

Fact Sheet on National Data Center Energy Efficiency Information Program

U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA)
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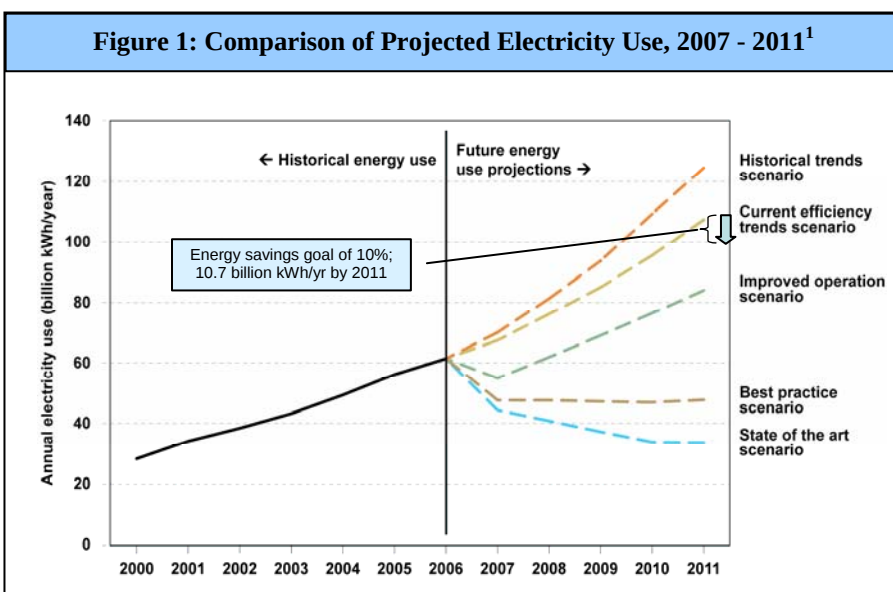


Summary: The voluntary **National Data Center Energy Efficiency Information Program** has been initiated. The Program coordinates a wide variety of activities from the DOE Industrial Technologies Program Save Energy Now initiative, the DOE Federal Energy Management Program (FEMP), and the EPA ENERGY STAR program. The program is engaging numerous industry stakeholders who are developing and deploying a variety of tools and informational resources to assist data center operators in their efforts to reduce energy consumption in their facilities. These groups include, for example: 7 x 24 Exchange, AFCOM, American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), Critical Facilities Roundtable, Information Technology Industry Council (ITIC), Silicon Valley Leadership Group, The Green Grid Association, and The Uptime Institute.

Background: U.S. data centers consume a growing portion of the U.S. energy/electricity supply due to growing demand for the services they provide. Data centers used 61 billion kWh of electricity in 2006, representing 1.5% of all U.S. electricity consumption and double the amount consumed in 2000. Based on current trends, energy consumed by data centers will continue to grow by 12% per year.

Opportunity: The existence of best energy management practices and best available technology to process digital information (i.e., energy efficient computer servers and virtualization server software), to deliver and condition electrical power to supply power to computers, and to remove the heat rejected from data center information technology (IT) equipment in an energy efficient manner provides an opportunity to significantly improve a data center's energy efficiency.

The EPA report to Congress¹ estimated that if state-of-the-art technology were adopted then energy efficiency could be improved by as much as 70 percent (see Figure 1). However, even saving a modest 10 percent of total energy use would amount to energy savings of 10.7 billion kilowatt-hours per year -- an amount equivalent to the electricity consumed by one million US households and valued at about \$740 million.²



¹ Report to Congress on Server and Data Center Energy Efficiency, Public Law 109-431, U.S. Environmental Protection Agency, ENERGY STAR Program, August 2, 2007.

² U.S. Department of Energy (DOE). 2007. Annual Energy Outlook 2007. Energy Information Administration. Report DOE/EIA-0383(2007).

