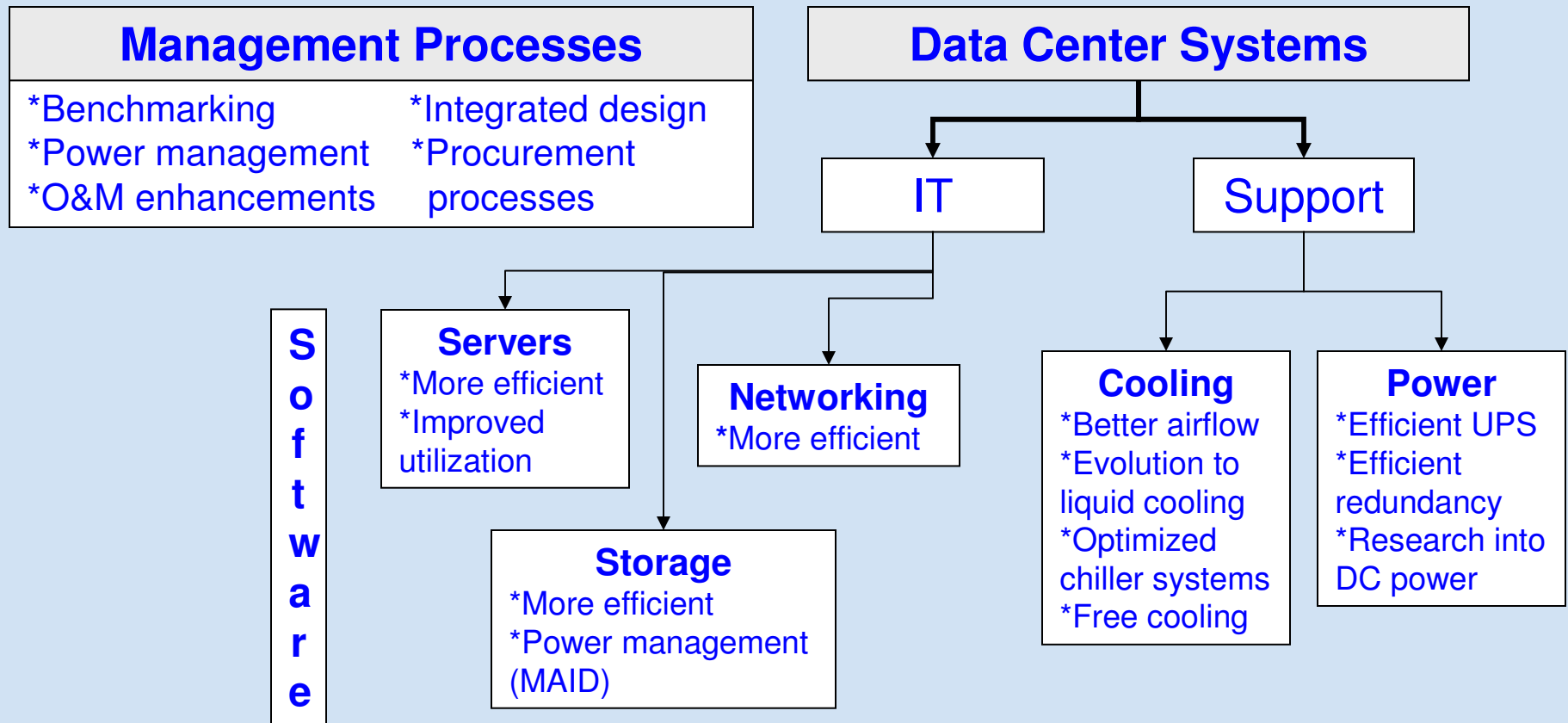
Cooling: 25-30%

E. Distribution: 25-30%



Source: Emerson Network Power, Data Center Users Group 2007

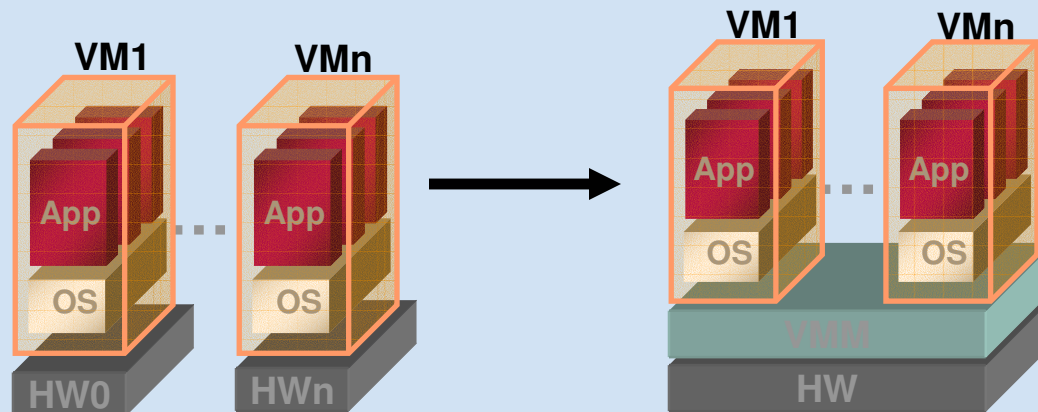
# Data Center Energy Efficiency Opportunities



