DOCKETED

Docket Number:	15-IEPR-05
Project Title:	Energy Efficiency
TN #:	205073
Document Title:	Lawrence Berkeley National Lab (LBNL) Presentation by Alan Meier
Description:	Along with the UC Davis Energy Efficiency Center - Comments for Integrated Energy Policy Report (IEPR) on Plug Loads
Filer:	Laura Laurent
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/18/2015 11:12:42 AM
Docketed Date:	6/18/2015

Comments for Integrated Energy Policy Report (IEPR) on Plug Loads

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June 2015

Many Ways to "Slice" the Plug Loads Topic

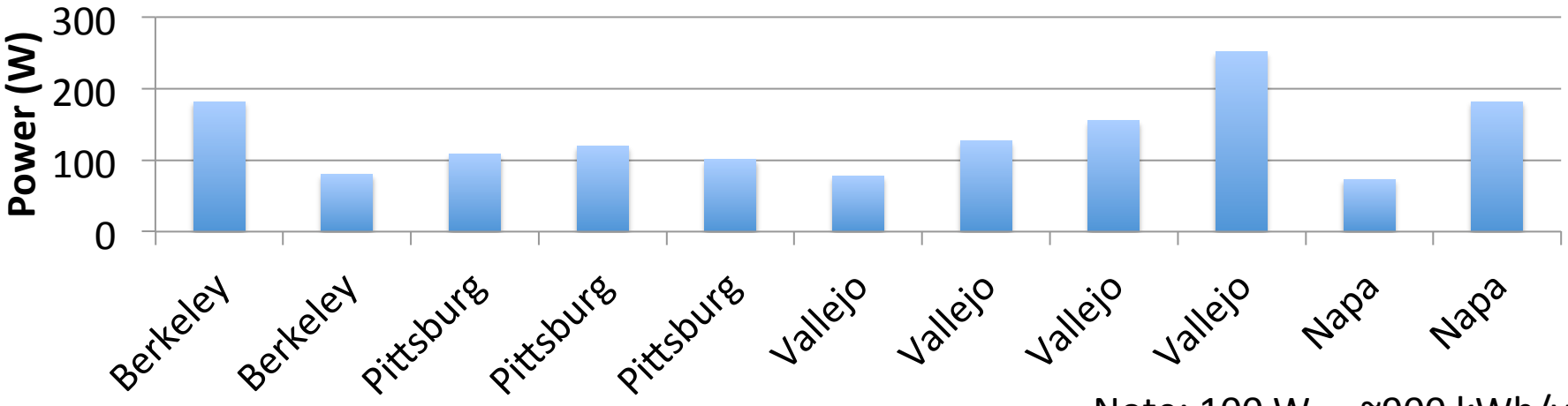
Plug Loads is a Topic Area, including:

- **electronics**
- **miscellaneous, and**
- **"hard-wired" components**
- **pieces of other end uses**

- Electronics is a separate end use—where the primary function is information management
- "Builder-installed" components installed by a single entity
- Uses linked to regulated products
- Products with low saturation but high energy consumption
- Products with high saturation, but low energy consumption
- Products whose energy use is dominated by continuous, networked, or active modes

→ Diverse strategies will be needed to cover the whole topic

Power Consumed by Homes Before People Moved In



Note: 100 W = ~900 kWh/year

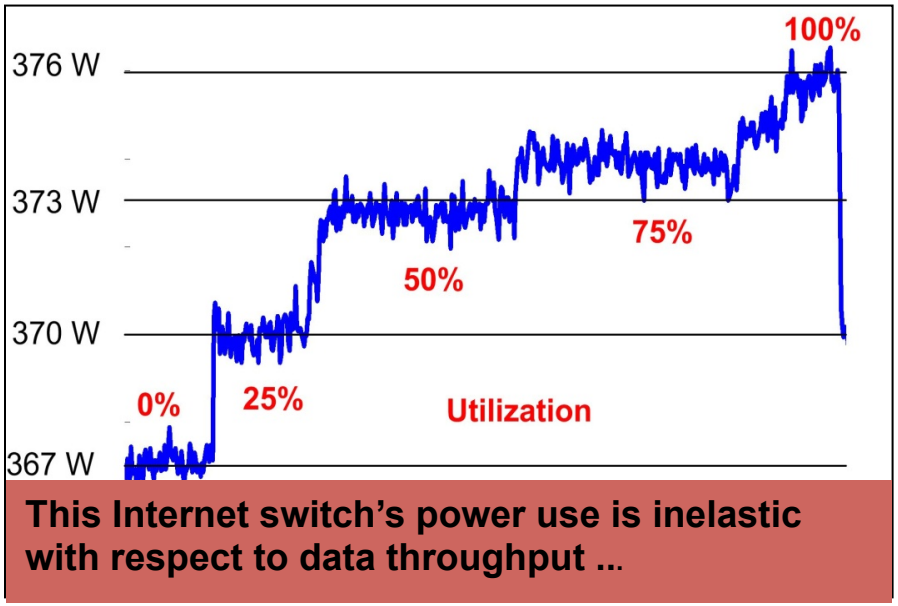
GFCIs, smoke alarms, HVAC controls, security, communications infrastructure, garage door openers, irrigation controls, etc.