Overview: The **National Data Center Energy Efficiency Information Program** integrates and coordinates existing activities from the DOE Save Energy Now initiative, DOE FEMP, and the EPA ENERGY STAR program. The elements of the Program include:

1. **Consensus energy efficiency metrics and benchmarking:** DOE and EPA are working with industry to develop consistent measurement protocols and metrics to define energy performance in a data center facility.
2. **Energy saving tools and training:** DOE Save Energy Now and EPA ENERGY STAR are developing tools to assist data center operators in characterizing their energy use and identifying opportunities for improvement. Two tools form the cornerstone of these efforts – the DOE Save Energy Now DC Pro tool suite and the EPA ENERGY STAR Portfolio Manager tool (which will house EPA’s energy performance rating for data center infrastructure). The DC Pro and Portfolio Manager tools will be linked to facilitate the transfer of data for users. All parties will conduct awareness training for data center operators.
3. **Certification of data center energy efficiency experts:** DOE Save Energy Now is developing a certification program for data center energy efficiency experts. Save Energy Now Qualified Specialists will be able to assist data center operators in identifying and implementing energy saving projects.
4. **Equipment performance specification and labeling:** EPA is developing an ENERGY STAR specification for enterprise servers which will allow this equipment to earn the ENERGY STAR, indicating that it is among the most energy efficient products on the market. In the future, EPA will consider opportunities to develop ENERGY STAR specifications for additional IT equipment, possibly to include data storage and networking equipment.
5. **Recognition of Best-in-Class data centers:** DOE Save Energy Now will recognize those data centers which have demonstrated a defined level of energy savings using the DC Pro tool to validate energy saved similar to the recognition already offered to manufacturing plants. EPA ENERGY STAR will provide the ENERGY STAR label for those data centers that achieve a high level of energy performance. DOE Save Energy Now and FEMP will develop Best-in-Class guidelines with industry partners to initially guide the specification and design of newly constructed Federal data centers. DOE Save Energy Now will also explore with industry the development of a voluntary third-party certification process to validate energy intensity improvement and Best-in-Class performance for newly constructed or existing data centers.

Designation of a Data Center Energy Efficiency Organization: To address the unique energy management needs of data centers, DOE and EPA have consulted with a wide variety of industry groups and individual companies during the development of existing program elements. Section 453 of the Energy Independence and Security Act of 2007 requires DOE and EPA to jointly designate an organization to consult with and to coordinate a voluntary national information program for energy efficiency in data centers. DOE and EPA are in the process of determining the role of this organization as well as the criteria for selection. Once the role is established and criteria identified, DOE and EPA will issue a Federal Register notice announcing the plan to select an organization.

More Information: Further information about the National Data Center Energy Efficiency Information Program can be found at DOE or EPA websites below:

DOE Save Energy Now data center webpage
www.eere.energy.gov/datacenters

EPA ENERGY STAR data center webpage
www.energystar.gov/datacenters

NATIONAL DATA CENTER ENERGY EFFICIENCY INFORMATION PROGRAM ELEMENTS



EPA ENERGY STAR

EPA's ENERGY STAR program offers building owners and managers resources to adopt a strategic energy management program. An essential element of strategic energy management is assessing energy performance to prioritize resources, find best practices, and set goals using metrics that are simple and can be tracked on a continuous basis. EPA currently provides an energy performance rating for a wide variety of commercial buildings and plants that allows their operators to compare their performance against a national sample of similar buildings and track changes in energy use over time. For commercial buildings, this is accomplished through a national energy performance rating system accessed through EPA's Portfolio Manager on-line tool. The rating is given on a scale of 1-100, with a rating of 50 indicating that the building, from an energy consumption standpoint, performs better than 50% of all similar buildings nationwide. A rating of 75 qualifies the building for the ENERGY STAR label. As of the end of 2007, over 60,000 buildings have received energy performance ratings, and over 4,000 have earned the ENERGY STAR label for superior energy management. ENERGY STAR Partners can also make use of proven Guidelines for Energy Management, case studies, training, networking, financial analysis tools, and other resources available through the program.

Likewise, ENERGY STAR has developed energy efficiency specifications for a variety of residential and commercial products. To qualify as ENERGY STAR, products need to meet specified testing and energy efficiency performance requirements. ENERGY STAR labeled products are among the top 25% of models in the marketplace in regards to energy efficiency. Product performance is also maintained or enhanced with ENERGY STAR qualified products, and they are typically highly cost-effective to consumers. The ENERGY STAR labeling program has more than 3,000 partners representing manufacturers, retailers, utilities, and state organizations. More than 1,700 manufacturers are using the ENERGY STAR label on a total of over 40,000 individual product models across more than 50 product categories. American consumers are purchasing about 300 million ENERGY STAR products annually, a total of more than 2 billion ENERGY STAR qualified products since 1992.

ENERGY STAR is currently developing an energy performance rating for data center infrastructure, as well as a new ENERGY STAR product specification for enterprise servers.

