

Critical Recommended Actions for Improved Statewide Transportation Energy Security, Greenhouse Gas Reductions, and Economic Growth by 2020

California Action Plan

FOR TRANSPORTATION ENERGY SECURITY



SUMMARY



The California Secure Transportation Energy Partnership

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This Action Plan was independently researched and the assessment and analysis were independently performed by CALSTART staff on behalf of the California Secure Transportation Energy Partnership. Matt Peak served as the principal manager, investigator, and writer. Bill Van Amburg provided primary assistance and editorial review. Tom Brotherton provided key analysis and project support, as did Nate Glasow, Natalie Mims, and Kyle Datta at the Rocky Mountain Institute. Funding for this Action Plan was provided by the Hewett Foundation.

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The California Secure Transportation Energy Partnership (CalSTEP) is a diverse partnership of industry, automotive, business, academia, policy, and nongovernmental professionals working in their individual capacities to create a pro-business, comprehensive action plan that leads to significantly increased transportation energy efficiency and fuel choice in California.

CalSTEP believes that such action will expand the state's economy, enhance security, and reduce global warming emissions and other forms of pollution without compromising personal choice or backsliding on statewide air quality targets. It will also significantly improve productivity, geopolitical relations, and Californians' quality of life.

CalSTEP also believes that with an issue of this importance, waiting for federal action is not a option.



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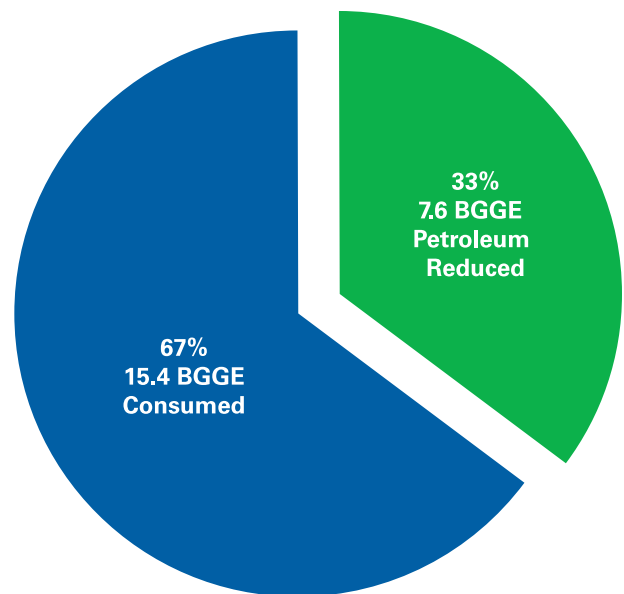


CalSTEP believes that it is critical to immediately reduce California's dependence on petroleum and increase its share of nonpetroleum fuel use. Such action will expand the state's economy, enhance security, protect California from severe energy supply and price shocks, and help meet California's transportation and greenhouse-gas (GHG) emissions goals without compromising personal choice.

For the past year and a half, CalSTEP partners and staff have worked in a collaborative process to identify, quantify, and select the most effective, politically viable, and economically beneficial actions the state can take to strengthen its transportation energy status. This resulting California Action Plan focuses on state-level measures that will achieve the following goal:

A sustainable reduction in the overall on-road petroleum fuel consumption in California to at least 15 percent below 2003 levels by 2020, while increasing the proportion of alternative transportation fuels in the state to at least 20 percent of total on-road transportation fuel demand.

CalSTEP's targets represent amounts that the state and governor, in part or as a whole, already have concluded are required for California to reduce the negative impacts associated with overdependence on imported oil. Since California used 18.1 billion gasoline gallon equivalents (BGGE)¹ of on-road gasoline and diesel in 2003, CalSTEP's target means deviating from a business-as-usual path on which the state would become more dependent on petroleum by consuming 23 BGGE in 2020,² and instead consume 15.4 BGGE.



The Goal - 7.6 BGGE Reduced in 2020
15.4 BGGE Consumed

¹ BGGE represents all fuels in energy-equivalent terms as a gallon of gasoline.
² 18.1 and 23 BGGE numbers obtained from: Kavalec, Chris, et al. Forecasts of California Transportation Energy Demand. California Energy Commission. CEC-600-2005-008. April 2005; p.9, Figure 3. (Assumes 1.1096 volumetric energy density ratio between diesel and gasoline.)