This is just part of the plug loads story …

Plug Loads Need to Be More Elastic with Respect to Utilization

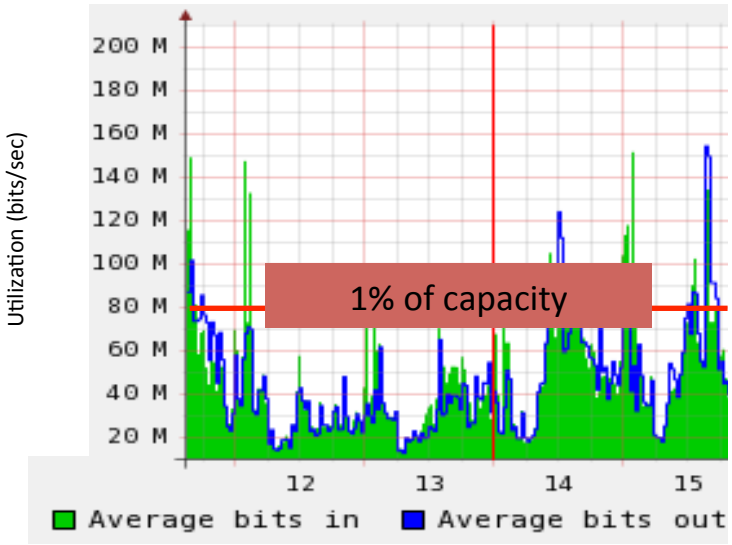
The Problem: Fixed uses in many buildings are now > 50% of annual building electric use and *growing*

The Cause: Devices are oversized for most hours but are not "elastic" enough to cut energy use when operating at very low utilization rates



This Internet switch's power use is inelastic with respect to data throughput …

… while the switch operates mostly below 1% of capacity



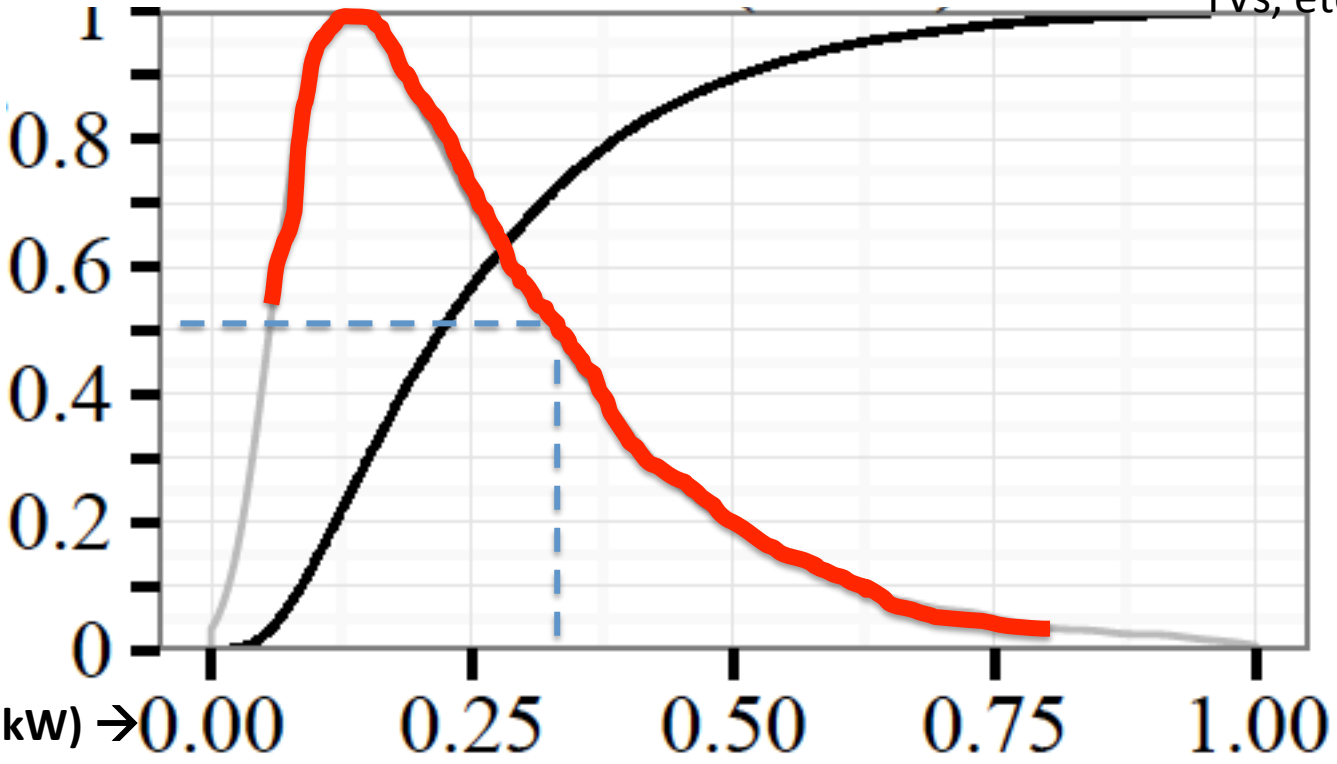
Research Approach: Find ways to make usage more elastic (power scaling):

1. Raise efficiencies when operating at extremely low utilization (<20% of capacity)
2. Exchange information among devices to enable lower power modes

Distribution of Minimum Power in 20,000 California Homes

(typically occurs on a spring day at 3 AM)

No AC, lights, refrigerators, TVs, etc.



In the median home, the minimum power is responsible for ~ 0.3 kW (= ~ 2400 kWh/year)

Solutions

- Actions
  - Limit builder-installed loads as part of Title 20/24
  - Require products to be more elastic with respect to utilization
  - Develop new Title 20/24 compliance paths that reward resilience, energy reporting, other?
  - Support research to reduce plug load energy use

- Research
  - Methods for enabling greater power scaling
  - In-building DC grids to service plug loads
  - Improve efficiency of common products, including energy scavenging
  - Technologies and protocols for energy reporting
  - User interfaces that facilitate low-power operation
  - Standards that promote interoperability among products
  - Social science approaches that affect acquisition and operation