# Data Center Energy Efficiency Opportunities

## E.g., Server Virtualization

- Consolidates multiple workloads onto one physical server (3-1; 5-1; 7-1; 30-1 and more depending on application)
- More businesses moving towards virtual environments
- Large potential for energy savings depending on application

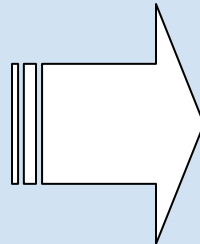


Sources: Intel Corporation (Graphic); VMWare, IDC (Content)

# CEE Data Centers & Servers Initiative

## Challenges

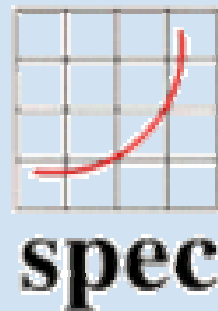
- Lack of efficiency definitions and need for consistent metrics and test procedures
- Lack of consistent info for the end users
- Split incentives between IT & facility managers
- Risk aversion and barriers to EE acceptance – reliability and uptime concerns trump others
- Dynamic nature of software and hardware operations



## CEE Initiative Objectives

- Developing & supporting consensus-based definitions and performance specs
- Facilitating our collective understanding of opportunity, market players & industry motivations
- Identifying recommended program strategies to help move more of the market to a preferred outcome

# National & Local DC Activities



# CEE Activities



## Broad Activities:

- Support active Data Centers and Servers Members Committee
  - Over 25 utility and other efficiency program administrators participating
- Building knowledge of IT industry and opportunities to work together
- Active participation in EPA and DOE programs
- Developing and supporting local program strategies to help customers arrive at optimal solutions

# Government DC Activities

U.S. DOE and EPA initiating a voluntary national DC energy efficiency information program

- DOE Industrial Technologies Program, DOE FEMP program, and EPA ENERGY STAR program
- Close coordination with numerous industry stakeholders, developing tools and informational resources to assist data center operators reduce energy use

# U.S. DOE - Activities

- Develop DC Pro Software tool suite
- Create consensus metrics
- Develop and publicize case studies through pilot energy assessments
- Create best practices information and training curriculum
- Develop qualified specialists program for data centers
- Create guidelines for Best-In-Class data center

