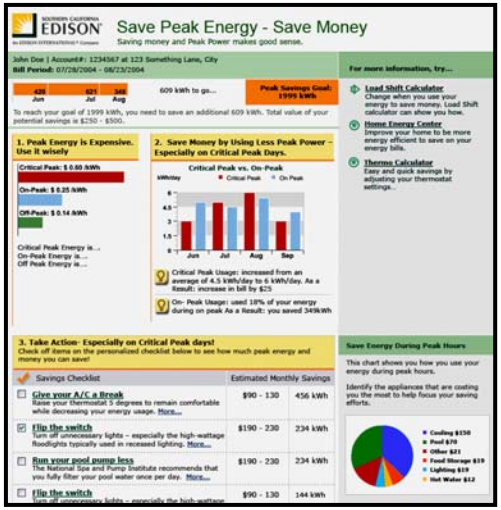
What is Data from AMI about?
(a point of view)



Presented by:

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781-694-3301

Presented to:

NYDPS AMI Technical Conference - *Data Access*

Albany, NY

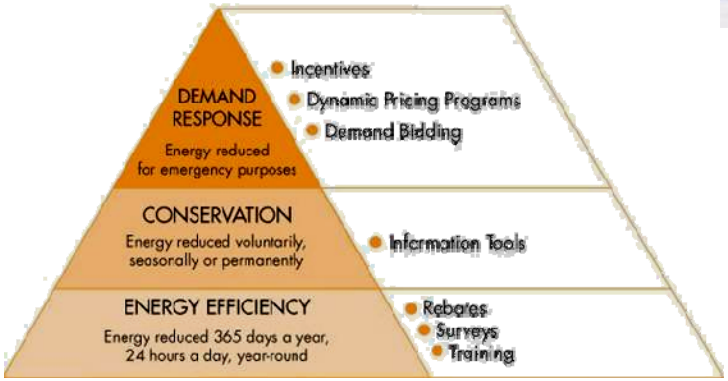
April 15, 2008

A Post-Embargo Energy Efficiency Professional:

- **Began careers in 1973-80 Gulf War/Oil Embargo/OPEC crisis.**
- ***Hot Cycle: Soft Energy Path 1980's:***
  - **for 1st time in 100 years - *economy grows faster than energy use.***
- ***Cold Cycle: Soft Energy Market* 1990's:**
  - ***dot.coms, deregulation, anti-conservation politics***
- **2000 – 2007, lights out in CA, Midwest! …Prices! …Mideast! and finally, recognition that Global warming …is *not a good thing!***
- ***Which brings us to 2008 and beyond….***

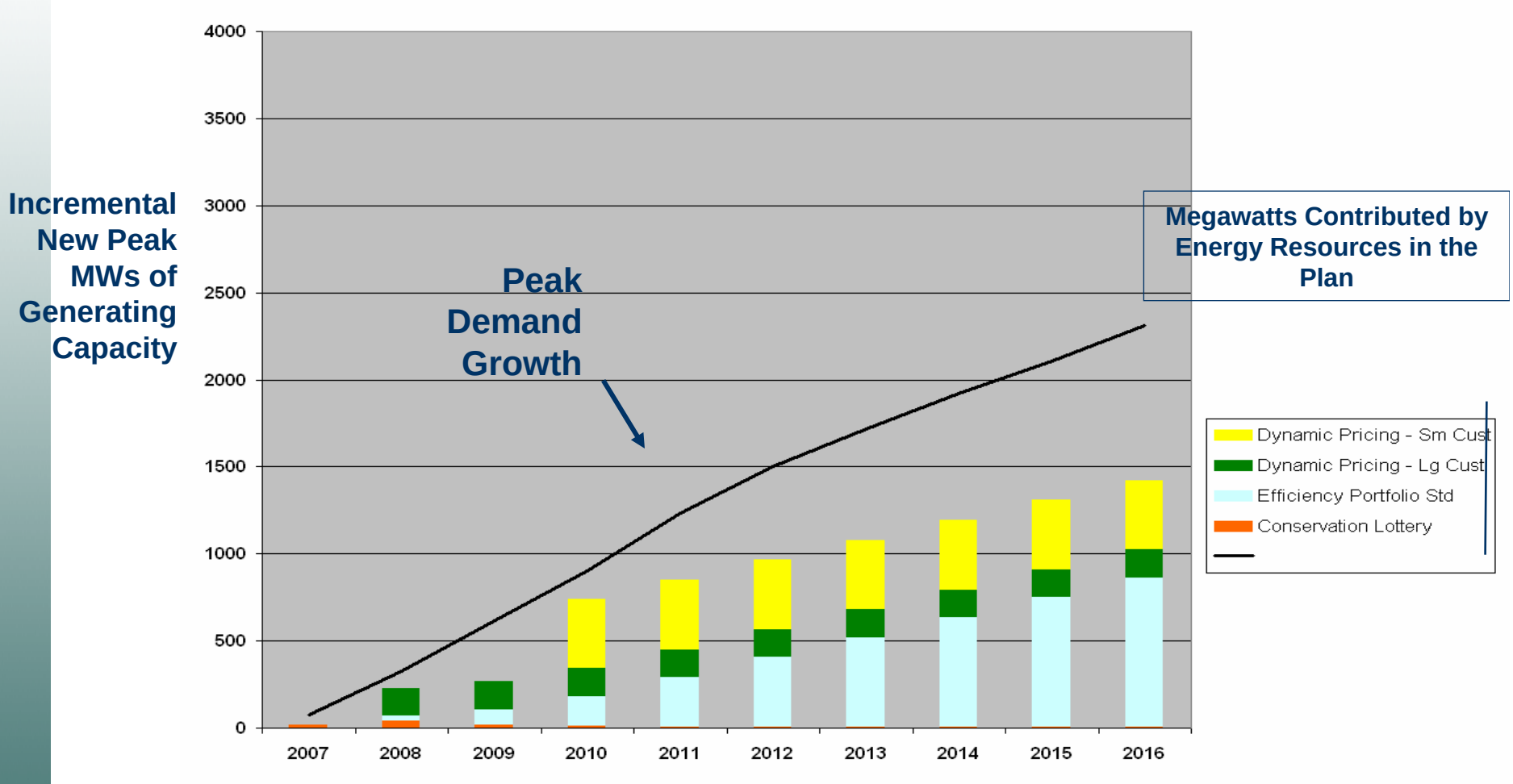
The BIG NEWS: Consumers, Business and Government are *All* Embracing New Alternatives to meet Resource Needs

- ***Building power plants alone (any kind) won't work.***
  - **Recognition that we *must* look to consumers to help achieve energy balance.**
- ***Consumers are demanding lower bills*.**
- **Environmental stewardship is now *a universal priority*.**



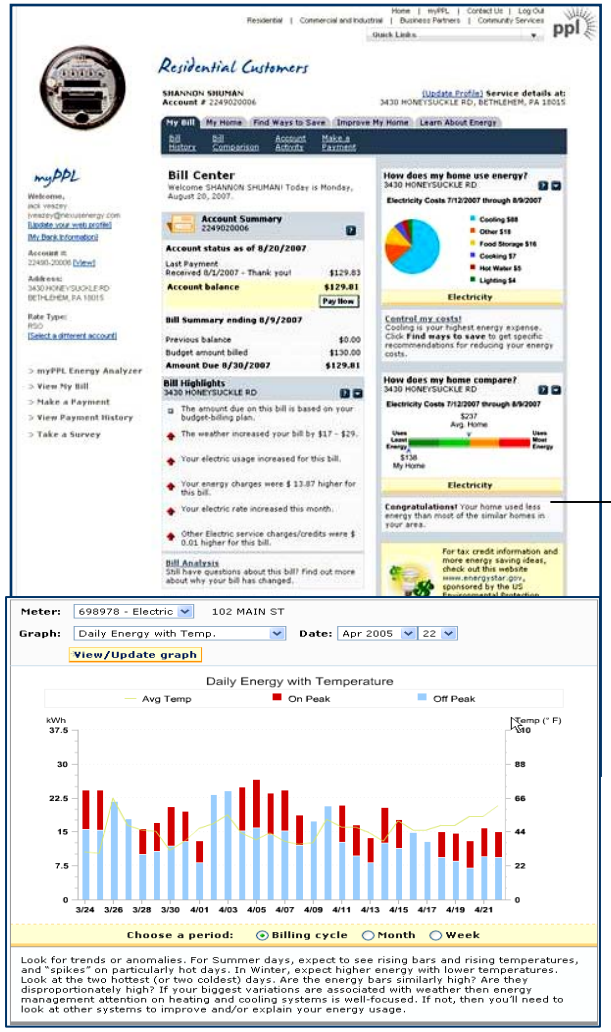
A *Perfect Storm* Requiring *Innovative Resource Strategies*

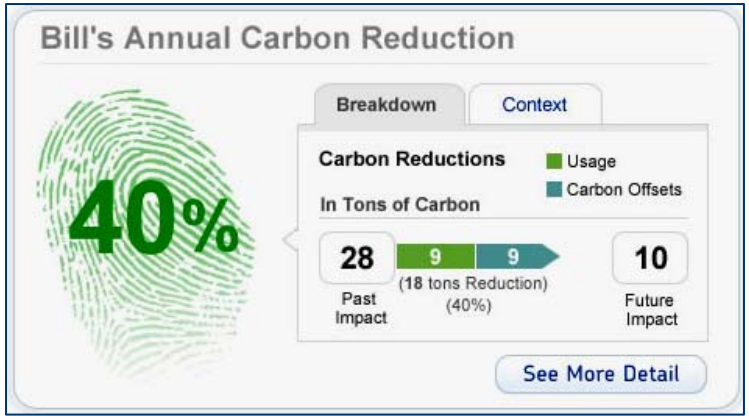
The lowest cost, largest resource for closing the gap *appears to be the customer*



A *Top Tier* Option:

Providing consumers with energy diagnostics, feedback, control



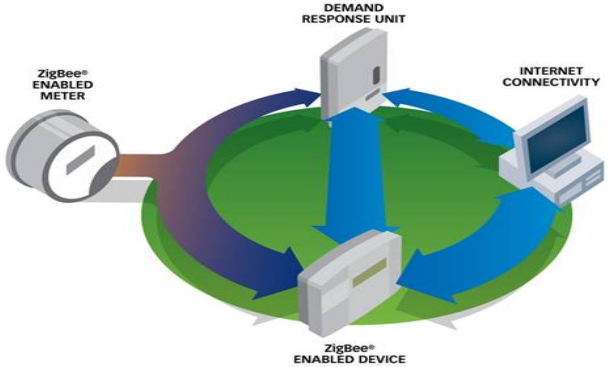


Smart Grid/Smart Home/Smart Customer

- **Vision:**

  "Enable responsive, smart energy environments that are *gracefully integrated with people."* *