7.6 BGGE Petroleum Reduced

This Action Plan directs its attention to three distinct and complementary areas of action to supplement the 15.4 BGGE of petroleum consumed in 2020:

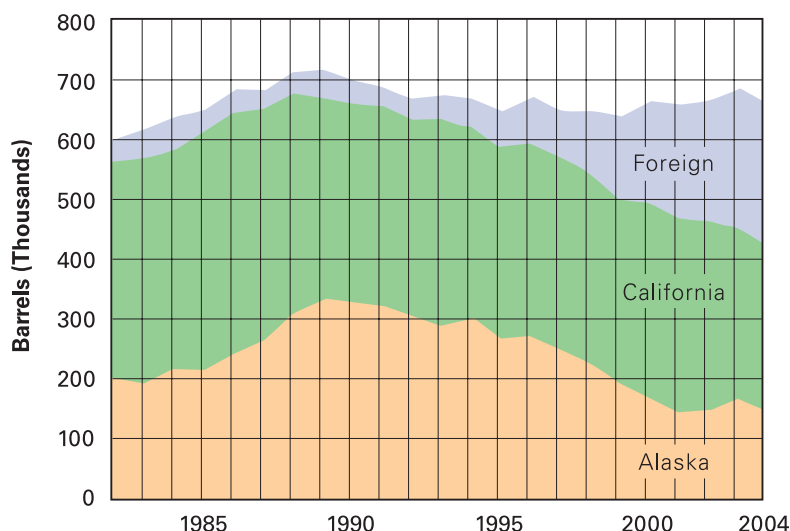
- Diversifying the state's fuel supply;
- Improving vehicular efficiency; and
- Reducing the need to drive.

CalSTEP chose to focus its attention on these three areas of action because they are complementary and provide a comprehensive look at the way Californians travel by road. These areas follow California's successful stationary energy strategy, allowing for the diversification of transportation energy sources and their efficient use while incorporating the more structurally related issue of reducing the need to drive. The Action Plan also recognizes that a major public education campaign is required to support the transition to a more energy efficient, secure, and prosperous society.

There are no silver bullets: No single action alone, or category of actions, is sufficient to achieve the results needed. But, if taken as a whole, the CalSTEP recommended actions will reduce statewide oil dependence by 7.6 BGGE and vehicular GHG emissions by 62 million tons each year, while leading to multiple and long-lasting economic and other benefits. This is a significant and meaningful outcome that is fully achievable through the actions CalSTEP outlines.

Why Reduced Oil Dependence Is Critical for and Beneficial to California

The United States' high consumption level, along with a steady and significant increase in demand from emerging economies such as China and India, is



Graph 1: California Petroleum Sources

Domestic sources decline as foreign imports increase.

Source: California Energy Commission

leading the world to consume ever greater amounts of oil. This problem could be significantly compounded if geologists' global "peak oil" predictions come true. Some speculate that the peak has already happened for the production of light, sweet crude oil, leading to problems such as increased price volatility. This volatility is also driven by the fact that, as indicated in **Graph 1**, California imports over 40 percent of its oil, which expands the state's trade deficit and weakens its economy.

The international race to discover and develop new oil fields that these factors prompt is leading to the increased support of unstable and undemocratic countries. It's also leading to the rapid development of nontraditional hydrocarbons, such as oil shale and sands. While this may appear to be a positive outcome, given that the United States and Canada have significant reserves of these nontraditional hydrocarbons, problems lie in their substantial production-related energy inputs and environmental impacts, including significant GHG emissions.

Even without the increased production of non-traditional hydrocarbons, excessive consumption of fossil fuels is the leading source (41 percent) of California's GHG emissions. If unchecked, California's growing oil demand will make it difficult for the state to meet its Assembly Bill (AB) 32 GHG goals,



thereby endangering its economy. Another potential source of economic risk comes from California's lack of spare petroleum refining capacity. It would require between \$8 billion and \$18.6 billion worth of refining capacity to meet all of the state's projected growth in transportation energy demand between 2003 and 2020 solely from petroleum sources.

After more than thirty years of ineffective national policies, dependence on imported oil has increased in the nation as a whole. Fortunately, in the absence of federal leadership, the state can take action. In fact, forty years of leadership and precedent indicates that California can not only succeed in securing its own transportation energy future, but can also reap multiple benefits by doing so and prompt the rest of the nation to follow its lead. By modeling action on the state's stationary energy policy, which teaches the virtues of energy diversity and efficiency, California can help or fully achieve its adopted transportation and AB 32 GHG goals and create a "California advantage" that buffers the state against the negative consequences associated with an excessive reliance on oil, while helping to grow the economy through the use of new technologies and fuels in which the state can be a worldwide leader.

Three Primary and Seven Supporting Actions to Achieve the Goal

CalSTEP supports actions in the three aforementioned distinct and complementary areas. The actions within these areas can be divided into:

Primary Actions	Supporting Actions
Primary actions are those that achieve the bulk of the petroleum and alternative fuels goals and are most urgent to adopt and implement.	Supporting actions complement and further enable the primary actions while leading to additional statewide economic, educational, and other benefits, but on their own may not achieve the stated goal.

Each of CalSTEP's primary and supporting actions helps to diversify California's fuel supply, increase its use of efficient vehicles, and reduce Californians' need to drive; each action also helps to make the state a better place to live.

