



Grid Modernization

Smart Grid: Changing Our Use of Electricity Now and in the Future

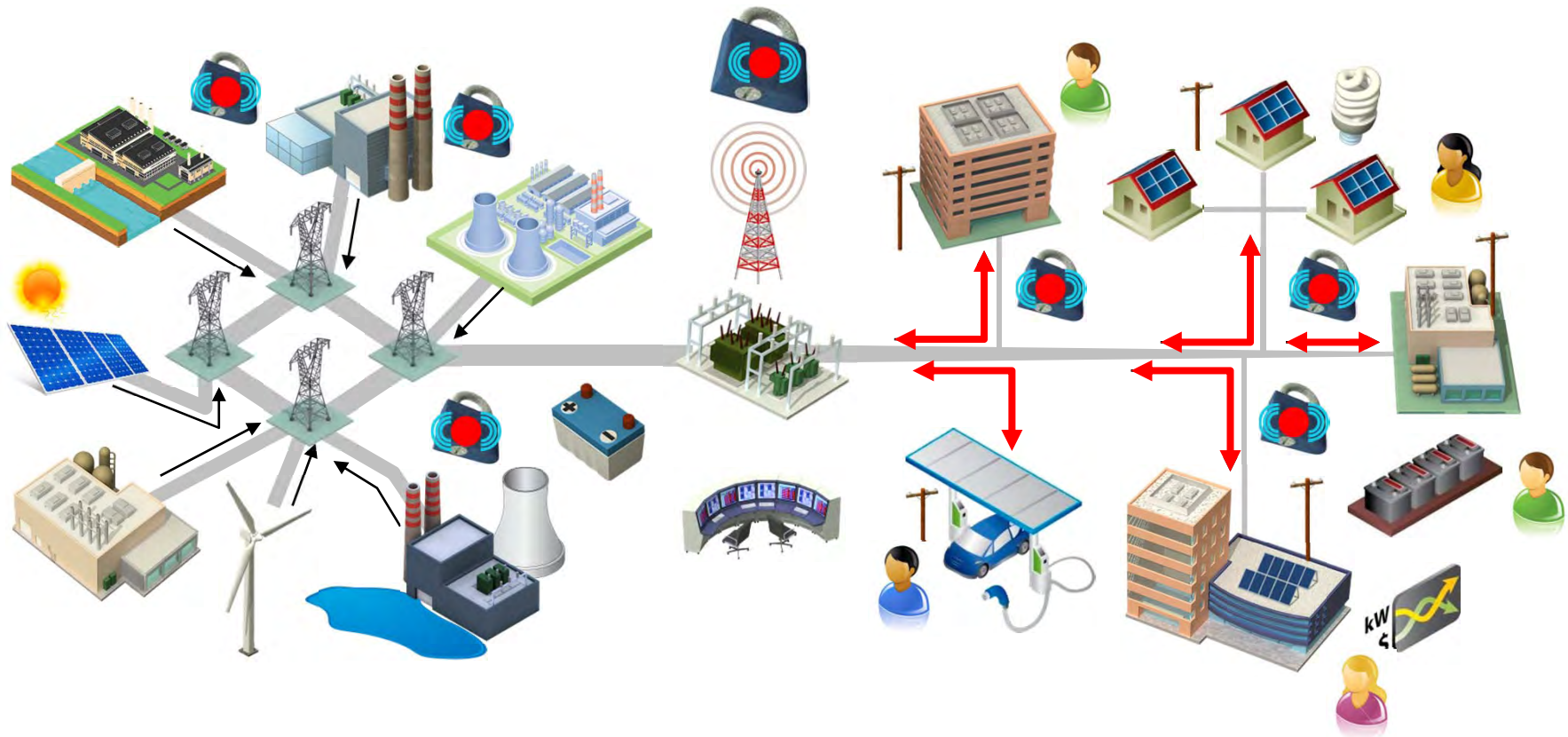
National Association of State Energy Officials
October 10, 2012

Tom Reddoch
Senior Technical Executive

What is Grid Modernization

- **Replacing aging power apparatus infrastructure (some in excess of 50 years old) and antiquated information and control hardware (analog and early vintage digital equipment).**
- **Applying modern and evolving communication and control infrastructure (advanced digital technology and software systems – so called Smart Grid apparatus) and advanced metering (“Smart Meters”)**
- **Creating a flexible grid system to accommodate renewable energy sources, energy efficient technology, new end-use electrification options, demand response, and electric transportation.**