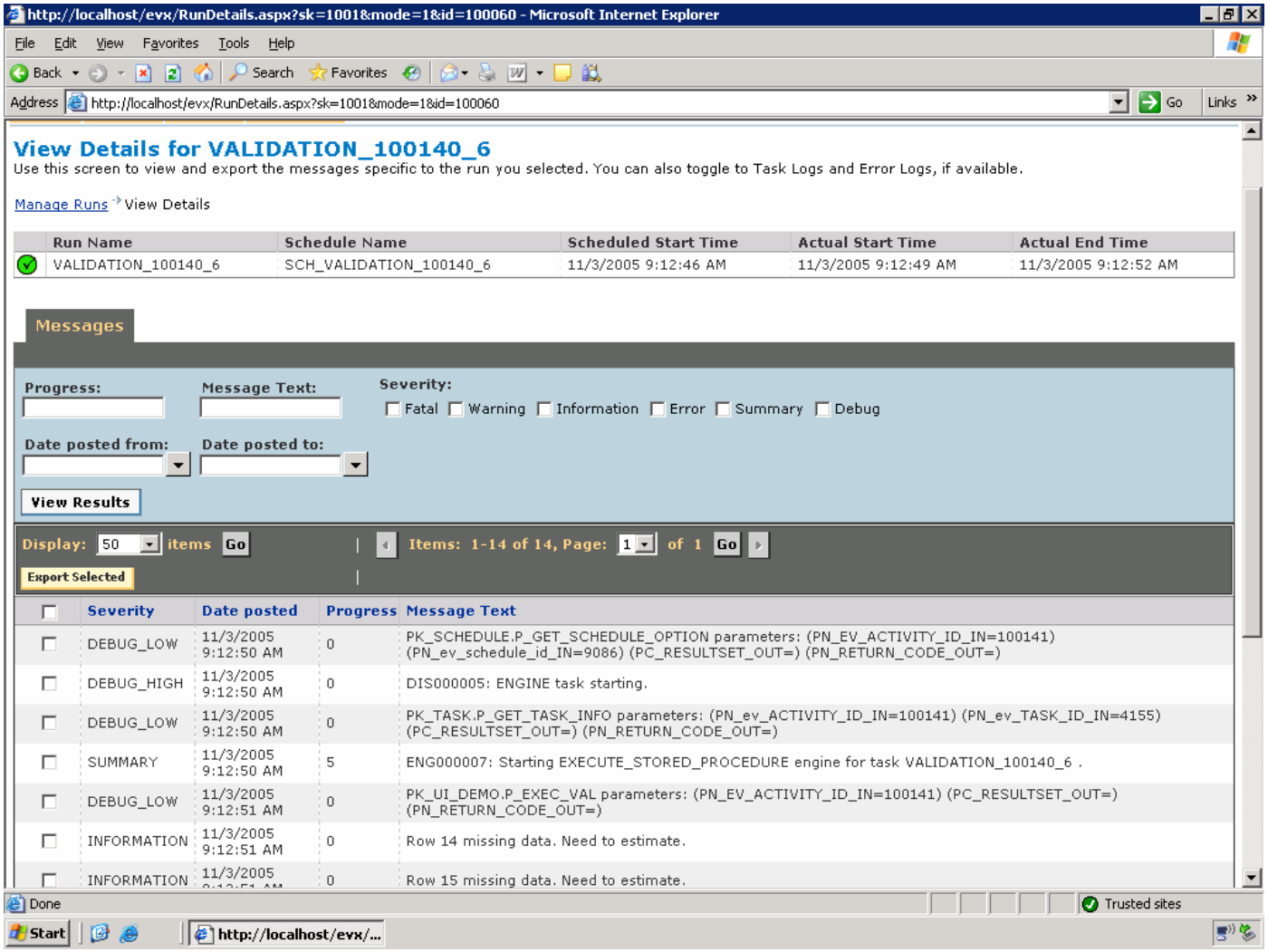
- **Economics:**
  - **Costs $150-$200 per home for smart meters**
  - **60-100% covered by operating benefits: remote/frequent reads, monitoring, control.**
  - **$25-$50 annual resource benefit from hourly pricing.**
  - **Potential 2x to 4x benefits with analysis, home controls.**
  - **Typically exceeds all renewable potential.**



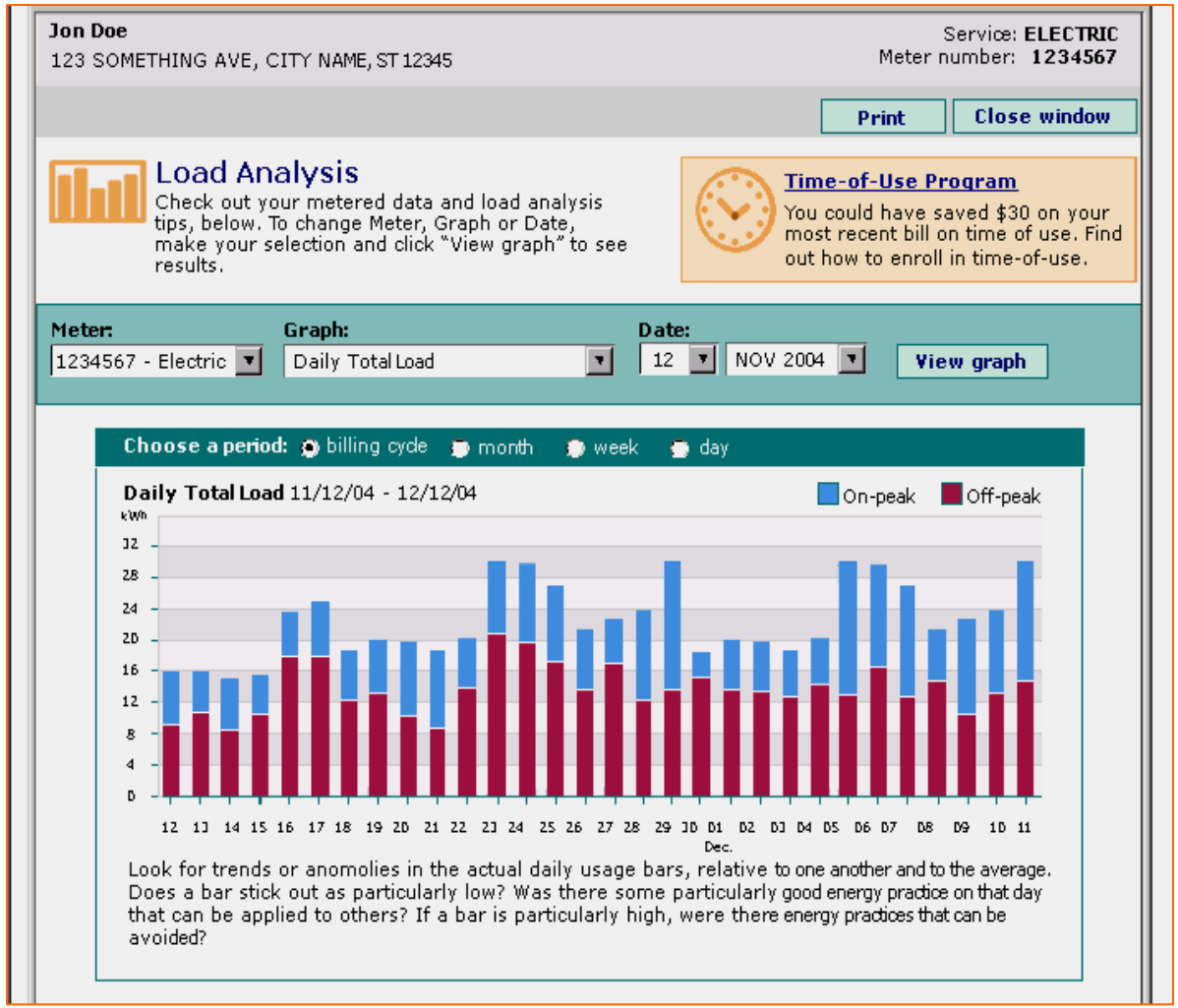
**6/26/2007 - meeting on Industry standard HAN development - PG&E, SCE, and SDG&E – presented to CPUC and CEC*

Adapted from Texas PUC Smart meter Ruling - May 2007

Is this Data Access?



Or Is This Data Access?



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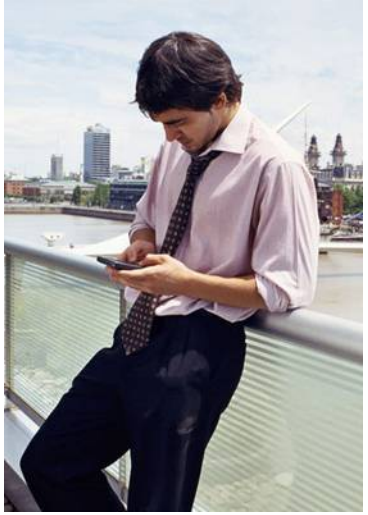
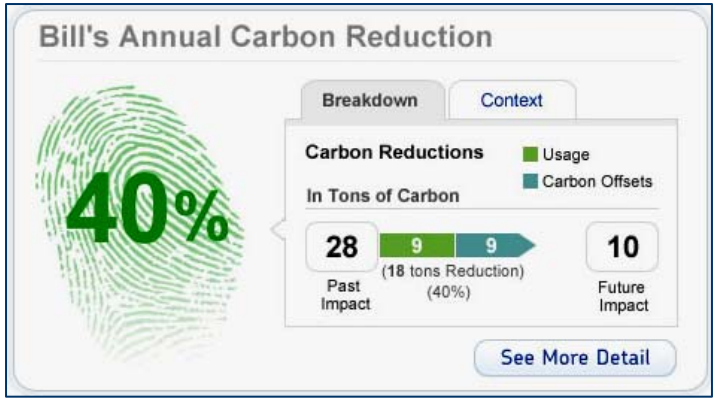


