



The Role of Emerging Technologies in Energy Efficiency Programs

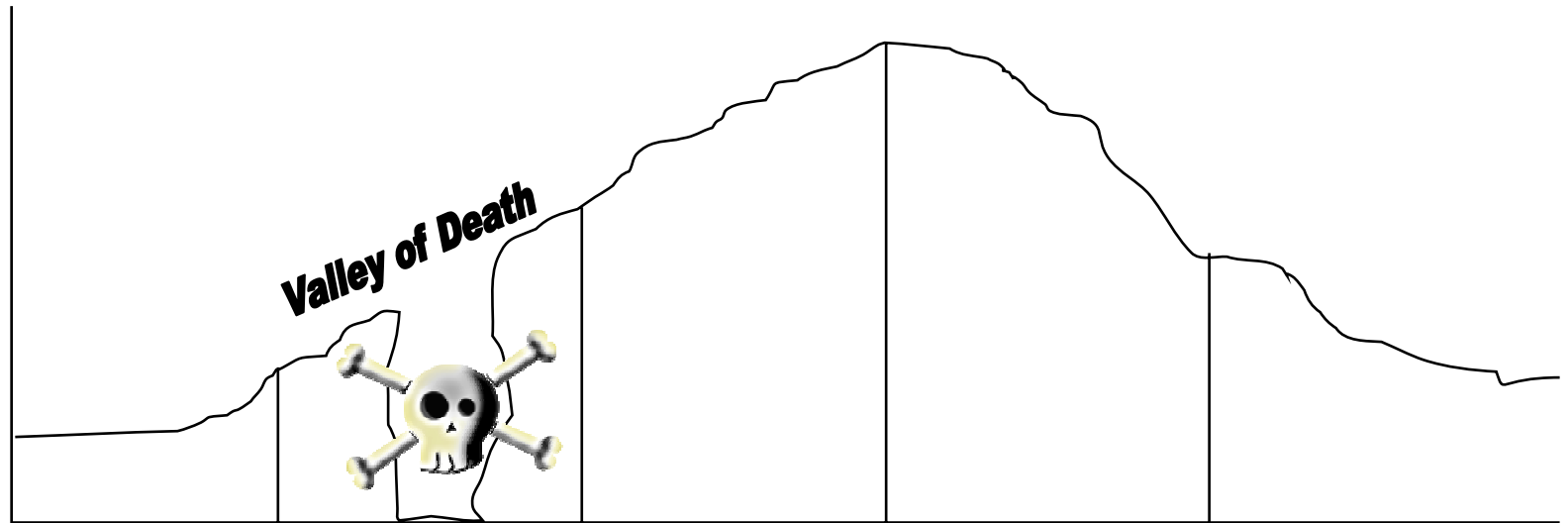
CEE Program Meeting

Jim Parks

Energy Efficiency and Customer R&D Manager

January 14, 2009

Emerging Technology Life Cycle



Innovators

Willing to take a risk. Love new technology

Early Adopters

Wait a bit, but willing to take some risk

Early Majority

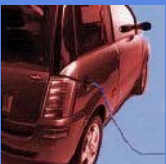
Need solid evidence

Late Majority

Need solid evidence plus the passage of time

Laggards

What? Get rid of my VCR?



The Need for Emerging Technologies

- ◆ Continue to fill the energy efficiency pipeline with new technologies
- ◆ Help meet aggressive energy efficiency goals
- ◆ Reduce need for new power plants, provide more diversity/stability to power system
- ◆ Reduce GHG emissions



Emphasis Has Never Been Higher

- ◆ Entrepreneurs developing moving into clean tech and developing new technologies
- ◆ VCs and angel investors are investing in clean tech
- ◆ Consumers are jumping onto the green wave
- ◆ Politicians are promoting green technologies and jobs
- ◆ Emerging tech funding is growing at the utility level



SMUD's Energy Efficiency Goals

- ◆ SMUD's board of directors adopted aggressive energy efficiency goals – 15% over ten years
- ◆ The most aggressive utility energy efficiency goals in California
- ◆ A large percentage of the goal will be met through development of emerging technologies

10-YEAR ENERGY EFFICIENCY TARGETS ADOPTED BY THE SMUD BOARD OF DIRECTORS

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total	10-Yr Avg
GWh	70	107	145	196	200	205	209	213	217	222	226	1940	194
MW	18	28	40	58	59	60	62	63	64	66	67	568	57
Budget (\$millions)	\$ 25	\$ 34	\$ 40	\$ 45	\$ 45	\$ 46	\$ 46	\$ 47	\$ 48	\$ 49	\$ 50	\$ 450	\$ 45

