Staff Draft Public Interest Energy Strategies Report

Integrated Energy Policy Report
Committee Hearing

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Don Schwartz

Public Interest Energy Strategies Report

- Project Manager - Don Schwartz
- Principal Authors:
  - Cheri Davis
  - Gerald Pine
  - Mike Messenger
  - Monica Rudman
  - Pam Doughman
  - Sylvia Bender
  - Terry Surles
- Clerical Support
  - Rachel Salazar
- IEPR Manager – Karen Griffin

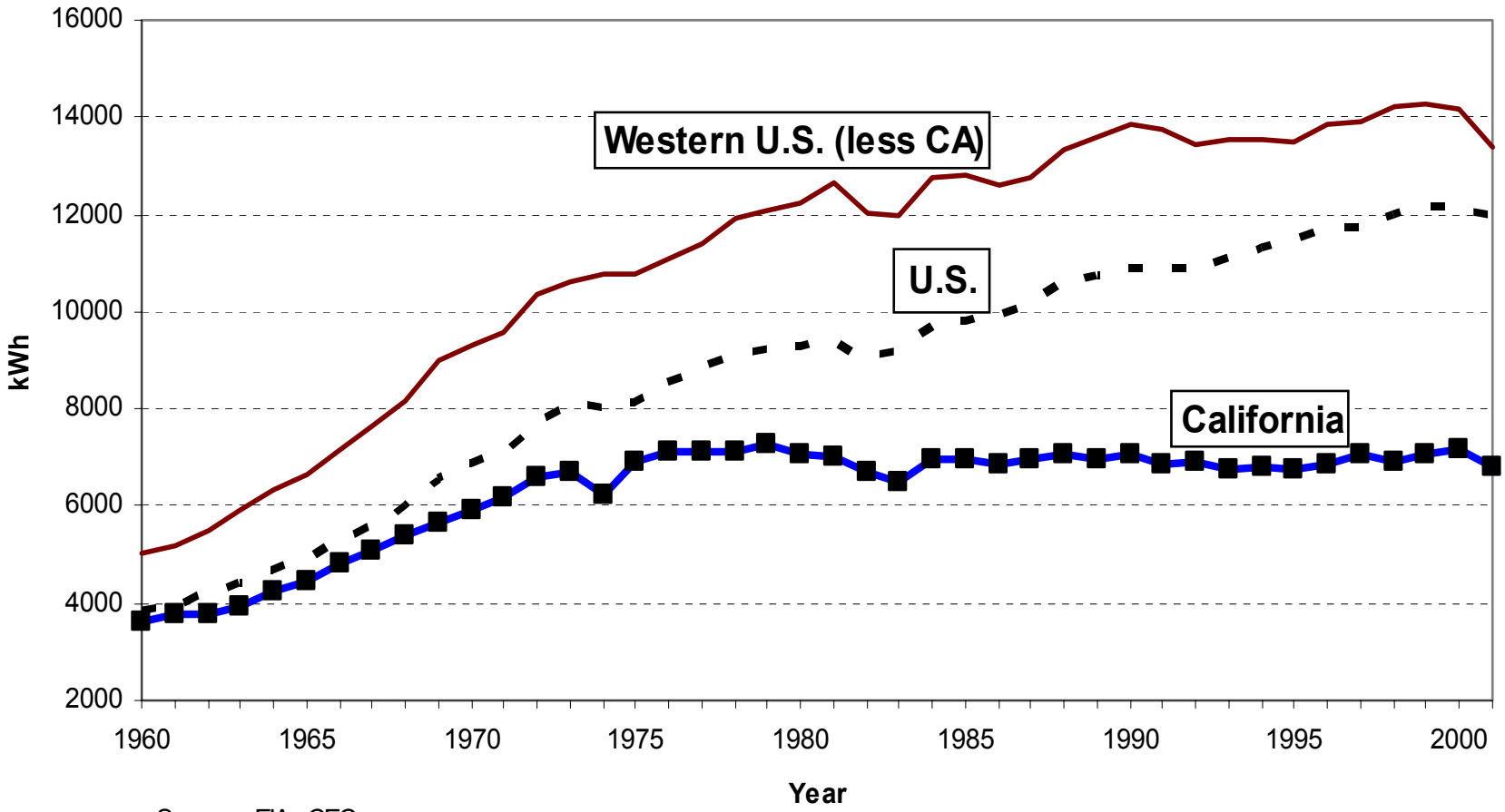
Presentation Overview

- Electricity and Natural Gas Assessment Report
  - Demand Outlook
  - Supply Adequacy Outlook
- Public Interest Energy Strategies Report – Goals and Targets
- Strategies
  - Definition
  - Findings
  - Challenges
  - Actions

Energy Demand Trends

- California will add 5 million people to its current population of about 35 million by 2014
- Three-quarters of our electricity growth and all of our natural gas growth will be driven primarily by the need to serve these new citizens
- Commercial growth, spurred by the state's economic expansion, will be the largest user of electricity
- California uses electricity more efficiently than do other Western states or the U.S. as a whole

Total Per-Capita Electricity Use

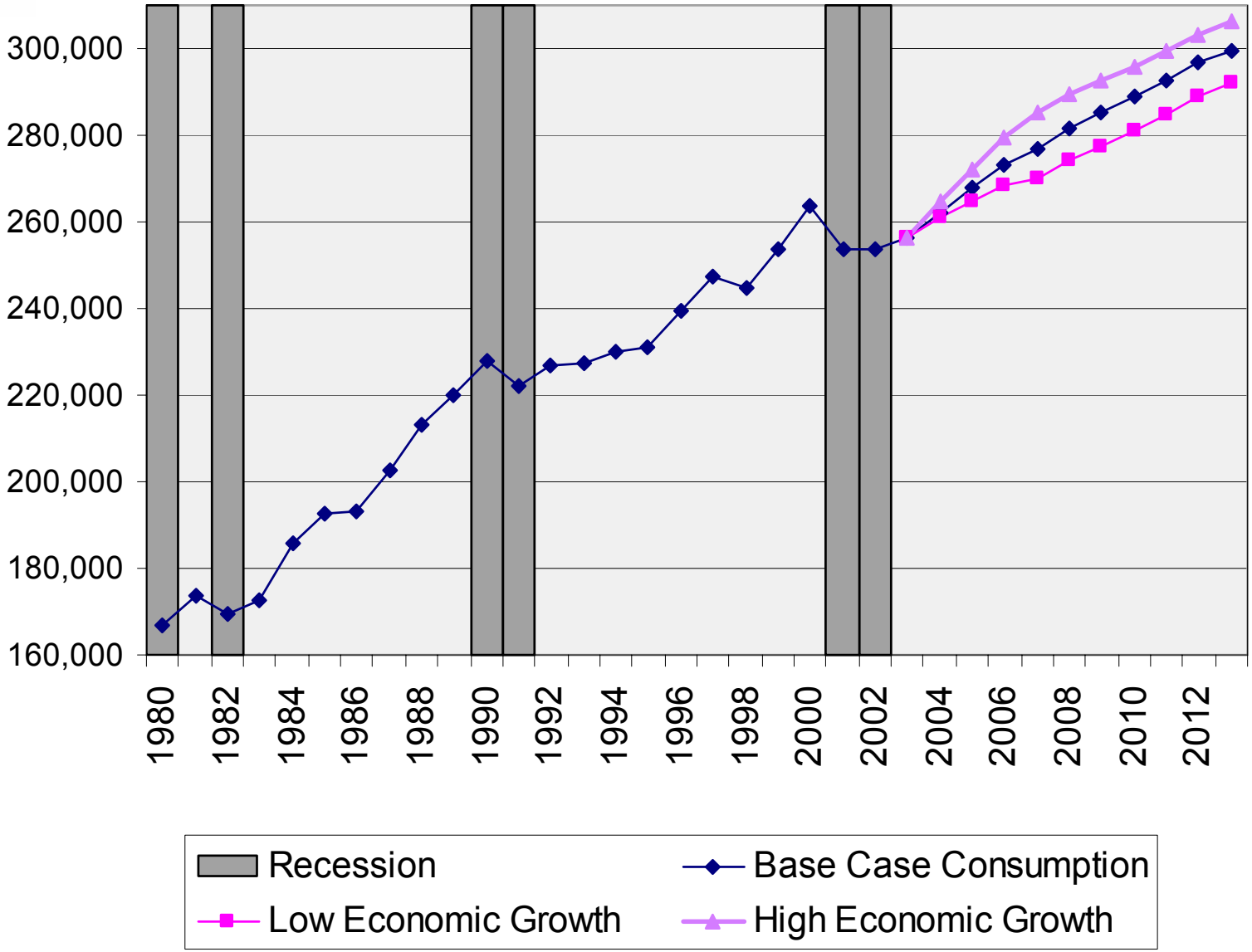


Source: EIA, CEC

Electricity Demand Forecast

- Base case consumption
- High economic growth
- Low economic Growth

Statewide Electricity Consumption (GWh) and Business Cycles
Base case Forecast and Economic Scenarios



Demand Forecasts: Electricity

Scenario Name	Description	Average Annual Peak Demand Growth 2004-2008	MW Difference in 2008
Baseline		1.7%	
High Economic Growth	Economic growth 2004-2008 1% higher than baseline	2.2%	1659
Low economic growth	Economic growth 2004-2008 1% lower than baseline	1.1%	-1736