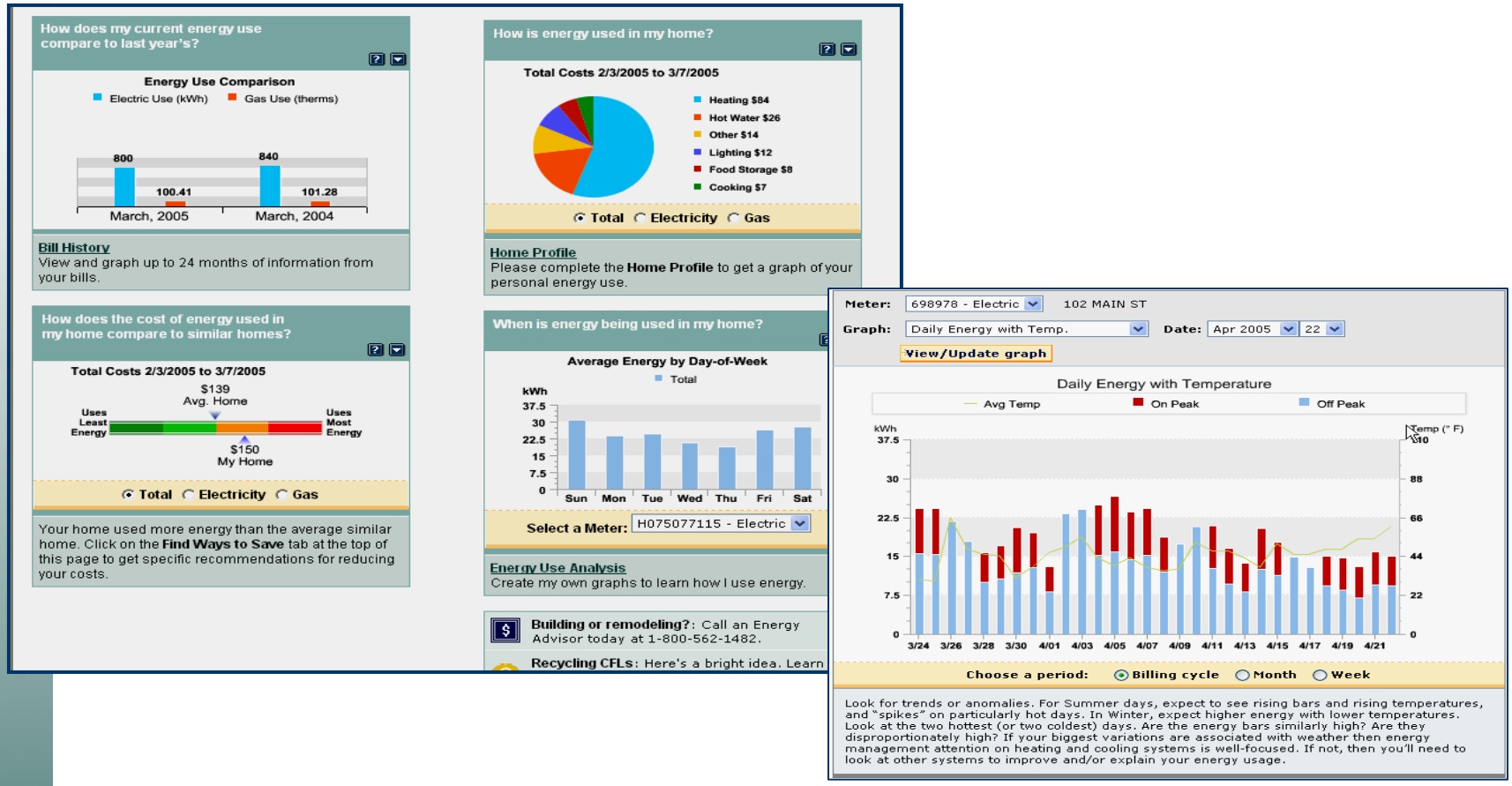


Smart meter/network technology- some Data Access *key questions*

- Consumer access – what, where, how?
- Thermostat/control point access – whats needed, what network, who controls?
- Data access - how much/how fast?– Consumer, Dist. Utility, 3rd party?
- What data access do distribution utility systems require?
- Which decisions are the big ones up front *and which can wait?*

Bell Canada EE in a box solution

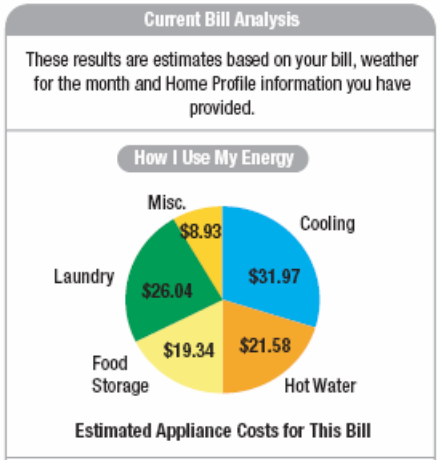
Data Access via Web Dashboard – even with *monthly billing*, proving to be a low-cost way to improve the cost-responsiveness of energy consumers.



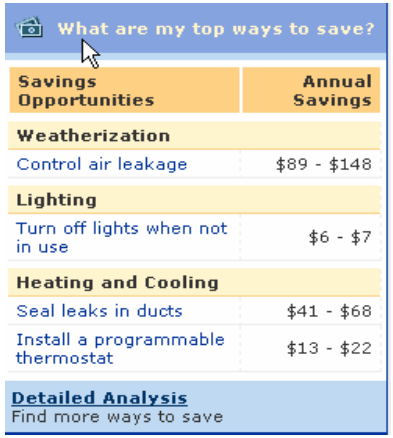
At some utilities, over 30% *of all customers* are regularly visiting Utility-provided Web customer dashboards, *today.*

Examples of model-based audit and bill analysis Web Dashboard Components:

Relation of Value to Cost -

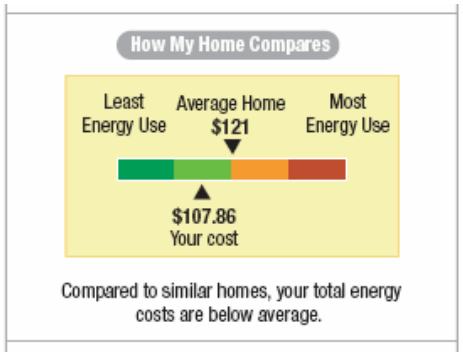


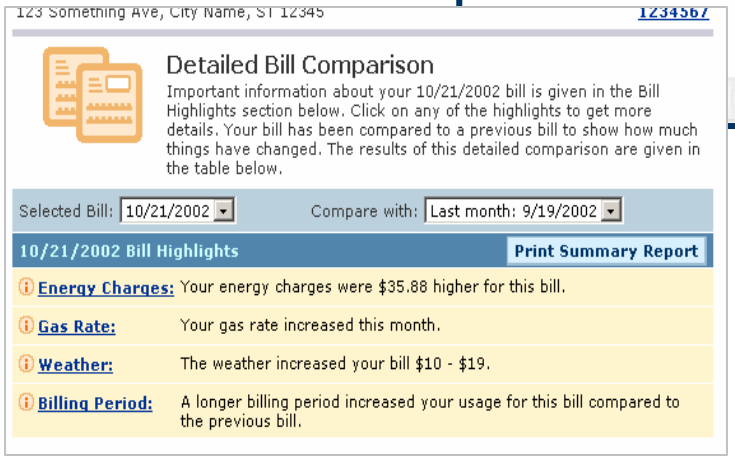
Control Options



Explaining Bill Changes

Benchmarking-





Strong evidence that Diagnostic support *works…*

- **Methods *are well understood and tested.***
- **Multiple studies *show conclusively* that customers want this information and find it useful.**
- **Incremental customer response remains to be proven, but meta indicators are a minimum *3-5% direct energy impact.***
- **Reductions in billing and customer service costs *offset most or all of the marginal costs* of diagnostic support on the bill.**

BUT –

there is much to be learned about how to be most effective.

The Customer Side of AMI: 2 strategies

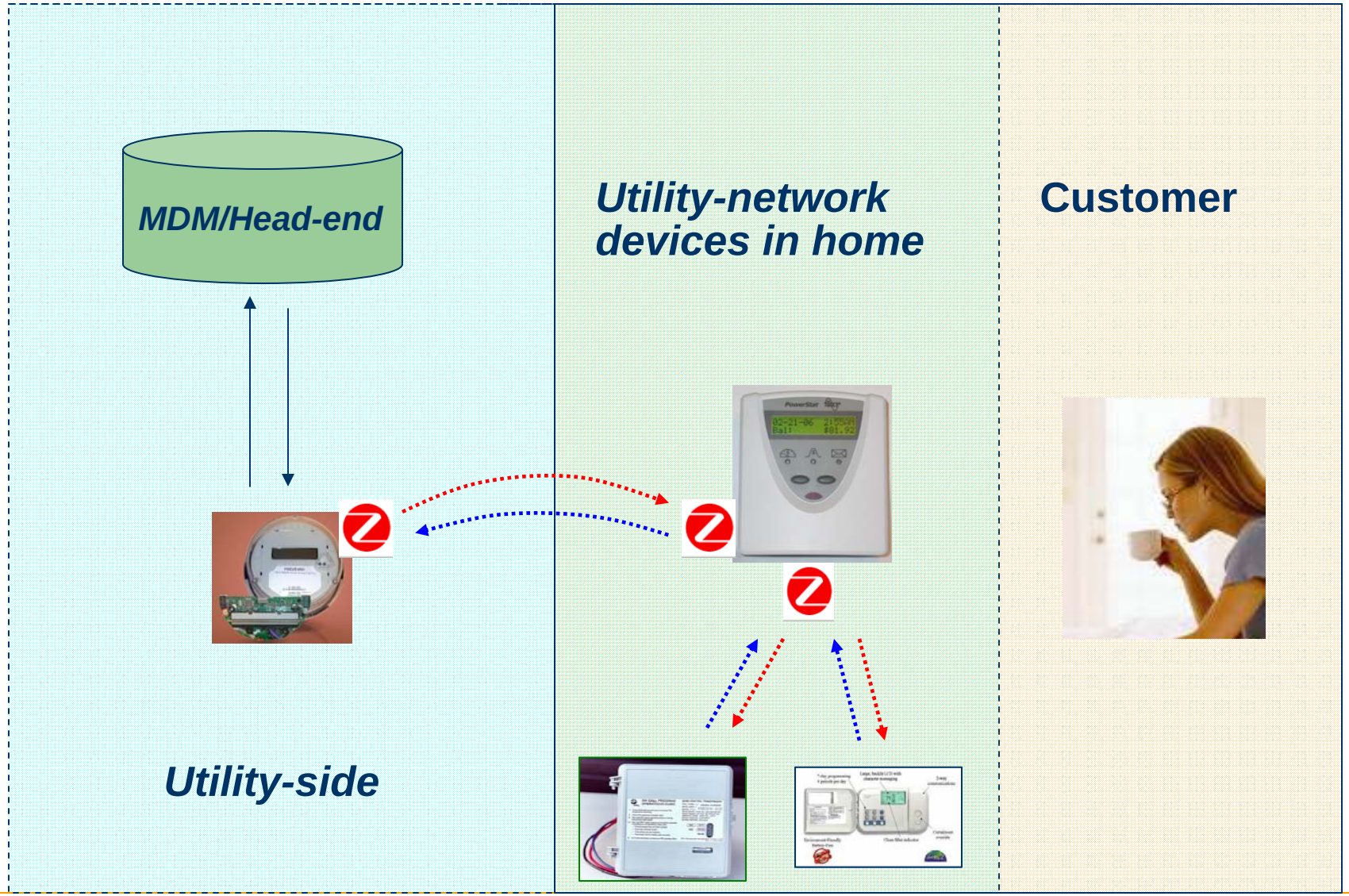
1: *Smarter Customer Strategy*

- ***Price-based*** **demand response, using time-differentiated rates, which requires AMI.**

2: *Smart Grid Strategy*

- ***Push-button Control-based*** **demand response – The Utility monitors and controls end use equipment.**
  - **Interval meter reads not essential.**

Smart Grid – Utility Private Network Architecture – utility provides meter-to-devices communication/control



Do we want “Smart Grid” Device Control?

- **End use equipment is visible and controllable by utility–**
- **“Smart Grid” is more dispatchable (perhaps) and therefore can replace spinning reserve**
  ….but some find it kind of scary.