EPA ENERGY STAR Data Center Buildings Activities and Resources

Many current ENERGY STAR partners and users of Portfolio Manager are also owners and/or operators of data centers. They and others have expressed a strong desire to have an energy performance rating that will allow them to compare the energy use of their data center infrastructure with that of similar data centers across the country. As a result, EPA, through the ENERGY STAR program, is initiating efforts to develop a rating for data center infrastructure. EPA's goals for this initiative include:

- Provide owners and operators of data centers with the ability to assess the overall performance of their facilities at the building level.
- Develop a rating system that is usable for both whole-building data centers, as well as data centers housed within office or other buildings.

- Use a methodology similar to that employed for other building types in the ENERGY STAR program, with a rating given on a 1-100 scale.
- Make the rating available through EPA's Portfolio Manager on-line energy tracking tool to allow current users to add data centers to the portfolio of buildings they are already managing using the tool.
- Provide users with information and links to additional resources to aid in their efforts to determine next steps after receiving an energy performance rating for their data center, such as using the Save Energy Now "DC Pro" software tool suite.

Data center owners and operators will use the rating to assess the performance of their buildings relative to each other and to those nationally, as a primary means of identifying those with the largest opportunities for improvement. The rating will explain how their data center infrastructure is performing in terms of energy use, but it will not explain why. To determine next steps to improve the energy efficiency of their data centers, users will be directed to a variety of energy management resources and other technical guidance. They will be encouraged to continually update their data in Portfolio Manager to see new ratings in order to determine the impacts of any energy efficiency projects they are implementing. Those whose energy performance is in the top 25 percent of similar buildings will be eligible to earn the ENERGY STAR label for the building.

Key current and planned activities for ENERGY STAR data center buildings include:

- Industry stakeholder meetings to discuss data collection needs.
- Collection of energy use data from over 100 existing data centers.
- Review and analysis of data collected to develop an energy performance model for data center infrastructure.
- Making the data center infrastructure rating available in the ENERGY STAR Portfolio Manager tool.
- Awarding the ENERGY STAR label for top-performing stand-alone data centers.

For more information visit:

ENERGY STAR data center webpage

www.energystar.gov/datacenters

Portfolio Manager webpage

www.energystar.gov/benchmark

ENERGY STAR labeled building webpage

www.energystar.gov/index.cfm?c=business.bus_bldgs

EPA ENERGY STAR IT Equipment Activities and Resources

At the core of every data center is the information technology (IT) equipment, which consists of computer servers, data storage, and networking equipment. The use of IT is an increasingly necessary strategic component for organizations around the world to achieve company goals and objectives.

A datacenter's site infrastructure is comprised of uninterruptible power supplies, power distribution units, computer room air conditioners and other equipment, whose purpose is to support the reliable

operation of the IT equipment. This is accomplished in part by delivering consistent power to the IT equipment and removing waste heat from the facility to keep this equipment cool and operating properly. IT equipment that consumes less energy to perform a given computing task will exhaust less waste heat, leaving a smaller cooling burden for the building's air conditioning units, and lessening the demand on the electrical grid from the overall facility operation. For every watt of energy saved in operating the IT equipment, one watt or more will also be saved at the site infrastructure level. Improved energy performance in IT equipment may also aid data center managers in overcoming power-ceiling budgets at the facility or the server rack level, while complementing, or improving, site reliability and uptime. Moreover, in addition to lower utility bills, more efficient IT may also delay costly capital expenditures and alleviate the need for expansion of existing facilities or the construction of new ones.

EPA has identified computer servers as its top data center IT priority at this time, and believes that helping organizations to identify the most efficient servers through the use of the ENERGY STAR label represents a major energy savings opportunity. EPA is currently in the process of developing ENERGY STAR specifications for enterprise servers, and released the first draft server specification on February 14, 2008. EPA will follow its well established process for product specification development, and plans to work with industry throughout 2008 to finalize the specification. The process being used is the same as that used for other types of products.³ In the first draft, EPA stated the need to work with all stakeholders to:

- Define key specification framework elements including explicit technical product definitions.
- Broadly address as many key market segments as possible without defining a one-size-fits-all specification for servers.
- Develop a combination of energy efficiency performance criteria and other requirements that marry technical merit, current business practice, and market realities to recognize the most efficient products currently available.
- Complete the specification as quickly as feasible while ensuring a systematic and transparent process.

