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INTEGRATED ENERGY POLICY REPORT

EXECUTIVE *Summary*

As the fifth largest economy in the world, California is a nation state that runs on energy. Every day, we spend $82 million for gasoline and diesel, $82 million for electricity, and $22 million for natural gas. And although Californians use energy very efficiently, energy supplies have not necessarily been affordable, nor have they been reliable.

The state's flawed electricity restructuring experience caused prices to skyrocket, with Californians systematically removed from the grid on several occasions to avoid widespread blackouts. State government responded to the crisis by investing nearly $1 billion for new efficiency programs. Consumers also quickly flexed their power by replacing inefficient appliances, turning up their thermostats, and postponing energy-intensive appliance use during the hottest afternoons. The end result—California consumers reduced peak demand in 2001 by more than 10 percent, or approximately 6,000 megawatts.

Streamlined permitting procedures encouraged new power plant construction, and more than 9,500 megawatts of generation capacity were added in just three years— the largest expansion of the power plant fleet in California history.

Natural gas prices also rose at the height of the energy crisis to nearly $60 per million British thermal units, or Btus, more than 10 times the average price at that time. Working together, utilities and regulators increased the state's natural gas pipeline capacity by 25 percent and its total storage capacity by nearly 10 percent. These improvements allowed more natural gas to flow where needed, helping to moderate prices.

In contrast to price increases in the electricity and natural gas markets, price increases in the gasoline and diesel fuel markets are felt immediately at the pump. A refinery outage or pipeline failure, as happened this past August in Arizona, can quickly translate into high prices for gasoline and diesel fuel. This event left Californians paying an average of $2.10 for a gallon of gasoline. In past years, prices have spiked frequently, and twice this year, fuel prices have reached record levels. Typically, retail fuel prices rise rapidly, but drop slowly. With few viable alternatives, consumers wait for prices to settle.

Despite the current calm in the state's energy system, California's demand for energy is growing, fueled by an expanding population and a growing business sector. State government must act now to reduce demand, secure additional energy supplies, give consumers more energy choices, and build needed infrastructure improvements to protect California from future supply disruptions and high prices.

Electricity

Although electricity markets appear relatively stable for now, Californians still pay, on average, the third highest rates in the nation. Under average conditions, the state's electricity generation system has adequate supplies to meet demand for at least the next six years. Hot weather, coupled with other factors, however, could reduce reserves to very low levels as early as 2006.

To meet electricity demand, the state is taking steps to help ensure that preferred resources are available by implementing new efficiency standards and programs, evaluating the benefits of dynamic pricing, and aggressively developing renewable energy resources, as required under California's Renewables Portfolio Standard.

The Energy Commission believes that additional electricity resources should be procured using an integrated process that accounts for electricity demand and supply variations, efficiency gains, renewable energy potential, dependence on natural gas, and local reliability problems as in San Francisco and San Diego. The process must also account for expansions and upgrades of the bulk transmission system; strategies for retiring or modernizing older, less-efficient natural gas-fired power plants; as well as the benefits to the electric system of allowing consumers to choose their own electricity supplier and develop their own supply through distributed generation and cogeneration.

Natural Gas

Even though prices are currently stable, Californians now pay $5 per million Btus, roughly double the price consumers paid in the 1990s. California competes with other states for natural gas and depends on out-of-state resources for 85 percent of its supply. With the state located at the end of the interstate natural gas pipelines, California businesses and consumers are vulnerable to further natural gas supply disruptions and price volatility.

To help moderate demand, the state is increasing its energy efficiency programs, evaluating targeted retirements of less efficient power plants, and diversifying its fuel mix by accelerating the Renewables Portfolio Standard.

Looking forward, California must actively encourage infrastructure enhancements such as additional pipeline capacity, incentives for increased operation and use of in-state storage, in-state productive capacity, and nontraditional supply sources such as liquefied natural gas.

Transportation Energy

Even more pressing than the difficulties in the electricity and natural gas markets, tight supplies and volatility characterize California's gasoline and diesel market. In-state refineries operate near maximum capacity. Compounding the problem, California refiners must now use ethanol as an oxygenate to replace methyl tertiary butyl-ether (MTBE), which will further reduce in-state gasoline production.

In addition, California's import and storage systems have little, if any, excess capacity, and as demand for gasoline and diesel continues to grow, so will California's reliance on imports of crude oil, blending components, and refined petroleum products, further exacerbating California's tight gasoline and petroleum market.

In the short-term, the state must act to expand its petroleum infrastructure facilities, removing the barriers for industry to obtain needed permits in a timely manner, without jeopardizing environmental quality. But in the long-term, unless the state acts aggressively to change these emerging energy trends, California could face further supply disruptions and price volatility.

In July 2003 the Energy Commission and California Air Resources Board approved a joint strategy to reduce California's near total reliance on petroleum for transportation. This strategy depends primarily on raising new vehicle fuel economy standards and, to a lesser extent, increasing the use of alternative fuels and advanced vehicle technologies.

Recommended Actions for the Governor

The Energy Commission believes that state energy policies should capture the best features of both prudent and effective regulation and vigorous, open, competitive transparent procurement processes, and energy markets that provide adequate investment opportunities. These policies should promote affordable energy supplies; improve energy reliability; and enhance public health, economic well-being, and environmental quality.

The Energy Commission also believes that targeted research, development, and commercialization is a necessary means of introducing new, more efficient, and cleaner technologies into the market.

The following energy policy recommendations, highlighted from the body of this report, reflect these principles. Please note that various state government entities are currently undertaking or plan to conduct numerous actions that do not appear below as policy recommendations. However, these actions are critical to the formation of state energy policy and are discussed throughout this report.

Electricity

The state should:

- Incorporate the forecasts, resource assessments, and policy preferences of the *Energy Report* into an explicit resource adequacy requirement for all retail electricity suppliers to guide resource procurement.
- Ramp up public funding for cost-effective energy efficiency programs above current levels to achieve at least an additional 1,700 megawatts of peak electricity demand reduction and 6,000 gigawatt-hours of electricity savings by 2008.
- Rapidly deploy advanced metering systems if analyses show the results are favorable to the customer and will effectively decrease peak electricity use.

- Enact legislation to require that all retail suppliers of electricity meet the Renewables Portfolio Standard's goal of 20 percent of retail electricity sales and accelerate the target date for reaching the goal from 2017 to 2010.

- Explore through a collaboration between the California Public Utilities Commission and the Energy Commission the implications of a core/noncore market structure for electricity, with the goal of making recommendations in 2004.

- Create a transparent electricity distribution system planning process that addresses the benefits of distributed generation, including cogeneration.

- Consolidate the permitting process for all new bulk electricity transmission lines within the Energy Commission, using the Energy Commission's power plant siting process at the Energy Commission as the model.

Natural Gas

The state should:

- Increase funding for natural gas efficiency programs to achieve an additional 100 million therms of reduction in natural gas demand by 2013.

- Encourage the construction of liquefied natural gas facilities and infrastructure and coordinate permit reviews with all entities to facilitate their development on the West Coast.

- Ensure that existing natural gas storage capacity is appropriately used to provide adequate supplies and protect prices.

- Initiate legislative hearings that will:

  1) examine the issue of gas quality and gas gathering as it relates to California gas production and

  2) determine whether additional legislative action is warranted to resolve the issues.

Transportation Energy

The state should:

- Adopt a goal of reducing demand for on-road gasoline and diesel to 15 percent below 2003 levels by 2020 based on identified strategies that are achievable and cost-beneficial.
- Build a coalition with other states and stakeholders to influence Congress and the U.S. Department of Transportation to double the combined fuel economy of new passenger cars and light trucks by 2020. If the federal government fails to revise corporate average fuel economy standards, California must reassess its petroleum reduction strategy.
- Increase the use of nonpetroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030 based on identified strategies that are achievable and cost-beneficial.
- Establish a one-stop licensing process for petroleum infrastructure, including refineries, import and storage facilities, and pipelines that would expedite permits to increase supplies of transportation energy products available to California while maintaining environmental quality.

Environment

The state should:

- Require reporting of greenhouse gas emissions as a condition of state licensing of new electric generating facilities.
- Account for the cost of greenhouse gas emission reductions in utility resource procurement decisions.
- Use sustainable energy and environmental designs in all state buildings.
- Require all state agencies to incorporate climate change mitigation and adaptation strategies in planning and policy documents.

Some Guiding Thoughts

This *Energy Report* establishes a real-time, dynamic process for continuing dialogue on California's energy issues. The recommendations in this report represent an aggressive, wide ranging agenda for decision makers, businesses, and individuals. The Energy Commission believes that this report, along with its subsidiary volumes, lays the proper foundation for future action.

INTEGRATED ENERGY POLICY REPORT

SECTION ONE *Introduction*

In the fall of 2002, the Legislature passed Senate Bill 1389 [Chapter 568, Statutes of 2002, Bowen] requiring the Energy Commission to prepare a biennial integrated energy policy report, or *Energy Report*. This first *Energy Report* is due to the Governor in November 2003.

In passing SB 1389, the Legislature made clear that the *Energy Report* would be the foundation of energy policies and decisions affecting the state. The statute directs state entities to carry out their energy-related duties and responsibilities based upon the information and analyses contained in the *Energy Report*.

During the Spring of 2003, California's three principal energy agencies created a common vision to direct the future efforts at the California Public Utilities Commission (CPUC), the California Power Authority (CPA), and the Energy Commission. As envisioned in the plan, the *Energy Report* process represents "a critical step in identifying future statewide energy needs."[1]

The *Energy Report* consists of a Policy Report and three Subsidiary Volumes. In the Policy Report, the Energy Commission assesses the major energy trends and issues facing the state and uses these results to recommend energy policies that balance broad public interests to conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety.

The three Subsidiary Volumes address:

- Electricity and Natural Gas
- Transportation Fuels, Technologies, and Infrastructure
- Public Interest Energy Strategies

Report Development and Outreach

To develop these volumes, the Energy Commission staff undertook numerous technical studies examining all aspects of energy supply, production, transportation, delivery and distribution, demand, and pricing.

[1] California Energy Commission, *Energy Action Plan*, California Energy Commission, April 30, 2003, Sacramento, CA, pp. 1-4.

Throughout the spring and summer of 2003, the Energy Commission staff held many workshops on the three Subsidiary Volumes and supporting technical studies. At these workshops, technical experts critiqued the staff's work and provided valuable comments. The Energy Commission staff consulted with key federal, state, and local agencies in preparing these studies, involving more than 140 public and private stakeholders. The more than 3,000 pages comprising the Subsidiary Volumes and supporting technical studies lay the foundation for the Policy Report.

Because the Policy Report contains recommendations that will affect all Californians, the Integrated Energy Policy Report Committee conducted a series of hearings throughout California in early October 2003. The Committee received substantial and thoughtful comments from key public interest groups, energy developers, the business community, and general public. The Committee has studied these comments and used them to further shape the final Policy Report.

Strategies to Guide California's Energy Future

The Policy Report identifies four overarching strategies that serve as the basis of California's energy systems. It is imperative that the State of California take all necessary steps to implement the recommendations contained in this report. In doing so, the Governor, Legislature, and other state agencies should give great weight to strategies in addressing energy-related issues that:

- continue to harvest energy efficiency programs
- diversify fuels and fuel sources of petroleum and natural gas with alternative fuels and renewable energy
- offer consumers energy choices
- strengthen the state's energy infrastructure

These strategies will provide the stable environment necessary to attract investments to meet the demand for more energy resources and services and protect our economy and environment.