Resistance is Futile

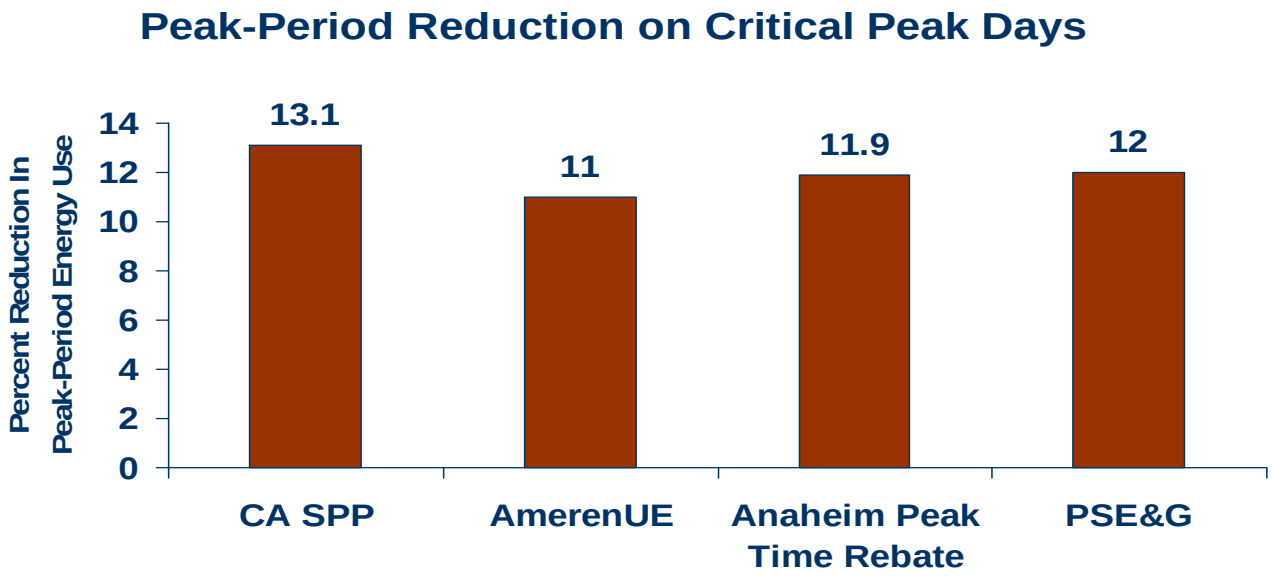
Prepare to be Assimilated

Smarter Customer: AMI/Price option

- **Theoretically, the same result occurs with price as a boundary providing some privacy.**
- **Time-based rates are more fair, and some would argue inevitable.** ***A Supermarket Analogy***
  - ***But, how certain is it that customers will respond?***
  - ***Or are Time-based rates just too complicated?***
  - ***Will customers, or their devices, respond?***

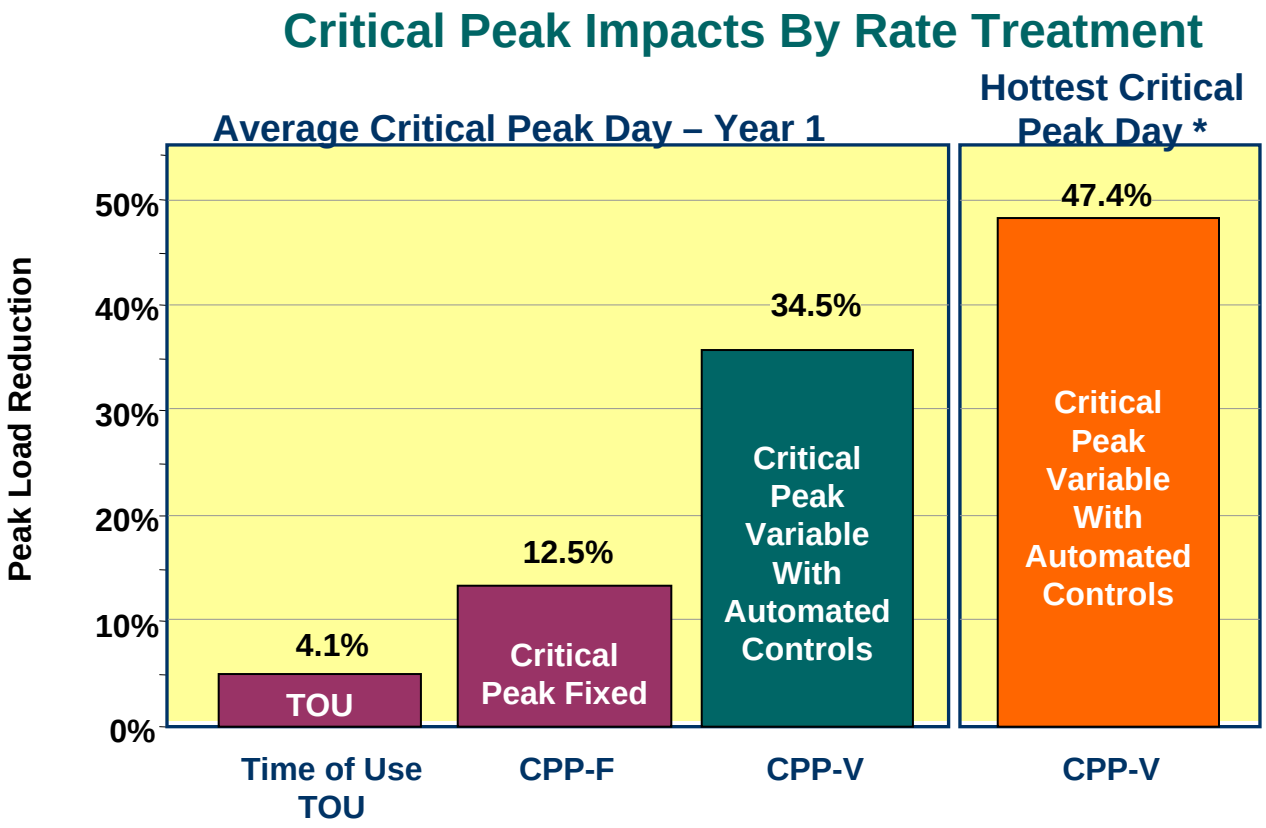
As the results of each new pricing pilot become available, a common story is developing:

Customers respond to dynamic price signals



Price Ratio:	**4.1:1**	**4:1**	**4.6:1**	**6:1**

Customers respond to dynamic price signals, *but they respond more with information and/or controls*



Source: Statewide Pricing Pilot Summer 2003 Impact Analysis, Charles Rivers Associates, Table 1-3, 1-4, August 9, 2004.

Will customers respond to their energy bill?...

Yes – regardless of how complex the rate:
if they understand the implications of their choices.

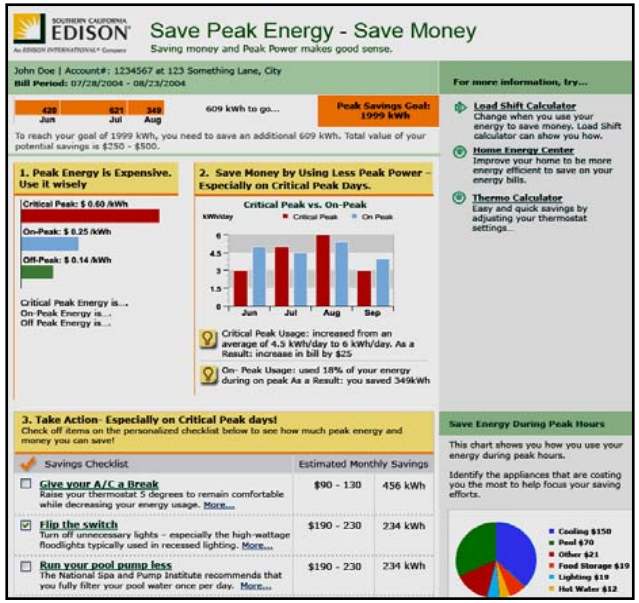
- **Example:**

What happens to my bill if I turn off my lights during the day (hot summer weekday) , or turn up my thermostat?

***Without diagnostics*, almost no one knows the answer to that question, even on a simple rate.**

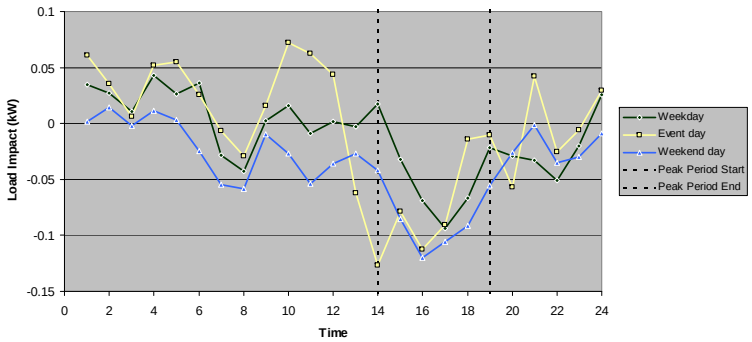
***With diagnostics,* customers will see what they save, regardless of the rate.**

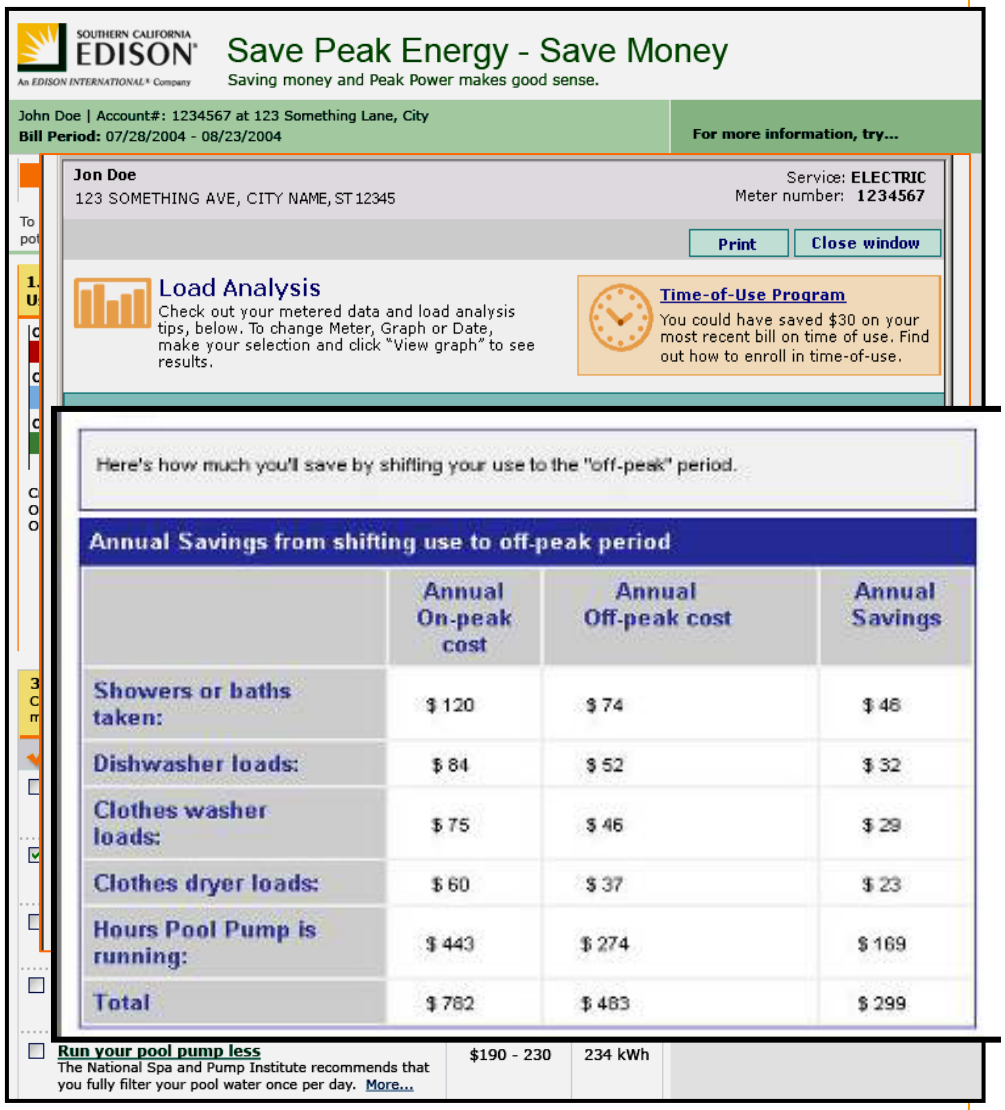
The impact of time-based rates is simply: that they *will save more.*



