Planning, Coordinating and Funding of Integrated Demand Side Management Research

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Discussion Topics

Panel Questions:

1) Identify Processes & Strategies to **Accelerate Market Adoption** of Zero Net Energy in California
2) Suggestions for Establishing RDD&D Funding Priorities

Presentation Topics:

- Public Interest Energy Research Program Overview
- Energy Efficiency Policy Drivers and Goals
- Challenges and Opportunities
- Questions for Audience

Public Interest Energy Research Program Overview

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- **Purpose:** Funds public interest energy research not provided by the competitive or regulated markets; advances science and technology to the benefit of CA ratepayers, and provides environmentally sound, safe, reliable and affordable energy services and products.

- **Research Areas:**
  - Energy Efficiency & Demand Response
  - Renewable Energy
  - Transmission & Distribution
  - Energy Related Climate and Environment
  - Transportation

- **Approximate $86.5 Million Annual Budget**
  - $62.5 million electric
  - $24 million natural gas
  - Approximately 33% of the funding for energy efficiency research (80% for buildings)

CA Energy Efficiency Policy Drivers

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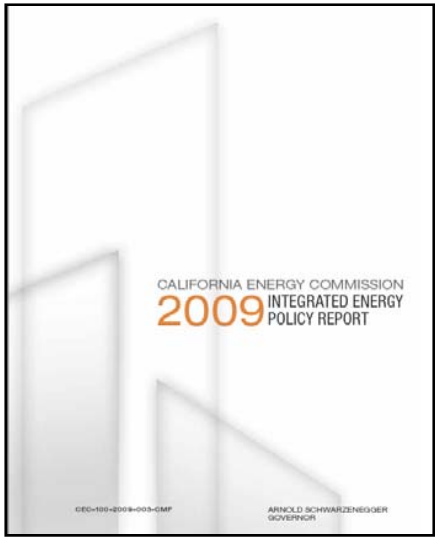
- **Energy Action Plan –**Efficiency is 1st in Loading Order

- **Integrated Energy Policy Reports (IEPR)**
  - Adopt statewide energy efficiency targets
  - Enact stronger CA appliance & building efficiency standards and combine with on-site generation
  - Requires new building standards to achieve net zero energy levels by 2020/2030
  - Increase energy efficiency through R&D



- **California Energy Efficiency Strategic Plan**
  - All *new residential* construction ZNE by 2020
  - All *new commercial* construction ZNE by 2030
  - 50% of *existing commercial* buildings ZNE by 2030
  - HVAC transformed to be optimal for CA climate

CA Energy Efficiency Policy Targets

Legislation

- AB 32: Reduce GHG emissions to 1990 levels by 2020
- AB 758: Achieve savings in existing residential & commercial bldgs
- AB 1109: Reduce energy indoor/outdoor lighting energy use
- AB 2021: Establish statewide energy efficiency goals
- SB 1250: Develop and bring to market energy technologies that increase environmental benefits and system reliability, lower system cost and that provide tangible benefits to electric utility customers

Governor Brown's Clean Energy Job Plan

- Zero net energy buildings; maximize energy efficiency; water efficiency and recycling; DG and combined heat and power