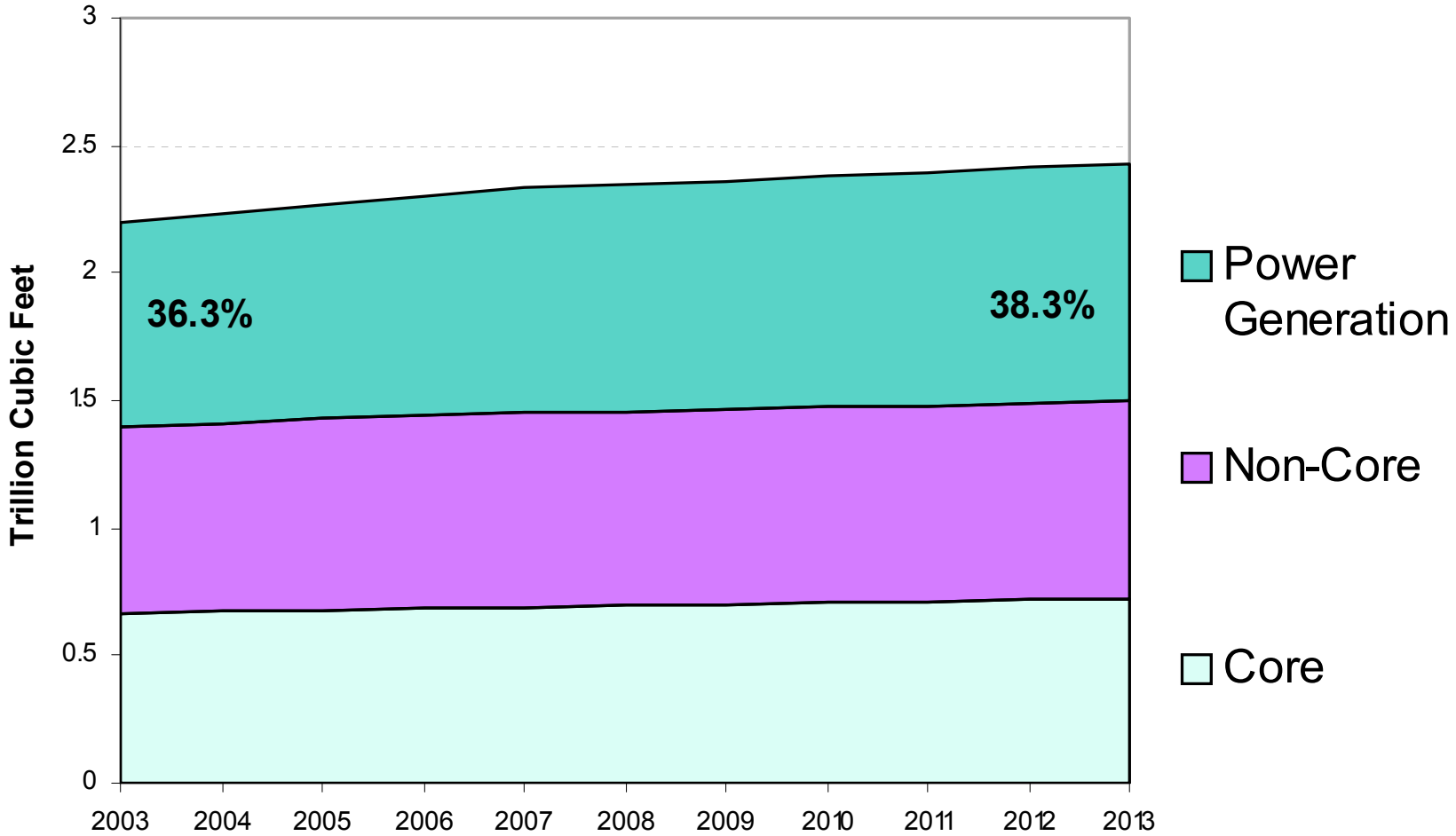
Natural Gas Forecast

- Power generation
- Non-core
- Core

Natural Gas Outlook

- Natural gas used for non-electricity generation is expected to increase by 0.6% per year over the next 10 years
- Natural gas used for power generation is expected to increase by 2% overt the next 10 years

CA Natural Gas Demand by Sector



Demand Issues

- Uncertainty in economic forecast
- Uncertainty in the price forecast
- Funding level of utility efficiency programs
- Changes in the rate structure
- Privately-supplied energy

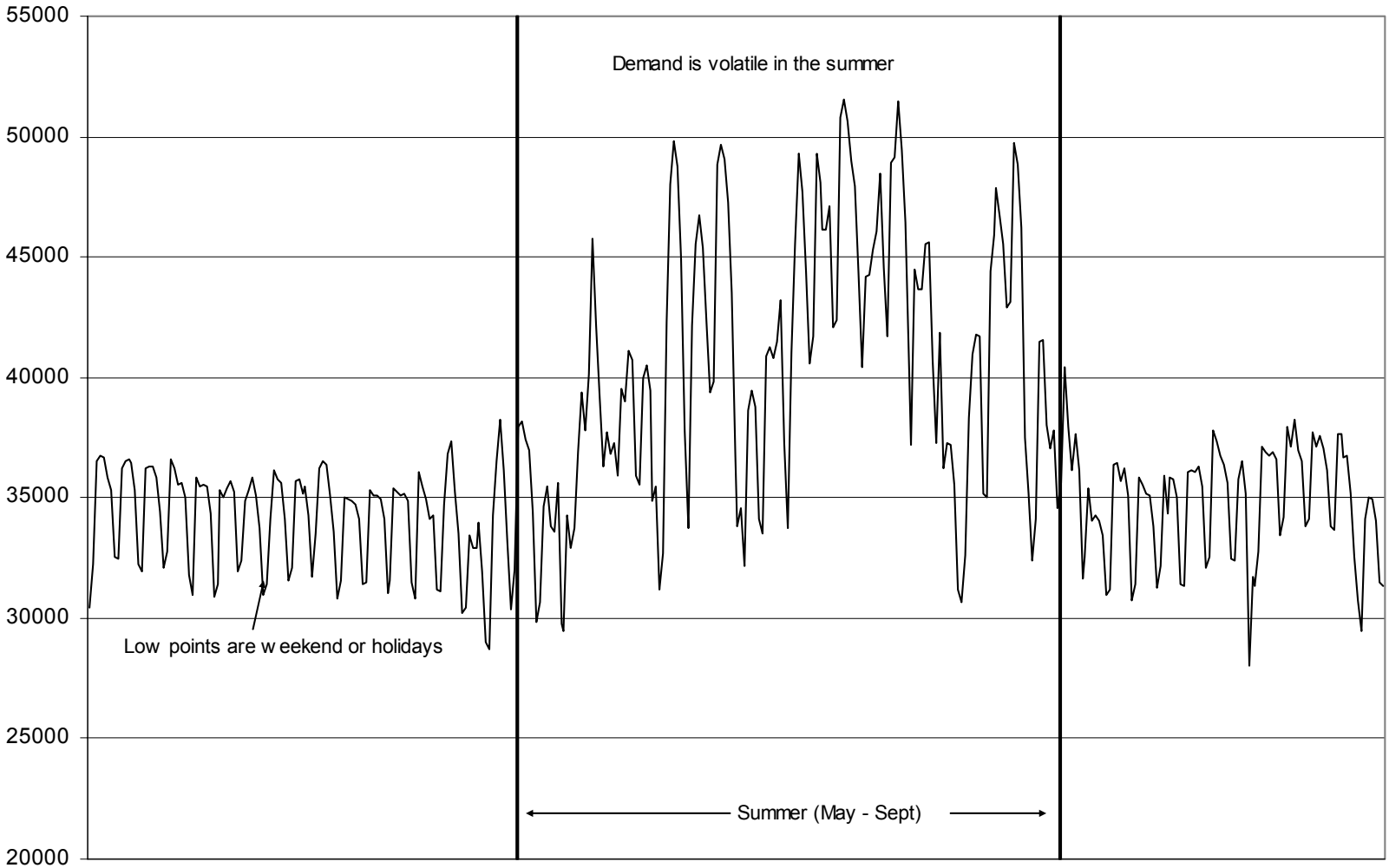
Electricity Supply Outlook

- Short term outlook secure. Have not seen reserves this high in CA and the West since the 1980's
- Some short term uncertainties, such as retirements, but California should be okay through 2006
- Long term outlook uncertain
- New generation (and natural gas supplies) will be needed, though some of that need may be displaced by public interest energy strategies

Supply Issues

- System peaks drive the need for capacity addition
  - The Electricity system must be able to meet summer demand spikes
  - Natural gas system needs must have sufficient storage and delivery capacity to meet winter heating demand spikes
- The interrelationship between natural gas and electricity generation compounds the peak problem
  - Natural gas-fired generation dominates CA's electricity mix
  - Double peak for natural gas – summer generation peak when gas is usually pumped into storage

Patterns of Daily Peak Demand



Additional Supply Issues

- Congested Transmission Paths
- Local Reliability Problems in San Francisco and San Diego areas
- Insufficient Transmission Capacity to Accommodate New Renewable Generation
- Increasing Cost of Natural Gas

Natural Gas Supply Outlook:

- Over the past three years, pipeline expansions and additions have made pipeline capacity sufficient to serve California's need through 2006.
- Beyond this date, annual average capacity is adequate, but peak day conditions could warrant further expansion.
- Increasing gas demand in Arizona and New Mexico may absorb a significant amount of the natural gas that would otherwise serve Southern California.