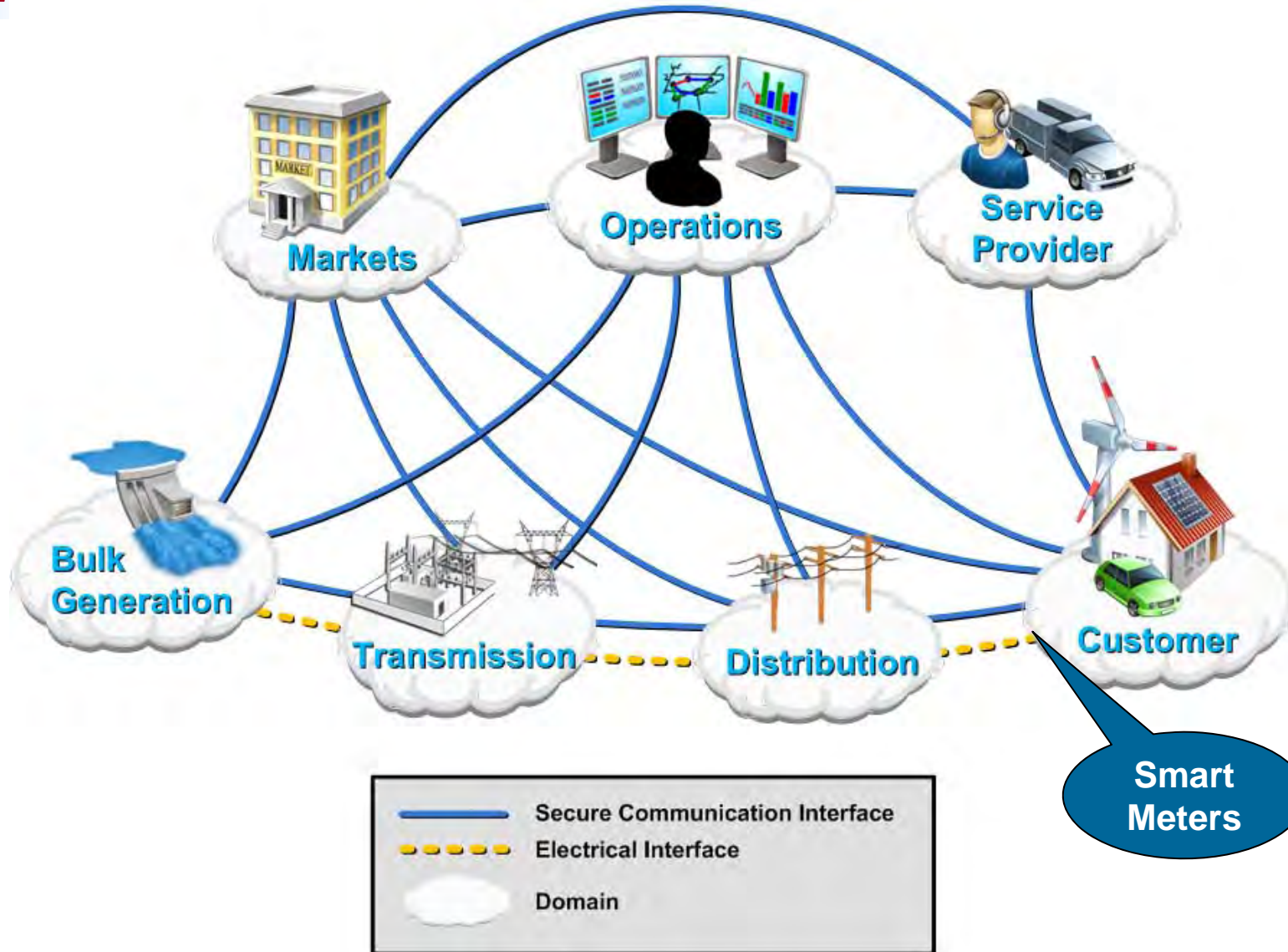
Tomorrow's Power System...



