ENERGY STAR® ICT Product Roadmapping Workshop Organizing Document

TRACK 2: ICT-ENABLED INTELLIGENT EFFICIENCY SOLUTIONS AND ENERGY STAR

INFORMING DOCUMENT PURPOSE.
Recognizing the unique nature of Information and Communication Technology (ICT) products −their complexity, their rapid evolution, their global applicability, their connectivity with many other products types − EPA and ITI see value in hosting an informal brainstorming dialog regarding the near term future of ENERGY STAR for ICT products and ICT-enabled solutions. This informing document is intended to assist participants in preparing for the Track 2 breakout, enabling the richest and most productive discussion possible on July 10 and beyond.

DESIRED OUTCOME FROM TRACK.
Outline key topics to be considered in the development of ENERGY STAR's vision for engagement with ICT-enabled intelligent efficiency solutions recognizing the US economy's increased reliance on ICT-enabled systems architectures for growth and efficiency improvements. This planning discussion will focus on the next 3-5 years. EPA and ITI anticipate that these considerations will be more fully discussed and documented through a limited set of conference calls hosted through the second half of the 2012 calendar year.

FRAMING DISCUSSION.
"System efficiency opportunities produce energy savings that dwarf component-based efficiency improvements by an order of magnitude. System efficiency is performance-based, optimizing the performance of the system overall—its components, their relationships to one another, and their relationships to human operators. One of the cornerstones of systems-based efficiency is information and communication technologies, such as the Internet, affordable sensors, and computing capacity that are the foundation upon which systems efficiency are built…If homeowners and businesses were to take advantage of currently available information and communications technologies that enable system efficiencies, the United States could reduce its energy use by about 12-22 percent and realize tens or hundreds of billions of dollars in energy savings and productivity gains." (ACEEE Report, "A Defining Framework for Intelligent Efficiency," June 5, 2012)

As the recent ACEEE Report on intelligent efficiency highlights, ICT equipment usage is evolving to networks of highly interconnected devices forming complex integrated systems, and this is a positive development for US energy efficiency. These solutions are being utilized horizontally across the US economy, allowing each industry sector to improve its efficiency and reduce its environmental impact.

Increasingly, small portable devices will appear to have almost unlimited capabilities, while data center equipment takes on an ever greater role as organizer, analyzer, and director of systems. All of these devices are participants in networks that provide complementary functions that support each other in presenting the appearance of boundless and seamless capabilities served up by an invisible integrated whole.

Meanwhile, the data centers that enable this ubiquitous, mobile environment are gravitating to two modes of operation:

1. Small to medium to large centers of interconnected systems dedicated to the needs of a single enterprise; and

2. Large centers, and even networks of large centers, providing services to a broad and geographically diverse population whose only common element is the applications they choose to use.

What these models have in common is the expectation of physical distance from client devices without direct physical connections, as well as a focus on applications as the means and reason for the interactions between clients and the centers. Not only is virtualization a means to improved efficiency, but the entire user experience is based on a virtual experience of seamless interconnection between unrelated systems.

Given this model, devices are evolving differently to meet the needs of the roles they play.

- Traditional ICT products such as PCs and imaging equipment have been connected to local and wide area networks for over 10 years. In the future, these devices will become even more connected, not just sending and receiving information from traditional sources but also additional sources such as portable clients. These devices will continue to interact together, as a system, to perform the customer functions.
- Portable clients are focusing on being physically light, having longer battery life, and expecting all services to be accessed via the ubiquitous wireless connectivity of WiFi or 4G. The result is that the available real estate and energy budget is used for high-performance communications and perfecting the display characteristics of a device.
- Data center equipment is focused on increasing the scalability of devices in this interconnected world and is driven along two different models: (1) Scale-up, where one system adds connectivity, capacity or CPUs, and (2) Scale-out, where multiple smaller systems are aggregated to offer a large virtual system. Each approach offers different benefits, and no single approach is appropriate for all application needs.
- Diverse, formerly independent devices are increasingly reliant on and part of a network, a network which is impacting the total energy usage of that particular device, but also a network where some percentage of the energy usage is occurring elsewhere within an even larger network (primarily at the data center level). The combination of devices will result in a significant net decrease in energy use even though the individual component devices may not be optimized for efficiency.

A level of systems integration has already been occurring and ENERGY STAR's role already discussed with regard to such non-ICT products as climate controls, HVAC, and certain "smart appliances." Yet the intelligent efficiency advances to be encouraged also include diverse, challenging systems such as campus-wide energy monitoring and controls, lighting optimization systems, microgrid control systems, precision agriculture, plant-wide manufacturing optimization systems, travel substitution, and other smart transportation solutions, sustainable cities solutions, and the like.

The role of ENERGY STAR in all of this is unclear and needs to be the focus of ongoing discussion.

KEY FRAMING QUESTIONS.

- Which ICT-enabled intelligent efficiency solutions and systems architectures should be addressed in this roadmapping exercise?
- There are cases where energy efficiency is already defined and measured by systems, such as the energy-efficiency of commercial buildings through Portfolio Manager. Can these examples act as a guide for considering ENERGY STAR's role within the intelligent efficiency solutions and systems architectures being addressed in this exercise?
- Conceptually, efficiency is measured as energy consumed per unit of desired service delivered. Can we identify some types of complex systems for which it is possible to define a unit of service appropriate to the combined system? How do we go about defining system boundaries that can be reasonably drawn so that energy used to deliver the service is adequately captured?

- To the extent that system efficiency becomes a more attractive energy savings opportunity for products that ENERGY STAR has typically labeled individually, what role(s) could the ENERGY STAR brand play? What are the policy challenges associated with these roles?
- Are there ways to partner with utilities to identify exemplary systems and approaches, and also to encourage utilities to drive meaningful, intelligent efficiency advancements through energy efficiency or other incentive programs?