

Market Characterisation and Potential of Home Energy Management (HEM) Technology

Concept Proposal for IEA DSM Task 25
Presented by: Beth Karlin and Sea Rotmann



CUSA

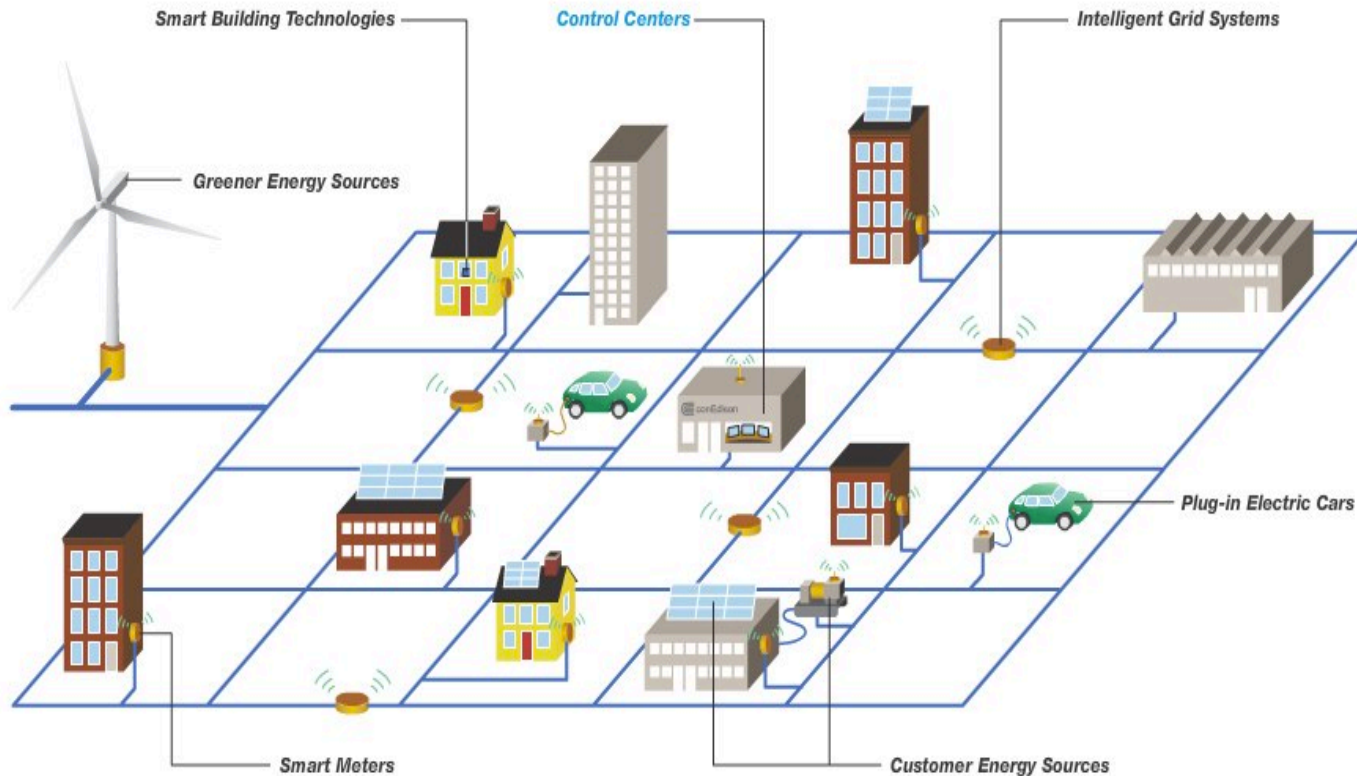
Center for
Unconventional
Security Affairs



The Smart Grid

“the modernization of electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth”

(EISA, 2007)