Distributed generation, two-way power flow, active consumers

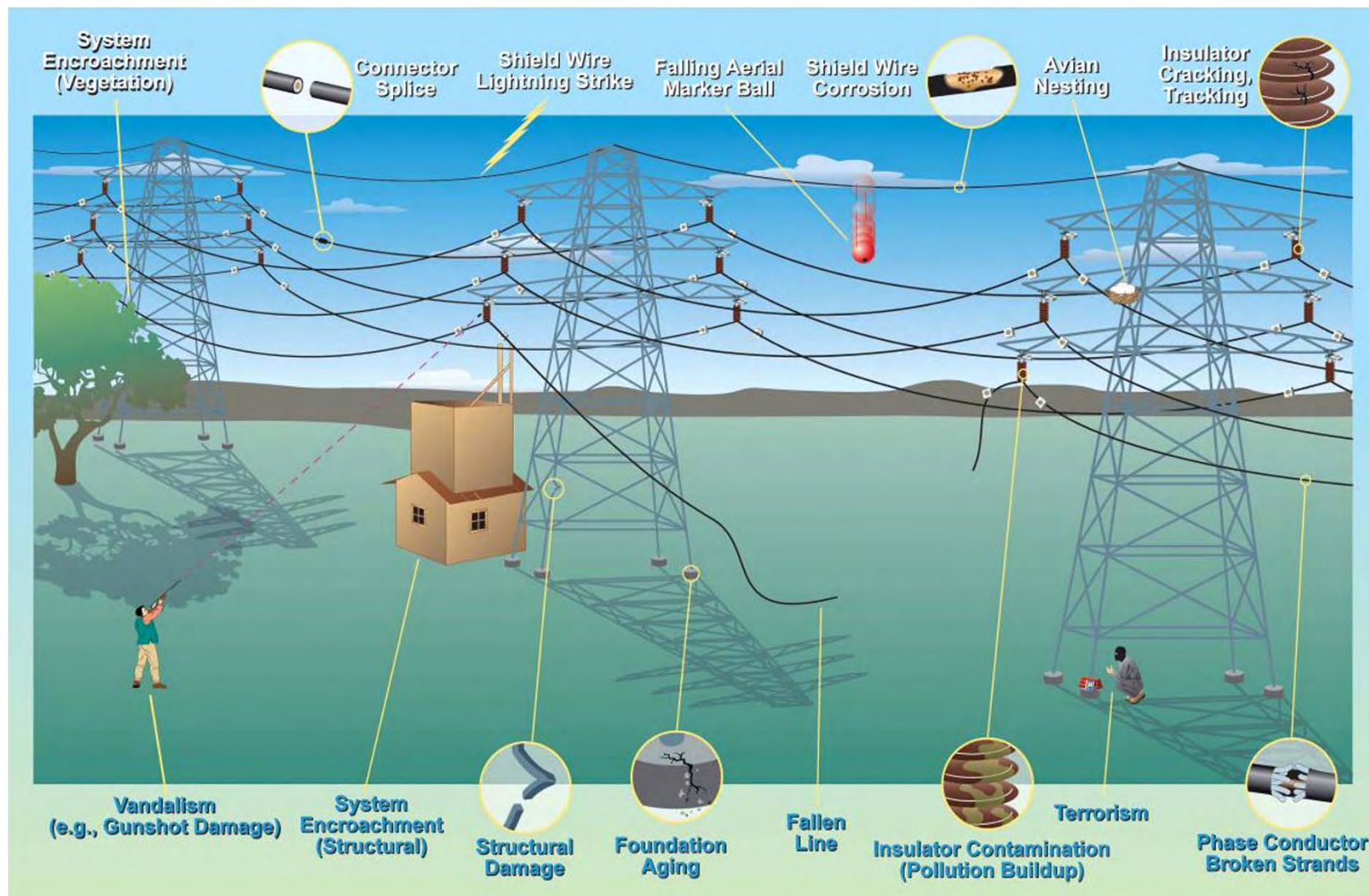
Grid Modernization -- Conceptual Model

Applying Modern Communication & Control Technology



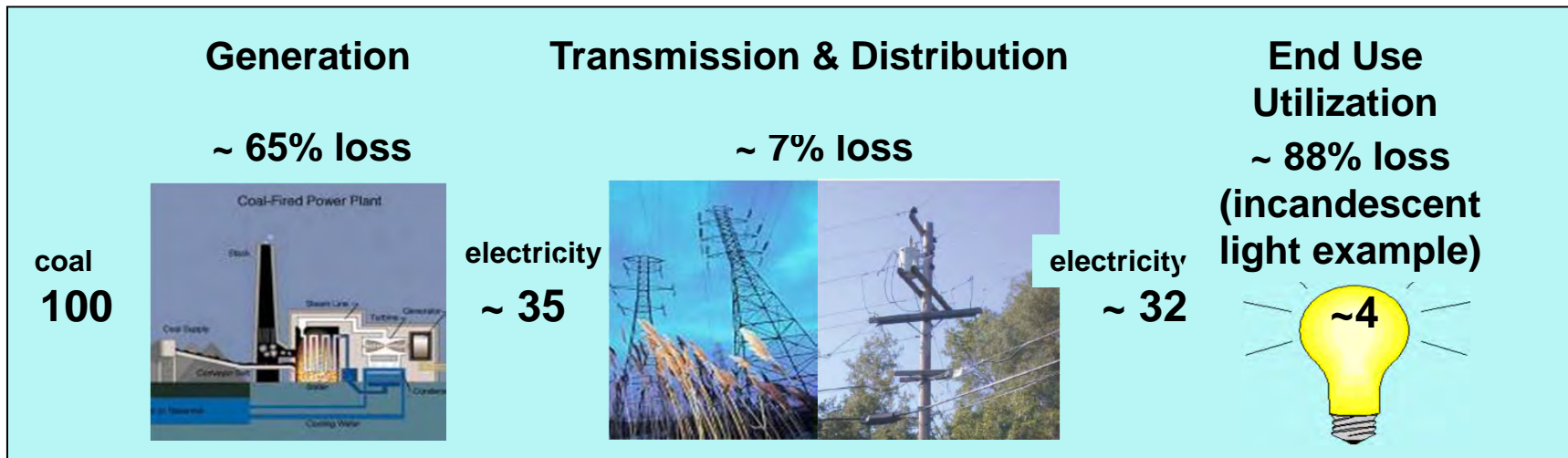
Source: EPRI Report to NIST, 2009

Sensor Needs for Transmission Lines & Towers



Source: EPRI 1016921

End – to – End Efficiency



Methodology

- **End-to-end assessment of the possible use of sensors, communications