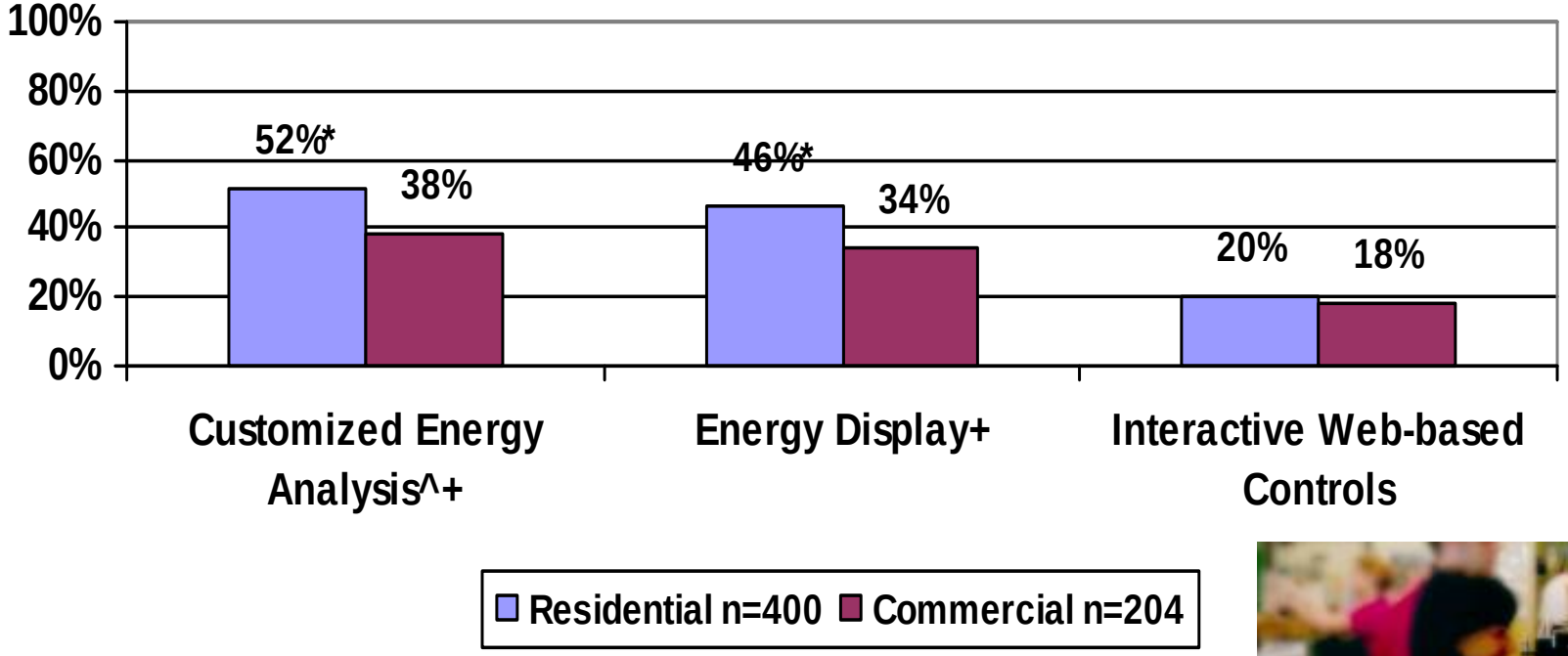
2004-2005 CA Internet Dashboard Results

- **46% stated that they took actions to reduce peak usage.**
- **Statistical reduction in usage during the peak period in both years.**



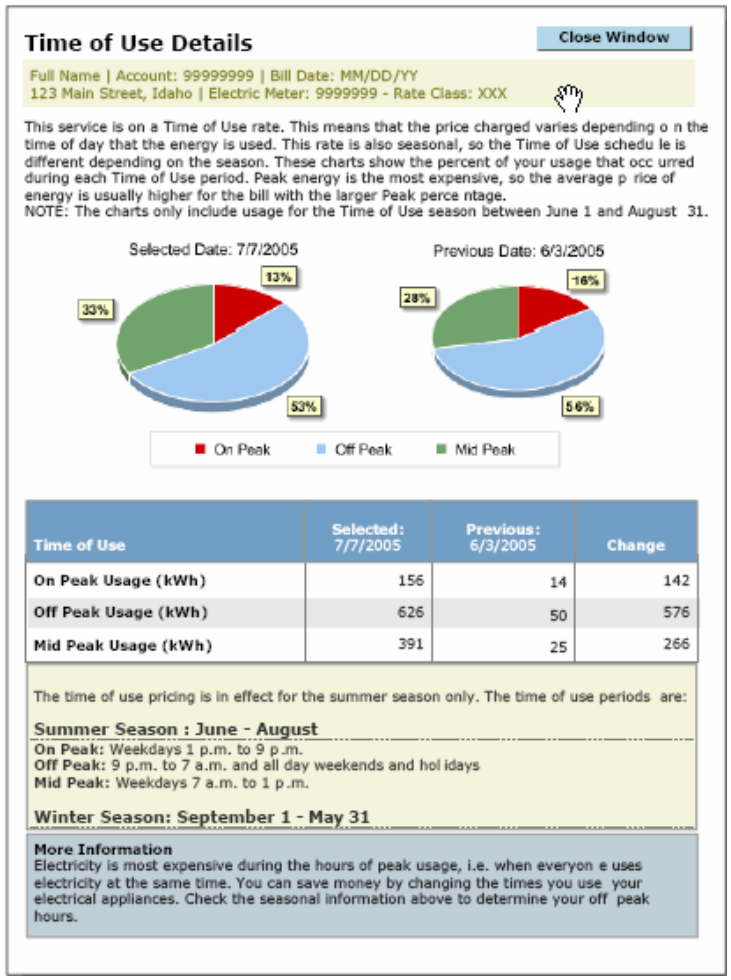


Customer interest levels from 2004 Cal statewide survey for various types of support to dynamic pricing:



Data for Customer Service Applications – *Daily system reads are enough*

MDM with model based analytics



My Bill-to-Date

My Bill | My Home | Find ways to save | Improve My Home | Learn about energy

About My Bill | Bill History | Bill Analyzer | Payments | Payment Options | Billing Preferences

Bill Center

Welcome JOE & JANE USER! Today is Tuesday, March 6, 2007.

Account Summary
9992439

Account status as of 4/22/2005

Last Payment
Received 4/16/2005 - Thank you! $62.49

Account balance $78.24 ...as of last bill

Bill Summary ending 4/22/2005 View this Bill

Previous balance	$0.00
Total current charges	$78.24
Amount Due 5/16/2005	**$78.24**

You can pay future bills online by registering for our E-Bill online payment service. **Register Now!**

Bill Highlights
102 MAIN ST

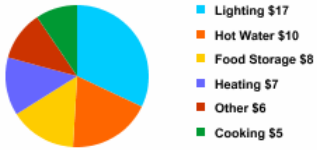
- Other "non-energy" charges were $ 25.00 higher in this bill.
- Your energy charges were $ 9.25 lower for this bill.
- Your electric usage decreased for this bill.
- The weather decreased your bill by $3 - $5.
- Other Electric service charges/credits were $ 0.27 lower for this bill.
- This bill contains a correction to electric charges due to previous estimated readings.

Bill Analysis
Still have questions about this bill? Find out more about why your bill has changed.

How does my usage compare?
102 MAIN ST

How does my home use energy?
102 MAIN ST

Electricity Costs 3/23/2005 to 4/22/2005



Electricity

Control my costs!
Lighting is your highest energy expense. Click **Find ways to save** to get specific recommendations for reducing your energy costs.

How does my home compare?
102 MAIN ST

Electricity Costs 3/23/2005 to 4/22/2005

Electricity

Congratulations! Your home used less energy than most of the similar homes in your area.

When does my home use energy?
102 MAIN ST

Usage Since Last Bill

- Your Estimated Bill To Date: **$27.32**

Save Money with Your Advanced Meter!
Our LoadShift Calculator and Appliance Tips can help you find savings on your time-of-use energy rate.

When does my home use energy?
102 MAIN ST

Usage Since Last Bill

- Your Estimated Bill To Date: **$27.32**

Save Money with Your Advanced Meter!
Our LoadShift Calculator and Appliance Tips can help you find savings on your time-of-use energy rate.

