G20 Energy Efficiency Action Plan: Networked Devices

International Programs & Policies: Intelligent Efficiency

By Jeremy Dommu, US Department of Energy

December 8, 2015: ACEEE Intelligent Efficiency Conference

Overview

- The G20 Action Plan & Mandate
- Achievements & activities
- Key recommendations
- Way forward

The G20 Issue

- Networked Devices always in standby modes drawing additional power to maintain network connectivity
- Number of networked devices is increasing rapidly - 100 billion networked devices by 2030. Consuming more than 6% of current total final global electricity consumption.
- Uptake of best available technologies could reduce energy demand by up to 65%
- Huge opportunity for energy savings in devices and networks

IEA Report: *More Data, Less Energy: Making Network Standby More Efficient in Billions of Connected Devices*

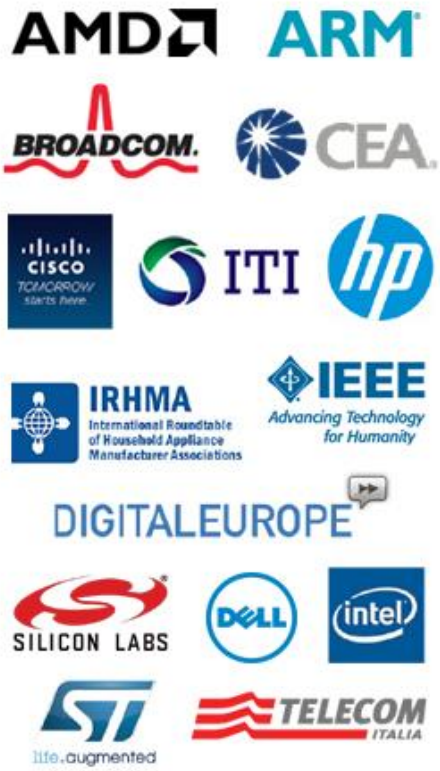
https://www.iea.org/publications/freepublications/publication/more-data-less-energy.html

Mandate from G20 EE Action Plan

- Participating countries will work together to accelerate the development of new ways to improve the energy efficiency of networked devices.
- In 2015, this work will include consideration of options for goals for reducing the global standby mode energy consumption of networked devices.

Involvement of Government & Industry

- **Connected Device Alliance** between governments and industry
- 19 government energy efficiency agencies (see table) have participated
- Additional liaison through SEAD & IPEEC
- Industry Participation through 3 workshops and 26 teleconferences.



Australia	Germany	Spain
Austria	Japan	Sweden
Canada	Korea	Switzerland
Denmark	Netherlands	Turkey
European Commission	Mexico	United Kingdom
France	Singapore	USA

Integrating Intelligent Efficiency

- Recognize the benefits brought about by networks and opportunities enabled by ICT to deliver systems-level energy savings
- Incorporate intelligent efficiency as a major part of the work-stream

Achievements of G20 Work

- **Development of a Common Goal**
  - *Maximize network-enabled energy savings and minimize the energy consumption from all networks and network-connected devices*
- **Key outputs in 2015:**
  - Voluntary **Design Principles** for the design and operation of connected devices
  - Voluntary **Policy Principles** to encourage a common global framework
  - A set of global **Definitions** to underpin the development of policies and initiatives
  - **Centre of Excellence** to promote best practices, including IE
    - DESSC Paper on ICT-Enabled Intelligent Efficiency
  - Development of **Awards** to recognize significant achievements

Design & Policy Principles

DESIGN AND OPERATION PRINCIPLES

1. Networked device design should follow standards-based communication and power management protocols to ensure compatibility and interoperability, and should take advantage of standards and protocols that actively support energy efficiency.
2. Networked devices should not impede the efficient operation of a network (for example by injecting bottlenecks or faults, or impeding power management activities in other devices).
3. Network-wide energy efficiency optimization should be a primary development consideration. Network power management should coordinate with individual device power management techniques to achieve this.
4. Connection to a network should not impede a device from implementing its internal power management activities.
5. Networks should be designed such that legacy or incompatible devices do not prevent other networked devices on the network from effective power management activities.
6. Networks and networked devices should have the ability to scale power levels in response to the amount of the service (level of functionality) required by the system.
7. Edge devices without networking functionality should enter network standby, if appropriate, after a reasonable period of time when not being used. Edge devices with networking functionality should provide power management capabilities for each function consistent with that function's role in the network.