Public Interest Energy Strategies

The strategies presented in the *Public Interest Energy Strategies Report* are those called out in SB 1389.

- Energy efficiency and conservation
- Load management
- Renewable generation technologies
- Research, development and demonstration (RD&D) and the commercialization of new technologies

In addition to these strategies, the PIER report covers:

- Local reliability issues
- International markets

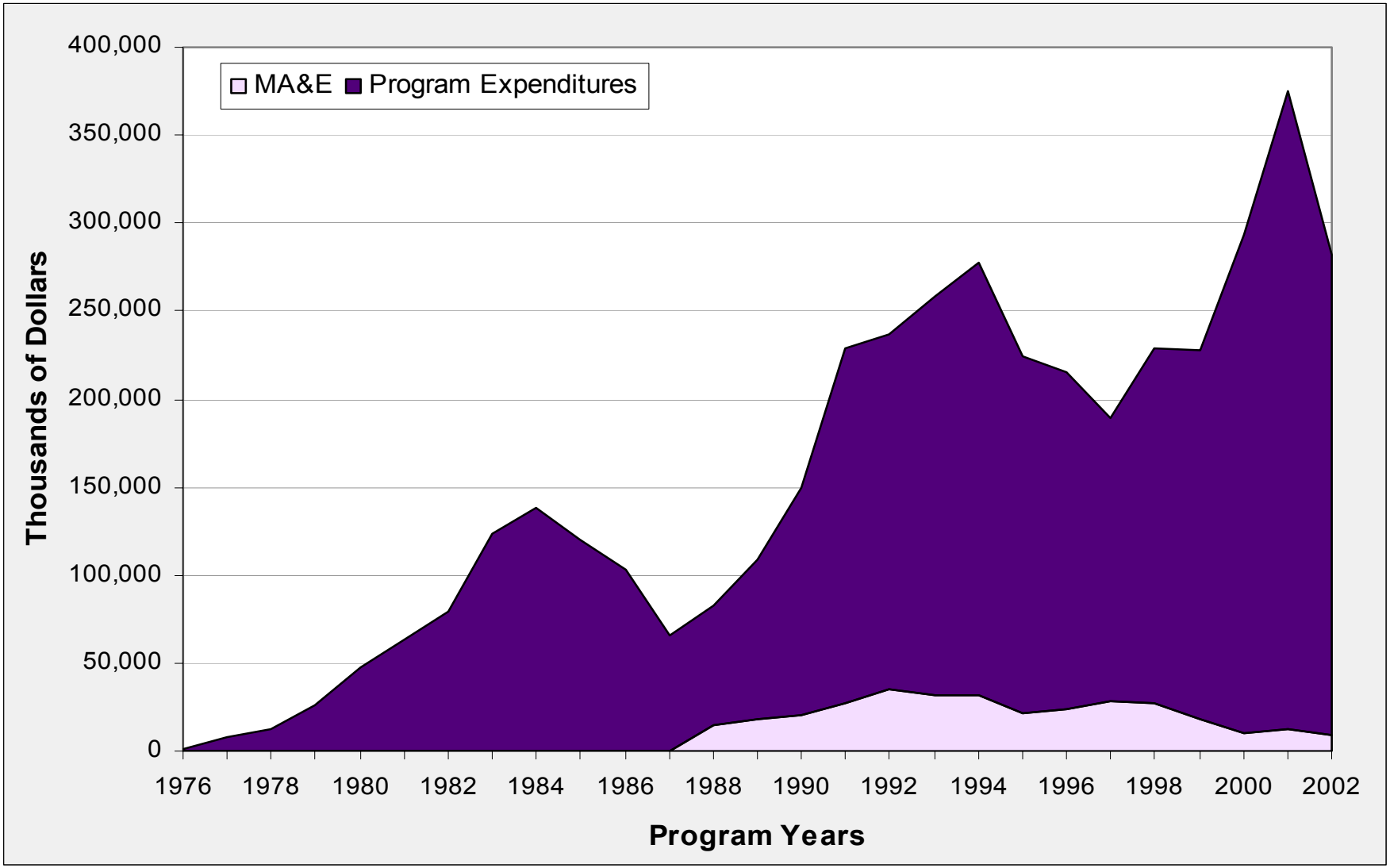
Goals and Targets

The California ***Energy Action Plan*** identifies public interest strategies:

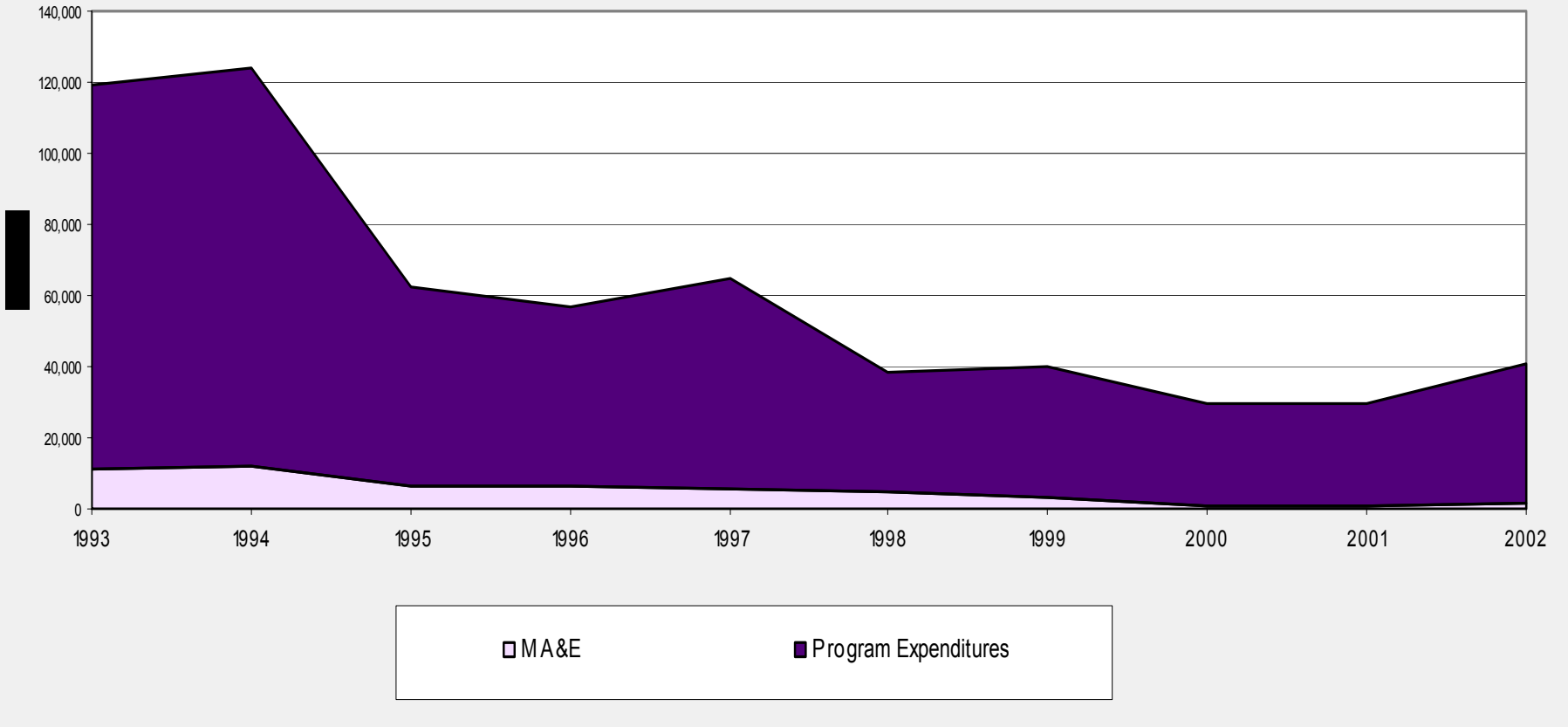
- Meet Ca's energy growth needs while optimizing energy conservation and resource efficiency and reducing per capita electricity demand
- Accelerating the state's goal for renewable resource generation
- Promote customer and utility-owned distributed generation
- Ensure a reliable supply of reasonable priced natural gas
- Upgrade and expand the electricity transmission and distribution infrastructure and reduce the time it takes to get needed facilities on line

Energy Efficiency and Conservation: Findings

- The electricity crisis led to a dramatic decline in electricity consumption in 2001 compared to 2000. Residential customers cut use by roughly 6.5% and commercial customers by 5% over 2000 levels
- The commercial sector accounts for 35% of electricity consumption
- Residential and commercial air conditioning and commercial lighting contribute the most to peak demand
- Doubling current program spending on electricity-oriented efficiency programs could reduce peak load by an additional 1,700-1,800 MW over the next 10 years
- Doubling current program spending on natural gas efficiency could cut the growth in natural gas demand by 5% over the next 10 years