and computational ability in each element of tomorrow's power system.**
- **Validated with EPRI staff, industry advisors and select vendors and consultants.**
- **Cost estimates are uncertain – therefore a range of estimates was used.**

Estimating Cost/ Benefit of “Smart Grid”

The Analysis is Different

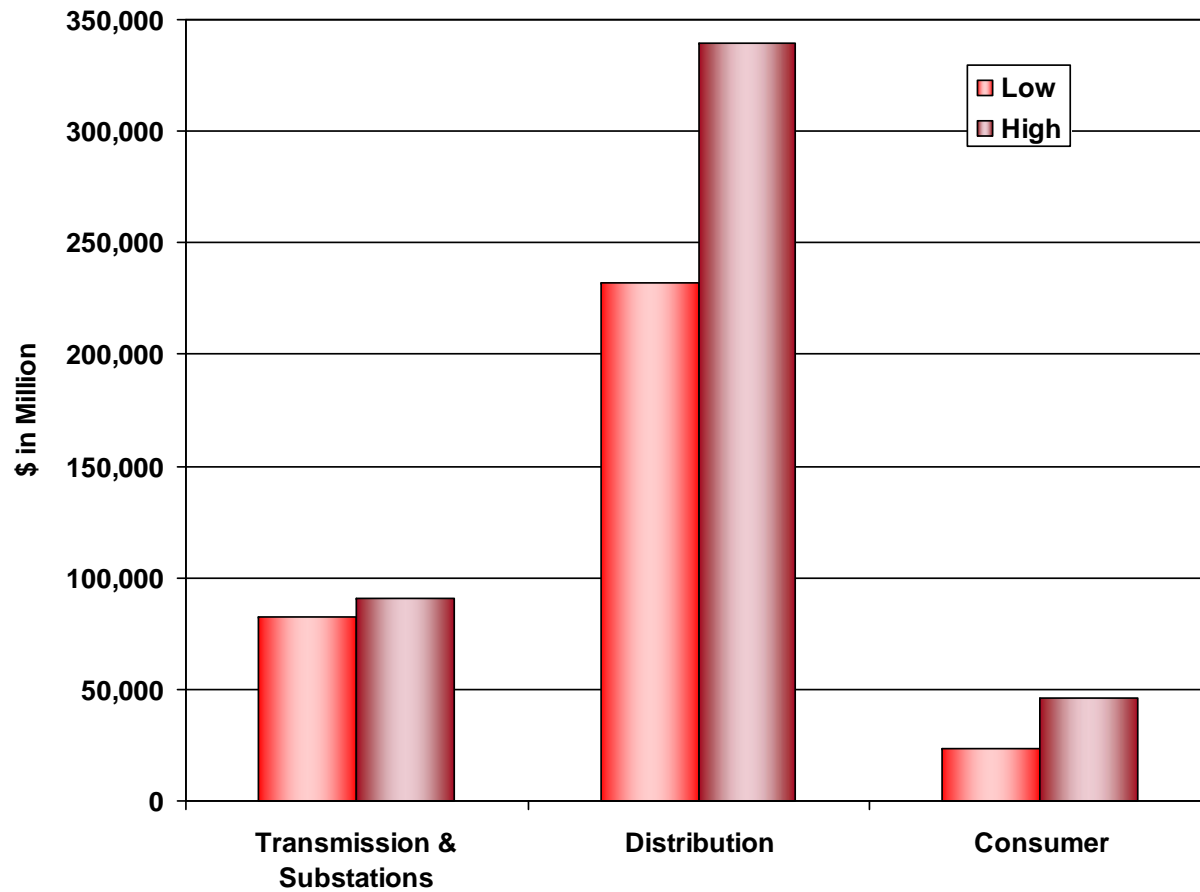
- **Scope of the Technologies**
- **Scale of the Technologies**
- **Span of Markets and Market Players**