DESIGN AND OPERATION PRINCIPLES (continued)

8. Networking and networked infrastructure devices should not autonomously go to network standby mode. These devices should support power scaling.
9. Consumers should be informed about and have control over device power management, when applicable, including networked device low power modes that may affect the user experience.
10. The design and operation of networked devices should be compatible with, and promote the positive effects of, using consumer electronics and information and communication technology (ICT) to enable energy to be used more efficiently, often referred to as "Intelligent Efficiency."

POLICY PRINCIPLES

1. Government and industry should seek harmonized policy approaches that benefit the global marketplace for consumer and commercial technology products and services, and that enhance the productivity and efficiencies achieved via networks.
2. Policy, including government procurement and best-practice sharing, should support continued device, network and intelligent efficiency innovation.
3. Energy efficiency requirements should be performance-based and technology neutral. Policy should account for the different capabilities of networked devices.
4. Policy should neither impede the functionality of networked devices or efficiency of the network nor impair the implementation of standards for enabling device or network security.

Definitions

Device Power management: The capability of a device to adapt its power to the required functionality. Examples of device power management are power scaling, and transitioning into a low(er) power operating mode.

Edge device: An end-user device that is connected to a network. Edge devices range from electronic devices such as smart TVs to appliances, heating, cooking and lighting equipment.

Latency: The time it takes for a device or part thereof to change state or mode so that it can respond to a request or to provide a requested function.

Network or Network System: A digital communication infrastructure with a topology of links, an architecture, including the physical components (devices), organizational principles, communication procedures and formats (protocols). Networks can interconnect with other networks and contain sub-networks.

Network power management: The capability of a community of networked devices to manage power optimally across the community. Examples of network power management include consolidation of resources, managing the state of network links, and proxying.

Networked infrastructure device: A device connected to a network that is shared by more than one edge device (client). A server would be an example of such a device.

Networked devices: A general term meant to cover all devices that are connected to networks and make up the network. Edge devices, networked infrastructure devices, and networking devices are all subsets of networked devices.

Network idle: The inactive status of a network (link) which a device is connected to (i.e. is not processing a “pay load”). Under this condition, the device(s) connected may still be required to support various functions to support its network connection and operation

Network standby: A low power mode in which a device has the capability to maintain a persistent network presence after its operation has been suspended.

Networking device: A device connected to a network whose main functions are to pass along data traffic, routing data between networked devices, and optimizing available bandwidth and transmission delays according to a wide variety of requirements. A WiFi access point would be an example of such a device.

Networking functionality: The functionality to pass along data traffic and routing data between networked devices. For networking devices, the networking functionality is the main function. For edge devices, the networking functionality may be one of the (secondary) functions, e.g. a network printer with an integrated wireless access point.

Power scaling: The capacity of a device to dynamically change its power level in relation to its variable workload; it may involve voltage and/or frequency scaling.

Standards and protocols: Widely-accepted technical documents which specify how networked devices communicate or manage energy consumption. Published by standardization organizations or recognized standards developing organizations / alliances. Does not refer to regulatory standards.

Next Steps for 2016 and beyond

- G-20 Energy Minsters Commique endorses the work and agrees to continue future collaboration
- G20 and CDA participants keen to develop longer term plans
- Launch of new phase of **Connected Devices Alliance**.
  - Workshop scheduled May 19 & 20 at IEA HQ in Paris
    - Welcome broad-representation at the workshop;
    - Email OA Steve Beletich (info@edna.iea-4e.org)
- Government-funded Scoping Study on Initiatives and Policy Options for governments to encourage IE
- Formulation of working group on IE measurement methodologies

US Government Initiatives on Intelligent Efficiency

- DOE Sensors and Controls Technologies Quadrennial Energy Review
- NREL Energy Systems Integration Facility
- Building to Grid Integration: Characterizing Connected Equipment
- Green Button Initiative

- ITI/EPA Workshops on Systems Efficiency
- Systems Efficiency Metric Development & Pilot
- ENERGYSTAR Connected Products
- State Compliance Programs under 111(d)?

Office of Science & Technology Policy Council on Environment Quality

- Climate Data Initiative and Commitments
- Climate Resiliency Toolkit
- Smart Cities Discussions & Projects

- Connected Vehicles Program
- Intelligent Transportation Systems Program
- Smart Roadside Program
- NIST's Global City Teams Challenge

Note: above video requires audio. Video also downloadable from http://edna.iea-4e.org/cda

Links and Contact

- **Connected Device Alliance:** http://cda.iea-4e.org
- **IEA 4E Electronic Devices and Networks Annex:** http://edna.iea-4e.org

Jeremy.Dommu@ee.doe.gov
(202) 586-9870