Improving Energy Efficiency in Information and Communication Technology Sectors

Fourteen projects awarded to reduce energy intensity in data centers and telecommunications facilities.

Representative goals of awarded ICT projects.
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Introduction

The Department of Energy (DOE) has awarded $47 million to 14 projects across the country to support the development of new technologies that can improve energy efficiency in the information and communication technology (ICT) sectors. Information technology (IT) data centers use millions of servers and computing devices for data processing and storage, and the telecommunications industry uses a similar assortment of equipment for central offices, service centers, and switching centers. The rapid growth of these industries has led to increased electricity use, and improvements in the sector's energy efficiency can provide significant savings. The energy efficiency projects awarded will reduce energy use and carbon pollution while helping to develop a strong, competitive domestic industry.

"These [American Recovery and Reinvestment Act] projects will improve the efficiency of a strong and growing sector of the American economy. By reducing energy use and energy costs for the [ICT] industries, this funding will help create jobs and ensure the sector remains competitive," said U.S. Secretary of Energy Steven Chu. "The expected growth of these industries means that new technologies adopted today will yield benefits for many years to come."

Benefits for Our Industry and Our Nation

Data centers accounted for 60 billion kilowatt hours (kWh) of annual electricity consumption in 2006. Adding telecommunications center consumption doubles the number and to an equivalent of 3% of all U.S. electricity use. Moreover, rapid growth in the U.S. data center industry is projected to require two new, large power plants per year just to keep pace with the expected demand. Without gains in efficiency, the industry will face increasing costs and greenhouse gas emissions along with challenges to the reliability of the electricity service.

Applications in Our Nation's Industry

ICT is a crosscutting, critical part of most industries in the nation. Improvements in equipment efficiency will benefit most industries and will be of special significance to the following sectors:
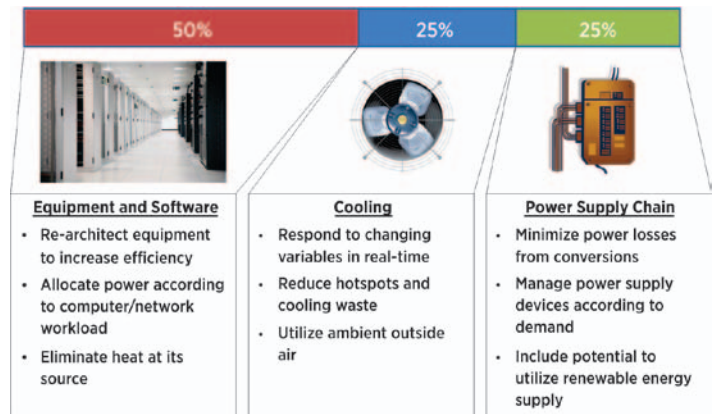
- "Cloud computing" providers, Internet application providers, and network and telecommunication service providers

- Computing, network, and telecommunication equipment manufacturers

- ICT facility operators, owners, service contractors, and utilities

- Facility managers and planners, and building management system manufacturers, installers, and owner/operators

- Standards organizations for computing, electrical, and network devices and protocols

Project Description

The Recovery Act is providing funding for research, development, and field experiment projects to improve the energy efficiency of the data processing, data storage, and telecommunications industries.

As shown in Figure 1 and described in DOE's Vision and Roadmap: Routing Telecom and Data Centers Towards Efficient Energy Use, the rough distribution of power use within these facilities is:

- 50% from Information technology (IT) equipment

- 25% from sophisticated power conditioning and delivery systems,

- 25% from cooling systems for heat loads that can be 10 to 100 times greater than those of typical commercial buildings on a square foot basis.

As such, the awarded projects will provide benefits to at least one of these three power use categories:

- Equipment and Software: These projects will focus on the core components of an ICT center, such as servers and networking devices, as well as software to optimize equipment energy use.

- Power Supply Chain: These projects will develop technologies to minimize the power loss and heat generation that occurs as electricity moves through the ever-growing number of server-based ICT systems.

- Cooling: These efforts will seek to develop technologies to cool the equipment used in ICT systems more effectively and with less power than current methods.

These projects promise to reduce energy use by 10%–75% over conventional systems.

Barriers

The ICT industry is constrained by market drivers for rapid growth in capacity and reliability at decreasing cost thereby making it difficult to fund energy efficiency improvements. In addition, the time-to-market for incremental technology improvements will not keep pace with energy requirements that are predicted to double for this industry every five years. Therefore, investment into transformational technology innovations is required.

Pathways

Funding has been spread across projects at various stages of development. Three of the awards were for concept definition studies to further explore the feasibility of a particular avenue of research, seven were for research and development, and four were for field experiments to verify expected benefits.

Milestones

- Completion of concept definition studies in 2011

- Completion of research and development and field experiment projects in 2012

Commercialization

Each partner will submit commercialization plans as part of the project.

Project Partners*

Alcatel-Lucent Bell Labs: CD, R&D

BAE Systems: CD

California Institute of Technology: CD

Columbia University: R&D

Edison Materials Technology Center: R&D

Federspiel Controls, Inc.: FE

Hewlett-Packard: R&D

IBM T.J. Watson Research Center: FE, R&D

Lineage Power Corporation: R&D

Power Assure, Inc:. FE

SeaMicro Inc. R&D

Yahoo! Inc. FE

	Equipment & Software	Cooling	Power Supply Chain
Alcatel-Lucent Bell Labs	CD	R&D	
BAE Systems			CD
California Institute of Technology	CD		
Columbia University			R&D
Edison Materials Technology Center		R&D	
Federspiel Controls, Inc.		FE	
Hewlett-Packard			R&D
IBM T.J. Watson Research Center	FE	R&D	
Lineage Power Corporation			R&D
Power Assure, Inc.			FE
SeaMicro Inc.	R&D		
Yahoo! Inc.		FE	

* CD = Concept Definition Study,
  FE = Field Experiment,
  R&D = Research & Development

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