Updates to the Energy Report in 2004 and Beyond

In passing SB 1389, the Legislature intended this process to be a dynamic policy tool, requiring the Energy Commission to submit updates to the *Energy Report* every other year, beginning in November 2004. Work has already begun for a 2004 update in the following critical areas:

- re-powering, refurbishing, replacing old power plants
- transmission planning and permitting
- long-term renewable targets

Report Organization

Following this brief introduction, the *Energy Report* is organized into the following sections:

Section II	*Electricity*
Section III	*Natural Gas*
Section IV	*Transportation Energy*
Section V	*Stewardship of the Environment*
Section VI	*Concluding Observations*

INTEGRATED ENERGY POLICY REPORT

SECTION TWO *Electricity*

California's electricity system appears stabilized for now, but faces critical challenges for the years ahead.

There have been major investments to increase generating capacity in California and the surrounding Western states. These additions have helped to alleviate immediate concerns about adequate supply and price volatility. However, average retail prices for electricity in California are still among the highest in the nation. To address future supply and price concerns, California needs a balanced mix of supply and demand-side options that help to capture energy efficiency opportunities, allow for customer choice, diversify our electricity system, and strengthen our electricity infrastructure.

To maintain reliable supplies and reduce prices, California must establish resource adequacy requirements for all suppliers of retail electricity. The Energy Commission uses the term resource adequacy to encompass an integrated planning, procurement, and monitoring process for electricity suppliers in California. This process should assess the supply and demand for electricity, as well as the most prominent risks to the reliability of the system and electricity consumers in terms of electricity costs, and establish benchmarks to ensure that adequate planning reserves are maintained.

One of California's highest priorities is to ensure that electricity is used as efficiently as possible. Lowering per capita electricity consumption through standards and energy efficiency programs will benefit Californians substantially. In addition, reducing peak demand for electricity can also help to address consumer costs and environmental concerns, as well as avoid the need for investments in generation equipment that operates only a few hours a year.

California is increasingly dependent on natural gas for its electricity, and natural gas costs are a large component of wholesale electricity costs. Volatility in the natural gas markets can drive up wholesale electricity prices, especially during peak demand periods when gas-fired resources are the marginal supplies that establish the wholesale market clearing price. The state can reduce the demand for natural gas to generate electricity by aggressively developing energy resources required under California's Renewables Portfolio Standard (RPS).

California consumers and businesses could benefit from having more effective choices available to meet their unique electricity needs. This includes being able to choose an alternative energy provider through a well designed core/noncore retail market structure. In addition, consumers and businesses should be able to supply their own generation through the deployment of distributed generation and cogeneration. This will necessitate continued effort to remove barriers to their implementation and the establishment of effective electricity distribution system planning.

The state can further reduce natural gas consumption for electric generation by taking steps to retire older, less efficient natural gas-fired power plants and replace or repower these facilities with new, more efficient plants. The state must take care though, in targeting such retirements, as many older plants operate to provide critical grid reliability.

The state's bulk transmission system needs major upgrades and improvements. The broken transmission permitting process in the state must be fixed so that needed transmission investments can move forward.

Recent Trends in Meeting California's Electricity Needs

California's electricity system is a complex grid of electric power plants and transmission lines that meets the state's need for electricity by instantaneously balancing supply and demand. The California grid interconnects to the surrounding Western states, Mexico, and Canada, allowing utilities to exchange energy and share reserve support to the benefit of the broader region. This also means that problems in one area of the grid can have price and reliability impacts throughout the region. Ensuring adequate generation and transmission are critical to ensuring reliability and grid stability at reasonable prices.

As California's economy expanded in the 1990s, so did its electricity consumption. Although California's energy efficiency standards have slowed the growth of per capita electricity use, power plant development in California and the West did not keep pace with demand growth. This lack of investment in electricity infrastructure was largely a result of uncertainties surrounding the pending electricity market restructuring at the state and federal levels.

In the summer of 2000, as the energy crisis began, wholesale electricity prices began to increase dramatically. As the winter of 2000-2001 approached, the price of natural gas more than doubled, further exacerbating already high electricity prices. Prices continued to climb during the winter, and electric utilities throughout the West incurred enormous costs to purchase electricity.

The reliability of the California grid was in jeopardy numerous times throughout the summer of 2000 and, more surprisingly, during the winter of 2000-2001 when demand is typically low. Utilities were forced to institute systematic rotating outages on several occasions to maintain grid stability and prevent more severe and widespread blackouts.

Supply shortages and high prices during this energy crisis were exacerbated by transmission congestion problems. The transmission systems of the state's utilities were originally designed and operated to meet their own customer needs. Major investments in higher-voltage bulk transmission made during the 1960s through the early 1990s allowed utilities to import cheap power from the Pacific Northwest and Southwest regions. These upgrades also facilitated electricity transfers between utilities within the state.

In recent years, however, investor-owned utilities (IOUs) have not been successful in obtaining the necessary construction approvals for major bulk transmission upgrades to move power within the state and access imports from the remainder of the Western region.[2] As a result, congestion on the transmission system has become a more frequent occurrence since the mid-1990s. During the energy crisis, transmission congestion frequently hampered the effective transfer of electricity to meet demand at critical times and contributed to the run-up in wholesale prices.

Amid these serious problems, two factors emerged that played a key role in helping California through the summer of 2000. Despite not being paid for generation as a result of the adverse financial condition of the IOUs, cogeneration and renewable facility operators maintained relatively high levels of availability and were largely responsible for keeping the lights on during the darkest days of the crisis.

Also, in response to rising retail prices and statewide public information campaigns, Californians voluntarily reduced electricity consumption to unprecedented levels, shaving approximately 6,000 megawatts (MW)[3] off peak demand statewide. Surprisingly, recent analyses show that as much as half of these 2001 conservation efforts continued into 2002.[4]

For the next few years, California's electricity system appears to have sufficient planning reserves to balance supply and demand. Since 2001, more than 9,500 MW of generating capacity has come on-line, most new, efficient natural gas-fired generators. These additions constitute the largest expansion of the power plant fleet in California history.

Although wholesale prices are substantially lower than at the height of the energy crisis, this came at a cost. To ensure system reliability and control future price volatility, the state negotiated a series of long-term electricity supply contracts. The negotiated prices are much higher than current spot market prices. Furthermore, the contract terms have at times limited the operation of the system, contributing to higher wholesale costs. As a consequence, while the physical infrastructure currently provides reliable electricity, the prices that consumers pay for electricity are higher than in the 1990s and are among the highest in the nation.

Despite recent improvements in the electricity market as a whole, the Energy Commission is concerned about local reliability in San Diego and the San Francisco peninsula. Both areas experienced serious reliability problems during the energy crisis.

Not surprisingly, both areas have limited local generation and limited transmission capacity to access generation outside of those boundaries. These local reliability challenges warrant priority attention from local and state decision-makers.

[2] California Energy Commission, *Upgrading California's Electric Transmission System: Issue and Actions*, August 2003, Sacramento, CA, P100-03-011 p. 63.
[3] California Energy Commission, *Public Interest Energy Strategies Report*, October 2003, Sacramento, CA, P100-03-012D, p. 43. California Energy Commission, *The Summer 2001 Conservation Report*, pp. 12-14.
[4] *Public Interest Energy Strategies Report*, p. 43, Figure 3-6.

Electricity Outlook

Population and economic activity drive electricity consumption growth. Maintaining adequate supply reserves will be critical for meeting future electricity needs.

Under average weather conditions, the Energy Commission believes that California should have adequate supplies of electricity through 2009. However, because unusually hot weather conditions can significantly drive peak electricity demand, the Energy Commission is concerned about adequate supplies of electricity beginning in 2006. Under adverse weather conditions,[5] planning reserve margins could fall below seven percent in 2006 and even lower thereafter. Reserve shortages, according to the California Independent System Operator (CA ISO) could return as early as the summer of 2004 under "adverse conditions."[6]

Reserve margins can be affected by the retirement of older generating units. The CA ISO projects that 7,232 MW of generation capacity in California could be retired during the next several years,[7] while Dynergy, a merchant generator, has suggested that more than 10,000 MW may be retired as early as 2005 because of a lack of Reliability-Must-Run (RMR) contracts, contracts with the Department of Water Resources, or other power contracts.[8] In contrast, the Energy Commission has projected that 4,630 MW of existing capacity will likely retire through 2006.[9]

Notwithstanding all of these projections, the Energy Commission believes that planning reserve can improve through 2010, if California meets the goals in demand responsive programs, peak reduction programs, and the accelerated RPS.

Integrated Resource Planning, Procurement, and Monitoring Process

A reliable electricity system in California will depend on a resource adequacy process that goes beyond simply matching near-term demand with available generation resources. Resource adequacy requirements can best be achieved if forecasting and planning assessments, as well as procurement and monitoring activities, are fully integrated.[10] Policy and planning efforts must integrate energy efficiency, customer-side generation, and transmission upgrades necessary to bring additional renewable resources into the preferred resource mix. In addition, continuous monitoring efforts must be undertaken to ensure that planned resources are added as expected.

The resource planning process must also reflect the substantial risk and uncertainty in meeting future electricity demand. For example, there is risk in planning for average conditions. As we learned in 2000-2001, unexpectedly low hydroelectric and adverse weather conditions can profoundly influence the reliability and price of electricity. Adequately planning for these contingencies to ensure that cost-effective reserve options are available during low hydro and adverse weather conditions will help to prevent supply shortfalls and mitigate price volatility.

[5] Adverse weather conditions refer to a "hot temperature," 1-in-10 year weather scenario.

[6] CA ISO clarifies "adverse conditions" as low levels of hydroelectric power from the Pacific Northwest, higher than anticipated levels of generation outages inside the state, and the forced or economic retirement of older generation capacity. See CA ISO testimony at the Integrated Energy Policy Report Hearing, October 3, 2003.

[7] CA ISO, *California ISO Five Year Assessment (2004-2008),* CA ISO, October 10, 2003, Folsom, CA.

[8] See testimony of Greg Blue (Dynegy) at Energy Commission Integrated Energy Policy Report Hearing, October 2, 2003.

[9] California Energy Commission, *Electricity and Natural Gas Assessment Report*, October 2003, P100-03-014, pp. 141-142.

[10] The Energy Commission also made a similar proposal in the CPUC long-run procurement proceeding R.01-10-024.

Also, economic activity varies cyclically, and these variations in electricity demand are likely to continue to be significant; the mix of resources may not produce as well as we anticipate. Some demand-side options depend on consumer behavior that may fall short of expectations. Similarly, the benefit of accelerating the development of renewable energy is clear, but funding may not be available to bring such benefits to fruition.

To ensure that resource adequacy is maintained, the Energy Commission proposes that an integrated planning, procurement, and monitoring process be established in collaboration with the CPUC, CA ISO, and the state's utilities and retail electricity suppliers. In the proposed process, the Energy Commission's information and analyses contained in the *Energy Report* would form the basis for long-term forecasting and supply-demand assessments. This would bring generation, efficiency, and transmission resource alternatives into a more integrated planning process than currently exists.

The CPUC's procurement process would be the means to authorize IOUs to secure long-term generation, renewable resource, and energy efficiency program resource additions. An expanded monitoring process would be created to ensure that a tight feedback loop exists to track progress for the preferred resource additions of energy efficiency, price responsive demand, distributed generation, and renewable resources, and make adjustments needed to ensure reliability.