When does my home use energy?
102 MAIN ST

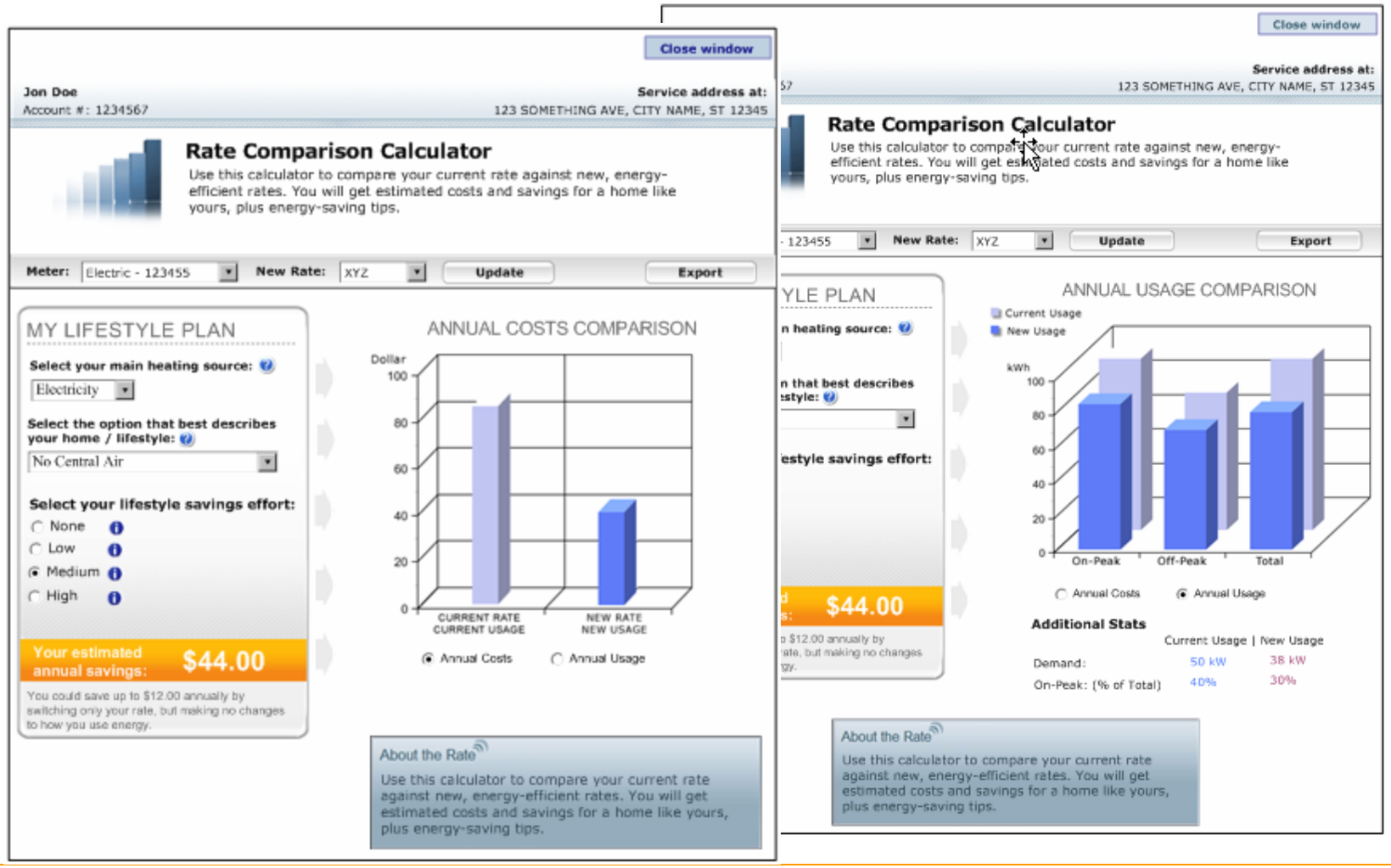
Usage Since Last Bill

- Your Estimated Bill To Date: **$27.32**
- Your Current *Average* Daily Expense: **$2.43**
- Your actual meter reads: The calculations are based upon your actual automatic meter reads, up to the end of the day on: 6/18/05. This represents 12 days of your current billing cycle.

Save Money with Your Advanced Meter!
Our LoadShift Calculator and Appliance Tips can help you find savings on your time-of-use energy rate.

Rate Comparison Analysis

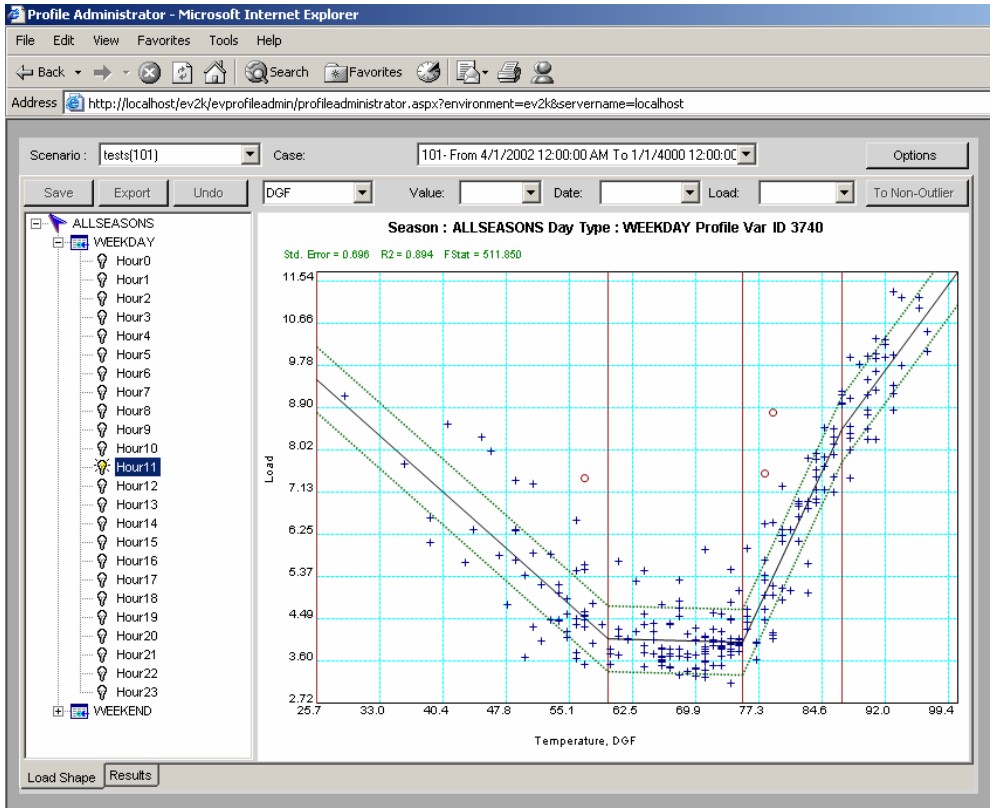
Is this time-of-use rate a good fit for me?



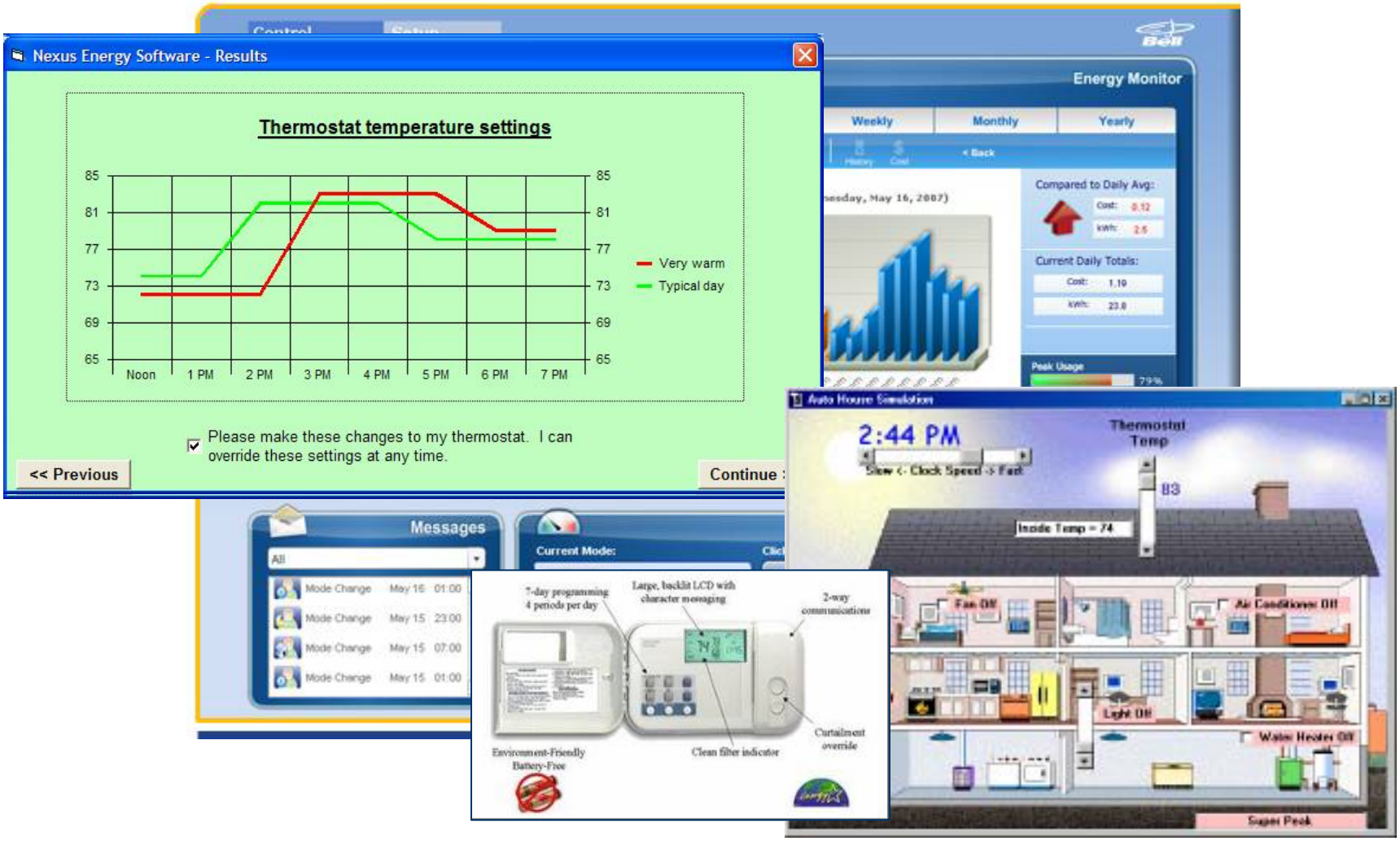
Data for Distribution Business Applications – *Daily system reads are generally enough*

MDM with model based analytics

- **Revenue Assurance**
- **Complex Billing**
- **Forecasting & Settlement**
  - **model, aggregation & profiling**
- **Distribution Asset Analysis**
  - **Hourly load on any point on the network**