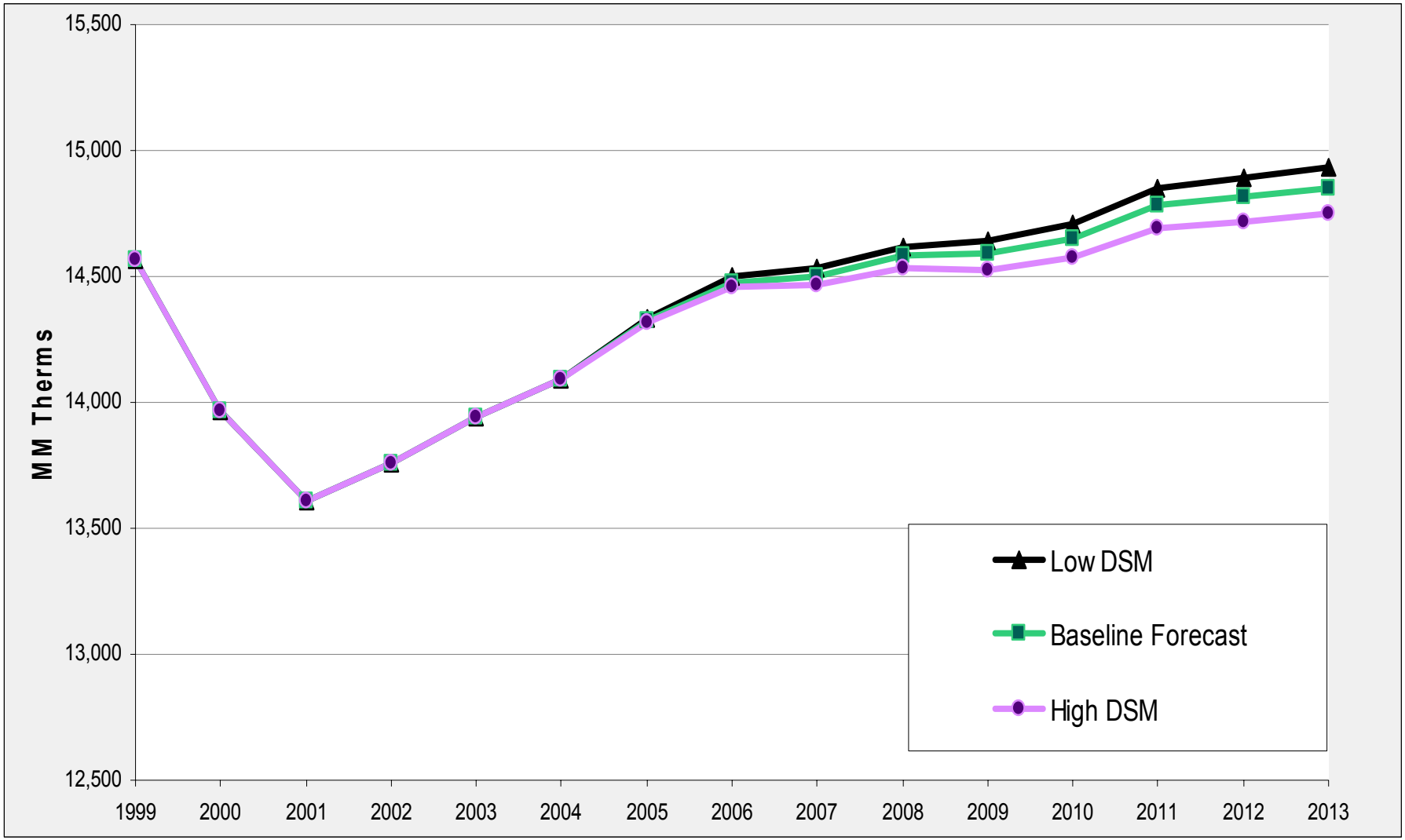

MA&E
Program Expenditures
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Thousands of Dollars
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
Program Years

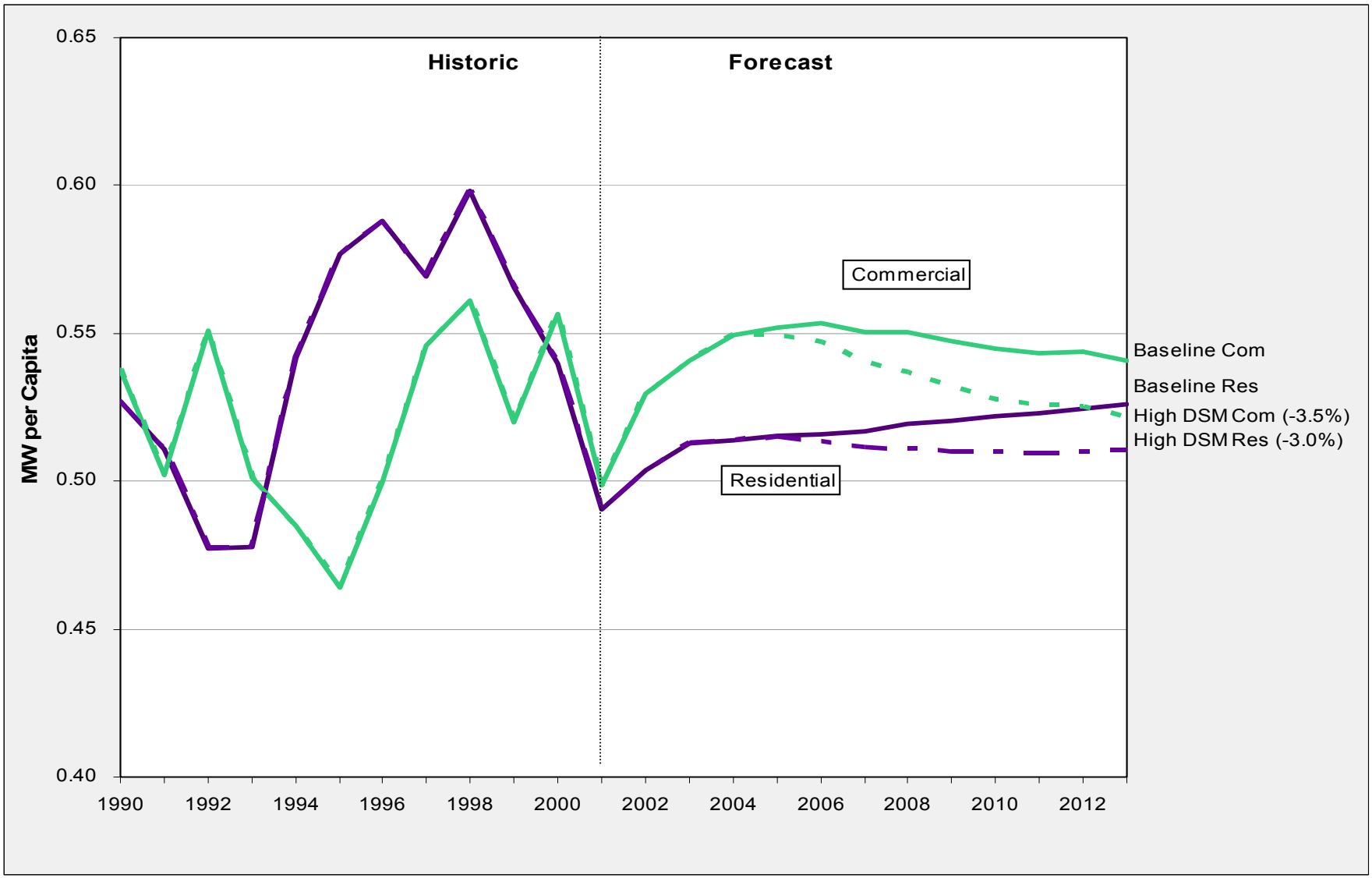
Annual Spending Gas Efficiency Programs over Past Decade