Decision-Making Path

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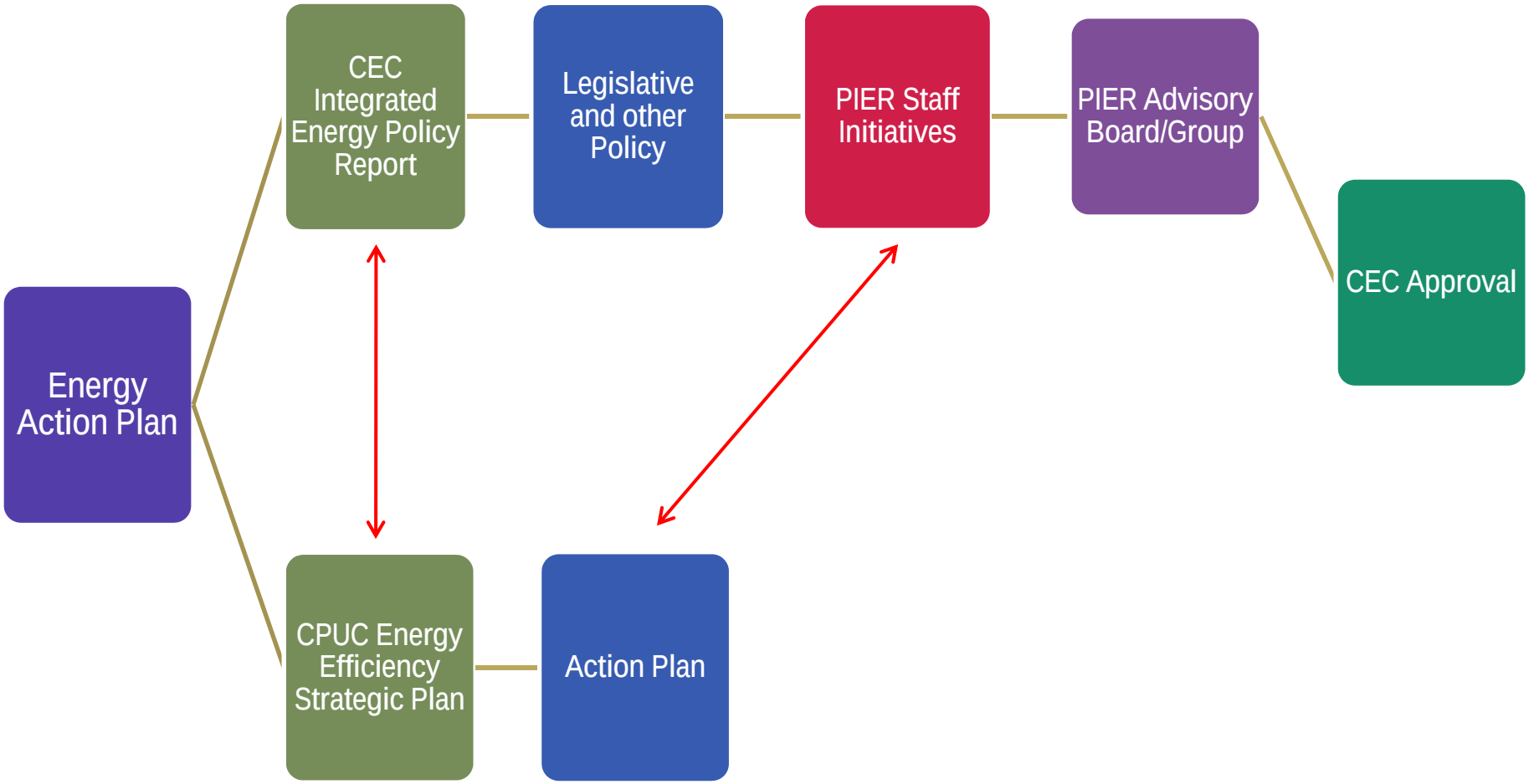

Challenges

- ZNE buildings are more costly than conventional construction and may not be possible for energy intensive sectors
  - How best solve ZNE technological and C/E challenges?
  - Is it achievable without a carbon offset price?
- Economy has slowed new construction & willingness to pay for ZNE buildings
  - How can ZNE buildings be widely replicated?
  - Should current focus be on existing buildings?
- Enforcement, verification and compliance
  - Who enforces and verifies whether buildings are ZNE initially and throughout building life?
- Widely deploying promising R&D strategies across the “valleys of death”
- Public goods charge reauthorization and scope

Improvements Required for ZNE Residential Buildings

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To get to neutral cost ZNE buildings will require 40-45% energy reduction over Title 24 – 2008, which will require development of several new technologies with remaining energy from PV (3.4-5.2 kW)

30% reduction of miscellaneous electric loads at very low incremental cost

Very High SEER/EER AC/HP (20+ SEER) with low cooling capacity and smart Controls[2 3]

High Efficiency Multi-Speed Pool Pumps [5] with solar hot water heating

EF 0.8+ Gas Tankless or hybrid water weater[7] or solar hot water htg

Low leakage, high R-value building envelopes (e.g. structural insulating panels)

Cost reduction of rooftop PV system[1]

90% market penetration of high-efficiency lighting for all needs[4]

R-10 and dynamic windows[6]