This proposed planning, procurement, and monitoring process should result in improving electricity efficiency, diversifying the electric generation mix with renewables, leveraging opportunities for customer choice, and strengthening the electricity generation and transmission infrastructure, as called for below.

Recommendation for Resource Planning, Procurement, and Monitoring

The state should:

- Incorporate the forecasts, resource assessments, and policy preferences of the *Energy Report* into an explicit resource adequacy requirement for all retail electricity suppliers to guide resource procurement.

Improve Electricity Efficiency

Electricity price stability and reliability depends on harvesting every opportunity to improve end-use and system efficiency. The total amount of electricity consumed directly affects price volatility, the amount of average utility bills, and environmental impacts of the electricity system. Lowering per capita consumption through standards and energy efficiency programs will benefit Californians substantially.

Reducing peak demand for electricity also can mitigate consumer and environmental concerns as well as avoid the need for significant investments in generation equipment that will operate only a few hours a year. While some standards and energy efficiency programs can affect peak demand, a direct and immediate approach can be achieved through dynamic pricing.

Efficiency Standards and Voluntary Conservation

California's building and appliance standards are the most cost-effective means of achieving energy efficiency in the state. Since 1975, the annual peak savings have grown to a total 6,000 MW. By 2013, a cumulative total of building and appliance efficiency standards will have saved Californians $79 billion on their utility bills.[11] Further, since 1977 energy efficiency in California has increased economic growth, benefiting the state's economy by $875 to $1,300 per capita.[12]

Voluntary energy efficiency programs and individual conservation efforts are the other major sources of energy savings. These programs and efforts are fueled by education, technical assistance, monetary incentives, and tax credits. During the summer of 2001, consumers reduced their electricity consumption dramatically in response to public education campaigns like Flex Your Power. That summer, between 70 to 75 percent of the peak load reductions came from consumer conservation efforts, while 25 to 30 percent came from energy efficiency investments.

The Energy Commission and the CPUC are collaborating on a plan to improve the operation of energy efficiency programs, carefully ramping up program funding for electricity efficiency from the current level of $230 million to double this amount by 2008 and triple this amount by 2013.[13] Over the next two years, the CPUC will oversee the expenditure of $512 million in public funding. They will reassess program administration and incorporate efficiency into their procurement process. By spending about $5 billion over 10 years, the state would save consumers over $15 billion.

Conventional, off-the-shelf technology can produce energy savings in existing buildings. In fact, the bulk of the energy efficiency funds collected under the Public Goods Charge has been spent on existing buildings. The Energy Commission is developing strategies to achieve additional savings in existing buildings. A mix of voluntary and regulatory approaches that supplement current incentive programs may be the most effective plan. The promotion of programs like the Energy Efficient Mortgage can tap into private funds for cost-effective investments in energy efficiency in the residential sector.

Achieving the most economical energy savings requires efficient program design, effective feedback, widespread customer participation, and reliable program funding. California's energy agencies will undertake a rigorous, ongoing monitoring and evaluation program to ensure that the savings and benefits from conservation and efficiency programs are delivered. Programs not meeting their targets will be modified or eliminated.

The Energy Commission is proposing program goals for energy efficiency savings. These targets would only be converted into firm resource plan additions when programs have been funded and an implementation method has been established. These programs would also be adjusted as monitoring and evaluation results are obtained. The staff analysis suggests that peak demand statewide could be reduced an additional 1,700 MW and that consumption could be reduced 6,000 gigawatt-hours by 2008 by doubling current energy efficiency funding levels.[14]

[11] *Public Interest Strategies Report*, pp. 40-41.
[12] Mark Bernstein, et al., RAND, *The Public Benefits of California's Investments in Energy Efficiency*, March 2000.
[13] California Energy Commission, *Proposed Energy Savings Goals for Energy Efficiency Programs in California*, October 2003, P100-03-021.
[14] *Public Interest Strategies Report*, pp. 45-49.

Dynamic Pricing

In California, the highest peaks in electricity demand are caused almost exclusively by air conditioning during unusually hot weather occurring a few times each summer (50-100 hours per year).

Traditionally, these "super peak" loads have been met by peaking power plants, either combustion turbines or hydro generators. In emergencies, electric services can be voluntarily interrupted at industrial and commercial business or by turning off residential air conditioners. As a last resort, rotating outages have been employed to prevent the entire system from collapsing, as it did in the Northeast in August 2003.

However, dynamic pricing offers a different tool for reducing peak demand before an emergency occurs and the system drops below the operating reserve minimums. Dynamic pricing provides consumers with various pricing structures that send a "real-time" price signal, which reflects the actual cost of generating electricity, whereby consumers are often motivated to shift their electricity use from peak times to avoid high electricity rates.

In 2001 and 2002, real-time meters were installed for most large customers. These meters, combined with new communication and control systems, work together to reduce energy use when the price of electricity goes up. Several pilot programs offered customers incentives to use them during periods of peak demand. These customers effectively reduced peak load and increased reliability at times of greatest stress on the system.

Real-time meters need real-time or other dynamic pricing tariffs and programs to be effective. At present, these are only available on a limited basis. In September 2003 the Energy Commission, with input from the CPUC, prepared a report on the feasibility of dynamic pricing, which recommends a process to provide all electricity customers with a choice of flat, inverted tier, time-of-use, or dynamic pricing rates by 2009.[15] While the report found that these tariffs and programs are feasible, the extent to which they can be implemented universally is still unclear. The report recommends continued collaborative assessment with the CPUC to gain a more complete understanding of the extent to which dynamic pricing is appropriate for various types of customers.

[15] The Energy Commission adopted the SB 1976 report addressing the feasibility of dynamic pricing on October 22, 2003.

The CPUC has adopted an initial set of dynamic pricing tariffs and programs for larger customers to use with their real-time meters. The IOUs are now testing a pilot project for residential and small commercial customers. The results of these activities will be available in 2004. The next steps are to determine if the real-time meters will pay for themselves with savings from reducing the state's peak energy use with the correct pricing structures, and along with creating additional tariffs necessary to achieve the long term goals for price responsive demand adopted by the CPUC.[16]

Recommendations to Improve Electricity Efficiency

The state should:

- Ramp up public funding for cost-effective energy efficiency programs above current levels to achieve at least an additional 1,700 MW of peak electricity demand reduction and 6,000 gigawatt-hours of electricity savings by 2008.
- Standardize and increase the evaluation and monitoring of energy efficiency programs to ensure that savings and benefits are being delivered.
- Implement appropriate mandates, incentives, and funding to maximize the energy efficiency potential of existing buildings.
- Rapidly deploy advanced metering systems if analyses show the results are favorable to the customer and will effectively decrease peak electricity use.
- Implement sufficient real-time and dynamic pricing tariffs to satisfy the goal of 5 percent of system peak load.

Diversify the Electric Generation Mix with Renewables

California's RPS is the centerpiece of the state's strategy to diversify our electricity system. Partly in response to concerns about growing natural gas dependence, the Legislature passed Senate Bill 1078 [Chapters 516, Statutes of 2002, Sher] establishing the RPS. The RPS requires all retail suppliers of electricity in the state to develop a RPS program and that IOUs supply at least 20 percent of their sales from renewable energy resources by 2017. To the extent that electricity generated from renewable resources is sold under long-term contracts, it is immune to fluctuating natural gas prices and helps to stabilize the market, providing real economic benefit.[17]

[16] CPUC Decision, D.03-06-032, San Francisco, CA, April 2003.

[17] *Public Interest Energy Strategies Report*, pp. 101-102. Also, Standard Contract Terms and Conditions for the RPS are discussed in the June 19 CPUC Decision 03-06-071, *Order Initiating Implementation of the Senate Bill 1078 Renewables Portfolio Standard Program*, p. 55.

The state's IOUs have already made significant strides in meeting RPS targets through interim solicitations conducted under the CPUC's resource procurement proceeding. Southern California Edison (SCE) recently reported monthly purchases of renewable resources which exceed 20 percent for May and June 2003; that it expects to achieve "nearly 20 percent" for the full year 2003 and that it expects to exceed 20 percent each year thereafter. San Diego Gas & Electric (SDG&E) and Pacific Gas & Electric (PG&E) have also reported that they expect to meet their RPS targets well in advance of the 2017 goal. In this context, accelerating the goal of meeting the RPS target by 2010, rather than 2017, should be readily achievable by the IOUs.

In light of the progress already being achieved under the RPS program, the Energy Commission believes that the RPS should extend to all retail suppliers of electricity. The Energy Commission also believes that development of more ambitious longer-term RPS goals for the post-2010 period is warranted. In establishing more ambitious RPS goals, the specific resource mix of each utility, transmission infrastructure, and the availability of cost-effective renewable resources should be taken into account. This may mean that individual utility targets should be developed to replace the more generic statewide RPS goals already established by the Legislature. Development of more ambitious RPS goals will be part of the 2004 *Energy Report* update activities.

Recommendation to Diversify the Electricity System

The state should:

- Enact legislation to require that all retail suppliers of electricity meet the RPS goal of 20 percent of retail electricity sales and accelerate the target date for reaching the RPS goal from 2017 to 2010.

Leverage Opportunities for Customer Choice

California's effort to restructure the electricity industry had its roots in the interest of some customers to manage their electricity expenses individually and determine generation resource preferences. This was accomplished in one of two ways. Consumers could choose a retail supplier of electricity other than the local utility; or, through advances in distributed generation technologies, consumers can supply their own electricity by cogeneration and self-generation, which contributes to electrical grid reliability and security.

Retail Customer Choice

Currently, California's electricity customers are limited in their ability to choose their electricity suppliers, but this has not always been the case. Beginning in 1998, most Californians were allowed to choose an electricity supplier other than their local utility through "direct access." At its peak, direct access represented 16 percent of all sales and 25 percent of all large customers' sales. As a result, local utilities found themselves with excess generation when customers left for these alternative suppliers.

However, as electricity prices rose during the energy crisis, many direct access providers could no longer offer savings to customers and dropped out of the market. Local utilities suddenly found themselves with insufficient generation when those same customers unexpectedly returned. Rising wholesale prices and the declining financial condition of the IOUs made it difficult to secure adequate supplies of electricity.

Legislation enacted in early 2001 authorized the state, through the Department of Water Resources (DWR), to procure electricity on behalf of the IOUs and issue bonds to cover the costs of purchasing the power.[18] It also directed the CPUC to suspend direct access. In its subsequent decision, the CPUC stated that "Suspending the right to acquire direct access service will assist in issuing these bonds at investment grade, by providing DWR with a stable customer base from which to recover its costs."[19]

Questions now are being asked whether that ability to choose is still beneficial to large customers and whether the suspension on direct access should be removed. If the answer to these questions is "yes," the state should examine the natural gas market structure as a possible model for the electricity sector.

However, while direct access was voluntary for electricity customers, customer choice in the natural gas market is different. Large natural gas customers are assigned to the "noncore" customer group, while smaller customers are designated as "core" customers. Local gas utilities are required to serve core customers, while noncore customers can shop around to purchase the cheapest natural gas supplies.

This model has been successful because it identifies a stable, unchanging group of customers. Because natural gas utilities are protected from customers who might return to their systems without adequate notice, the natural gas utilities are able to secure natural gas supplies effectively, plan storage, and adequately cover their costs effectively.