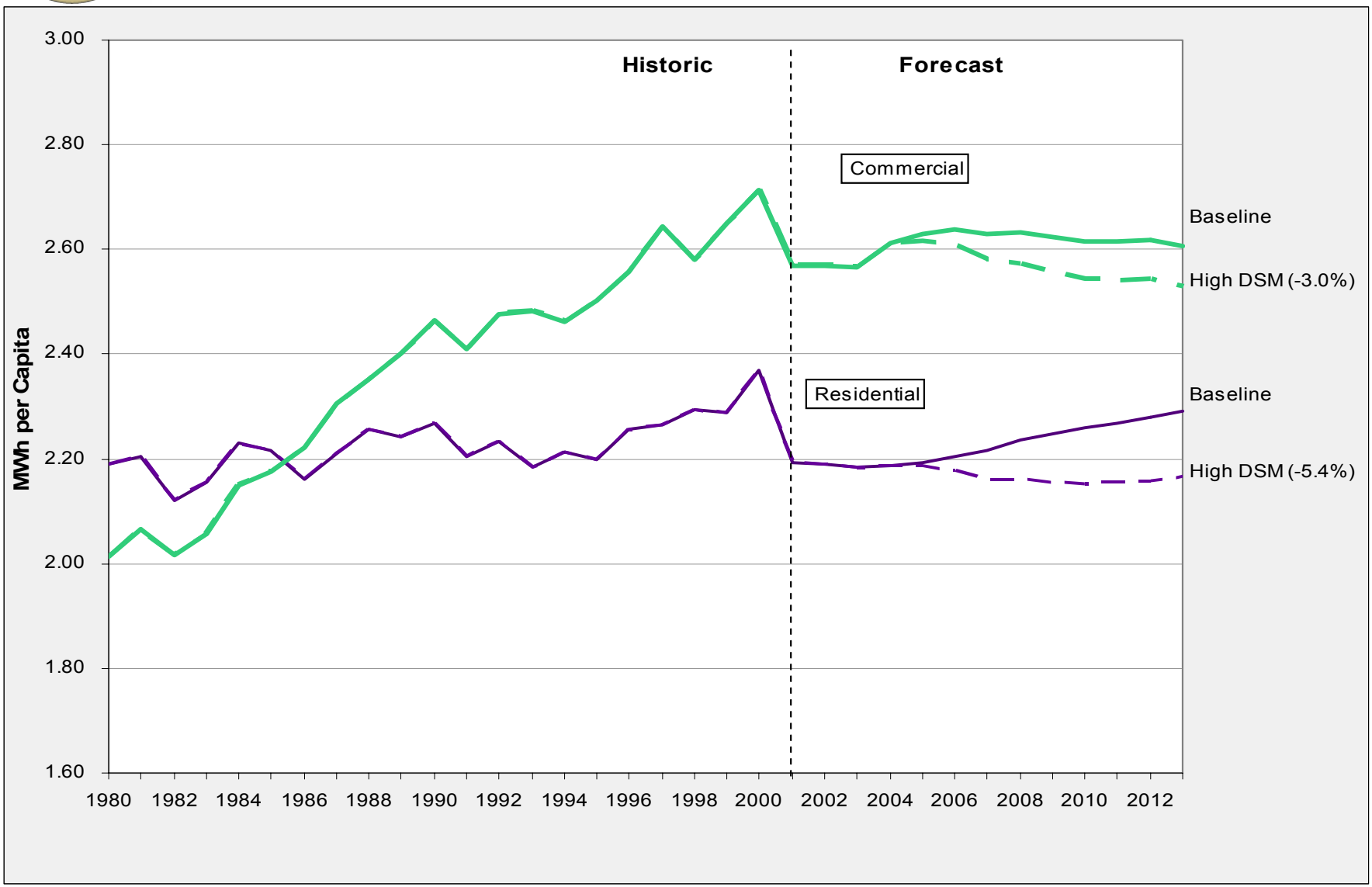


DSM Scenarios

- Baseline – Current PGC funding levels through 2013
- High DSM – Doubling of the PGC funding
- Low DSM
- Super high DSM – Quadrupling of the PGC funding


15,500
15,000
14,500
14,000
13,500
13,000
12,500
MM Therms
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Low DSM
Baseline Forecast
High DSM


Historic
Forecast
MW per Capita
0.65
0.60
0.55
0.50
0.45
0.40
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Commercial
Residential
Baseline Com
Baseline Res
High DSM Com (-3.5%)
High DSM Res (-3.0%)


Historic
Forecast
Commercial
Residential
Baseline
High DSM (-3.0%)
Baseline
High DSM (-5.4%)
MWh per Capita
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

Energy Efficiency and Conservation: Challenges

- Unbiased, realistic estimates of expected program savings impacts for efficiency need to be included if efficiency is in resource plans. This requires greatly expanded and redesigned measurement and evaluation processes
- Energy efficiency needs to be made more responsive to real-time needs
- Social science research that links economics with sociology, anthropology, and psychology along with expended data collection should be supported

Energy Efficiency and Conservation: Actions

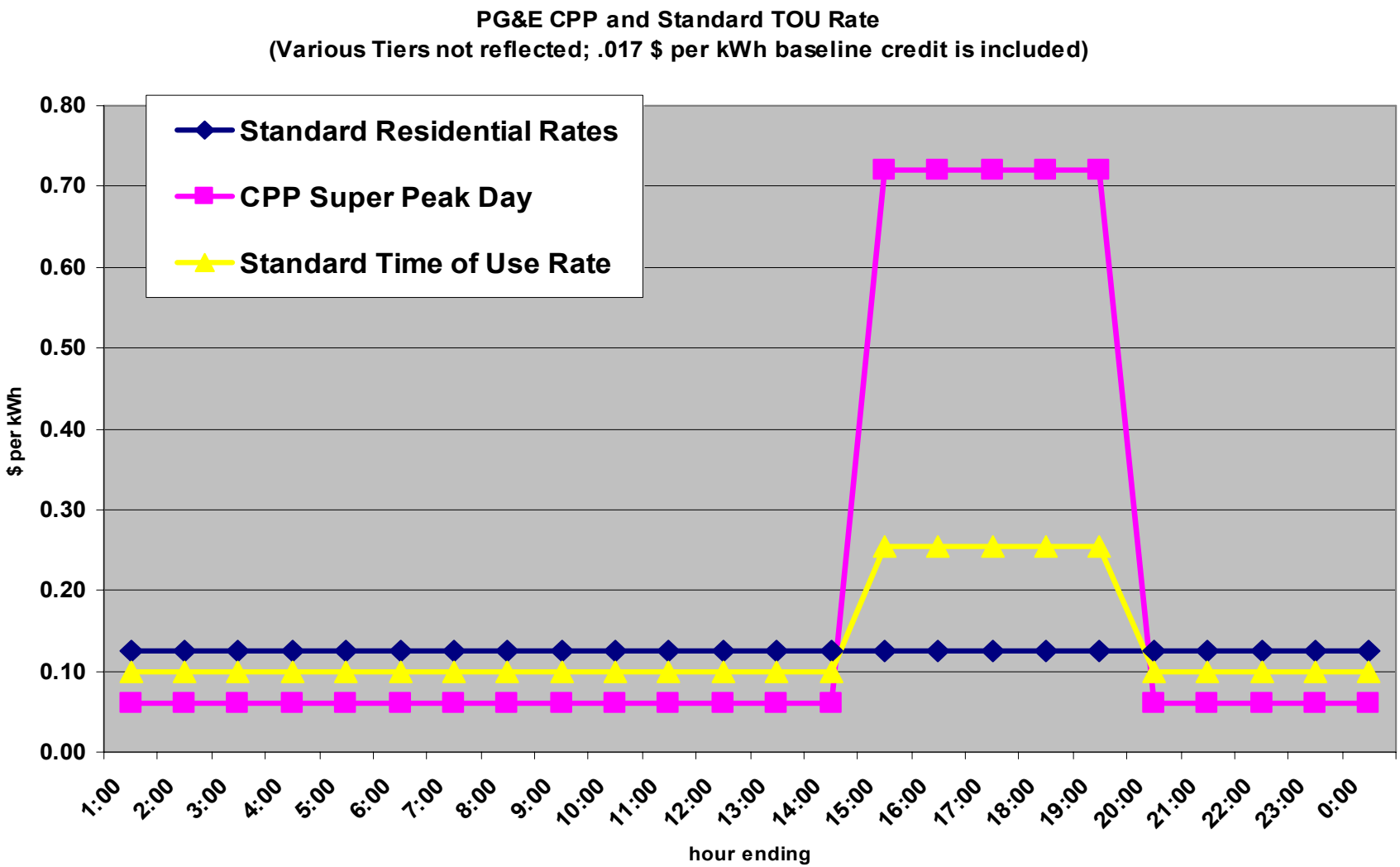
- Loading order – Efficiency comes first, but this requires improvements in measurement and evaluation, program design, and program administration
- Additional strategies beyond 10% AC efficiency and 5% building improvements needed

Dynamic Pricing: Definition

- Flat Rates – Retail prices known for weeks or months ahead of time regardless of wholesale prices or system conditions
- Dynamic Rates – Retail prices can be adjusted on short notice based on system conditions
  - Minutes, for real-time pricing
  - 24 hours, for critical peak pricing

Critical Peak Pricing Example

Experimental PG&E Tariff



Dynamic Pricing: Findings

- Time-based or dynamic pricing rates could help large commercial and industrial customers reduce their peak electric demand 500 MW by 2005
- Installing advanced meters to support dynamic pricing rates will produce improvements in customer service by reducing the cost of billing, reducing down time during outages, and giving customers more accurate information on the daily fluctuations of energy prices

Dynamic Pricing: Challenges

Key issues that need to be resolved regarding the implementation of dynamic pricing include:

- Should dynamic rates be made voluntary, mandatory, or simply the default rate choice for some customers?
- Does it make sense to install advance metering and automatic control equipment on a widespread basis, or only to those customers who choose a dynamic tariff?
- If given the choice, will enough customers choose to switch to a time-of-use tariff to produce the desired benefits?
- Will system operators be able to rely on widespread customer response to high prices?

Dynamic Pricing: Challenges

In addition to these issues, there exist barriers to widespread deployment of critical peak pricing rates. Examples of some of these barriers include:

- Low customer awareness of the benefits of switching to these rates
- Lack of consensus on the cost effectiveness of installed advanced metering

Dynamic Pricing: Actions

- Continued joint agency collaboration and educational activities. The joint agency collaboration in a current CPUC proceeding (R.02-06-001) should continue to promote dynamic pricing for these classes of customers who already have advanced metering systems.
- Phase 2 of the rulemaking should continue to pursue development of the "business case" for advanced metering.
- The agencies should complete their review of the costs and benefits of different strategies to deploy interval metering and dynamic pricing by the summer of 2004.