Key planned activities for ENERGY STAR IT equipment include:

- Releasing 2 or more additional draft specifications for enterprise servers.
- Holding on-line and/or in-person meetings to discuss comments on each draft.
- Developing and publishing a final specification for enterprise servers.
- Consideration of the opportunity to develop specifications for additional products, including possibly data storage and networking equipment.

For more information visit:

ENERGY STAR data center webpage
www.energystar.gov/datacenters

ENERGY STAR Enterprise Servers webpage
www.energystar.gov/index.cfm?c=new_specs.enterprise_servers

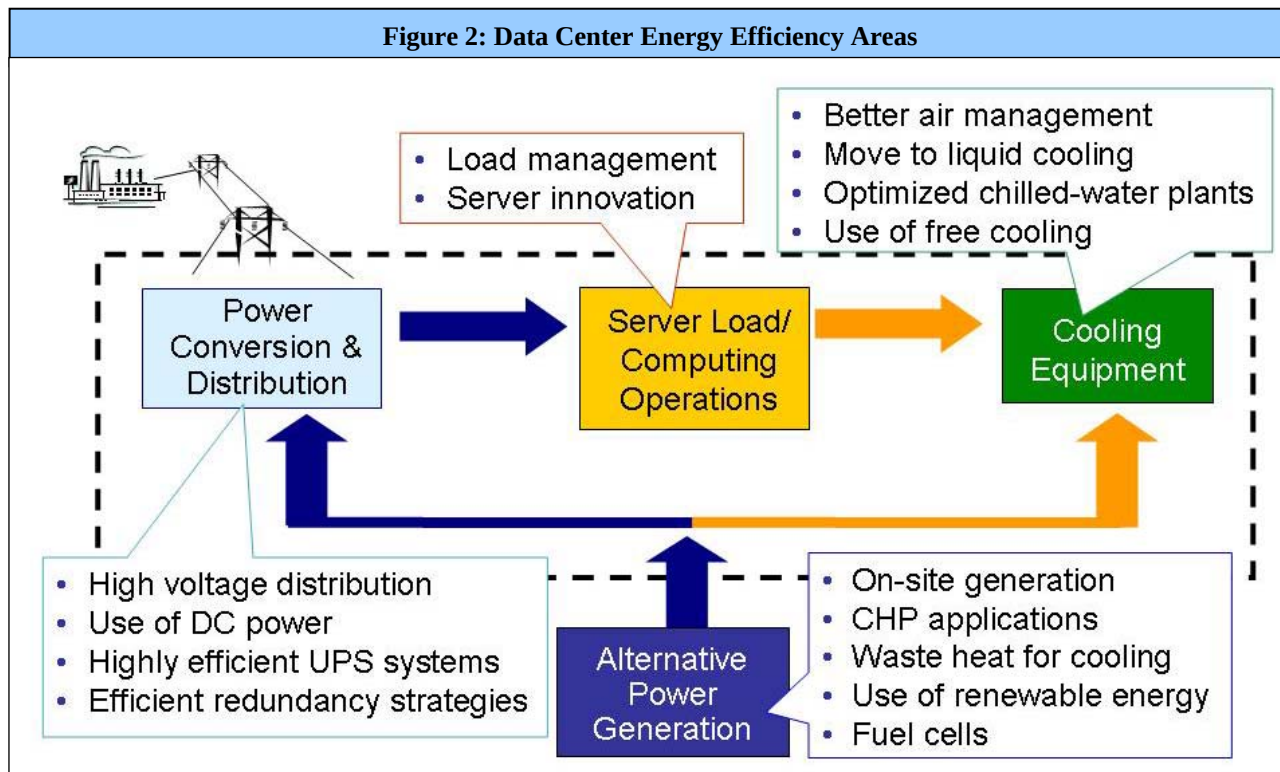
³ The process for the development of ENERGY STAR product specifications can be found at http://www.energystar.gov/index.cfm?c=prod_development.prod_development_spec_rev



DOE SAVE ENERGY NOW

The DOE Industrial Technologies Program is spearheading a broad initiative that harnesses public and private sector resources to drive a 25% reduction in industrial energy intensity over the next 10 years. ITP is engaging other federal agencies, leading corporations, states, utilities, universities, and other organizations to accelerate industry adoption of the technologies and practices that will enable increased production with reduced energy requirements. The Save Energy Now initiative reinforces energy efficiency as a profitable business model and paves the way for free enterprise to affirm America's global leadership in energy technology. The Save Energy Now initiative provides the resources industry needs to identify and implement the most cost-effective options for energy savings, including a Pledge program, plant assessments, standards development, tools and training, and recognition programs within ITP and its partner organizations. To date, more than 16,000 manufacturing plants have used these resources to reduce the energy intensity of their operations. As an all-inclusive initiative, Save Energy Now seeks to help all 200,000 US industrial facilities, wherever they currently stand along the energy efficiency continuum, to reduce their energy intensity and carbon footprint to the greatest extent practical.