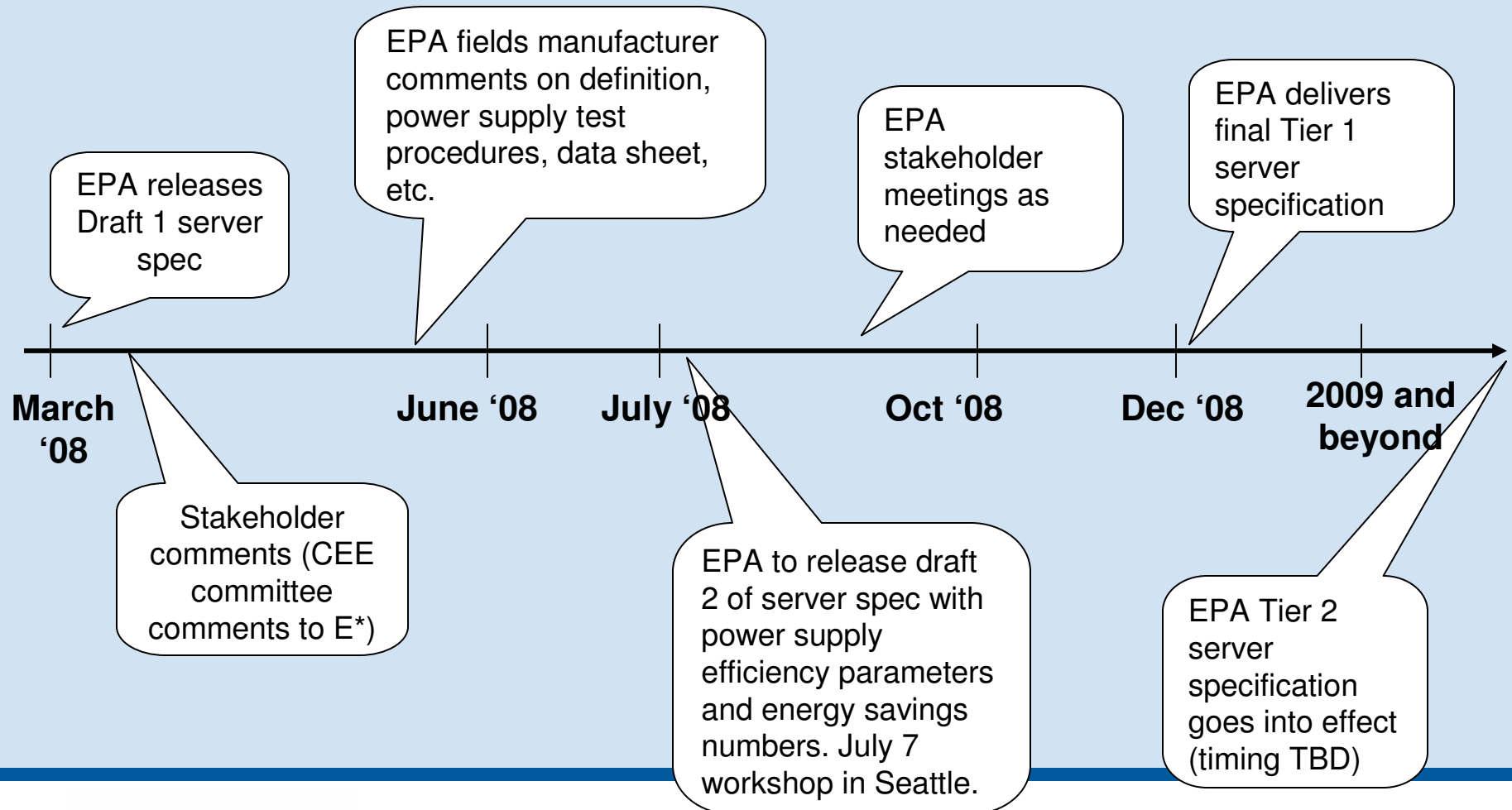
# U.S. DOE - Timeline

- **May 2008:** DC Pro tool beta release
- **May - September:** Training curriculum piloted
- **September 2008:** DC Pro tool version 1.0 release
- **December 2008:** Qualified Specialist training
- **More information:**
  - Paul Scheihing, DOE: [Paul.Scheihing@ee.doe.gov](mailto:Paul.Scheihing@ee.doe.gov)
  - Bill Tschudi, LBNL: [WFTschudi@lbl.gov](mailto:WFTschudi@lbl.gov)

# EPA - Activities

- **Benchmark Unit of Analysis: IT Energy/Total Energy**
  - Measure infrastructure efficiency
    - Captures impact of cooling and support systems
    - Does not capture IT efficiency
  - Best available whole-building measure
    - Important to start tracking, measuring, improving
    - Industry still developing ways to understand and measure IT output and efficiency
  - Express ratio (IT/Total) as an ENERGY STAR 1-to-100 rating
    - Percentile of performance
    - Ratio value adjusted for: climate, tier level, other key factors
- **Server Performance Specification**

# EPA - Timeline



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# CEE Member Programs

EE Program Tracking	Data Center Program Offerings
Austin Energy	*Financial incentives for IT and other measures (e.g., MAID, server virtualization, efficient UPSs, chillers/cooling)
BC Hydro	*Integrating data center assessment assistance and potential financial incentives for capital measures
Efficiency VT	*Technical assistance and may offer custom financial incentives for virtualization.
Energy Trust of OR	*Pilot project providing technical assistance on more efficient enterprise data center design
PG&E	*Financial incentives for various IT and facilities energy savings measures (e.g., server virtualization, MAID, cooling) *Design assistance for new construction (Savings by Design)
SCE, SDG&E	*Offer virtualization and other DC incentives through Standard Performance Contract (SCE running first pilot); *Design assistance (Savings by Design)



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# Program Experiences

- General data center program approach
- Program strategies and assumptions used to address customers' IT loads (servers, storage, network)
  - **Energy consumption baselines.** How is the program baselining the energy consumption of the server (or other IT) loads? What are the key assumptions, variables and timeframe used?
  - **Program evaluation strategies.** How is the program evaluating server virtualization and other complex measures? Are more traditional TRC tests used or is the program employing other cost benefit evaluation methods?
- Program results to date

# Resources

## Additional Resources:

- CEE Data Centers Initiative
  - Initiative description: <http://www.cee1.org/com/dcs/dcs-main.php3>
  - Technology opportunities and industry presentations: [http://www.cee1.org/cee/mtg/09-07ppt/09-07\\_pres.php3](http://www.cee1.org/cee/mtg/09-07ppt/09-07_pres.php3)
  - Member program summaries: <http://www.cee1.org/com/2007-ps/>
- EPA Data Centers programs
  - [www.energystar.gov/datacenters](http://www.energystar.gov/datacenters)
- DOE Data Centers programs
  - [www1.eere.energy.gov/industry/saveenergynow/partnering\\_data\\_centers.html](http://www1.eere.energy.gov/industry/saveenergynow/partnering_data_centers.html)
  - <http://hightech.lbl.gov/datacenters.html>