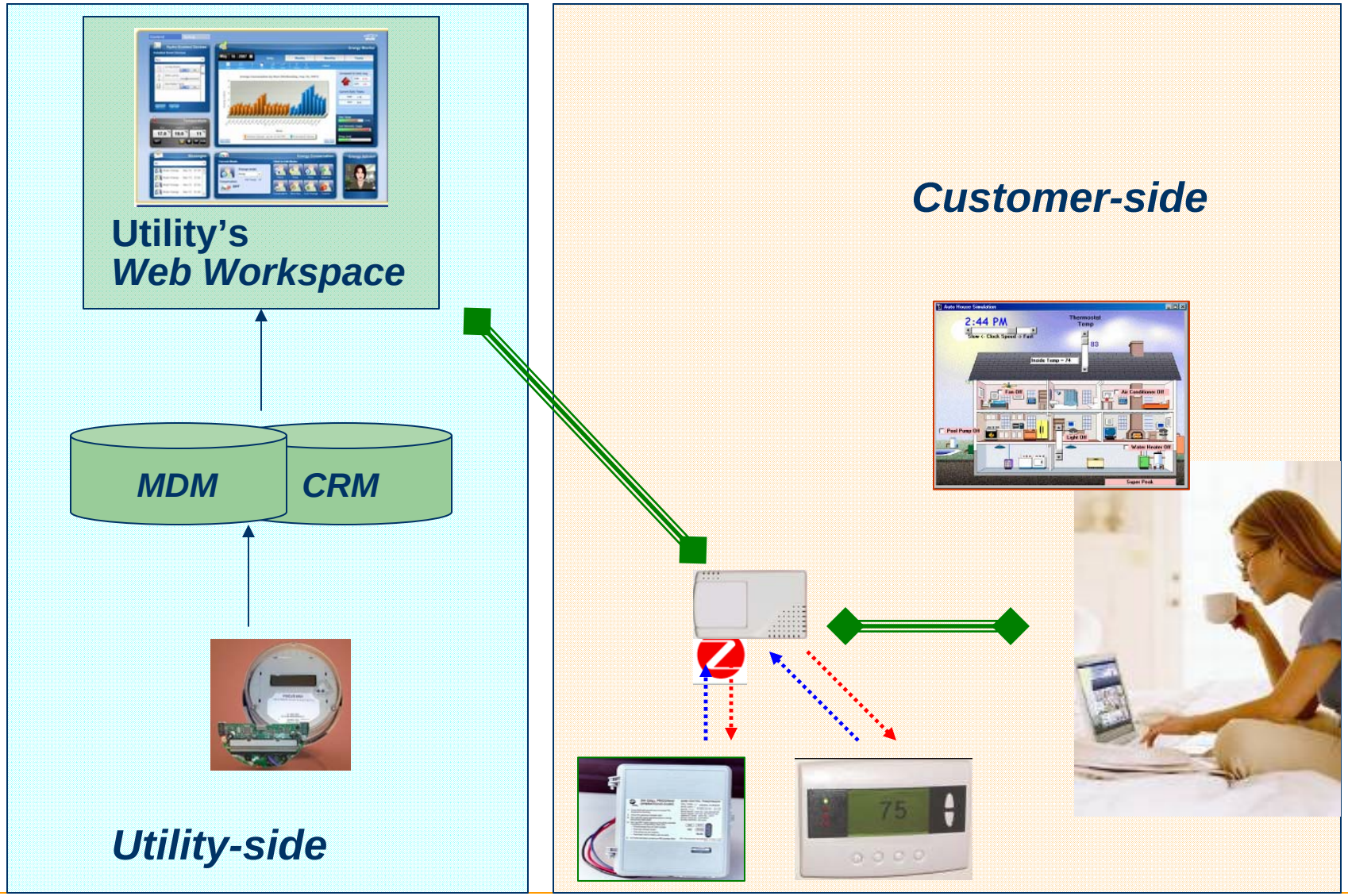


Vision – Utility Web Workspaces connect to network-enabled thermostats, water heater, pool pump, on request

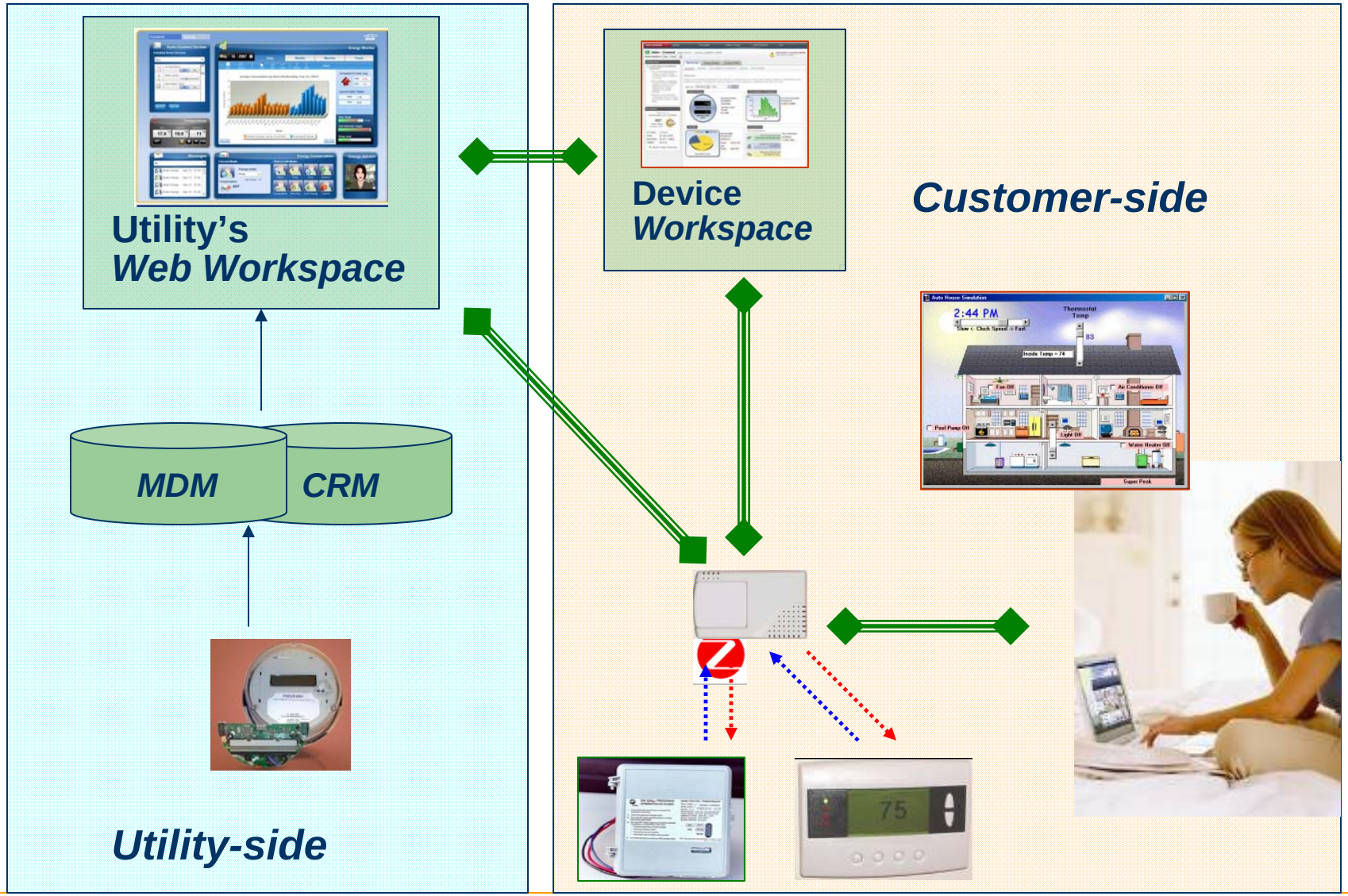


Vision – Data Access is on Public IP Network –

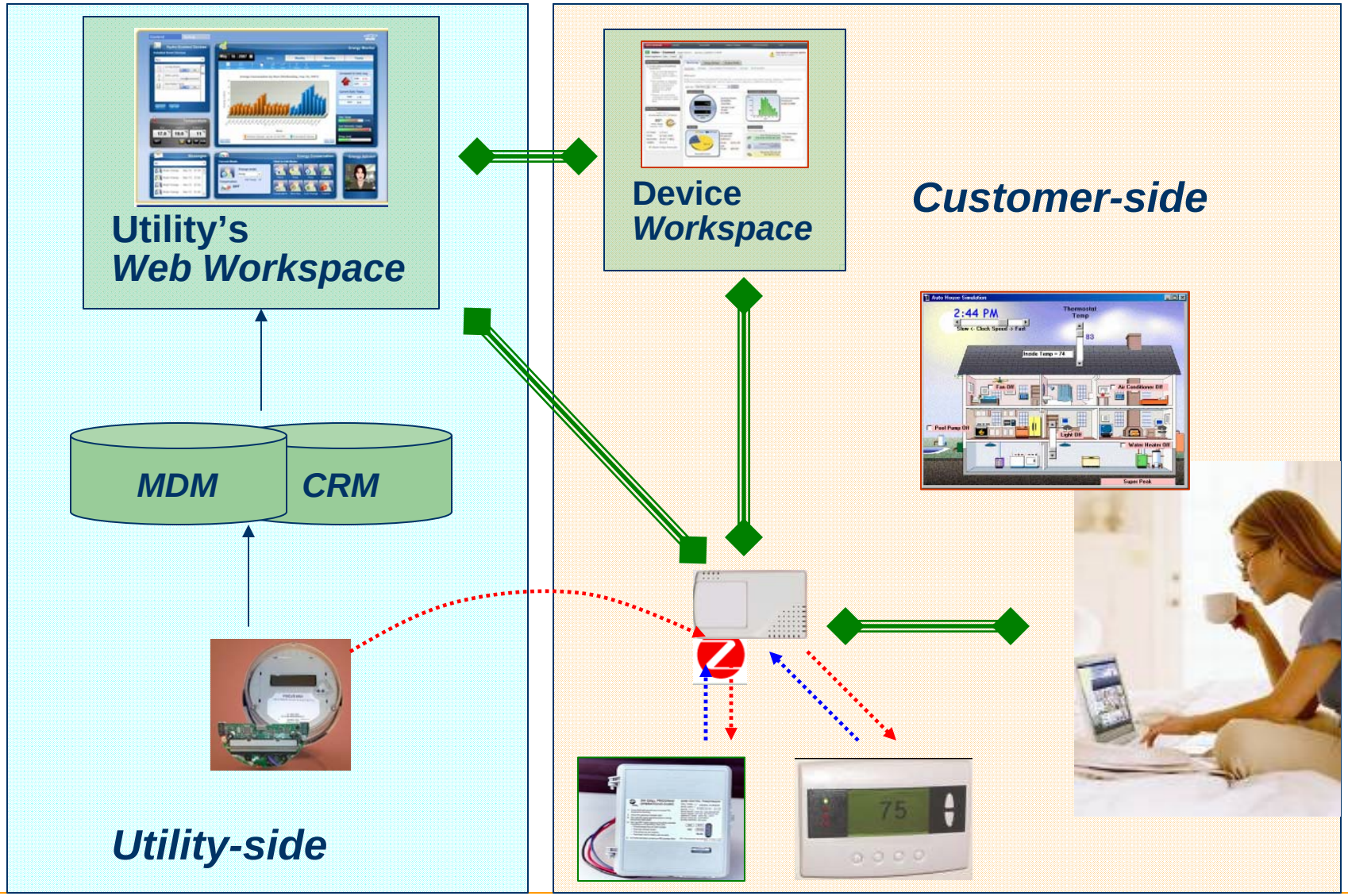
hourly meters, communicating daily to utility is sufficient – all home network equipment owned by the customer.



Vision – Collaboration of Utility and Market Workspaces–
controlled by the customer.