Save Energy Now has now targeted data centers as a high-growth and energy intensive sector of the US economy as an important area to improve energy efficiency. Save Energy Now is developing a tool suite backed with a training curriculum, energy assessment protocols, best-in-class guidelines, a process to certify data center energy experts, and is considering working with industry on a voluntary certification process that will validate any data center's continual improvement in energy efficiency (similar to the ANSI-accredited plant energy certification program being developed by Save Energy Now, EPA, NIST, Texas Industries of the Future, industry and ANSI).



DOE Save Energy Now Data Center Activities and Resources

The DOE Industrial Technologies Program (Save Energy Now) is creating in partnership with industry a portfolio of energy efficiency tools, training and other resources to assist data center operators to more effectively identify and implement energy saving actions. DOE's objective is to create the capacity in a short time frame (2 to 3 years) so that the market can address energy savings potential in four main data center areas (See figure 2):

1. Server Load and Computing Operations
2. Power Conversion and Distribution
3. Cooling Equipment
4. Alternative Power Generation

Building on the success and experience of the Save Energy Now program in the manufacturing sector, DOE has identified a set of major activities that will be initiated in FY2008, as follows:

- Develop the "DC Pro" software tool suite
- Create consensus metrics at the whole data center system and subsystem level
- Create and publicize Save Energy Now case studies through performing pilot energy assessments
- Create best practice information and a pilot an awareness training curriculum for data center operators
- Develop a Qualified Specialists program to certify data center energy efficiency experts
- Create guidelines for "Best-in-Class" data centers (in various classes) and technologies, including strategies for incorporating distributed generation technologies
- Explore supporting a third-party certification process to validate energy intensity improvement and Best-in-Class performance for newly constructed or existing data centers.
- Provide recognition for data centers that achieve a certain level of energy savings similar to the approach for recognizing manufacturing plants by the Save Energy Now program.

For more information visit

Save Energy Now data center webpage
www.eere.energy.gov/datacenters



DOE FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

The Department of Energy's Federal Energy Management Program (FEMP) works with Federal agencies to reduce the cost and environmental impact of the Federal government by advancing energy efficiency and water conservation, promoting the use of distributed and renewable energy, and improving utility management decisions at Federal sites. FEMP works closely with Federal agencies as well as the Office of Management and Budget and the Office of the Federal Environmental Executive to develop, disseminate, and refine policy related to Federal energy management. FEMP also develops guidance and tools, and assists Federal agencies with implementing projects to meet legislative and executive order requirements.

FEMP is currently developing plans to deliver the Save Energy Now data center energy efficiency tools and resources to a variety of Federal data centers. FEMP is also embarking on a survey of Federal data centers to better understand the energy characteristics, loads, expected growth and the overall facilities infrastructure.

DOE Federal Energy Management Program Activities and Resources

The Federal Energy Management Program is assisting Federal agencies to make their datacenters more energy efficient by:

- Raising awareness for data center energy efficiency opportunities through workshops and technical sessions with GSA, and at GovEnergy and Labs21 conferences, and other forums as appropriate.
- Conducting a DOE data center facility survey
- Facilitating the testing of the DC Pro tool suite at DOE data centers.
- Forming strategic alliances with other Federal agencies to coordinate Federal datacenter activities, when needed, and to disseminate use of the DC Pro tool suite.
- Providing the opportunity to Federal sites for recognition of “Best in Class” data centers at Federal Energy Management Program award ceremonies.
- Raising the awareness of and facilitating the transfer of the DC Pro tool suite to energy savings companies and utility companies so that energy efficiency projects can be implemented in the Federal sector.