Conceptually, a core/noncore structure in the electricity market, with very explicit contractual conditions for customers to return to their original supplier, could allow utilities to plan with more certainty. At the same time, such a structure may provide merchant generators, who already have permits to build new power plants, with a customer base that is willing to sign long-term contracts. Variations on this core/noncore structure for electricity customers are beginning to be implemented in restructured markets in the East. The existence of such a market may also encourage generators to take merchant risk.

System reliability is important for these customers as well. Noncore customers and businesses must meet specific reserve requirements without burdening other customers, either by cogenerating/self-generating or by buying electricity through another energy provider. All customers would be equally responsible for securing electricity supplies to maintain the system's reliability.

Many critical issues must be resolved, however. The CPUC staff is studying changes to the market structure and their implications for ratepayers, reliability, the environment, investor confidence, and market volatility, including the core/noncore model. The study is expected to be completed in March 2004.

[18] Assembly Bill 1x1, Chapter 4, Statutes of 2001, Keeley.
[19] CPUC Decision 01-09-060, September 20, 2001.

Distributed Generation

Although different from direct access, distributed generation offers consumers a range of choices for securing their electricity supplies. Distributed generation, including cogeneration and self-generation, has tremendous potential to help meet California's growing energy needs as an additional generation source and an essential element of customer choice. Its use offers potential benefits that extend to customers, utilities, and the system as a whole and can be used strategically to meet the policy objectives of the RPS and reduce greenhouse gases.

From a customer perspective, distributed generation allows customers to choose between electricity supplied via traditional utility grid service, electricity provided by a non-utility generator located at or near the point of consumption, or by some combination of the two. Benefits include improved reliability and power quality, peak-shaving options, security, and efficiency gains through the avoidance of line losses and the use of waste heat for heating and/or air conditioning.

Distributed generation also offers benefits to the utilities. While the actual benefits of each project will vary based on the location of the generating facility, distributed generation can benefit utilities by deferring transmission and distribution construction, reducing resource acquisition costs, and supporting the level of ancillary services offered.

To date, California has addressed many technical, institutional, and regulatory barriers inhibiting the effective deployment of distributed generation. During the past three years, the California Air Resources Board (CARB) adopted emissions regulations and guidelines for distributed generation technologies, while the CPUC adopted standardized interconnection rules. In response to industry concerns, the CPUC also exempted 3,000 MW of distributed generation over the next 10 years from the Cost Responsibility Surcharge or "exit fee" imposed on customers who leave the grid. The CPUC's decision gives preference to the cleanest technologies. The Energy Commission adopted regulations to determine how and which customers qualify for the exemption. These regulations will be implemented by February 2004.

A new collaboration between the Energy Commission and CPUC will begin shortly to address outstanding issues in establishing a transparent electricity distribution system planning process. Utilities are currently required to consider distributed generation as part of its distribution system planning process.[20] However, it is not clear how this process is actually implemented, and in particular whether it adequately addresses the benefits and costs of distributed generation. The collaboration will be part of a new CPUC rulemaking, a follow-up to the CPUC's February 2003 policy decision. The two agencies are also committed to working together to target research to identify cumulative system impacts and examine issues associated with new technologies and their use.

[20] Section 353.5 of the Public Utilities Code states that "Each electrical corporation, as part of its distribution planning process, shall consider nonutility owned distributed energy resources as a possible alternative to investments in its distribution system in order to ensure reliable electric service at the lowest possible cost."

Ultimately, the long-term successful deployment of distributed generation will require focused policy direction. Much of the focus should be targeted at increasing consumer awareness about the benefits of using distributed generation, providing financial incentives to offset the cost of installation, and funding research to advance technology so that incentives are eventually no longer needed. Consistent with the desire to implement the RPS effectively, statewide incentives should reflect a preference for renewable resources. In making these commitments, policy makers must ensure that the regulatory rules governing the use of distributed generation do not in themselves create new barriers to entry.

Recommendations to Leverage Customer Choice

The state should:

- Explore through a collaboration between the CPUC and the Energy Commission the implications of a core/non-core market structure for electricity, with the goal of making recommendations in 2004.
- Create a transparent electricity distribution system planning process that addresses the benefits of distributed generation.

Strengthen the Electricity Infrastructure

Despite the significant expected gains in efficiency and reductions in peak demand, at some point the state will need new generating capacity. The type of new plants will depend on the effectiveness of an integrated resource planning, procurement and monitoring process. Additionally, the extent to which the need for and location of new transmission capacity is identified and ultimately permitted will determine whether the state will continue to rely largely on conventional technology or broaden the mix of cleaner renewable resources.

Generation

To achieve the policy goals for electricity outlined in the *Energy Report*, the CPUC's procurement process must be open, competitive and transparent, and incorporate the results of the Energy Commission's resource planning, forecasts, and assessments. The state's three large IOUs—PG&E, SCE, and SDG&E who serve over 80 percent of the state's demand—are actively developing both interim and long-term resource procurement plans under the supervision of the CPUC. It appears that the CPUC may authorize some degree of long-term contracting for the three IOUs in its forthcoming procurement decision even if a comprehensive resource adequacy framework is not yet established. However, the Energy Commission believes that it is critical that progress be achieved in establishing a resource adequacy framework for the state.[21]

[21] FERC has deferred to the state to develop a resource adequacy requirement as part of the CA ISO's market redesign. In a recent decision (ER02-1656-015, et al.), FERC noted the importance of the resource adequacy to signal the need for new infrastructure in the electric power markets and its importance to overall market design and established timelines for when the CA ISO must make a filing on resource adequacy following the CPUC's procurement decision expected in December 2003.

California also needs to examine the efficiency of its existing fleet of power plants. Concerns have been raised that the aging fleet of power plants still operating in the state are more polluting and less efficient than modern power plants. Many of these older plants are presently needed to maintain local reliability because of their location in the grid. Many have RMR contracts with the CA ISO or long-term DWR contracts. Additionally, some of the RMR and DWR contracts provide that pollution control upgrades can be paid for through contract revenue streams, allowing renovation to meet air district requirements.

Those facilities paid under RMR or other contracts are unlikely to shut down unless and until their reliability function is provided by a new plant or is no longer needed because of upgrades to the transmission system. However, uncertainty does exist regarding the continued future operation of older facilities that either do not have RMR contracts or for which RMR contracts are not renewed. The Energy Commission is undertaking a detailed study of aging power plants and the costs, benefits, and strategies for their replacement as part of the 2004 *Energy Report* update proceeding.

Transmission Planning

California's transmission system links power generation resources with customer loads in a complex electrical network that must balance supply and demand on a moment-by-moment basis to reliably deliver the lowest cost generation to consumers. The transmission system must be efficient and robust to facilitate competitive markets, pool resources for ancillary services, and provide emergency support in the event of unit outages or natural disasters. California's transmission system must deliver these benefits in a manner that maximizes their value while minimizing negative environmental and other impacts as the system is upgraded to respond to changes in generation and load patterns. This includes the state's commitment to develop renewable generation aggressively through its RPS program.

Under existing generation and load conditions, the transmission system regularly experiences congestion on major paths that prevents its optimal economic operation. Also, transmission constraints in major load centers such as San Francisco and San Diego affect both the economic and reliable operation of the system. Transmission upgrades, generation additions, and demand-side management actions may provide solutions to these problems. However, the existing transmission planning and permitting processes have not provided effective and timely mechanisms for bringing forward such projects to provide California with a more robust and reliable transmission system.

The state currently does not have an official role in transmission system planning. Transmission planning for about 80 percent of the California grid is the responsibility of the CA ISO, and California IOUs must participate in the CA ISO planning process. However, publicly owned utilities and federal agencies do not have to participate and in most cases, they have chosen not to do so. For the most part, publicly owned utilities and federal agencies propose, plan, and build transmission projects to meet their own reliability and economic needs. Merchant transmission line developers may propose economic projects for consideration in the CA ISO process.

As a result of the fragmented approach to transmission planning in the past, a statewide perspective has not been brought to the table, regardless of ownership. Consequently, the planning process has addressed issues important to the transmission owners and CA ISO, but may have overlooked issues that are vital to the state's broader interests. Some of these statewide interests include future renewable resource development, right-of-way needs, system reliability, and the efficient use, environmental performance, and economic expansion of the existing system.[22]

California must have accurate and comprehensive assessments available to ensure the timely planning and ultimate permitting of needed transmission projects. There is a critical need for improvement in the analytical methodologies that are used for evaluating the costs and benefits of transmission projects. Current analytical methodologies used in project planning typically employ short-term analytical horizons, economic valuation methodologies that do not recognize strategic benefits, and cost/benefit evaluations that unduly discount long-term project benefits.[23]

Additionally, current analytical approaches typically assume average conditions only and therefore fail to recognize the cost of unforecasted low probability, but high impact events, such as droughts, regional blackouts, and temperature extremes. Experience with past transmission investments has shown that while there is tremendous angst in regulatory proceedings over project need, including costs and benefits, transmission lines can pay for themselves in just a few years because of these low probability, but high impact events. Given the longer lead times required for transmission projects and the locational impacts of potential new power plants, modernizing and upgrading the bulk transmission grid should be a centerpiece of the state's electricity planning process.

To ensure that California meets this goal, the Energy Commission is implementing a fully collaborative state transmission planning process including the CA ISO, CPUC, and utilities. The process will be implemented in 2004 to determine the statewide need for bulk transmission projects and assess and compare the costs, benefits, and alternatives to individual projects. The process, which will build on the CA ISO's annual transmission plan, will evaluate transmission, generation, and demand-side alternatives to help reinvigorate the state's transmission planning process. The goal of this effort will be to ensure that expansion of the grid is made on a timely basis, and that statewide objectives are considered in determining transmission investments that best meet the needs of California.

The transmission planning and assessment process will be carried out during the 2004 *Energy Report* update, will be integrated with other electricity analyses and policy work, and use appropriate assumptions for demand and price forecasting and supply options. The process will evaluate broader strategic benefits than those currently considered. This will include low-frequency, high severity events; strategic values of transmission, such as expanded access to regional markets; enhancement of grid reliability; insurance against major contingencies; and regional alternative economic approaches to evaluation of project costs and benefits. This process will consider the costs and benefits of generation and demand-side management (DSM) as alternatives to transmission.

[22] *Upgrading California's Electric Transmission: Issues and Actions*, pp. 61-62.

[23] Ibid., p.73. California Energy Commission Consultant Report prepared by Consortium of Electric Reliability Technology Solutions, *Planning for California's Future Transmission Grid, Review of Transmission System, Strategic Benefits, Planning Issues, and Policy Recommendations*, October 2003, Sacramento, CA, P700-03-009, p. 15.

Transmission Permitting

The permitting of transmission lines in California currently suffers from jurisdictional responsibilities that are fragmented and overlapping, environmental analyses that are inconsistent, and inadequate consideration of regional and statewide benefits. As a result, existing permitting processes create duplication between local, state, and federal agencies, delay in approvals, and denial of needed projects. Because of the existence of several permitting jurisdictions, it may be difficult for a lead agency to conduct an environmental review of the entire project under the California Environmental Quality Act (CEQA).

Merchant transmission projects are subject to review by all local land use agencies whose jurisdictions they cross. However, publicly owned utilities are responsible for performing their own environmental reviews, regardless of the local jurisdictions they cross, potentially calling into question the objectivity and fairness of how transmission projects get reviewed and by whom. Publicly owned utilities determine if proposed projects are needed for reliability and economic purposes based on benefits and costs to their own ratepayers.