This combination of scope, scale and market span makes it challenging to identify market barriers and program beneficiaries, and complicates program evaluation.

Summary of Estimated Cost & Benefits of the “Smart Grid”

Categories	20-Year Total (\$billion)
Net Investment Required	338 – 476
Net Benefit	1,294 – 2,028
Benefit-to-Cost Ratio	2.8 – 6.0

Total “Smart Grid” Costs



What can you buy for \$500 Billion

- You can buy all 32 NFL football franchises – 19 times
- You can buy 14 Marlin stadiums for all counties in FLA
- You could buy 5 Mac laptops for every school-age child in the USA
- President Bush spent \$700B to bail out our financial institutions

Jobs for “Smart Grid”

- **One study identifies 334 relevant U.S. employee locations spread across 39 states**
- **“Smart grid” provides a way for well-established firms to transition from traditional products into new areas, including new manufacturing opportunities**
- **The fast-growing global market for smart grid technologies presents valuable export opportunities for U.S. firms, large and small**
- **Future U.S. job creation by vendors will likely concentrate in high-value IT innovations, product development and systems design and engineering**

Smart Meters in the News

Three Issues:

- ▶ Value
- ▶ Health
- ▶ Privacy

Mother Jones

IN THE BLOGS

KEVIN DRUM | MOJO | BLUE MARBLE | THE RIFF | THE RIGHTS STUFF | ALL BLOGS

—Econodrums

Will "Smart" Household Electricity Meters Give You Cancer?

—By **Kiera Butler** | Mon Jan. 17, 2011 2:30 AM PST



—Image courtesy of Wikimedia Commons

You'd think Marin County, California, famous for its tree huggers, would be all for "smart" household electricity and gas meters. Experts say that the devices, which allow utilities to calculate your energy rates in real time instead of once a month, are an important step toward greening our Ruben-Goldberg-ish energy grid. But earlier this month, the Marin County board of supervisors voted unanimously to impose a

moratorium on installation of the devices, primarily because of health concerns about the electromagnetic radiation the devices emit. As Jonathan Hiskes points out in his post on the subject, health worries are only part of the debate: Some worry that smart meters will broadcast consumers' private information to utilities and businesses. Still others believe that smart meters will actually increase users' power bills.

Maine Sunday Telegram

Sunday, December 5, 2010

November 23

Smart electric meters: Folly, or energy's brave new world? CMP moves ahead as foes seek to halt the Maine program.

