WELCOME TO ACEEE’S WEBINAR ON INTELLIGENT EFFICIENCY

Date: Tuesday, June 5\textsuperscript{th}  
Time: Noon EDT / 9 AM PDT  
Dial-in: +1 (877) 397-5980  or Toll: +1 (706) 645-7073  
Enter Participant Passcode: 1075103 #  
(if required, your Conference ID is 86902923 #)  
Tech Support if needed: +1 (877) 283-7062

Visit www.aceee.org to download ACEEE’s new report on Intelligent Efficiency this afternoon after 1:30 PM EDT
• **Neal Elliott**, Associate Director for Research, ACEEE
• **Paul Hamilton** Vice President, Government Affairs, North American Operations, Schneider Electric
• **Clay Nesler**, Vice President, Global Energy & Sustainability and Building Efficiency, Johnson Controls
• **Larry Plumb**, Executive Director, Emerging Issues and Technology Policy, Verizon
• **Arkadi Gerney**, Senior Director for Policy, Opower
• **Stephen Harper**, Global Director, Environment, Intel Corporation
Energy Efficiency’s Past Role in Meeting US Energy Needs

U.S. Energy Use in Relation to GDP 1970-2008

Source: ACEEE
Future on Energy Efficiency—Moving Beyond Device Efficiency

• Big energy efficiency hits have come from device efficiency: cars, appliances & equipment

• Significant potential remains for device efficiency

• Even greater efficiency opportunity exists from systems—but this efficiency requires a different approach
Device vs System Efficiency

- Devices are parts of systems—attacking efficiency of devices does not necessarily improve efficiency of the system.
- Low-hanging efficiency opportunities already harvested—additional device-focus policies producing more modest returns—savings typically 2-5%.
- Opportunities from optimization of energy-using systems huge—report found 12-22% efficiency gain potential from ICT alone—more with network effects.
- Computer, sensor & communications advances enable system efficiency opportunities.
What is *Intelligent Efficiency*?

*Intelligent efficiency* is a systems-based, holistic approach to energy savings, enabled by information and communication technology (ICT) and user access to real-time information.

*Intelligent efficiency* differs from component energy efficiency in that it is adaptive, anticipatory, and networked.
**Intelligent Efficiency**

INTEGRATED, RELIABLE, and SMART.

**People-Centered Efficiency**
Providing real-time information and management tools that enable users to lower energy consumption in response to changing information.

**Technology-Centered Efficiency**
Using sensors, controls, and software to automate and optimize energy use.

**Service-Oriented Efficiency**
Shifting behavior and organizational structures to reduce energy-intensive activities.

- Fuel Economy Display
- Home Energy Monitor
- Bus Arrival Apps
- GPS Fleet Management
- Building Control Systems
- Power Grid Controls
- Intelligent Transport Systems
- Fuel-Saving Systems
- Telecommuting
- Video Conferencing
- Ebooks & Digital Music
- E-Commerce
Realizing System Efficiency through Intelligence

- Goal is optimization to meet users' varying needs, not efficiency at a single point.
- Requires a different approach to implementation & evaluation from device efficiency.
- Levels of system efficiency exist:
  - Economy-Wide
  - Community
  - Facility
  - Process
- Expanding scope increases savings—increases complexity.
- Current focus sectoral—future opportunities crosscutting.
Policy Opportunities

• Recognition & awareness: lead by example in government & private sector
• Improving access to up-to-date, reliable & meaningful energy information
• Addressing privacy issues
• Performance-based energy efficiency codes, standards & incentives
• Alternative utility regulatory business models & alternative evaluation, measurement & verification (EM&V) approaches
• Support enabling infrastructure, including broadband
• Encouraging innovation
Intelligent Efficiency Advisory Group

• ARM
• California Institute for Energy & Environment
• Google
• IBM
• Information Technology & Innovation Foundation
• Information Technology Industry Council
• Intel
• Johnson Controls
• Lawrence Berkeley National Laboratory
• OPower
• Rockwell Automation
• Schneider Electric
• Southern California Edison
• U.S. Department of Energy
• Verizon
Understanding *Intelligent Efficiency* through Examples

*Intelligent efficiency* is:

- Complex and multidimensional
- Has been emerging for a decade
- Factors critically into business strategy of diverse group of companies.
- Best understood by examples, but the future not limited by what is happening today.
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Paul Hamilton
VP Government Affairs

Make the most of your energy™
“The goal with ESB has been to define intelligent choices which will either save money, spend the same money more efficiently, or spend additional sums for which there is reasonable payback through savings. Succeeding in these efforts will make a replicable model real for others to follow.”