The Smart Home

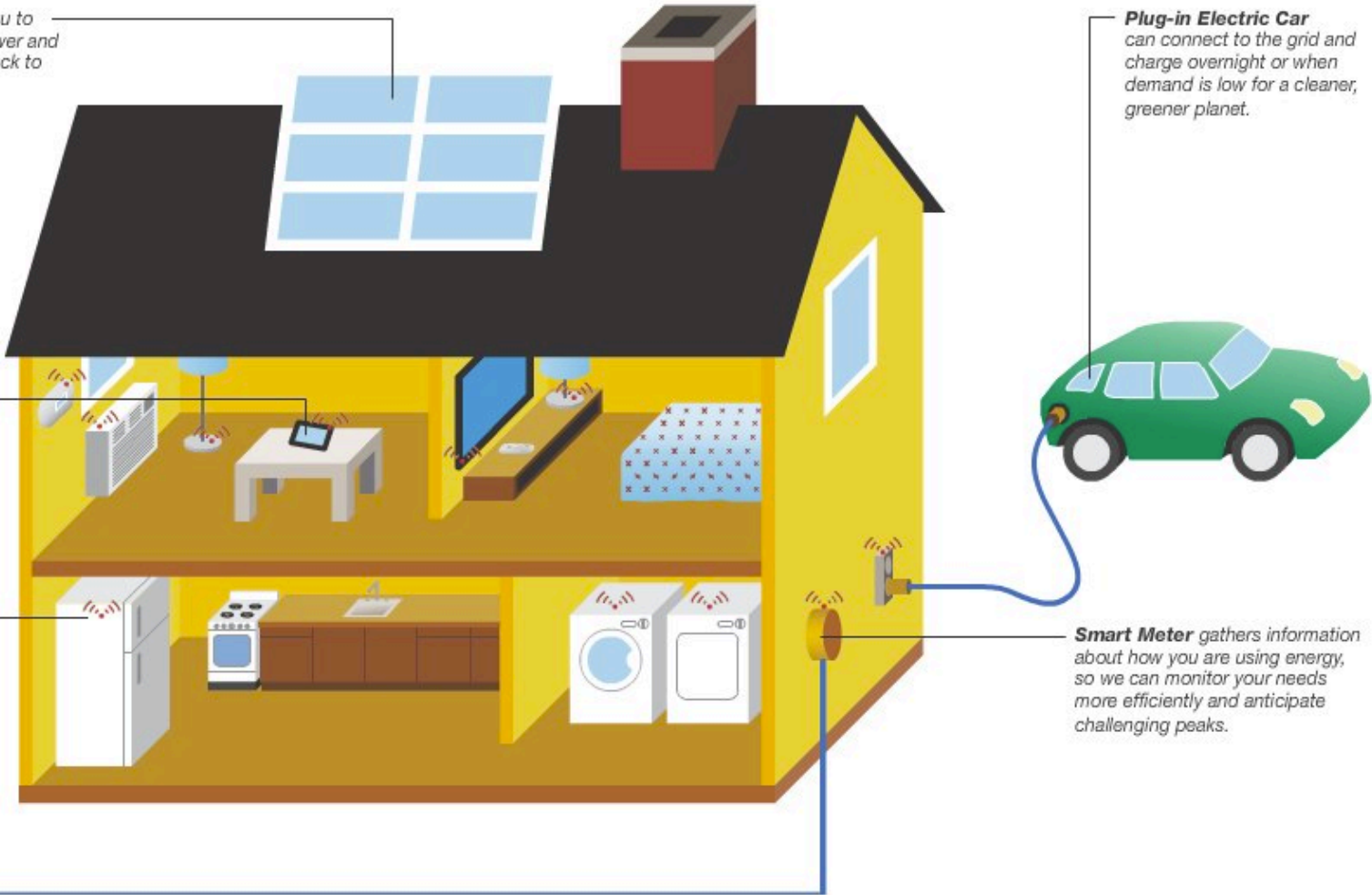
Solar Panels allow you to generate your own power and send excess energy back to the grid.

Plug-in Electric Car can connect to the grid and charge overnight or when demand is low for a cleaner, greener planet.

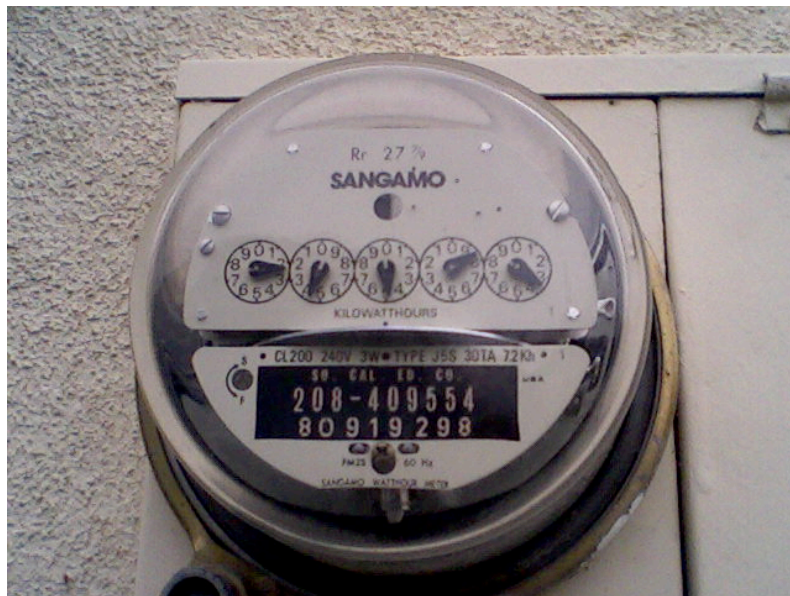
In-Home Energy Monitor communicating with the smart meter allows you to track and manage your energy use.