By **Tar Turkel** turkel@mainesunday.com
Staff Writer

PORTLAND — Diane Leonard had lots of questions about smart electricity meters. Through the media, she had heard that they emit radiation, and she was worried about potential health effects. —br—br—

Standing outside Leonard's home in the city's West End, a representative of Central Maine Power Co. told her that the meters emit no more radio frequency transmissions than the cordless phone she was holding. Moments later, she became one of the 1,500 or so CMP customers who had smart meters installed Monday. —br—br—

"I just want them to know I'm uncomfortable, because I don't know what this will bring," Leonard said as her old meter was being switched out.

CMP has begun a two-year project to replace all of its 620,000 meters with a new generation of wireless, digital devices.

Opponents of the technology have asked the Maine Public Utilities Commission, which approved the \$192 million program, to stop it and investigate potential health effects.

CMP has requested that the complaint be dismissed. On Monday, the lead opponent in the case asked for 21 days to respond to CMP's request before the PUC takes any action.

Meanwhile, CMP is moving ahead with its program. So far, it has installed 50,700 meters. Fewer than 400 customers have asked the utility not to do the work — requests that CMP is honoring, for the time being.

The process of installing a smart meter generally is very straightforward. A technician working for Aston, Pa.-based VSI Meter Services, CMP's subcontractor, knocks on the door to explain what's about to be done. If no one's at home, the technician leaves an informational tag on the door.

Then the meter panel is removed, the old unit is pulled out and the new meter is plugged in. The switch takes less than five minutes. Power is disrupted for about 15 seconds.



Zach Pomeroy, wearing face and hand safety equipment, installs new smart meters at homes on Brackett Street in Portland.
John Ewing/Staff Photographer



"It would be up to the commission to permit (customers to opt out of the program or have smart meters hard-wired to the network), but our goal is to have a uniform technology," said John Carroll, a CMP spokesman.
John Ewing/Staff Photographer

The New York Times 1/30/11 Environment

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION

New Electricity Meters Stir Fears



Answer 1/30 for The New York Times

Katharina Sandizell, at home with her sons Jacob, left, and Luca, helped block meter trucks in Marin County.
By **FELICITY BARRINGER**
Published January 30, 2011

INVERNESS PARK, Calif. — Pacific Gas and Electric's campaign to introduce wireless smart meters in Northern California is facing fierce opposition from an eclectic mix of Tea Party conservatives and left-leaning individualists who say the meters threaten their liberties and their health.

In the San Francisco Bay Area, "Stop Smart Meters" signs and bumper stickers have been



What is our Progress at deploying Smart Meters

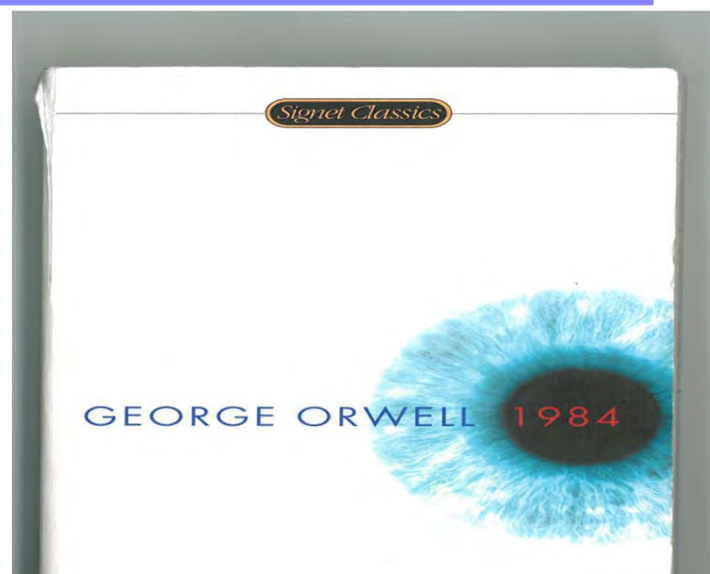
- Market size: 160 M
- 2012: 30M
- 2015: 60M