Projects proposed by IOUs are subject to the CPUC's review, whose environmental review process has typically depended on external consultants rather than in-house professional staff. This has led to inconsistencies in environmental review and analysis between different transmission line projects, adding time and complexity to the review process. In addition, the legalistic nature of the CPUC process has often inhibited effective involvement of the general public.

The CPUC review of the need, under the Certificate of Public Convenience and Necessity (CPCN), for IOU transmission projects has, in many cases, been protracted and subject to multiple delays. As a result, only a very small number of transmission projects that require a CPCN have been constructed by IOUs in recent years.

The CPUC assesses the need for reliability and economic projects proposed by IOUs based on limited cost/benefit analyses that focus primarily on impacts to the sponsoring utility even though the CA ISO charges these costs to all users of its grid. In the CPCN process, the CPUC often re-examines planning issues, refusing to accept the CA ISO's determinations in the planning process. As a result, projects with regional or statewide benefits that could help the state mitigate market power, stabilize electricity prices, and improve the reliability and environmental performance of the electricity system have been denied permits by the CPUC or suffered long delays in the process because of an inadequate assessment of these benefits.

As an example, in the late 1980s, the CPUC denied IOU participation in the California-Oregon Transmission Project. The project was subsequently built by municipal utilities, and now provides critical capacity to their customers for importing low cost electricity from the Pacific Northwest. Current projects that have experienced similar difficulties with the CPUC process include the Path 15 upgrade and the Valley-Rainbow project. Similar problems are likely to plague future projects.[24]

[24] *Upgrading California's Electric Transmission System: Issue and Actions*, p. 63.

Ensuring reliable and reasonably priced electricity supplies—increasingly from renewable resources—depends on a well-maintained and adequate transmission and distribution system. The state must reinvigorate its planning, permitting, and funding processes to ensure that necessary improvements and expansions to the distribution system and the bulk electricity grid are made on a timely basis.

To meet this goal, permitting for new bulk electric transmission lines should be consolidated with, and modeled after, the Energy Commission's current licensing process for generation. This step, as identified in the Energy Commission's collaborative transmission planning process, would include public input and a comprehensive, independent professional staff review in a specific time frame.

This consolidation is consistent with the Little Hoover Commission's 1996 recommendation[25] that generation and transmission permitting be consolidated, and the State Auditor's 2001 recommendation[26] that the Legislature institute a coordinated electricity transmission siting process similar to the Energy Com-mission's generation siting process. Given the critical need to upgrade and expand the state's transmission system, the Governor should expedite the consolidation through the exercise of his agency reorganization powers, using the Little Hoover Commission process.[27]

Recommendation to Strengthen the Electricity Infrastructure

The state should:

- Consolidate the permitting process for all new bulk electricity transmission lines within the Energy Commission, using the Energy Commission's power plant siting process as the model.

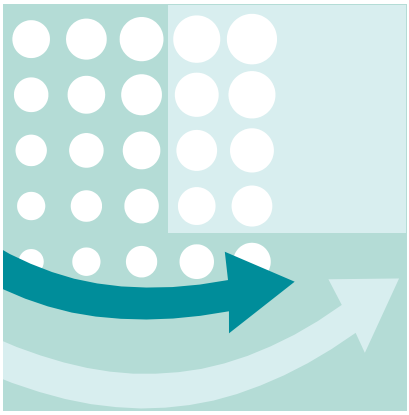
[25] *When Consumers Have Choices: The State's Role in Competitive Utility Markets*, Little Hoover Commission, December 1996.
[26] *Although External Factors Have Caused Delays in Its Approval of Sites, Its Application Process Is Reasonable*, California State Auditor, Bureau of State Audits, August 2001.
[27] Government Code Section 12080.1.

INTEGRATED ENERGY POLICY REPORT

SECTION THREE *Natural Gas*

California is the nation's second largest consumer of natural gas. Policy makers have questioned California's increasing dependence on natural gas, with demand for natural gas increasing to meet the needs of the growing power generation market, increasing price volatility, and California producers who are able to satisfy only 15 percent of statewide demand.

In general, the higher overall level of natural gas prices nationwide during the past year calls into question the point of view, developed during the 1980s and 1990s, that natural gas will be plentiful and cheap into the foreseeable future. Our current assessment is that natural gas supplies will continue to be available but at much higher prices than previously anticipated.



Recent Trends in Meeting Natural Gas Demand

In the past three years, California consumers have experienced two significant natural gas price spikes. In the winter of 2000-2001, gas prices were high throughout the country, but much higher in California. Driven by record low hydroelectric imports and underutilized storage, prices regularly exceeded $8 per million Btus at the California border and peaked at nearly $60 per million Btus.[28] California consumers' natural gas bills increased dramatically relative to consumers in other parts of the nation.

A price spike last winter once again increased natural gas bills to consumers. This time, however, California natural gas users fared well compared to consumers in the rest of the country. National spot prices for natural gas tripled in late February, driven by a prolonged cold snap in the Northeast, concerns about the impacts of war in Iraq, and low nationwide storage levels. Prices in California were also affected, rising above $9 per million Btus at the height of the price spike. However, California's relatively high storage inventories and unseasonably warm weather allowed prices to return to pre-spike levels relatively quickly and allowed them to stay below national levels.[29]

To focus greater attention on mitigating the potential for future price spikes, the California state agencies involved in natural gas issues formed the Natural Gas Working Group. The group meets regularly to keep the agencies well-informed on key natural gas issues, coordinate development of policies affecting natural gas use, and provide regular reports to the Governor's office on impending issues. The Group has allowed the state's activities in natural gas production, purchasing, permitting, regulation, environmental protection, and policy to be relatively well integrated.

[28] California Energy Commission, *Natural Gas Market Assessment*, California Energy Commission, August 2003, Sacramento, CA, P100-03-006, p. 27.
[29] Ibid., p. 2.

Natural Gas Outlook

Natural gas demand in California is projected to increase as a result of the growing use of natural gas for electric generation. This trend is even greater in the other western states. Natural gas demand for uses other than electric generation is expected to grow at only one-half percent per year in California over the next ten years, compared to a 1.5 percent annual growth rate in natural gas consumption in the electricity generation sector.[30]

The Energy Commission forecasts that, under average annual conditions, interstate pipeline capacity is adequate to meet demand through 2013 in Southern California and through 2007 in Northern California. However, meeting peak day demand under extreme weather conditions may require infrastructure investments earlier.[31]

Increasing Energy Efficiency in the Natural Gas Marketplace

As stated previously, Californians are energy efficient, aided by the state's stringent building and appliance standards. However, these achievements are not enough and more can be done to save energy.

The integrated nature of the natural gas and electricity markets suggests that programs targeted at cutting both peak and overall electricity use will also have a significant impact on reducing statewide natural gas consumption. Reductions during peak summer hours will have a great impact on ratepayer costs and price volatility, since electricity costs are most affected by underlying gas prices during these periods. Additional funding, targeted specifically at natural gas demand reductions, would yield significant cost-effective reductions.[32]

Beyond measures that individual consumers and businesses can take to conserve, electricity generators could retire older, less-efficient natural gas-fired power plants and replace or repower them with new, more efficient ones. Unfortunately, many of these plants are presently used to maintain system reliability.

Hence, before California can retire or replace existing power plants, it must examine the contractual arrangements that dictate their use. Many of these older power plants have RMR contracts with the CA ISO or long-term DWR contracts. To replace the aging power plants now used for reliability purposes, their cleaner, more efficient upgrades or replacements must receive similar financial incentives that recognize their benefits to local reliability and California's overall grid system. This issue will be further addressed as part of the 2004 *Energy Report* update proceeding.

Cogeneration offers another low-cost, low-emission option for the efficient use of natural gas. By creating both electric and thermal energy, cogeneration plants can achieve heat rates that "match or exceed the heat rates of new gas-fired combined-cycle power plants."[33] Cogeneration is a major element in the state's energy system, contributing more than 6,300 MW.[34]

[30] Ibid., p. 14.
[31] Ibid., p. 103.
[32] *Public Interest Energy Strategies Report*, p. 45.
[33] See written testimony of Scott Hawley, Watson Cogeneration Company, October 14, 2003, p. 3.
[34] See written testimony of the California Cogeneration Council, October 14, 2003, p, 2.

Recommendation for Natural Gas Efficiency

- Increase funding for natural gas efficiency programs to achieve an additional 100 million therms of reduction in natural gas demand by 2013.

Leveraging Opportunities for Customer Choice

Retail customer choice has been available to California natural gas consumers in many respects since 1988. At that time, driven by the growing movement for a competitive natural gas market and interest in building interstate pipelines into the state for the first time, the CPUC approved a mechanism whereby customers could procure natural gas from any energy service provider, not just the customers' local gas utility.

Driven by the success of unbundling the procurement function from other utility services, stakeholders pushed for further unbundling, including storage services and pipeline capacity reservations (both in-state and outside California). Unfortunately, the latter efforts have proceeded with mixed results.

Since the PG&E Gas Accord Settlement was adopted, customers in Northern California have had the ability to reserve long-distance pipeline transmission capacity specific to a particular location. SoCalGas, on the other hand, has not offered such specificity, only allowing customers to reserve capacity in its system. In that case, any oversubscription of capacity at a particular location may result in a pro rata reduction in capacity reserved for particular customers. Hence, SoCalGas cannot offer firm trading rights to its customers, reducing the value of the "unbundled" capacity rights that it might otherwise offer.

Ultimately, effective utilization of the natural gas system from a customer and utility perspective depends on the consistent application of rules and regulations statewide. California currently lacks this consistency, and this inconsistency needs to be resolved.

Reducing Natural Gas Dependence

With demand for natural gas increasing to meet the needs of a growing electricity generation market, concerns have emerged among state policy makers about California's increasing dependence on natural gas. These concerns have become even more pronounced with increased price volatility. The risks associated with long-run increases in the price of natural gas and supply shortfalls can be mitigated by reducing demand for natural gas for power generation. The effective implementation of the RPS and expanded energy efficiency programs are the critical element of reducing the state's dependence on natural gas.

Despite its support of renewable energy, California depends increasingly on natural gas generation, and natural gas-fired generation in California is expected to increase from 36 percent in 2004 to 43 percent in 2013.[35] The reductions in available hydroelectricity will push this percentage even higher. If California accelerates its use of renewable generation and meets the RPS goal of 20 percent by the year 2010 instead of 2017, and continues funding energy efficiency and DSM at present levels, the state can double the natural gas savings that come from displacing natural gas-fired generation by 2013.

Using other fuels can also reduce the demand for natural gas facilities. Nuclear, large hydroelectric, residual fuel oil, and coal facilities are unlikely candidates for offsetting natural gas-fired generation for California for a host of legal, environmental, and cost reasons. On the other hand, the development of cost-effective renewable resources (wind, geothermal, biomass, and solar) have tremendous potential in California to meet part of our future demand.

Natural Gas Infrastructure

California is located at the western end of a complex network of pipelines that spans the United States and Canada. While California has managed its own natural gas demand growth, supply sources, and infrastructure reasonably well, it is nonetheless greatly affected by supply/demand imbalances that occur in other regions, particularly with respect to infrastructure constraints that impede natural gas deliverability. Given the strong growth in natural gas demand in Nevada, Arizona, and the Pacific Northwest, it is paramount that California continues to:

1) develop additional interstate pipeline capacity from Canada, the South west, and the Rocky Mountains,

2) develop operational flexibility to utilize its in-state storage,

3) develop in-state productive capacity, and

4) develop non-traditional supply sources such as liquefied natural gas (LNG).