Smart Appliances communicate with your in-home energy monitor, allowing you to program them so that you use less energy.

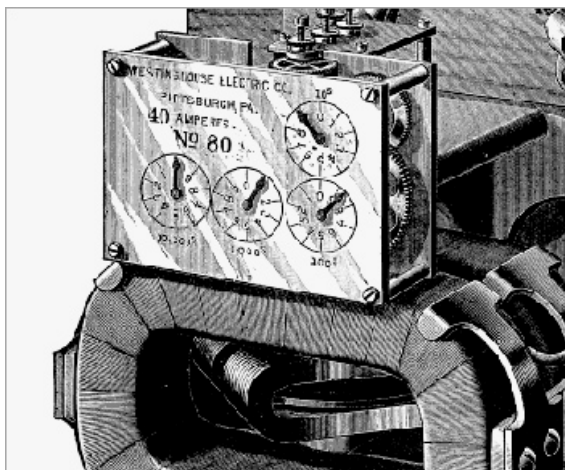
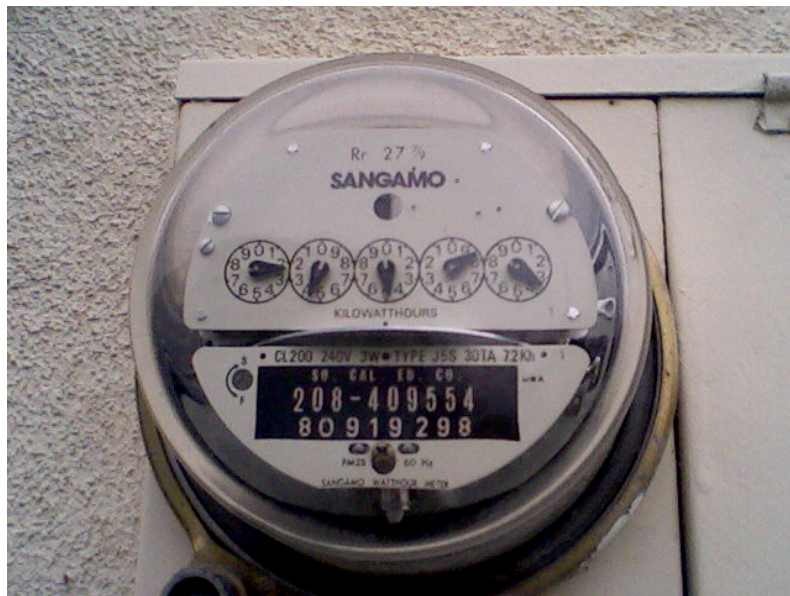
Smart Meter gathers information about how you are using energy, so we can monitor your needs more efficiently and anticipate challenging peaks.