- Anthony E. Malkin

Clay Nesler
VP, Global Energy & Sustainability
Johnson Controls
05 June 2012
Eight Measures Result in 38% Reduction
Intelligent efficiency driving half the savings

Annual Energy Savings by Measure

Intelligent Efficiency Impact

38% Reduction

Baseline
Balance of DDC
Tenant Daylighting/Plugs
VAV AHU's
Retrofit Chiller Plant
Building windows
Tenant Energy Mgmt
Radiative barrier
Tenant DCV
Energy Use

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For more information about the Empire State Building Retrofit Project, visit:

www.esbnyc.com
November Neighbor Comparison

<table>
<thead>
<tr>
<th>EFFICIENT NEIGHBORS</th>
<th>YOU</th>
<th>ALL NEIGHBORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,450*</td>
<td>1,851</td>
<td>2,759</td>
</tr>
</tbody>
</table>

* This energy index combines electricity (kWh) and natural gas (therms) into a single measurement.

WHO ARE YOUR "NEIGHBORS"?

ALL NEIGHBORS
Approximately 100 occupied nearby homes that are similar in size to you (avg 2,023 sq ft) and have both electricity and natural gas service.
Opower’s Utility Partners
70+ Utility Clients, 10M+ Households on Platform, data from 40M homes

Not Shown
- CA
  - Anaheim
  - a
  - Glendale
  - Pasadena
  - Palo Alto
  - CO
  - Loveland
  - IN
  - Hoosier
  - NIPSCO

- MN
  - MERC
  - Lake
  - Country
  - Power
  - Owatonna
  - Austin
  - Rochester
  - Shackopee
  - Otter Tail
  - UI
1.5 – 3% savings.
It adds up across millions of homes:

>1 Terawatt-Hour (1bn kWh)
--> Enough to power 90,000 homes

>1,520,210,000 lbs CO₂

>$100,000,000 saved on energy bills
Thank you

arkadi@opower.com
Envision Charlotte is a unique public-private partnership that will be a global model of environmental sustainability for measurable community and economic results.

Our goal is to drive dramatic reductions in energy and water consumption over the next five years, while reducing our waste and improving our air quality.

By doing so we will lower operating costs, and increase profitability for our building owners, improve the health and livability of our community, and solidify our position as a new energy capital.
Have made an incredible start:

- Smart Energy Now, our energy efficiency program, is fully deployed.
- Smart Water Now has begin execution and should be complete by Fall 2012.
- Over 98% of office building owners are participating, and more than 600 volunteer energy champions have been trained.
- We’re drawing up plans for our waste and air programs for introduction later this year.
Taking a Strategic Approach to Intelligent Energy

Stephen Harper
Global Director
Environment and Energy Policy
Intel Corporation
Technology for the Environment

2% Opportunity
Enable IT industry to be more energy-efficient

98% Opportunity
Use energy-efficient computing to help others reduce their own consumption and solve complex environmental challenges facing the planet
Shrinking the 2% - The “Micro Story”

• Keeping pace with Moore’s Law

• “Going mobile” is inherently smarter and greener

• Greening the data center – The Green Grid

• Laser focus on energy productivity – driving more performance output for less energy input
Moore’s Law pushes performance and power reduction

Each transistor in Intel’s newest 45 nanometer processors uses 1/7000th of the power compared to our earliest transistors. If automobile fuel efficiency had improved at the same rate, today’s cars would get ~100,000 miles per gallon.
The Micro Story at the System Level

Estimated Annual Energy Consumption

<table>
<thead>
<tr>
<th>Configuration</th>
<th>kWh Consumed per Year</th>
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<tbody>
<tr>
<td>Unmanaged Pentium® Dual Processor 945</td>
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<tr>
<td>platform</td>
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</tbody>
</table>

>17x Reduction

Going Mobile
Shrinking the 98% - The “Macro Story”

• Developing products for the proliferating “embedded” market

• Supporting the “cloud”

• Pilot new applications of intelligent efficiency

• Investing in intelligent energy through venture capital funding

• Partnering with government to develop and implement public policies that enable the growth of intelligent efficiency
  – Digital Energy and Sustainability Solutions Campaign (DESSC)
Embedded energy solutions
The “Cloud” as an Energy Efficiency Driver

• The Data Center and the network is at the center of the “macro story”

• The Carbon Disclosure Project (CDP) commissioned Verdantix to examine the impact of a broad US roll-out of Cloud Computing, based on extrapolation from existing case studies:
  – Huge CO2 emissions reductions
  – Huge financial savings
  – Strong positive financial ROI
  – Indirect benefits from increased business process efficiencies and organizational flexibility

Intel Sustainable & Connected Cities Institute

The Concept: driving the computing continuum and inventing the city of the future

The Testbed: London

The Opportunity
- Create sustainable future city vision
- City of London offering test bed access
- Two world-class universities joining forces to lead the initiative
- Partnership with other fellow travellers

The World-Class Research Universities: UCL & UCI
DESSC-US Partners

*ITI serves as the host organization for DESC
Q&A Session

To submit your question, click on Q&A on the top grey menu bar.
Type in your question and hit enter.
We will address as many questions as possible.
Polling questions go here
How to Contact Us

- Please visit [www.aceee.org](http://www.aceee.org) to download the report this afternoon after 1:30 PM EDT
- We will e-mail you a link to access the webinar presentation slides and the audio recording
- Follow us on Twitter at: @ACEEEEdc

Thank you very much for participating in our webinar!
Please stay tuned for our future work on intelligent efficiency.