Since the energy crisis, the state has increased access to out-of-state production through expansions of key interstate pipelines delivering gas from the Southwest, Canada, and the Rocky Mountains. The Federal Energy Regulatory Commission (FERC) has approved, on an expedited basis, additional interstate pipelines that now bring additional supplies to California. Under the watchful eye of the Natural Gas Working Group and CPUC oversight, SoCalGas and PG&E have expanded their pipeline capacities to receive more out-of-state supplies and enhanced the operational flexibility of their pipeline systems.

[35] California Energy Commission, *Electricity Infrastructure Assessment*, California Energy Commission, May 2003, Sacramento, CA, P100-03-007F.

Need for Effective Storage

Effective utilization of storage is critical to maximizing the operational flexibility of the natural gas system in California and reducing the need to add infrastructure. California presently has more than 240 billion cubic feet (Bcf) of storage capacity available with the ability to remove more than 5 Bcf per day on a peak winter day.[36]

Increases in storage capacity and withdrawal capability in both northern and southern California are important to meeting the growing energy needs of California gas customers. Equally important is the need to create a regulatory framework that encourages the effective use of storage throughout the state. Unfortunately, the existing tariff structure allows customers to reserve storage capacity but not necessarily fill it. This raises the likelihood that storage capacity will not be fully utilized, resulting in not enough gas being injected into storage during the storage injection season. Suboptimal use of storage leads to higher gas prices.

A result of the energy crisis, the CPUC authorized the utilities to increase natural gas storage capacity, including increased withdrawal and injection capabilities for existing utility storage and the addition of new non-utility storage facilities. As important as these improvements are to enhance capability of the state's natural gas system, further improvements will be necessary during the next decade.

Recognizing the Role of California Natural Gas Production

California gas producers play an important role in meeting the needs of natural gas consumers. As mentioned earlier, these producers satisfy approximately 15 percent of statewide natural gas demand. Stakeholders representing a number of producers suggested that this share could easily be maintained or even grow further if some of the various economic and regulatory disincentives are removed. Some of these disincentives include but are not limited to the following:

- Restricted access to utility gas gathering systems
- Lack of a streamlined permitting process for wellhead and production facilities
- Strict utility enforcement of gas quality specifications, with little opportunity to blend low Btu-quality gas with higher Btu-quality gas
- Limited access to land where natural gas deposits exist
- Absence of any rules enabling the effective testing of a new gas discovery[37]

[36] Ibid., *Electricity and Natural Gas Assessment Report*, California Energy Commission, October 2003, Sacramento, CA, P100-03-006D, p. 94.
[37] See written testimony of Joe Sparano (Western States Petroleum Association), dated August 29, 2003.

Some parties have suggested that the state should provide regulatory and tax incentives to expedite drilling and exploration. Others have argued that California producers should have better access to California natural gas markets.[38]

As a starting point toward removing these barriers, the Energy Commission, in collaboration with the Department of Conservation's Division of Oil, Gas, and Geothermal Resources, is beginning to explore these issues through the formation of a regulatory working group to promote cooperation between state and federal regulatory agencies, gas producers, and other interested parties to help improve the permitting process for drilling natural gas wells.

While collaboration has been an effective tool to address many of the barriers affecting California gas production, the Energy Commission recognizes two specific areas where legislative input may be needed for resolution. For more than a year, the Natural Gas Working Group has unsuccessfully attempted to broker a solution between California producers looking to serve the compressed natural gas vehicle market and SoCalGas, which imposes strict gas-quality requirements on these customers. For more than a decade, producers in Northern California have not been able to reach a solution which would allow them effective access to PG&E's gas gathering system, despite the issuance of two key CPUC decisions outlining such a solution.[39]

The Energy Commission recommends that the appropriate legislative committees initiate hearings to explore these two issues in greater detail and determine whether additional legislative action will be required to resolve the issue. The Energy Commission stands ready to assist if this approach is utilized.

Liquified Natural Gas Development

There are growing concerns that natural gas production from existing basins is in decline and unable to keep pace with growing demand for natural gas in North America. Many public and private natural gas analysts now predict that North American gas production will decline in future years. It is also unclear whether the industry can provide enough infrastructure to find and extract new sources of supply as well as add enough pipeline capacity to match current and future natural gas demand. Therefore, there is considerable interest in further developing infrastructure for liquefied natural gas (LNG) in North America to supplement our current supply of natural gas.

The completion of one or more of the currently proposed LNG facilities on the West Coast could add in excess of 1 Bcf per day of additional supplies. More importantly, LNG provides an opportunity for California to access supply from other countries and continents that may help bring downward pressure on Canadian and U.S. gas prices. However, overdependence on a foreign supply source has to be an additional concern.

[38] See testimony of John Allen (Occidental Petroleum – Elk Hills) at Energy Commission Integrated Energy Policy Report Hearing, October 10, 2003.
[39] See CPUC Decisions 89-02-016 and 97-08-055.

In the past two years, a number of developers have shown interest in building LNG facilities on the West Coast, along the coast of both Mexico and California. There have been at least 10 projects proposed on- and off-shore along the West Coast during the past year.[40] However, financial backing is probably available to support construction of one or two projects. Given recent regulatory activity in Mexico, which includes approval of all necessary permits for one proposal, it appears likely that at least one project will be built along the Baja California coast. California could benefit economically from LNG infrastructure being provided in the state.[41]

LNG, however, does not come without issues that will need resolution before it enters any pipeline system on the West Coast. Some are concerned about the relative safety of LNG. Others are concerned that the relative heat content of delivered LNG, which far surpasses what is considered to be appropriate for the utility systems in California, makes it difficult to move the gas into California without significant treatment or blending. Others are concerned about the type of natural gas sales contracts that are needed to support these large investments.

To address LNG issues more effectively at the state government level, the Energy Commission recently sponsored the formation of the LNG Interagency Permitting Working Group. The group meets on a regular basis and includes 13 public agencies potentially involved with permitting any potential LNG facility in California. The goal of the group is to ensure that any LNG development is consistent with state energy policy that balances environmental protection, public safety, and local community concerns.

Recommendations for Improving Natural Gas Infrastructure

The state should:

- Encourage the construction of LNG facilities and infrastructure and coordinate permit reviews with all entities to facilitate LNG facilities and infrastructure development on the West Coast.
- Ensure that existing natural gas storage capacity is appropriately used to provide adequate supplies and to protect prices.
- Initiate legislative hearings that will:
    1) examine the issue of gas quality and gas gathering as it relates to California gas production and
    2) determine whether additional legislative action is warranted to resolve the issues.

[40] California Energy Commission, "Pending Natural Gas Infrastructure Projects," [http://www.energy.ca.gov/naturalgas/documents/PENDING_PROJECTS.PDF].
[41] See testimony of Gene Voiland (AERA Energy) at Energy Commission Hearing, October 10, 2003.

INTEGRATED ENERGY POLICY REPORT

SECTION FOUR *Transportation Energy*

The demand for transportation fuels in California is increasing at an alarming rate, surpassing in-state refining capacity. California's refiners rely increasingly on imported petroleum products to meet demand, and these imports enter through ocean port facilities that are reaching maximum capacity. The industry must expand its import and storage facilities, otherwise supply constraints and price volatility will continue.

The inability of the petroleum industry to meet today's needs without substantial price volatility causes concern about its ability to meet the growing demand for gasoline and diesel in the future. Without assurances from the industry how they will meet growing demand, the state must take aggressive steps to safeguard consumers and the California economy against more severe supply disruptions and price volatility.

The Energy Commission and CARB have developed a strategy to reduce California's singular dependence on petroleum that relies primarily on raising new vehicle fuel economy standards, and to a lesser extent increasing the use of alternative fuels, and introducing advanced vehicle technology such as hybrid-electric and hydrogen fuel cell vehicles.[42] The Energy Commission is beginning to work with stakeholder groups to identify effective avenues to implement the strategy.

The petroleum industry supports cost-effective vehicle efficiency improvements and alternative fuels development. It cautions, however, that a goal to reduce long-term demand for petroleum may significantly create disincentives to infrastructure investments, such as import and storage facilities that must be made now. The state must, nevertheless, balance supply and price consequences of infrastructure constraints with the potential benefits of moderating our dependence on petroleum.

Recent Trends in Meeting California's Transportation Energy Needs

In just the past 20 years, the demand for gasoline and diesel has increased 53 percent.[43] Californians now consume nearly 49.5 million gallons of gasoline and diesel each day, accounting for almost half of all the fossil fuel energy consumed in the state each year.[44] Several factors explain the increase, including:

[42] California Energy Commission and California Air Resources Board, *Reducing California's Petroleum Dependence*, California Energy Commission, August 2003, Sacramento, CA, P600-03-005F.
[43] California Energy Commission, *Transportation Fuels, Technologies, and Infrastructure Assessment*, California Energy Commission, October 2003, Sacramento, CA, P100-03-013D, p. 7.
[44] California Energy Commission, *Forecasts of California Transportation Energy Demand, 2003-2023*, Staff Report, California Energy Commission, 2003, Sacramento, CA, P100-03-016.

- Population growth and an increase in the number of on-road vehicles
- Declining per-mile cost of gasoline
- Land-use patterns that place jobs and housing increasingly farther apart
- The shift in consumer preference to larger, less fuel efficient motor vehicles
- A lack of viable and cost-effective alternatives to petroleum fuels

Until recently, California refiners produced enough transportation fuels to meet in-state needs and export to neighboring states. However, while demand has grown considerably, refining capacity has not. The last refinery built in California was in 1969. Since then, several refineries have shut down, reducing statewide refining capacity by nearly 20 percent.[45]

In spite of their age, the industry has upgraded and modernized its refineries over the years in response to meet the state's very tough fuel specifications. These refineries are now some of the most advanced and produce the cleanest-burning fuels in the world. Most recently, the industry is making significant modifications to its terminal facilities in response to the Governor's ban on MTBE, and these $800 million in modifications have proceeded without disrupting fuel supplies.

Since the mid-1990s, refiners have been able to increase production of gasoline and diesel at existing facilities through process improvements, but not enough to keep pace with the steadily growing demand. As a consequence, California increasingly relies on imports of blending components and finished products from other states and countries to meet demand. Today, refiners import about four million gallons of gasoline and diesel each day, a tenuous situation given the limited number of out-of-state refineries currently producing California gasoline.[46]

Gasoline, diesel, and blending components must be imported by marine tanker because California is not connected by pipeline to refining centers in other states. The state's marine facilities—where imports are off-loaded, stored, and distributed—operate at or near capacity. Likewise, refineries in California operate near maximum capacity for much of the year. Since inventories represent only 18 days of supply on average[47] and replacement supplies can take up to eight weeks to reach marine terminals, an upset in the petroleum system can immediately translate into tight supplies and higher prices at the pump.

Furthermore, gasoline and diesel demand does not drop when prices spike, so even small shortfalls in supply can cause very significant price swings. Spurred by record prices for crude oil and refinery problems in California, the average price for gasoline spiked to a record level of $2.15 a gallon in March 2003.[48]

[45] California Energy Commission, 1981- 2003, *PIIRA Reports*, Operable capacity of nine reports.
[46] Ibid., p. 26.
[47] California Energy Commission, *California Strategic Fuels Reserve*, Revised Contract Report, California Energy Commission, July 2002, Sacramento, CA, P600-02-017D, p. 54.
[48] *Transportation Fuels, Technologies, and Infrastructure Assessment*, p. 36.