The Smart Meter



The Smart Meter



1888

Window of Opportunity

GREEN BUTTON INITIATIVE



ACCESS YOUR OWN DATA

Energy Efficiency
Directive



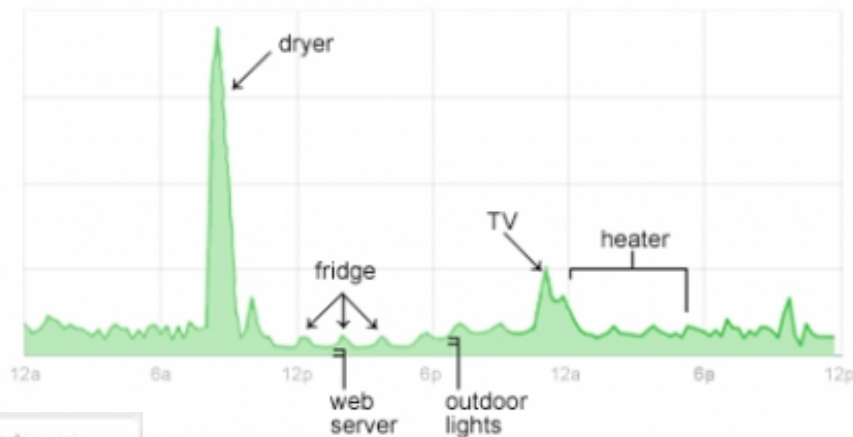
Window of Opportunity

GREEN BUTTON INITIATIVE



ACCESS YOUR OWN DATA

Home Electricity Use



Energy Efficiency Directive



Window of Opportunity

GREEN BUTTON INITIATIVE



ACCESS YOUR OWN DATA

Energy Efficiency
Directive



Window of Opportunity

GREEN BUTTON INITIATIVE



ACCESS YOUR OWN DATA

What are we missing?

Energy Efficiency Directive



Feedback is effective...

- 100+ studies conducted since 1976
- Reviews found average 10% savings
- Mean r-effect size = .1174 ($p < .001$)

Darby, 2006; Ehrhardt-Martinez et al., 2010;
Fischer, 2008; Karlin & Zinger, in preparation

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(from **negative** effects to **over 20%** savings)

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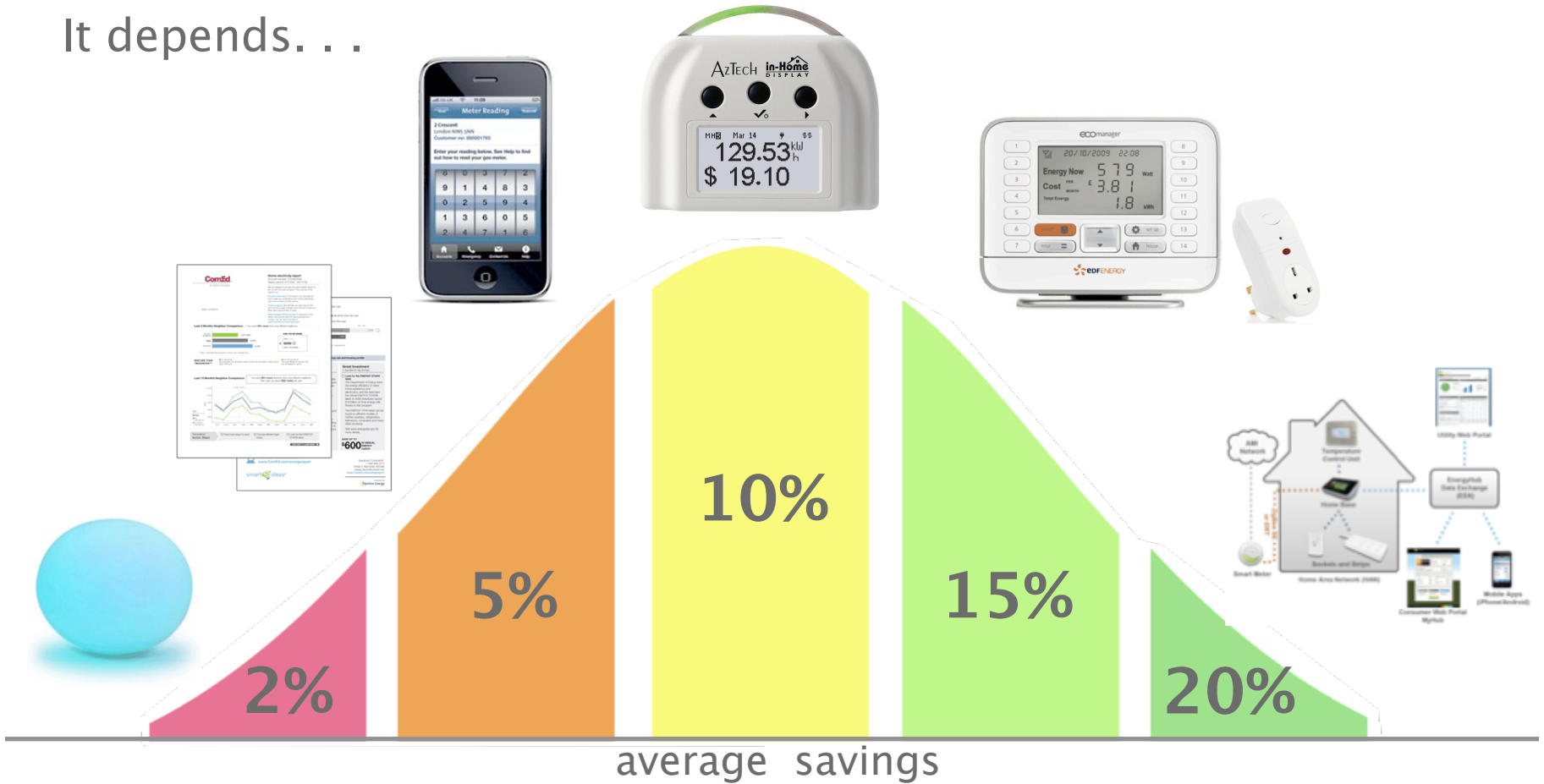
It depends...

