WORKING GROUP 3: Integrated Design, Operation, and Management Issues

This working group will discuss study tasks and information needs related to issues of datacenter integration (i.e., issues that span both IT equipment and datacenter infrastructure), in support of the following H.R. 5646 study objectives:

• An overview of the growth trends associated with data centers and the utilization of servers in the Federal Government and private sector **(Task 1)**

• Analysis of the industry migration to the use of energy efficient microchips and servers designed to provide energy efficient computing and reduce the costs associated with constructing, operating, and maintaining large and medium scale data centers **(Task 2)**

• Analysis of the potential cost savings to the Federal Government, large institutional data center operators, private enterprise, and consumers available through the adoption of energy efficient data centers and servers **(Task 3)**

• Analysis of the potential impacts of energy efficiency on product performance, including computing functionality, reliability, speed, and features, and overall cost **(Task 5)**

• Recommendations regarding potential incentives and voluntary programs that could be used to advance the adoption of energy efficient data centers and computing **(Task 8)**

Agenda

10:30-10:35	Discuss relevant study objectives and agenda for working session (5 minutes) • Read related H.R. 5646 language • Ground rules (no selling, stay at high level, let everyone participate) • We assume that all data received are public and citable
10:35-10:40	Introductions (Name and affiliation) (5 minutes)
10:40-11:00	Estimation of growth trends and trends in energy use affected by integration issues (20 minutes)
11:00-11:30	Definition of plausible efficiency scenarios and estimation of cost savings (30 minutes)
11:30-12:00	Identification and discussion of reliability, performance, and risk issues (30 minutes)
12:00-12:15	Break/ pick up lunch
12:15-1:00	Identification and discussion of barriers to integrated design, operation, and management of datacenters (45 minutes)
1:00-1:35	Recommendations regarding potential incentives and voluntary programs (35 minutes)
1:35-1:45	**Summarize key working group outcomes (10 minutes)**

TOPICS OF DISCUSSION

Specific data and information requests are indicated in **bold italics**

1) Estimation of growth trends and trends in energy use affected by integration issues (Task 1)

- Include qualitative discussion of general industry trends that may affect energy use, such as server utilization, transition to "services" architecture, cooling issues, etc.
    - ***Define datacenter integration issues that affect energy use***
    - ***How have energy use trends been influenced by datacenter integration issues?***
    - ***Where are these trends headed in the next 5 years?***

2) Definition of plausible efficiency scenarios and estimation of cost savings (Tasks 2 and 3)

- Estimation of future energy use (5 years out) for several plausible future scenarios, which could include: frozen efficiency, business as usual trends, modest efficiency gains; and maximum plausible efficiency gains.

    - ***What scenarios make sense to include in the study?***
    - ***How should integration issues be treated in energy use forecasts and efficiency scenarios?***
    - ***How much can be saved by improving datacenter design, operation, and management with an integrated approach?***

- Cost and benefit characterization
    - Benefits can include electricity savings, avoided hardware purchases, improved operational efficiencies, reduced rack/floor space needed, etc.
    - Costs can include investments in hardware and software, installation and support costs, system management costs, etc.

3) Identification and discussion of reliability, performance, and risk issues (Task 5)

- Identification of potential issues:
- Reliability
- Computing functionality and features
- Speed
- Overall cost

    - ***Input on potential positive and negative issues associated with integrated approaches to design, operation, and management of datacenters***

4) Identification and discussion of barriers to integrated design, operation and management of datacenters (Tasks 7 and 8)

5) Recommendations regarding potential incentives and voluntary programs (Task 8)

- Identification and discussion of possible recommendations for incentives and voluntary programs
    - Financial incentives (e.g., utility rebates, Federal tax deductions/credits)
    - Technology procurement (i.e., incentives for incorporating new efficiency technologies into commercially available products)
    - Information (e.g., technical guidance, awareness campaigns, publication of benchmark data)
    - Education and training (e.g., datacenter operator certification, outreach to industry orgs + trade pubs)
    - Industry standards (e.g., energy performance metrics, test procedures)
    - Endorsement Labeling (e.g., ENERGY STAR)
    - Government procurement (e.g., EPAct 2005 purchasing requirements)
    - Government operation (e.g., mandatory benchmarking of Federal datacenters, pilot program implementation in Federal facilities)
    - RD&D (e.g., new technology assessment, use DOE super computers as energy efficiency pilot, leverage Labs21 experience, assessment of aggregate savings potentials)
    - Energy (or Carbon) Pricing (and utility metering)
    - Public/private partnerships – X-prize-style incentives

5) Summarize key working group outcomes for reporting to general assembly

Examples of integrated design, operation and management issues:

- **Integrating energy into TCO for investment decisions;**
- **Integrated measurement and control strategies to improve data center energy efficiency;**
- **Whole-facility benchmarking approaches;**
- **Implementing user-chargeback systems that properly reflect true cost of energy consumed;**
- **Setting application reliability and availability requirements to improve energy efficiency;**
- **Implementing outside air cooling strategies;**
- **IT and Facilities staff cooperating to fully implement hot- and cold-aisle design.**

Integrated Critical Environment™ (ICE) Team Stakeholders

	CFO/Corporate Real Estate/Facilities	Information Technology
Strategic	**Quadrant 4 (Q4)** • Understanding the strategic implications of high-density on the data center real estate portfolio and subsequent capital budgeting and lifecycles for investment • Managing Corporate Social Responsibility initiatives which must include data center energy efficiency • Chartering of ICE Teams to optimize performance and minimize CapEx and OpEx costs	**Quadrant 1 (Q1)** • Understanding the long term implications of data center facility costs becoming 5 percent to 15 percent of IT's budget • Incorporating site costs into the economic analysis of new application decisions • Mandating consideration of IT Productivity per Embedded Watt (IT-PEW) in system architecture and equipment selection decisions • Chartering of ICE Teams to optimize performance and minimize CapEx and OpEx costs
Operations	**Quadrant 3 (Q3)** • Managing the site infrastructure's Critical Layer Dashboard (Actual loads, Remaining Capacity, Projected Exhaustion Point) • Understanding computer room cooling science and implementing best practices • Understanding the Site Infrastructure Energy Efficiency Ratio (SI-EER) and working with Q3, implement best practices • Tactical Critical Physical Layer implementation and best practices • ICE Team operations	**Quadrant 2 (Q2)** • Managing the site infrastructure's Critical Layer Dashboard (Actual loads, Remaining Capacity, Projected Exhaustion Point) • Implementing IT-PEW best practices • Tactical Critical Physical Layer implementation and best practices • ICE Team operations

Source: Ken Brill, "Data Center Energy Efficiency and Productivity," Uptime Institute, 2006.