Renewable Energy: Definition

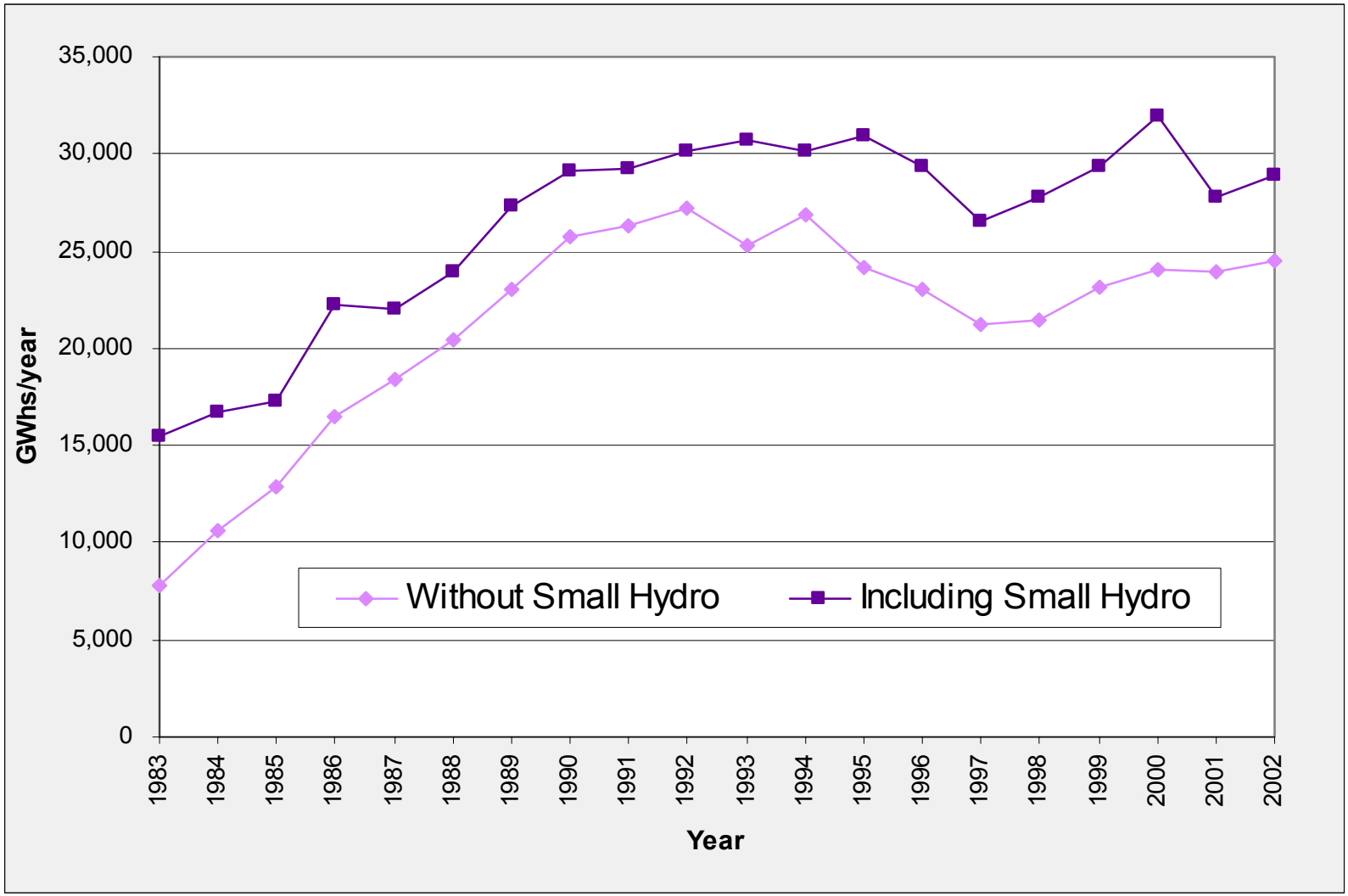
Electricity generated from geothermal, organic waste, wind, solar and the portion of hydroelectricity generated by systems that are 30 MW or smaller.

Renewable Portfolio Standard

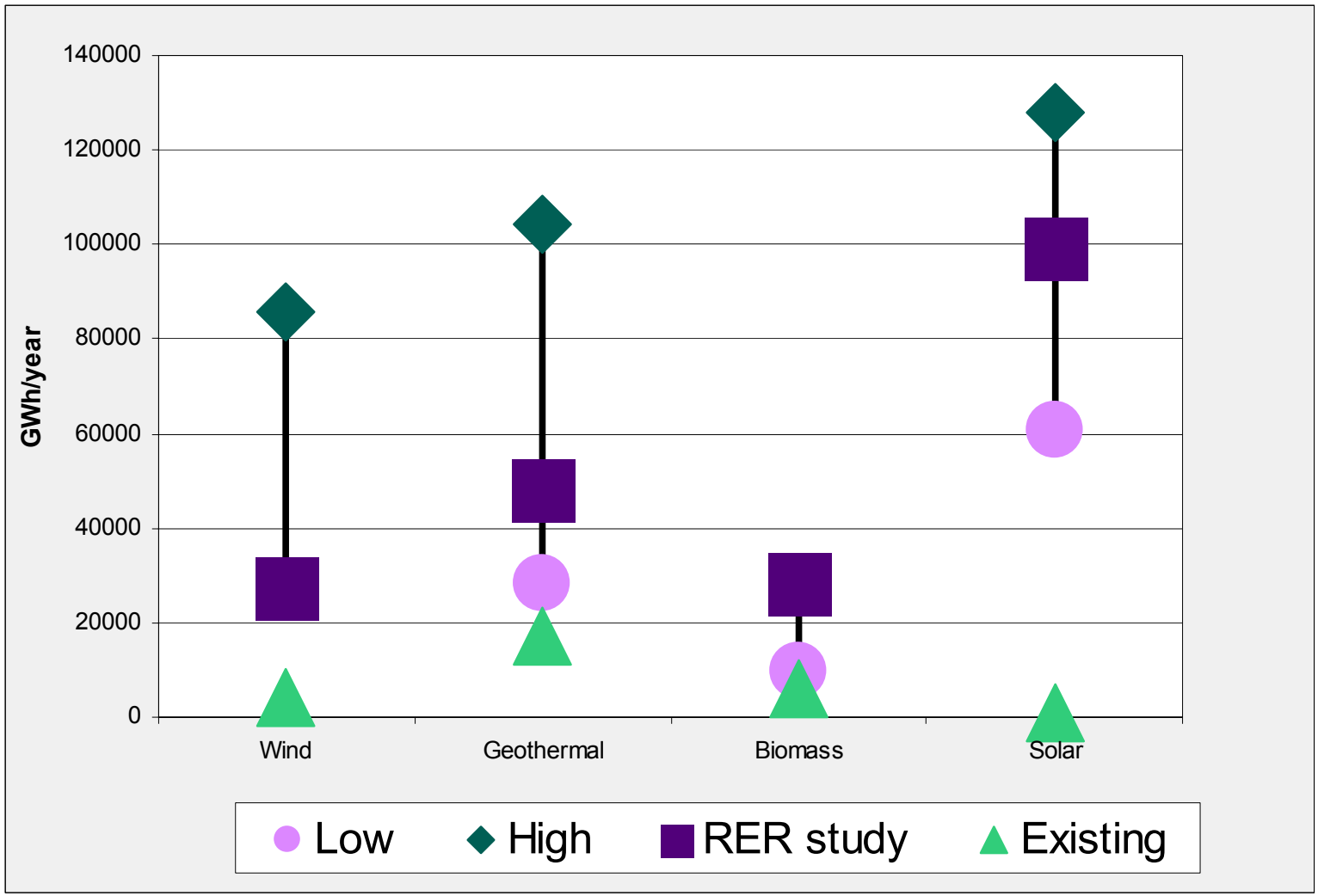
To address the problems raised by the 2000-2001 energy crisis and further promote the development of renewable resources, the California legislature passed SB 1078, creating California's Renewables Portfolio Standard (SB 1078, Sher, Chapter 516, Statues of 2002).

- The RPS program requires investor-owned utilities, electric service providers, and other regulated entities to provide 20% of retail sales from renewable electricity resources by 2017.
- Municipal utilities are also encouraged to increase their use of renewable electricity resources.

Trend in Renewable Energy Production in California (1983-2002)



Technical Potential in California by Technology (GWh/yr)



Roof-Top PV Energy

- The potential for roof-top solar electric systems is considerable:
  - Regional Economics Research, Inc. estimates the technical potential of roof-top PV energy in CA to be about 9,450 MW
  - NREL estimated the capacity potential of 198 MW on municipal buildings and 1500 MW on schools using roof area estimates of 66 million ft^2
    - Energy produced from PV at these locations could be about 2,200 GWh/year.