The 10-year goals (2008-2017) were adopted by the SMUD Board of Directors on May 17, 2007





LED Refrigerated Case Lights



Benefits

- ◆ 40% initial savings over fluorescent lighting
- ◆ Light levels set at 30% during periods of no movement
- ◆ 100% light level upon detection of movement
- ◆ Lights at 30% level for 65% of the time
- ◆ >70% savings
- ◆ Long life, 18 month payback

Challenges

- ◆ Product consistency - different manufacturers of varying quality create confusion






Finelite PLS Lighting System

Benefits

- ◆ Variety of options depending on cubicle arrangement
- ◆ 24 watts provides 2 table lamps and one under-counter fixture
- ◆ Lights controlled by occupancy sensor
- ◆ Excellent quality light
- ◆ Long life



Challenges

- ◆ Expensive - ~\$500/cubicle
 - ◆ Potential theft issues
- 

Bi-Level Parking Garage Fixtures

Benefits

- ◆ LED Fixture
- ◆ Good quality light
- ◆ 50% reduction during periods of no occupancy
- ◆ Long life - >50k hours

Challenges

- ◆ Up to 3 times more expensive than HID fixtures



LED Downlights (LLF)



Benefits

- ◆ LED Fixture
- ◆ Good quality light (92 CRI)
- ◆ Only 12 Watts
- ◆ 650 delivered lumens
- ◆ Dimmable
- ◆ Relatively easy retrofit
- ◆ Long life - >50k hours

Challenges

- ◆ Expensive (~ \$90 per fixture)



Aqua Chill Evaporative Condensed AC

- ◆ Developed by a Sacramento-based HVAC contractor
- ◆ Installed 30 units to pilot test the product

Benefits

- ◆ Energy efficient: 15+ EER
- ◆ Excellent peak load performance
- ◆ Compressor runs at much lower operating pressures

Challenges

- ◆ Long term reliability unknown
- ◆ Maintenance requirements
- ◆ Cost ~ \$2,000 more than a T24 compliant AC unit