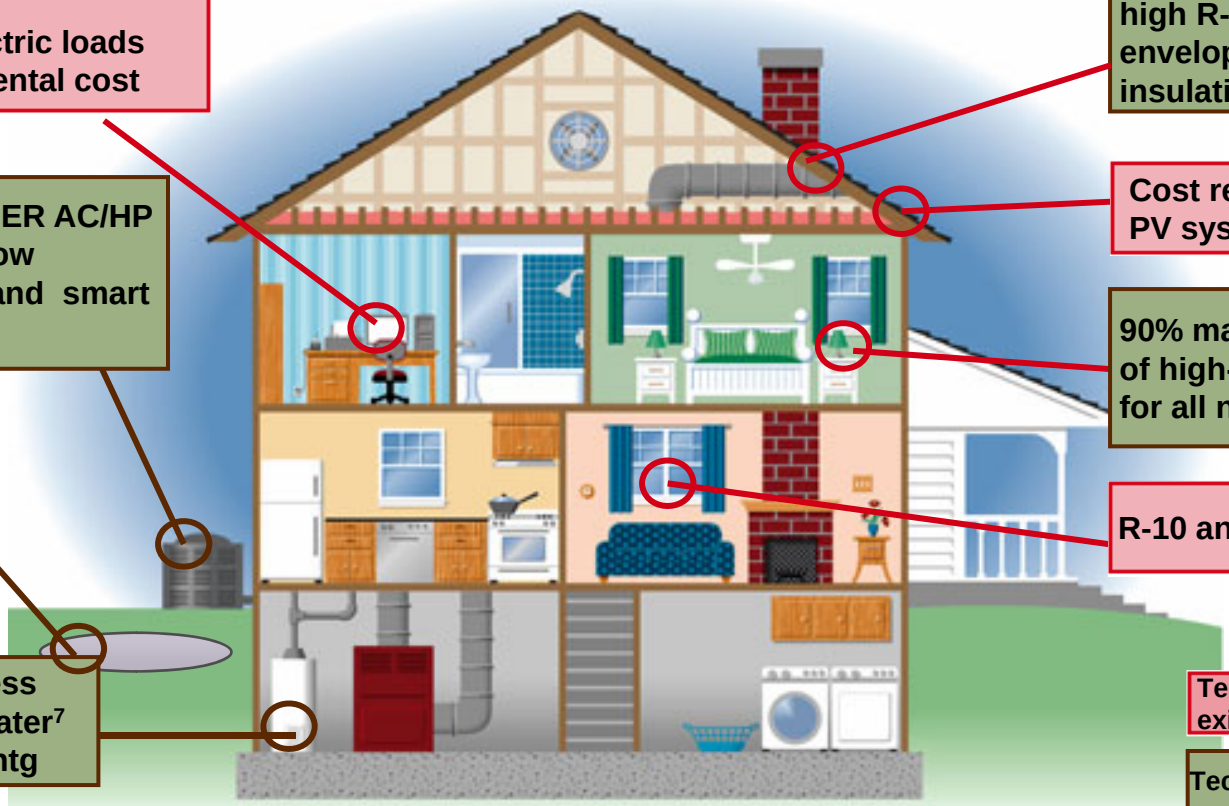

Image source: http://www.takecharge-ne.org/images/house.jpg

Legend:

Technology does not yet exist

Technology requires R&D

1 Estimated target $3.30/watt.
2 Not applicable to Marine climate zone.
3 20+ SEER ACs exist but are extremely expensive and unavailable in 1-1.5 ton capacities
4 CFLs, LEDs, induction, and other high efficiency lighting.
5 Not included in DOE analysis.
6 Estimated target $20/sq ft.
7 Experience shows that EF 0.8+ is not currently achievable in the field.

Key Assumptions: Energy consumption from EnergyGauge. Building characteristics from Regional Economic Research, Inc., *Residential New Construction Study Project Year #2*, 2002.

Source: BEopt Analysis, 10/31/07 , Navigant Consulting, 2008, PIER staff

Opportunities

- Coordinate and synergize with key stakeholders to accelerate market adoption of new technologies
- Technology integration with energy efficiency, renewable energy, grid, transportation and other areas resulting in a comprehensive approach

Potential New/Emerging Technologies for Commercial Buildings Requiring RDD&D
• Building envelope (high R value, low leakage), including cool roofs
• High efficiency lighting
• Integrated equipment/smart meter controls
• High efficiency HVAC, chillers, boilers and controls, including cooling systems optimized for CA hot/dry climates
• Miscellaneous electric load controls
• High efficiency dynamic windows
• High efficiency hybrid water heater or solar hot water heating (pre-heat)
• Low cost renewable energy system