For more information visit:

Save Energy Now data center webpage
www.eere.energy.gov/datacenters

ADDITIONAL RESOURCES ON DATA CENTER ENERGY EFFICIENCY

In addition to the tools and resources being developed by DOE and EPA, there are a large number of industry associations and other organizations that provide valuable tools and information to assist owners and operators of data centers in their efforts to improve the energy efficiency of their operations. Many also sponsor regular meetings and conferences. Interested owners and operators might consider continuing their research using the following resources.⁴

Industry Associations and Research Organizations

7x24 Exchange – www.7x24exchange.org – Membership organization, primarily data center owners and operators. From the organization’s website: “7x24 Exchange is the leading knowledge exchange for those who design, build, use and maintain mission-critical enterprise information infrastructures. 7x24 Exchange's goal is to improve end-to-end reliability by promoting dialogue among these groups.”

AFCOM – www.afcom.com – Membership organization of companies serving data centers. From the organization’s website: “Since 1981, AFCOM is the only association dedicated to providing education and resources for data center managers. Our mission is to enable data center management professionals

⁴ Statements “From the organization’s website” shown in this section represent how the organization characterizes itself and are taken verbatim from the organization’s website. DOE and EPA makes no endorsement of any particular organization.

to share industry best practices by providing a forum for dissemination of critical information; to provide education on key data center management issues; to provide the industry's most comprehensive insight and analysis in key areas affecting all data-intensive organizations; and to be the most comprehensive and effective resource available to the overall data center community."

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) – <http://tc99.ashraetcs.org> – International organization of 50,000 professionals that pursues research, standards writing, publishing and continuing education. ASHRAE has formed Technical Committee 9.9 to focus on mission critical facilities, technology spaces and electronic equipment. From the TC 9.9 organization's mission statement: "To be recognized amongst all areas of the datacom industry as the unbiased engineering leader in HVAC and an effective provider of technical information for the datacom industry."

Critical Facilities Roundtable – www.cfroundtable.org – Membership organization for operators of critical facilities. From the organization's website: "The Critical Facilities Roundtable is dedicated to the discussion and resolution of industry issues regarding mission-critical facilities, their engineering and design, and their maintenance."

Information Technology Industry Council (ITIC) – www.itic.org – Industry lobbying organization. From the organization's website: "The Information Technology Industry Council (ITI) is the premier group of the nation's leading high-tech companies and widely recognized as the tech industry's most effective lobbying organization in Washington, in various foreign capitals, and the WTO."

Silicon Valley Leadership Group – <http://svlg.net> – Membership organization of companies in the Silicon Valley region of California. From the organization's website: "The Silicon Valley Leadership Group (SVLG) is organized to involve principal officers and senior managers of member companies in a cooperative effort with local, regional, state, and federal government officials to address major public policy issues affecting the economic health and quality of life in Silicon Valley."

The Green Grid – www.thegreengrid.org – Membership organization, primarily hardware and software manufacturers, but also includes some users. From the organization's website: "The Green Grid is a global consortium dedicated to advancing energy efficiency in data centers and business computing ecosystems."

The Uptime Institute – www.uptimeinstitute.org – Membership organization of data center operators and companies serving the industry. From the organization's website: "The Site Uptime Network's mission is to identify, quantify and improve infrastructure availability. It achieves this by providing the best possible information exchange between members themselves, and between members and industry experts on the staff of The Uptime Institute."

Data Center Meetings and Conferences

1105 Government Information Group – www.1105govinfo.com – From the organization's website: "1105 Government Information Group is the leading provider of integrated information and media for the government information technology market. Our comprehensive portfolio of print, online, event, custom media and research products distinctively serves the information needs of the government IT buying team—agency executives, program managers, IT managers and systems integrators—across all segments of federal, state and local government."

Data Center Dynamics – www.datacenterdynamics.com – From the organization’s website: “The Datacenter Dynamics Global Conference and Expo Series is the leading source of information and the largest gathering of professionals involved in the design, construction and operation of 24/7 mission critical IT facilities in the worlds top business cities. It is an unrivalled education and networking opportunity.”

Next Generation Data Center – www.ngdcexpo.com – From the organization’s website: Next Generation Data Center (NGDC) is targeted to enterprise IT professionals ranging from IT architects to system administrators all seeking the right products and services to create their end-to-end solutions as they adapt to ever increasing needs for flexibility, scalability and performance. NGDC will focus on new technologies and their impact on the data center, covering mission-critical applications and the technology supporting those applications including storage, servers, databases, networking and communications.