Partners: Beutler, ADM Associates




Net Zero Energy Homes by 2020

Net Zero Energy Commercial Buildings by 2030





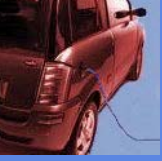


Home of the Future



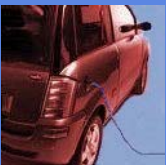
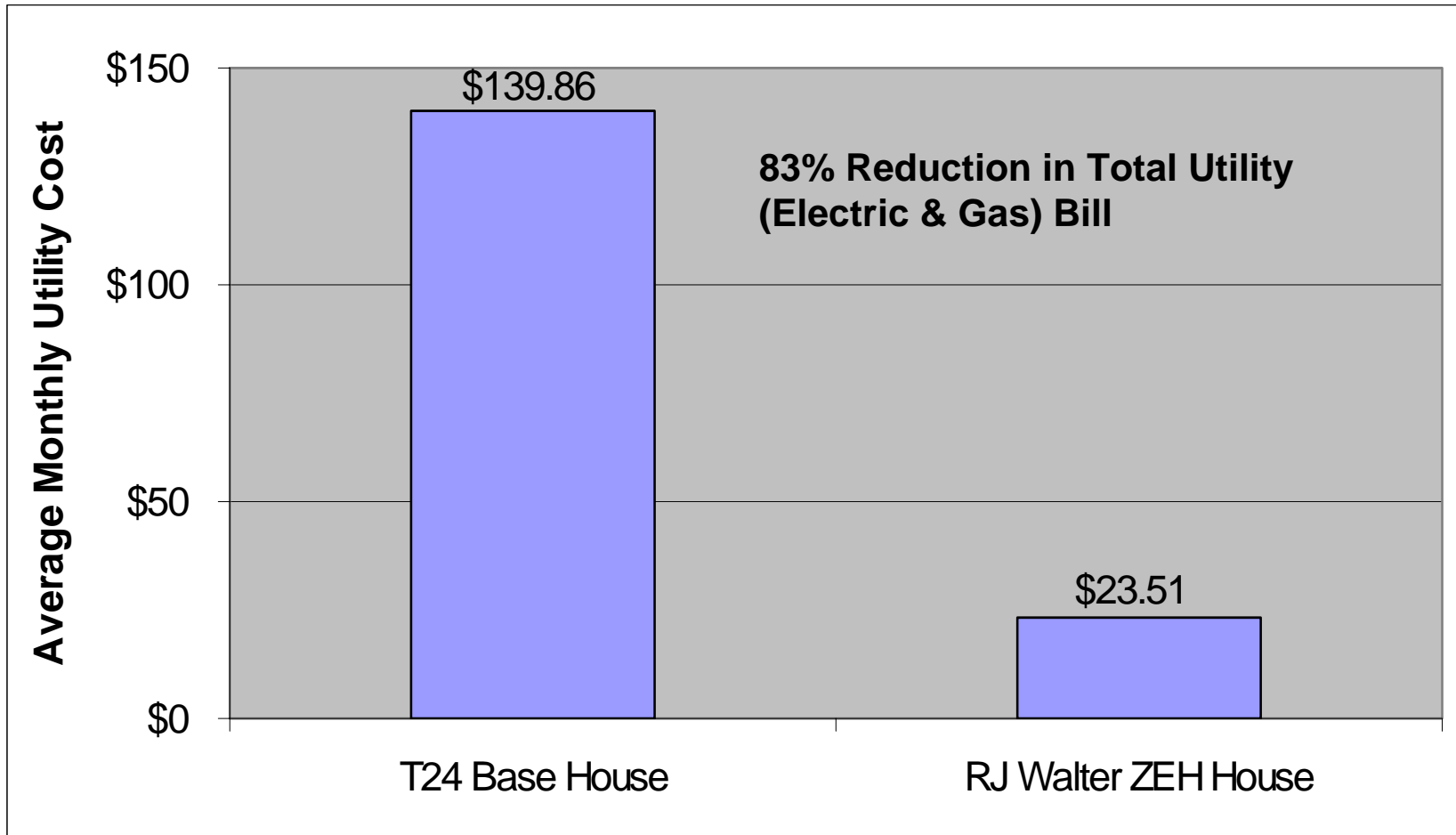


60% better than 2005 Title-24, LEED Platinum Home

- 
- Attic R50 ceiling assembly (low density foam)
 - Wall 2x6/R19-R21 cavity/R12 insulating sheathing - R30
 - Envelope .0002 SLA (4 ACH50)
 - Windows 0.29 U-value, 0.27 SHGC
 - Ducts Tight ducts, inside conditioned space
 - FURN Solar Assisted Hydronic space heating
 - A/C Aqua Chill Water Cooled AC (Home)
 - Ductless, HE, Mini-split Heat Pump (Casita)
 - Water Solar with HE boiler hot water backup
 - Lighting 100% CFL and LED Lighting
 - Solar 3.9 kW AC Solar Electric PV
 - Gas and/or Energy Star Appliances
 - Home Automation
 - Grid Tied Battery Back Up
- 
- 
- 
- 

Incremental Cost ~\$50k

Total Estimated Energy Bill Savings



Some Issues

- ◆ ZEH is currently expensive
 - ❖ Incremental cost is **\$50,000**
- ◆ Would hurt entry level buyers
- ◆ Builders opposed to mandates
- ◆ Ability to use community solar towards SB 1 goals
- ◆ Need to determine how ZEH fits into grid