As California learned in August 2003, infrastructure problems in other states can seriously affect California. When an Arizona pipeline bringing gasoline supply from Texas recently ruptured, California refiners diverted supply to Arizona because California was the only nearby source of gasoline. When combined with several refinery outages on the West Coast, these events caused the average price of gasoline in California to reach $2.10 a gallon.[49]

Transportation Energy Outlook

Petroleum will be the primary source of California's transportation fuels for the foreseeable future. Over the next 20 years, the Energy Commission projects that gasoline and diesel demand for on-road vehicles will increase 36 percent and the demand for jet fuel will more than double.[50]

As demand continues to rise, imports of foreign crude oil will increase as in-state and Alaskan supplies diminish. Additionally, the transition to ethanol as the only oxygenate for California gasoline will reduce refinery production by as much as 5 percent.[51] Low-sulfur fuel regulations scheduled to take effect in 2006 also may further limit refining production. With refineries operating close to full capacity, daily imports of gasoline and diesel will more than double to 10.1 million gallons by 2010.[52] Unless import facilities expand, gasoline and diesel markets will become increasingly volatile, with the likelihood of supply shortages and more prolonged periods of high prices.

Improve Vehicle Efficiency

In almost every area of energy consumption, Californians have put efficiency first, but not transportation energy. The state's standards continually set new benchmarks for electricity and natural gas efficiency. California does not have similar authority for transportation, as it has for electricity and natural gas, and neglect at the federal level has allowed new vehicle fuel economy to decline in recent years. This is a cause of the significant increase in gasoline consumption.

In 1975, Congress established corporate average fuel economy (CAFE) standards for new passenger cars and light trucks. Since current CAFE standards, 27.5 miles per gallon for cars and 20.7 miles per gallon for light-trucks, including SUVs and minivans, have not changed since 1985, automobile manufacturers have not had the incentive to improve new vehicle fuel economy. Further, sales for light trucks have increased to nearly 50 percent of all new vehicles sold in California. These factors combined have contributed to the dramatic rise in gasoline demand.

[49] California Energy Commission, *Causes for Gasoline and Diesel Price Increases in California*, California Energy Commission, September Monthly Update, September 2003, Sacramento, CA, p. 4.
[50] *Forecasts of California Transportation Energy Demand, 2003-2023*, Staff Report.
[51] *Transportation Fuels, Technologies, and Infrastructure Assessment*, p. 28.
[52] Ibid., p. 26.

In its recent joint report, *Reducing California's Petroleum Dependence*, the Energy Commission and CARB examined a range of options to reduce petroleum consumption in California. In the near term, the state can quickly realize significant savings by establishing a tire efficiency program, requiring government fleets to use the most efficient vehicles in a given class, and educating consumers about proper vehicle maintenance. Together, these actions can reduce fuel demand by three to five percent, or about one-half billion gallons each year.[53]

The state has taken action on two of these measures. SB 844 [Chapter 645, Statutes of 2003, Nation] requires the Energy Commission to establish a tire testing procedure, a tire efficiency rating system, and replacement tire efficiency standards. The Department of General Services also is revising its vehicle procurement requirements to include efficiency as a primary criterion.

More importantly, the report showed that improving the fuel efficiency of new vehicles would dramatically reduce petroleum demand and that the efficiency of new cars and light trucks can be improved significantly with existing and emerging automotive technologies. If the combined fuel economy of new cars and light trucks were improved to 40 miles per gallon (mpg) beginning in the 2008 model year, the growth in demand for on-road transportation fuels would begin to decline by the year 2010 and continue to decline to current levels by 2020. This could save over 6 billion gallons per year.[54] For most of the efficiency options evaluated, fuel savings for consumers exceed the increased cost of a more fuel-efficient vehicle.

The federal government, through CAFE standards, has sole authority to require improvements in vehicle efficiency. California can only act in concert with other states and stakeholders to influence needed changes at the federal level. In the event the federal government fails to increase efficiency standards, the Energy Commission recommends that the state carefully reassess its strategy rather than immediately implement pricing measures or other fuel taxes and fees to lower demand.

Recommendations to Improve Vehicle Efficiency

The state should:

- Adopt a goal of reducing demand for on-road gasoline and diesel to 15 percent below 2003 levels by 2020 based on identified strategies that are achievable and cost-beneficial.
- Build a coalition with other states and stakeholders to influence Congress and the Department of Transportation to double the combined fuel economy of new passenger cars and light trucks by 2020. If the federal government fails to revise CAFE standards, California must reassess its petroleum reduction strategy.
- Develop a public information program to inform consumers of the fuel saving benefits of efficient tires, proper tire inflation, and vehicle maintenance.

[53] Ibid, p. 13
[54] California Energy Commission staff work, staff used the Futures Model to provide input to the *Reducing California's Petroleum Dependence*.

Diversify Transportation Fuels

California's demand for gasoline and diesel fuel is projected to increase by almost 35 percent over the next 20 years. Even though improving vehicle efficiency is the single most effective means to reduce petroleum dependence, the Energy Commission and the CARB have concluded that improving vehicle efficiency alone will not be enough to maintain petroleum reduction goals over the long-term. By 2020, the demand for gasoline and diesel will begin to increase once more as the number of vehicle miles traveled overwhelms efficiency benefits. For that reason, California must also increase our use of alternative fuels, including:

- Natural gas
- Ethanol
- Liquefied petroleum gas (LPG)
- Non-petroleum-derived diesel fuel such as Fischer-Tropsch and biodiesel
- Electricity
- Hydrogen

California is home to a growing number of alternative-fuel vehicles, through the efforts of the Energy Commission, CARB, local air districts, federal government, transit agencies, utilities, and other public and private entities. More than 60,000 cars, transit buses and trucks currently operate on natural gas and LPG, along with nearly 13,000 electric vehicles. California also has in excess of 800 natural gas and LPG fueling stations and is host to the California Fuel Cell Partnership.[55]

However, increasing the use of these fuels faces significant uncertainties such as the availability of new vehicle technologies, the cost and availability of new fueling infrastructures, and acceptance of these fuels by consumers. Given the recent supply and price volatility experienced in the natural gas market, California should proceed cautiously in creating a large natural gas demand for transportation.

Providing ethanol fuel for the existing fleet of flexible fuel vehicles currently on the road in California will help to diversify the state's market for transportation fuels. All U.S. automobile manufacturers currently build flexible fuel vehicles. California's fleet now includes an estimated 200,000 vehicles, yet because fueling infrastructure does not exist to supply ethanol, these vehicles use gasoline. At current rates, this fleet could grow to as many as 400,000 vehicles by 2010.[56]

[55] *Transportation Fuels, Technologies, and Infrastructure Assessment*, p. 63.
[56] California Energy Commission staff, Presentation: *California's Transition from MTBE to Ethanol and Beyond* at the U.S. Department of Energy and California Energy Commission sponsored "California Ethanol Workshop," April 14-15, 2003, Sacramento, CA.

Recommendation to Diversify Fuels

The state should:

- Increase the use of non-petroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030 based on identified strategies that are achievable and cost-beneficial.

Strengthen the Transportation Energy Infrastructure

California is importing increasing amounts of crude oil, blending components, and finished gasoline and diesel fuels to meet the state's growing demand. Yet the state's import facilities do not have the capacity to handle the increase flow of product effectively. The Energy Commission has conducted a preliminary study of the state's ability to import petroleum products and concluded that the infrastructure is at, or near, capacity.[57] The problems are most serious in Southern California, where the bulk of increased quantities of imported crude oil and finished petroleum products will be received.

Unless this infrastructure is expanded, refiners will not be able to meet demand with additional imports, which may increase price volatility. It is essential that additional marine and storage facilities are constructed and operating as the demand for transportation fuel increases.

The Energy Commission is planning a more comprehensive evaluation of the state's petroleum infrastructure including refineries, pipelines, ports, and storage facilities to identify product flows, pricing, and bottlenecks in the system and recommend solutions. An important component of this effort is the rulemaking already underway to expand and improve the process by which the industry must report to the Energy Commission information regarding petroleum product volumes and pricing. The Energy Commission expects this proceeding to be completed in early 2004.

A major barrier to expanding petroleum infrastructure is the difficulty in acquiring construction permits from multiple local, state, and federal authorities. These existing layers of permitting are inefficient and overlapping and contribute to the continuing shortage of storage capacity. This shortage leads to higher lease and rental rates for storage tanks. As a result, suppliers minimize their inventories, making for tighter markets and higher prices.

The state has successfully dealt with similar permitting problems. In 1974, to help license power plants, the Warren-Alquist Act, established the Energy Commission as a one-stop permitting agency. The Energy Commission's 12-month public process consolidates all state and local agencies into a single permitting process that meets the requirements of the CEQA and ensures that local concerns are balanced against statewide needs.

[57] California Energy Commission, *California Marine Petroleum Infrastructure*, Consultant Report, California Energy Commission, Sacramento, CA, P600-03-008.

Recommendation for Transportation Energy Infrastructure

The state should:

- Establish a one-stop licensing process for petroleum infrastructure, including refineries, import and storage facilities, and pipelines that would expedite permits to increase supplies of transportation energy products available to California while maintaining environmental quality.

INTEGRATED ENERGY POLICY REPORT

SECTION FIVE Stewardship of California's Environment

California's increasing need for energy places added pressure on the state's electricity, natural gas, and transportation fuel infrastructures as well as the state's environment. California must strike a balance between delivering increasing levels of energy and its commitment to environmental quality. The challenge to policy makers will be, not just to sustain the current status of the environment, but to improve environmental quality while meeting the wide-ranging demand for energy. This section addresses several topics where energy and the environment are inextricably linked and where clear policy direction is warranted.

Power Plant Water Use and Waste Water Discharge

Clean fresh water is an increasingly critical resource in California. California's burgeoning population, expected to grow from 35.5 million in 2003 to 47.5 million in 2020, combined with businesses and industry, will continue to use increasing quantities of fresh water at rates that cannot be sustained. Imbalances in available fresh water supply result in "average year" shortages projected in every region except parts of the San Francisco Bay area and the North Coast.[58] Energy facilities are among the state's many water users and have the potential to affect fresh water supply and water quality.

Since 1996, an increasing number of new power plants have been sited in areas with limited fresh water supplies. As a result, the use of fresh water for power plant cooling is increasing. Although water use for power plant cooling is relatively small on a statewide basis, it can cause significant impacts to local water supplies.

Degraded surface and groundwater can be reused for power plant cooling. When sufficient quantities are available, reclaimed water is a commercially viable cooling medium. Of the 8,409 MW of new cogeneration or combined cycle generated capacity permitted by the Energy Commission and brought on line in California between 1996 and September 2002, more than 1,580 MW or 19 percent is cooled using recycled water. Alternative cooling options, such as dry cooling, are also available and commercially viable, and can reduce or eliminate the need for fresh water. Two projects using dry or air cooling became operational in 1996 and 2001. A third project using dry cooling in San Diego County has been permitted by the Energy Commission.

[58] DWR, *The California Water Plan Update*, 1998, Bulletin 160-98, Volumes I and II.

Water quality impacts to surface water bodies, groundwater, and land from waste water discharges are increasingly controlled through technologies such as zero liquid discharge systems to meet the state's water quality standards. Of the 8,409 MW of new cogeneration or combined-cycle generating capacity, 16 percent used zero liquid discharge. More than 35 percent of the projects now under licensing review or under construction will use this technology.