New Smart Meters have a projected life of 15 years

A Basis for Privacy

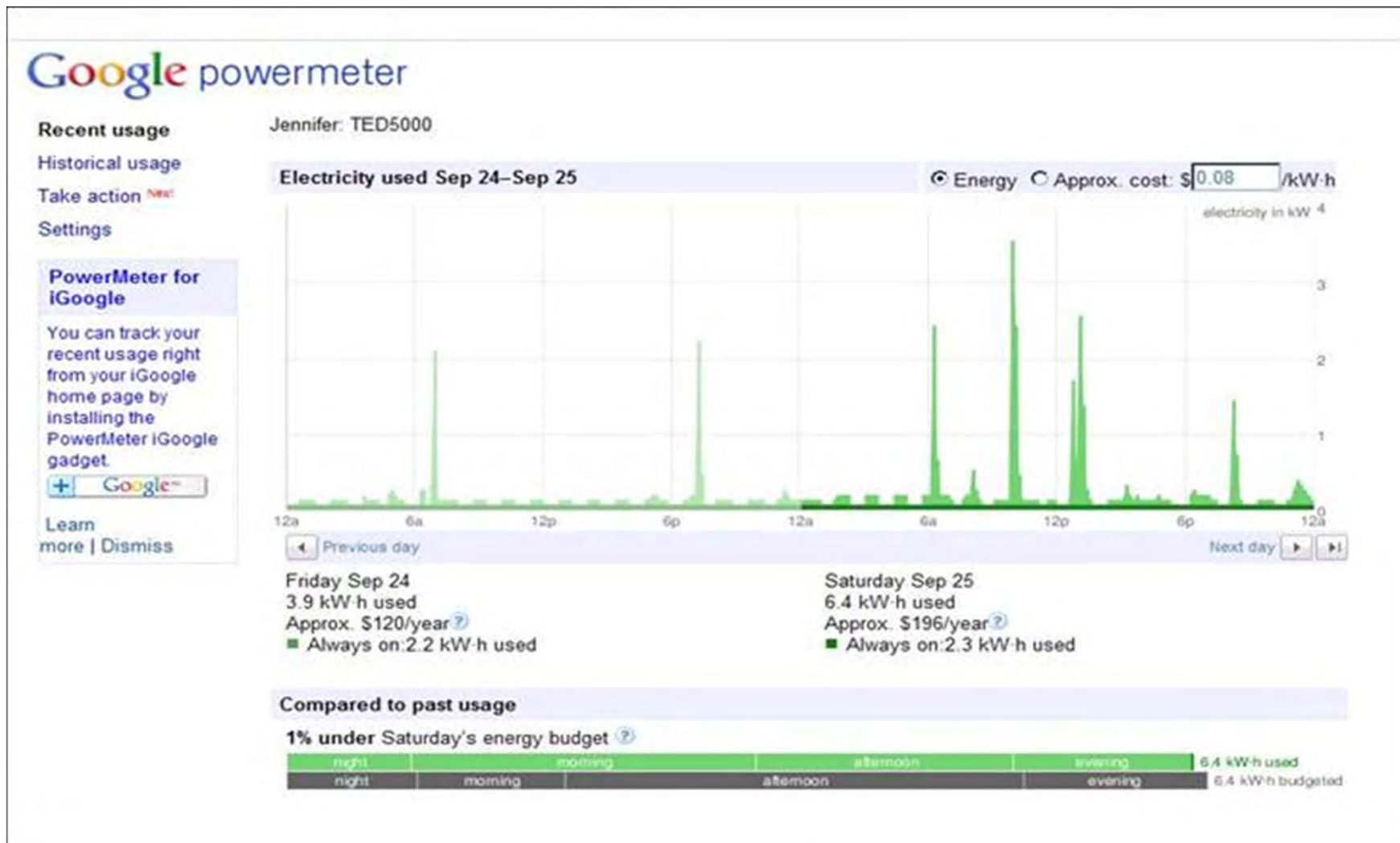
The instrument (the telescreen it was called) could be dimmed, but there was no way of shutting it off completely.

....He went back to the living room and sat down at a small table. For some reason the telescreen in the living room was in an unusual position. Instead of being placed as normal—where it could have full command of the room. By sitting in the alcove, Winston was able to remain outside the range of the telescreen. However, he could be heard.....



George Orwell's 1984 is a famous dystopian novel. The novel revolves around the experience of Winston Smith. Big Brother is watching.