Renewable Energy: Findings

- In 2001, about 10.5% of retail electricity sales in CA came from renewable energy sources
- Energy Commission simulations suggest that accelerating the RPS to 20% renewable resources by 2010 could reduce reliance on natural gas to produce electricity in the Western Electricity Coordinating Council (WECC) region by 5%
- An accelerated RPS could reduce NO_x emissions from natural gas and coal power plants in the WECC by 0.5% (31,500 tons) in the coming decade
- Replacing traditional fossil-fueled generation with renewable energy could reduce emissions of $C0_2$ from natural gas and coal produced electricity in the WECC region by 1.5% (62,000,000 tons) over the next decade

Renewable Energy: Challenges

- Transmission lines linking renewable energy sites (often in rural locations) with load centers can be costly
- Often difficult for renewable power plants to get contractual access to transmission lines
- Not all forms of renewable energy provide the type of power-on-demand that the system counts on for reliably serving CA customers
- Environmental Concerns: There is a need to reduce bird kills associated with wind energy and improve fish passage and water quality with small hydro facilities

Renewable Energy: Actions

- Reevaluating the adequacy of the public goods funds at the conclusion of the first solicitation for RPS to determine if funding should be increased
- Commercializing R&D of renewable energy storage technologies which enable renewable energy technologies to operate as dispatchable and/or peaking resources
- Working closely with transmission system operators so renewable power has access to the system
- Monitoring RPS implementation for Community Choice Service providers and Electricity Service providers and implementing SB 1078 by publicly-owned electric utilities over the next two years in order to identify and address potential barriers as they arise

Research, Development and Demonstration: Definition

RD&D can be defined as “the process of advancing science and technology from the initial stages of exploring a concept, through the laboratory and the application testing of components and systems, to eventual introduction into the market.”

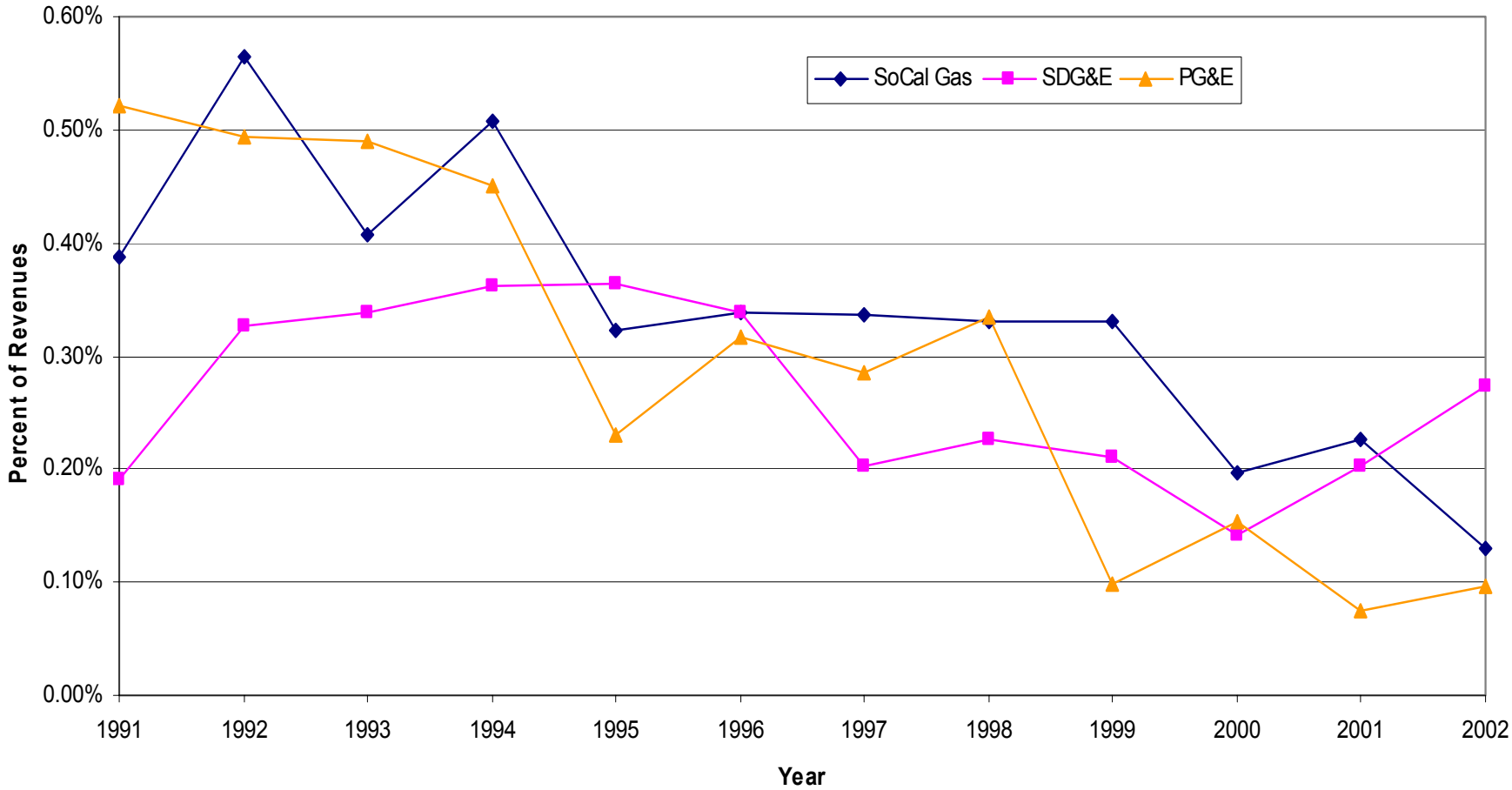
PIER Program

- Following 1996 deregulation, the Legislature authorized the Energy Commission to conduct public interest energy RD&D
- The goal of the PIER Program is to help make CA's electricity more affordable, diverse, clean, and safe
- The overall mission of the PIER Program is to fill gaps in technology advances once addressed by utilities
- PIER takes on critical RD&D initiatives that offer near-and long-term benefits to California
- Benefits of PIER RD&D products commercialized through 2002 is between $222-$579 million

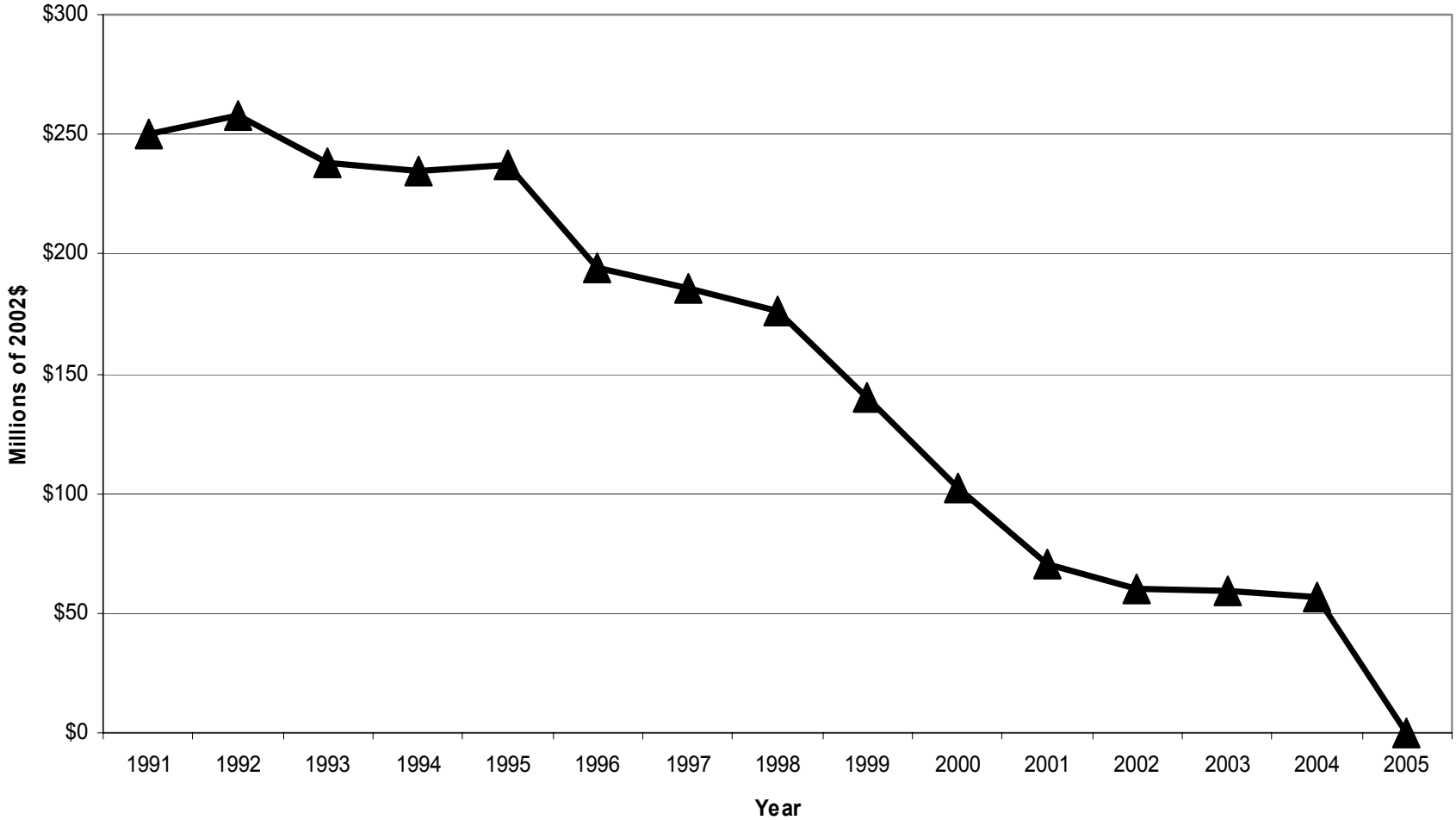
PIER RD&D Products Commercialized Through 2002