Continued use of once-through cooling at existing power plants may impact aquatic resources in the coastal zone, bays, and estuaries. While power plants using once-through cooling have not been proposed for new California coastal sites in the last two decades, proposals to repower existing generation units at these sites have not switched to dry cooling or recycled water.

Water conservation is of paramount importance to the state. Indeed, conserving fresh water and avoiding its wasteful use have long been part of the state's water policy, as reflected in the State Constitution, Article X, Section 2. Because power plants have the potential to use substantial amounts of water for evaporative cooling, the Energy Commission has the responsibility to apply state water policy to minimize the use of fresh water, promote alternative cooling technologies, and minimize or avoid degradation of the quality of the state's water resources.

State water policy regarding power plants is specified in Resolution 75-58 adopted by the State Water Resources Control Board (the Board).[59] With respect to using fresh water, the Resolution articulates an underlying policy "to protect beneficial uses of the state's water resources and to keep the consumptive use of freshwater for power plant cooling to that minimally essential for the welfare of the citizens of the state."[60] The policy reflects the state's concerns over discharges from power plant cooling, as well as the conservation of fresh water for cooling purposes.

Specifically, the Board states that it "encourages … power generating utilities and agencies to study the feasibility of using wastewater for power plant cooling" and "encourages the use of wastewater for power plant cooling where it is appropriate."[61] The Board also lists specific "discharge prohibitions" to limit the discharge of blowdown and waste waters from cooling facilities so as to "maintain existing water quality and aquatic environment of the state's water resources."

The Board further states as a matter of principle, "Where the Board has jurisdiction, use of fresh inland waters for power plant cooling will be approved by the Board only when it is demonstrated that the use of other water supply sources or other methods of cooling would be environmentally undesirable or economically unsound."[62]

[59] Adopted in 1975, the Resolution is outdated in part in that it promotes once-through cooling with ocean water without regard to impacts to aquatic resources. Aquatic biological data collected in the last 28 years show that the biological harm caused by using ocean water for once-through cooling could be substantial. The adoption of 75-58 should be used to inform the Board in any decision on updating the Resolution.

[60] DWR, *Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling*, June 19, 1975, mimeo, p. 1.

[61] Ibid., p. 5.

[62] Ibid., p. 4.

The Warren-Alquist Act reiterates state water policy in terms of conserving water and using alternative sources of water supply:“ It is further the policy of the state and the intent of the Legislature to promote all feasible means of energy and water conservation and all feasible uses of alternative energy and water supply sources.” (emphasis added).[63]

Consistent with the Board policy and the Warren-Alquist Act, the Energy Commission will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative cooling technologies are shown to be “environmentally undesirable” or “economically unsound.” Additionally, as a way to reduce the use of fresh water and to avoid discharges in keeping with the Board’s policy, the Energy Commission will require zero-liquid discharge technologies unless such technologies are shown to be “environmentally undesirable” or “economically unsound.” The Energy Commission interprets “environmentally undesirable” to mean the same as having a “significant adverse environmental impact” and “economically unsound” to mean the same as “economically or otherwise infeasible.”[64]

Air Quality and Global Climate Change

Air pollution continues to produce major health impacts and poses a significant ecological threat in California. The majority of air emissions occur as energy and transportation fuels are stored, transported, and combusted. Air quality concerns and energy needs must be addressed concurrently; protecting the environment must be paramount.

California requires the cleanest-burning fuels and the most advanced combustion and pollution-reduction technologies. Future energy policies will need to both preserve and build upon past efforts to meet energy needs while assuring progress in reducing air pollution.

Climate change also represents a significant risk to California. The signs of a global climate change trend are becoming more evident and much of the scientific debate is now focused on expected rates of future changes. Rising temperatures and sea levels, along with changes in hydrological systems, are threats to California’s economy, public health, and environment. Although these changes are not entirely predictable, climate change could lead to flooding of coastal communities, drought on our farmlands, disease and fires in our forests, decline of fish populations, reduced capacity to generate hydropower, and loss of habitat. Preliminary research suggests that annual residential and commercial energy expenditures in California alone could increase by as much as $2 billion by 2020 as a result of warmer climatic conditions.[65]

[63] Public Resources Code Section 25008.

[64] “Feasible” is defined under the CEQA as meaning “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors.” (Cal. Code Regs., tit. 14, § 15365.) The same definition exists in the Energy Commission’s siting regulations. (See Cal. Code Regs., tit. 20, § 1702(e).)

[65] Electric Power Research Institute, *Global Climate Change and California: Potential Implications for Ecosystems, Health and the Environment*, Consultant Report, California Energy Commission, 2003, Sacramento, CA, P500-03-099F, Appendix XI, Tables 9 and 11.

California has been a leader in responding to climate change through its inventory activities, the establishment of the California Climate Action Registry, the myriad energy efficiency, renewable energy, and environmental research and development programs, and regulation of automotive greenhouse gas emissions. However, more must be done to prepare for an uncertain climate future and improve the resiliency of the state's economy. The Energy Commission identified a range of strategies in 1998, including a need to account for the environmental impacts associated with energy production, planning, and procurement.[66] Through the West Coast Climate Initiative, California and its neighbors can partner in a leadership role to address risks posed by climate change.

Recommendations for Global Climate Change

The state should:

- Require reporting of greenhouse gas emissions as a condition of state licensing of new electric generating facilities.
- Account for the cost of greenhouse gas emission reductions in utility resource procurement decisions.
- Use sustainable energy and environmental designs in all state buildings.
- Require all state agencies to incorporate climate change mitigation and adaptation strategies in planning and policy documents.

Cross-Border Issues

California's environment along its border with Mexico is affected by energy consumption across the border as well as by energy consumption in California. Mexico has experienced strong industrial growth in its border area, resulting in increasing air pollution. States along the United States/Mexico border are affected by the increased emissions from inefficient power plants and boilers, fueling facilities, highly polluting industrial facilities, and traffic congestion. Baja California presents both compelling energy challenges and business opportunities for California.

Recommendation for Cross-Border Issues

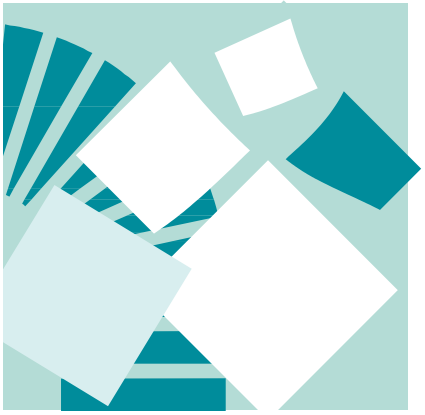
The state should:

- Conduct a Mexico Energy Program to fulfill joint declarations developed by the Border Governors' Commission Energy Worktable. The program should address energy and air quality issues on the California-Mexico border and stimulate energy technology exports for California energy companies.

[66] California Energy Commission, *1997 Global Climate Change, Greenhouse Gas Emissions Reduction Strategies for California, Volume 2*, Staff Report, California Energy Commission, 1998, Sacramento, CA, P500-98-001V2, p. 5.

Hydroelectricity Facility Relicensing

Hydroelectricity has historically played an important role in meeting California's electricity needs. Its low production costs and unique ability to meet critical peak demand have long benefited the state's ratepayers. Some hydroelectric projects unfortunately have serious environmental consequences such as significant, ongoing impacts to many California rivers and streams, native salmon and trout populations, and the water quality needed to support sustainable riverine ecosystems.



The restoration of imperiled salmon and trout fisheries is one of California's environmental policy objectives. Since the FERC licensed most of the state's hydroelectric facilities more than 30 years ago, these facilities were not subject to current environmental standards. By 2015, 44 FERC-licensed projects in California will seek renewals, affording the state the rare opportunity to address problems with existing fisheries and aquatic resources. In addition, decommissioning of high environmental impact hydroelectric facilities that supply little power is a possible method of restoring important aquatic habitat.

California's Department of Fish and Game and the State Water Resources Control Board both have principal roles as the state's representatives in FERC's re-licensing of hydroelectric facilities. The Energy Commission is helping these agencies and FERC understand the effects that operational and structural changes to these facilities will have on regional and statewide electricity supply.

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SECTION SIX *Conclusion*

In three short years, California has weathered an electricity crisis, unparalleled natural gas price spikes, and the highest gasoline prices in the nation.

As the fifth largest economy in the world, energy is a vital concern to California. Through crises, error, and innovation, California remains a world leader in energy policy and technology. What begins in California eventually moves throughout the world.

Since the 1970s, California has responded to each energy challenge by developing efficiency programs, promoting new forms of renewable energy, and fostering research and development. These efforts have pushed the boundaries of regulation and private investment.

California's growing population demands reliable and reasonably priced energy. Yet today, California finds itself facing an aging energy infrastructure and ever-growing demand.

The state rightfully feels a sense of urgency. Finding the most cost-effective, reliable, efficient resources, while protecting our environment, calls for more than a "business- as-usual" approach. If California's energy future is to remain economically workable and environmentally sound, progressive energy policy must remain high on the state's agenda.

The recommendations described in this report represent an aggressive, wide ranging agenda for decision makers, businesses, and individuals. The Energy Commission believes that this report, along with its subsidiary volumes, lays the proper foundation for future action.

INTEGRATED ENERGY POLICY REPORT

ACKNOWLEDGEMENTS

The Integrated Energy Policy Report represents the culmination of an extensive process of hearings, comments, and analysis. Along with the Energy Commission staff, numerous public agencies, private energy and energy-related companies, and public interest groups have provided invaluable comments and critiques of the technical analyses and policy recommendations. The final report reflects this broad range of experience and viewpoints. In particular, the Energy Commission gratefully acknowledges the following:

Government Organizations

Bay Area Air Quality Management District
California Air Resources Board
California Department of Transportation
California Independent System Operator
California Public Utilities Commission
City of San Diego
Consumer Power & Conservation Financing Authority
Electricity Oversight Board

Private Entities

AERA Energy, LLC
Alliance for Retail Energy Markets
Bay Area Economic Forum
Berry Petroleum Company
Border Power Plant Working Group
California Chamber of Commerce
California Cogeneration Council
California Manufacturers and Technology Association
Cal-Tax
Central Labor Council of Alameda County
Coldwell Banker
David L. Richter
DeMaria Electric Motor Services, Inc.
DeWitt Petroleum
Duke Energy North America
Dynegy, Inc.
Eco Securities
Energy Efficient Mortgage
Golden State Power Cooperative
Gray Panthers of the San Fernando Valley
Independent Energy Producers Association
Independent Oil Producers Agency
K.J. Kammerer & Associates
Kern River Cogeneration Company
Law Offices of Daniel W. Douglass
National Biodiesel Board

Private Entities (continued)

Natural Resources Defense Council
Ninyo & Moore
NRG Energy
Oak Creek Energy Systems, Inc.
Occidental Petroleum Corporation
Pacific Gas and Electric Company
Reliant Energy
San Diego Gas and Electric Company
Sempra Energy Global Enterprises
Sharon Lanini, Agricultural Consultant
Shell Trading Gas and Power Company
Silicon Valley Manufacturing Group
Southern California Edison Company
Sustainable Energy Development
The Southern California Gas Company
TIMEC
Utility Consumers' Action Network
Watson Cogeneration Company
West Coast Power
Western States Petroleum Association
Women's Energy Matters

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