Third Party Assessment of Consumer Usage



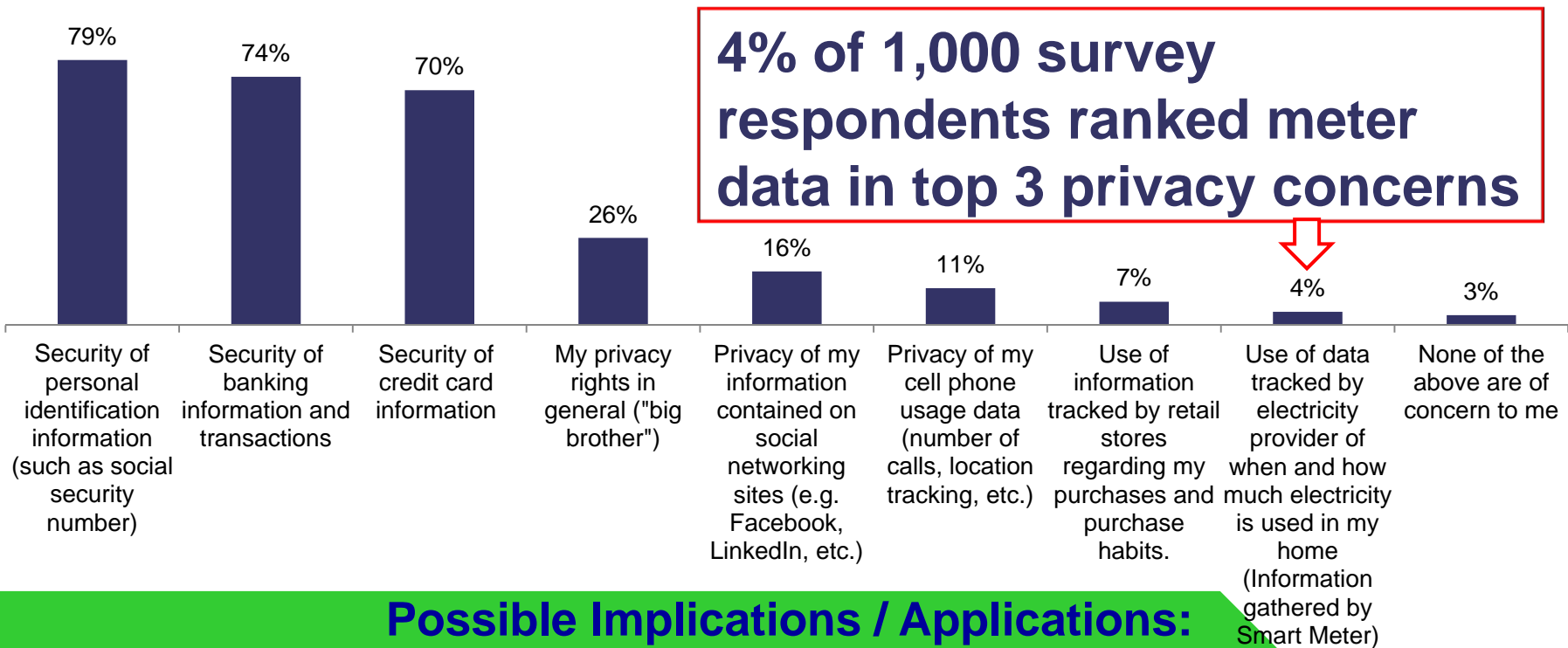
Technical Report on Smart Meter Measurements (Dec 2010) & Related White Paper (Feb 2011)



Omnibus Study: Quantifying Key Privacy Results

- **EPRI Team & Smith-Dahmer selected several key items of learning to quantify**
- **Several questions were created from the interactive consumer study for further study / validation**
- **A separate group of 1,000 survey respondents selected to represent a variety of demographics.**
- **Omnibus Study focused on:**
 - **Usefulness of select consumer smart grid technologies (utilization and/or ownership)**
 - **Usefulness of additional information**
 - **Relative ranking of meter data privacy**

1,000 survey respondents were asked to select their top three privacy concerns.



Possible Implications / Applications:

- Address privacy concerns before they emerge.
- Reassure consumers about what information will be gathered .
- Inform consumers about the purpose and use of information.
- Help consumers put the information into perspective

Closure

Evolving and Implementing Grid Modernization is a *Journey* not an End Point

- **Address consumer “pain points” such as:**
 - **Lack of knowledge about what is effective and what is not.**
- **Present / describe consumer’s accurate and timely personal energy information as a key tool to manage cost.**
- **Alleviate consumer concerns about privacy with both data policy and perspectives.**
- **Influence content in media and social media.**



Together...Shaping the Future of Electricity