Moderators identified in meta-analysis

- Study population (**WHO?**)
- Study duration (**HOW LONG?**)
- Frequency of feedback (**HOW OFTEN?**)
- Feedback medium (**WHAT TYPE?**)
- Disaggregation by appliance (**WHAT LEVEL?**)
- Comparison (**WHAT MESSAGE?**)

Feedback ~~X~~ can be effective...

It depends. . .



Ehrhardt-Martinez, Laitner, & Donnelly., 2010

A New Task for IEA DSM

Objective: Analyse the current and near-term potential for home energy management systems (HEMs) in enabling demand-side management (DSM).

1. What is the current and potential consumer market?
2. What are the key issues for governments and utilities?
3. What is the current & near-term technology potential?
4. What are the possible pathways and costs/benefits?
5. How can we create better channels for communicating with various stakeholders?

A New Task for IEA DSM

1. Market Assessment

1.1. Consumer Adoption

1.2. Design and Development

Antecedent characteristics:

1. Demographic
2. Psychographic

Did they adopt?

Knowledge

Persuasion

Decision

Confirmation

Knowledge factors:

1. Awareness
2. Impression

Perceived Barriers

1. Cost
2. Requirements

Confirmation factors:

1. Usability
2. Outcome

A New Task for IEA DSM

2. Landscape Assessment

2.1. Delphi Study

2.2. Technical Landscape



A New Task for IEA DSM

3. Technology Assessment

2.1. Available Technology

2.2. Near Term Potential

1	2	3	4	5	6
Standard Billing (for example, monthly, bi-monthly)	Enhanced Billing (for example, info and advice, household specific or otherwise)	Estimated Feedback (for example, web-based energy audits + billing analysis, est. appliance disaggregation)	Daily/Weekly Feedback (for example, based on consumption measurements, by mail, email, self-meter reading, etc.)	Real-time Feedback (for example, in-home displays, pricing signal capability)	Real-time Plus (for example, HANs, appliance disaggregation and/or control)

Information Platform



Management Platform



Appliance Monitor



Load Monitor



Grid Display



Sensor Display



Networked Sensor



In Home Control



Home Area Network



A New Task for IEA DSM

4. Pathways and Scenarios

5. Communication Platform

Product:	OWL Electricity Monitor
Manufacturer	2 Save Energy Limited
Price	\$68
Size	Sensor: 2X2X1 Transmitter: 4X3X2 Display: 5X4X1
Market	Residential
Power Source	Line Voltage, Regular Battery
Collection Point	Sensor (Whole Home)
Means of information transfer	Radio Frequency, USB
Display Information Breakdown	Whole Home
Display Medium	In Home Display, Computer Software
Display Information Format	Numerical and Graphical
Usage Measurement	Energy, Cost, Environmental Impact
Comparison	Historical
Update Frequency	Real time
Temporal Granularity	Daily, Weekly



Logistics

Our Team:

- **Beth Karlin**
- **Rebecca Ford**
- **Country Experts**
- **Sea Rotmann**
- **Skip Laitner**
- **Technology partners**

4 Countries	5-6 Countries	7-8 Countries	9+ Countries
€70,000 per country (2 project coordinators, travel, platform and database development, subcontracts) Total budget €280,000	€87,500 per country (2 project coordinators, travel, platform and database development, subcontracts) Total budget €437,000 - €525,000	€105,000 per country (2 project coordinators, travel, platform and database development, subcontracts) Total budget €735,000 - €840,000	€122,500 per country (2 project coordinators, travel, platform and database development, subcontracts) Total budget €1,102,500+
24 months	30 months	36 months	42 months

Thank you! Questions?

“Energy efficiency isn't just low hanging fruit;
it's fruit laying on the ground.

(Steven Chu, US Energy Secretary)

Beth Karlin

Transformational Media Lab
University of California, Irvine

Email: bkarlin@uci.edu

Web: www.cusa.uci.edu