Technology Integration

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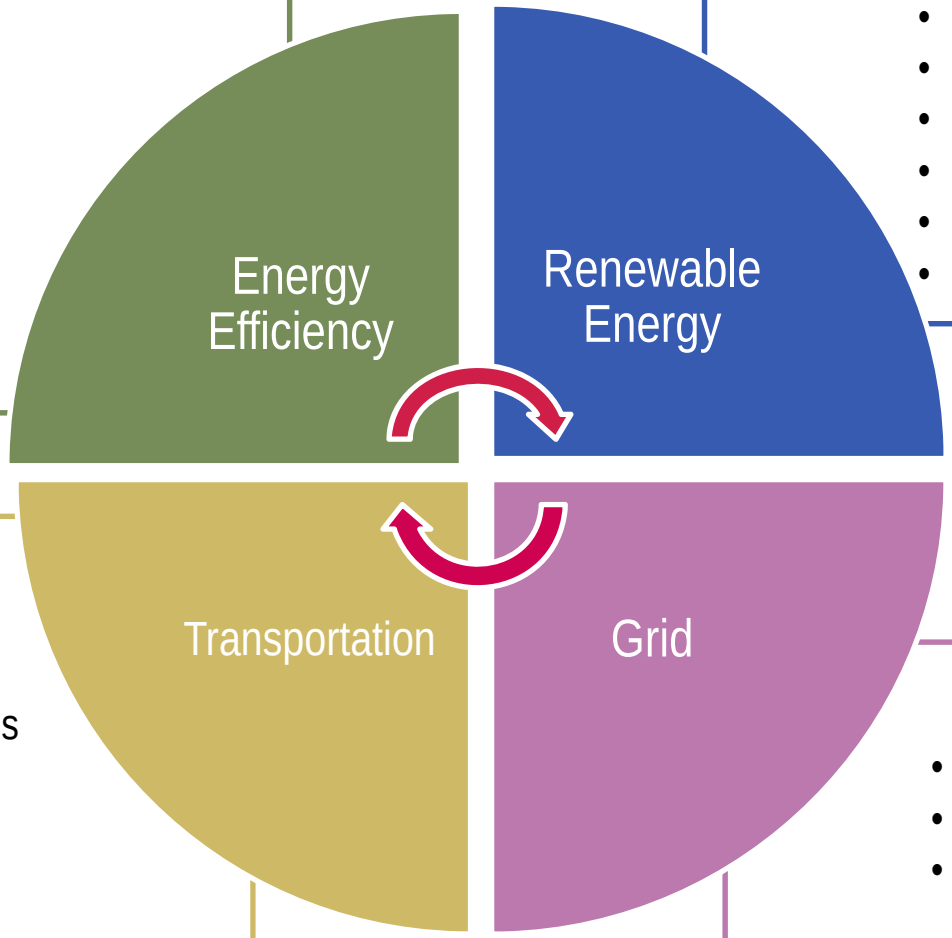
- Building envelope
- Lighting
- HVAC
- Controls, Demand Response
- Water heating
- Plug Loads
- Cool roofs
- Environmental



- Solar-PV/Thermal
- Geothermal
- Hydro
- Biomass/wind
- CHP/CCHP
- Storage
- Environmental

- Land Use and walkable communities
- Smart Garages
- Public Transit
- Plug in electric vehicles

- Smart/Micro Grid
- Demand Response
- Intermittency/Load issues

Strategies for Integration of Demand Side Management and RDD&D

- Conduct workshops (e.g., PIER Advisory Board/Groups, research forums, today's mtg)
  - Get input from researchers and stakeholders
  - Determine research/technology status
  - Identify synergies and integration among technologies and sectors
- Develop research gap analysis/road maps
- Update policy, regulatory & other issues to target R&D priorities
- Seek opportunities for other funding
  - DOE/DOD/EPA (e.g., ARRA) and private funding

Strategies to Accelerate Market Adoption

- Integrate emerging technology & energy efficiency programs
  - Besides utility incentives, what are other paths-to-market for new technologies?
- Demonstrate technologies and identify champions
  - Are group purchasing procurements effective to accelerate adoption?
  - Can we do more with military, campuses & other large customers?
- Coordinate with venture capitalists, incubator groups and clean tech organizations on promising technologies
  - Are “best of class” competitions effective mechanisms to help emerging/new technologies gain market acceptance?
  - How else can we increase clean technology manufacturing in CA?
- Develop innovative financing mechanisms to fund installation costs not covered by utility rebates
  - What about power purchase agreements with ESCOs for energy efficiency or integrated ZNE suite of projects?

Questions