Vision – customer/home network has access *on demand* to real time, high frequency meter reads

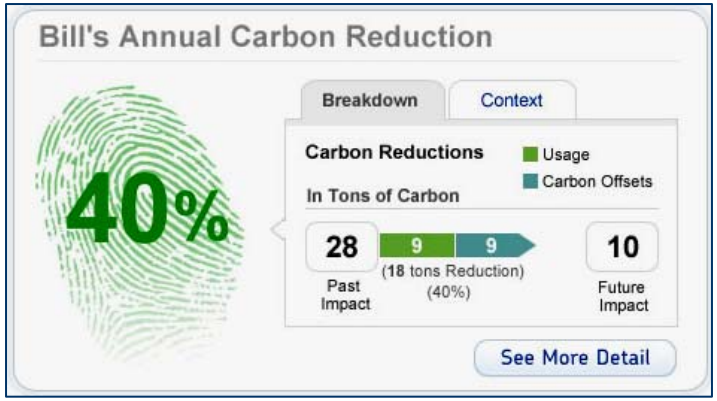


Vision - Applications for the Smart Consumer

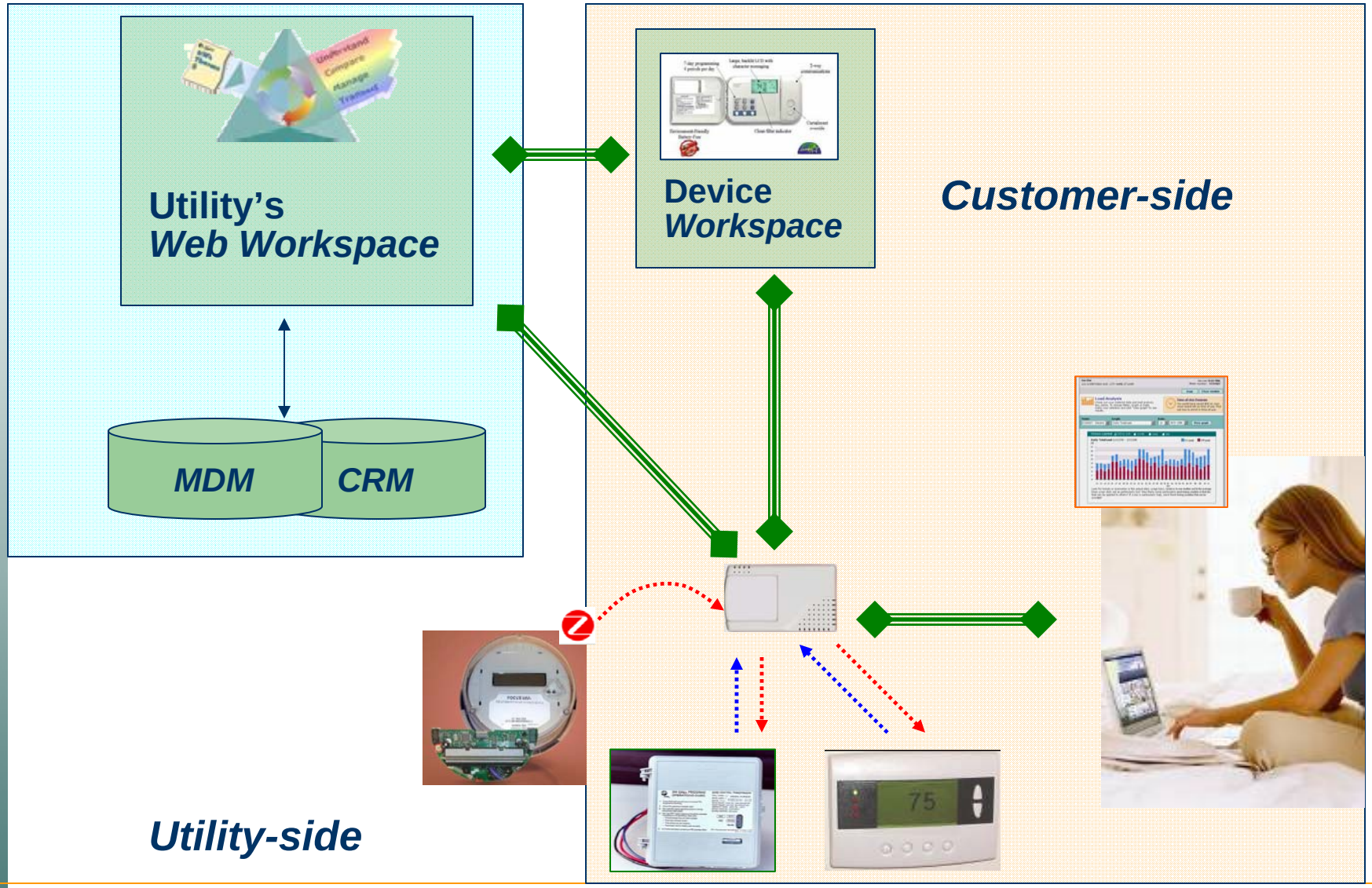
- Utility, thermostat, appliance, Google, etc. make app.
- View on home PC, work PC, TV, cell phone (at least until next year).

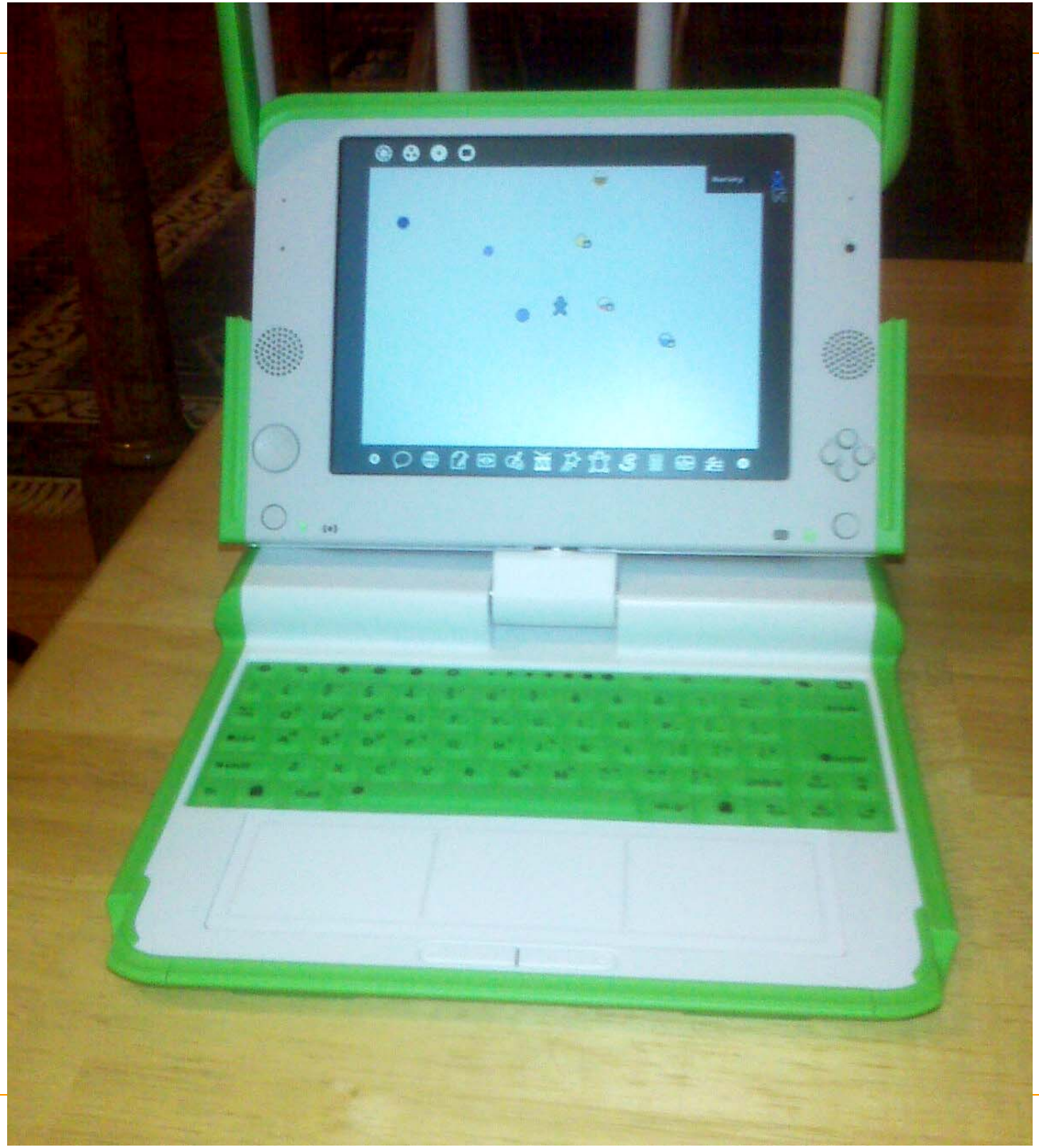
Application ideas:

- Make my AC, water heater, pool pump, refrigerator use pattern smarter.
- Find out what anything costs to run.
- Choose the best rate for me.
- Choose a theme – understand the consequences- do it *(ie. More Green)*
- Sell a DR option.



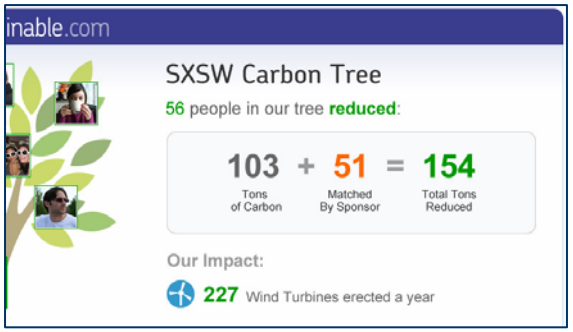
Meter on the Public Network?





Technology Companies with Data Access interests may include:

- ***Green*** **technologies - ex. Appliances, lighting, heat, AC**
- **Innovative information - Websites and Web Gadgets**
  - **Web 2.0 Social Computing**
  - **Application Service Provider model**
  - **E-Commerce model**
  - **AD model**



- **Energy Efficiency Home Network smart devices, enabling software.**
  - **Home Network Equipment Box of stuff**
  - **Components, network cards**
  - **Green Energy retailing**
  - **Network Operations – Enterprise software**

Bus. Strategies building on data access

- **Industrial : MS, Google, Apple, GE, Honeywell, Carrier**
- **Academic/Research**
  - **ex. MIT I2E (Intelligent Infrastructure for Energy Efficiency), managed by Neil Gershenfeld of the Center for Bits and Atoms/ Media Lab, as a cross-campus activity.**
- **Economics/Policy Users**
  - **New utility regulatory models: *ex. Duke Energy Save-a-Watt.***
  - **"Big-bold" energy efficiency resource planning – *like CA***

Things we know, and don't know

- Customers will use the Internet, understand, and respond (> 50%) IF we make it easy for them.
  - Effective communication is an emerging skill – Web approaches add flexibility and ease of upgrade.
- Over the life of AMI, we can't anticipate how, when, or where customers will prefer to communicate.
  - We didn't anticipate the current trend towards use of work Internet for home applications, nor use of cell phones for email and Web transactions.
- We CAN anticipate adoption of Home Networks, but not the speed of adoption.
  - Momentum and business interests favor early adoption of Internet addressable appliances and controls.
  - Remote monitoring is a strong driver, which suggests that in-home only meter monitoring approaches are too limiting.

What I think *

- **We urgently need meter systems to be hourly cash registers**
  - **it costs little beyond operating benefits ($2-$3meter/year) and only time-based pricing makes economic sense ($25-$100 resource benefit per year).**
- **We can anticipate that the customer's display of choice will connect *with the Internet.***
  - **Web systems are low cost, flexible, easily upgraded, promoting OPEN, Non-obsolescent customer connectivity.**
- **We can count *on the market* to develop and promote Internet-addressable displays, controls, and home networks.**
- **However utility time-based rates, Web-based customer workspaces, and communicating meters and thermostats *will encourage the market to move faster.***