Smart Grid Vision

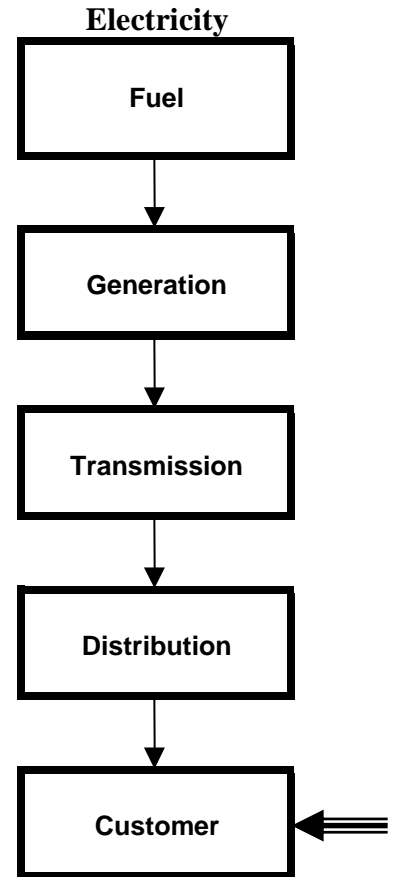
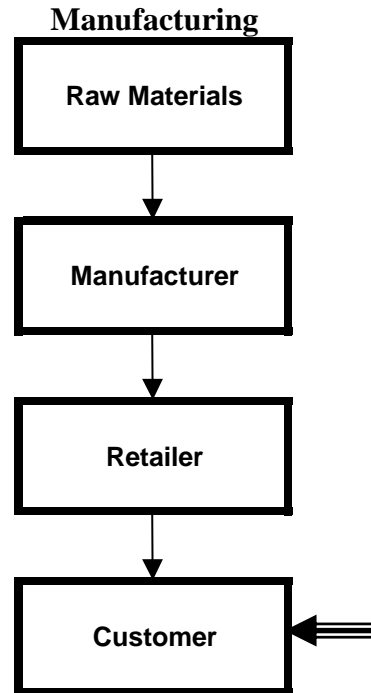
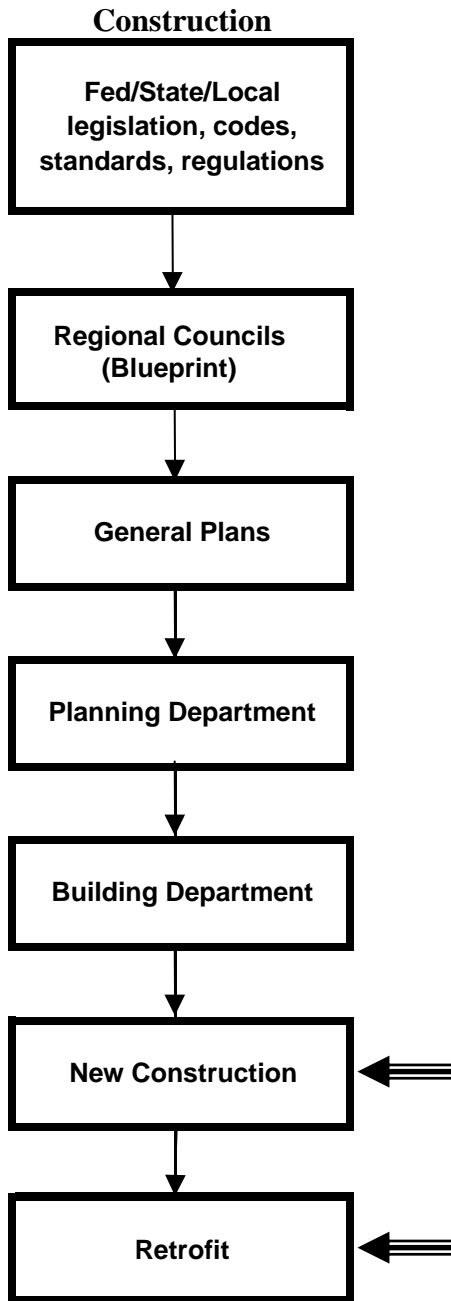


SMUD Smart Grid Elements

- ◆ Distribution System Smartening
 - ❖ Add or Expand SCADA at our distribution substations
- ◆ Advance Metering Infrastructure
 - ❖ Intercommunications with SCADA
 - ❖ Communications with end uses – controllable appliances/motors/ac
- ◆ Demand Response
 - ❖ System and targeted load control
 - ❖ Price response
- ◆ Distributed Generation
 - ❖ Photovoltaic Systems
 - ❖ Combined Heating/Cooling and Power
 - ❖ Plug-In Hybrids
 - ❖ Energy Storage
- ◆ Energy Efficiency
- ◆ Zero Energy Smart Homes and Commercial Buildings
 - ❖ Combines all of the above



Energy Efficiency Opportunities





The Potential is BIG

- ◆ A large portion of future energy savings is expected from emerging technologies
- ◆ We need to coordinate activities to leverage resources and achieve the biggest bang for the buck
- ◆ ET portfolios should contain a balance of short, mid and long term projects
- ◆ Working on upstream markets will have a greater impact
- ◆ Working simultaneously on multiple strategies (silver buckshot)—Emerging tech, codes and standards, PV, EE, transportation, land-use planning—will yield the biggest benefits