- Berkeley Lamp
- Commercial Kitchen Ventilation
- Duct Sealing
- Real-Time Energy Management and Control Systems
- Catalytica Xonon™ Burner
- DG Interconnect Hardware
- Real-Time Monitoring and Dynamic Rating System for Overhead Transmission Lines
- Interconnection Standards for Small Distributed Generation
- Improved Substation Seismic Design/Utility Building Vulnerability
- PowerGuard Solar Systems for Flat Roofs
- NO_x Control in Biomass-Fueled Boilers with natural Gas Cofiring
- Cast Metal Industry Electricity Consumption Study
- Poultry Rinse Water Recycling

California Investor-Owned Utility RD&D Expenditures as a Percent of Operating Revenues



RD&D Funding by Year at the Gas Research Institute



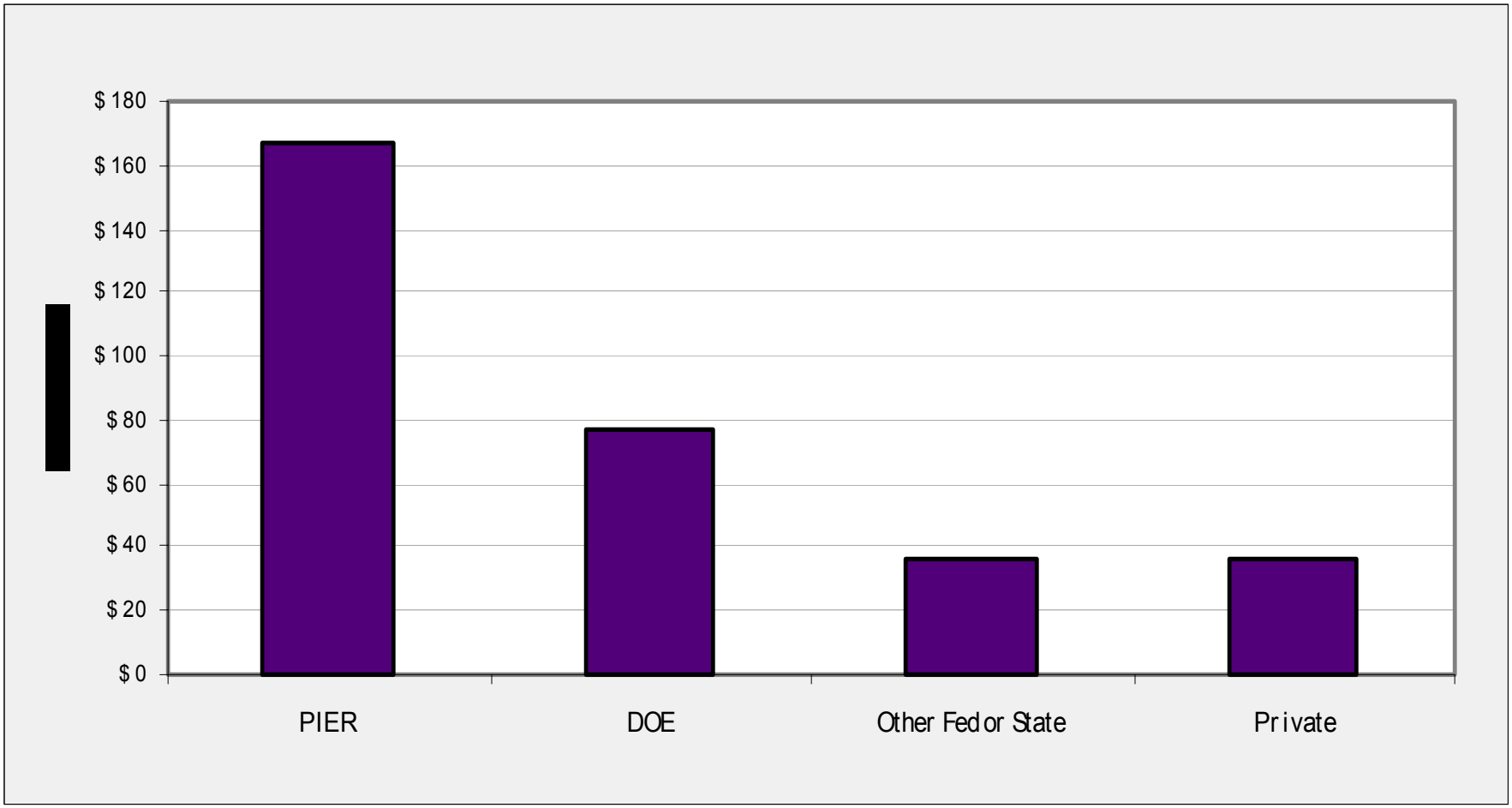
RD&D: Findings

- PIER Program activities help to stimulate the economy by focusing on producing successful commercial products
- A public interest R&D portfolio should maintain a focus on near-term development and application
- Public interest RD&D funding initiatives should focus in areas where there are other related state programs, such as building standards
- The most successful RD&D programs are closely ties to policy initiatives

RD&D: Challenges

- Leverage public funding and find niche research areas where $$ will make a difference
- All RD&D projects should have “exit” strategies – Projects must be quickly terminated when the project’s goals clearly will not be realized.
- There must be an effective management and marketing strategy for those products which DO meet their goals
- Produce demonstratable “successes”

R&D Collaborations



RD&D: Actions

- The state needs to continue to look at additional ways to encourage commercialization of promising new technologies. Too often, seemingly successful technologies are unable to penetrate the marketplace.
- Government should become “first buyers” of new technologies that offer benefits to the state.
- The state needs to develop and endorse a technology certification program for efficient energy technologies. One already exists for environmental technologies at Cal EPA.
- The state should encourage the federal government to promote federal RD&D programs that complement CA programs.

International Energy Markets

- The Energy Commission provides assistance to small, mid-sized, and some larger energy companies to help them export their technologies, products, or services to international markets.
- While technically not a "public interest" program, the international energy markets program works to boost economic activity in the state.
- Many smaller CA companies do not fully understand international financing techniques and have trouble competing on a level playing field with Japanese and European companies which are often heavily supported by their governments. Putting these firms on an even footing with foreign firms can substantially increase their market share.

International Energy Markets: Findings

- For 12 distinct energy sector categories, such as wind and geothermal, CA represents a significant portion of all U.S. energy companies
- A recent survey of 152 CA energy companies indicates that international markets account for an average of 24% of total sales, a percentage large enough to make or break small to medium size businesses
- Capital investments in new power plants by large independent power producers have fallen off in recent years
- Many energy industries in CA are shifting their attention away from domestic market and towards international markets

Best International Prospects for Project Development

Biomass	**Coal**	**Cogeneration**	**Energy Efficiency**
Mexico China Indonesia	China Australia Canada	Mexico China Canada	Mexico China Canada
Geothermal	**Hydropower**	**Natural Gas**	**Petroleum**
Philippines Malaysia Canada	Brazil Philippines Canada	Mexico Canada China	China Mexico Philippines
Photovoltaic	**Solar Thermal**	**Wind**	
Mexico China Japan	Mexico China India	Mexico Canada Germany	Source: CEC 2003 Energy Company Survey of 152 Companies

International Energy Markets: Challenges

- An emission trading policy has emerged from International Agreements that contain legally-binding GHG emission caps for 39 developing countries, including India and China. This emission trading policy allows governments and companies to trade emission credits. The goal of this trading is to reduce overall GHG emissions.
- To CA energy companies, this means that energy efficiency, renewable energy, cogeneration, methane recovery, and fuel conversion projects can earn credits that can be banked to meet a country's own goals and/or sold to foreign governments or private companies thus increasing the attractiveness of these projects.

International Energy Markets: Actions

- Public agencies, such as the Energy Commission, should explore ways to use the GHG emission trading mechanism to improve financing of international energy projects for CA businesses.
- Opportunity to develop a joint environmental strategy with Mexico to address how renewable energy, energy efficiency and new technologies could improve the energy and air conditions on the California-Mexico border.

Local Reliability: Concerns

- San Diego and San Francisco Peninsula have reliability problems.
- Both areas are characterized by limited generation within their electrical boundaries and limited transmission capacity to access resources outside of those boundaries.
- At least 100 MW of new capacity is needed in the San Diego area in 2006, another 100 MW in 2007.
- San Francisco area will need new generation or transmission upgrades, otherwise local reliability criteria will be violated by 2006.

Local Reliability: Findings

- Local stakeholders prefer to have a role in selecting solutions to energy problems so that they can insure that their local objectives and needs are considered
- Both the San Diego and San Francisco regions have determined that a diversity of energy resources makes the most sense for them
- Smaller scale generation, renewable energy, and DSM are more desirable to local residents than more transmission lines and traditional power plants

Local Reliability: Actions

- The work of the San Diego and San Francisco regions in developing a local energy policy has shown how important it is to educate stakeholders and to solicit their input early in order to get a consensus on regional issues and solutions
- A new intermediate local organization that could coordinate planning and lobbying in the region would be helpful in developing balanced energy portfolios that serve local needs
- The new organization could possible be a joint power authority that could group energy efficiency projects to take advantage of economies of scale and issue revenue bonds to support construction of generation resources