CalSTEP has identified three high-priority actions that it urges the state to take immediately to begin moving toward a secure and prosperous transportation energy future:

Primary Actions

1	Codify Governor Arnold Schwarzenegger's fuel diversity goal by implementing a fuel-neutral, minimum-pooled Alternative Fuels Portfolio Standard of at least 10 percent by 2012 and at least 20 percent by 2020 that will increase the availability of and access to a diverse array of alternative refueling stations.
2	In support of the directives outlined in Governor Schwarzenegger's Executive Order S-17-06, which focuses on developing market-based solutions to global warming, implement an Energy Security Tax Relief and Realignment (ESTRR) program consisting of a Foreign Oil Security fee coupled with a tax rebate for all California taxpayers, which would use market mechanisms and price signals to significantly increase the efficient use of petroleum and help protect efficient-transportation capital investments.
3	Initiate a Smart Communities program that encourages energy-efficient and climate-friendly land-use policies and practices by providing new state transportation funding to local governments that will implement regional blueprints that reduce the need to drive.



Supporting Actions

Diversify the state's fuel supply	California Alternative Fuels Infrastructure Partnership
	California Renewable Fuel Production Initiative
Improve vehicular efficiency	State Fleet Leadership Challenge
	New Transportation Future and Revolving Loan programs
	Energy-Independent Vehicle Labeling Program
Reduce the need to drive	Neighborhood Planning Revolving Loan and Transit Use Assistance programs
	Usage-Based "Pay As You Drive" Insurance

The supporting actions that complement and further enable the primary actions while leading to additional statewide benefits can be broken down into the three CalSTEP distinct and complementary areas.

Primary Actions

Working through its deliberative process, in which progress was measured in economic, geopolitical, and environmental costs and benefits, CalSTEP identified three high-priority actions that it urges the state to take immediately to begin moving toward a secure and prosperous transportation energy future.

Alternative Fuels Portfolio Standard

California's dedicated alternative fuel infrastructure and use is limited, displacing approximately 53.5 million of the nearly 19 billion gallons of petroleum consumed in 2005.

Today, California motorists are forced to deal with what can only be described as a "monofuel" culture (**Graph 2, see page 6**). This isn't the case, however, in other states such as Minnesota or in nations such as Brazil and Sweden, where motorists have options when they pull up to the pump. With the implementation of thoughtful, well-crafted policies, California can also diversify its fuel supply and provide motor-

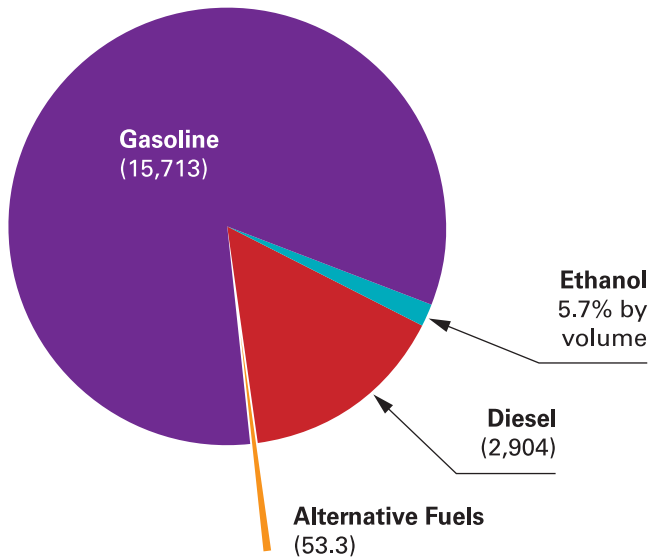
ists with nonpetroleum options when they refuel.

Accordingly, CalSTEP recommends the implementation of an Alternative Fuels Portfolio Standard (AFPS) that requires refiners to provide 10 and 20 percent of the state's transportation energy as alternative fuels by 2012 and 2020, respectively. An AFPS would establish a clear means by which the petroleum goals endorsed by two state agencies and the governor³ could be implemented and parallel the state's dynamic AB 32 Global Warming Solutions Act process.

The implementation of an AFPS would be modeled on the structure used to implement the more limited federal renewable fuels standards, which direct refiners to blend renewable fuels such as ethanol and biodiesel with petroleum fuels in order to reduce petroleum consumption and GHG emissions. CalSTEP believes that California should go beyond this directive and adopt a broader and more flexible AFPS that could include other nonpetroleum California Air Resources Board-approved alternative fuels and blends such as natural gas and propane. The AFPS, as opposed to the federal renewable fuels standards, is the approach of choice in Connecticut and Hawaii.

In addition to ensuring that the governor's previously outlined broad alternative fuel goals are met, an AFPS would give industry the flexibility to

³ In his response to the 2005 California Energy Commission Integrated Energy Policy Report, Governor Schwarzenegger asserted that the state should "adopt a goal of increasing 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."



Graph 2: California's Petroleum and Alternative Fuels Demand—2005 (millions of gallons)

California's dedicated alternative fuel infrastructure and use is small, displacing approximately 53.5 million of the nearly 19 billion gallons of petroleum consumed in 2005.

Source: California Energy Commission

choose the most cost-effective and expedient solutions that meet the standard's requirements while potentially providing motorists with a greater level of choice when they pull up to the pump. Furthermore, an AFPS allows time for resolving air pollution uncertainties associated with low-blend biofuels (progress is currently being made), but enables the goal to be met regardless of whether these uncertainties are resolved.

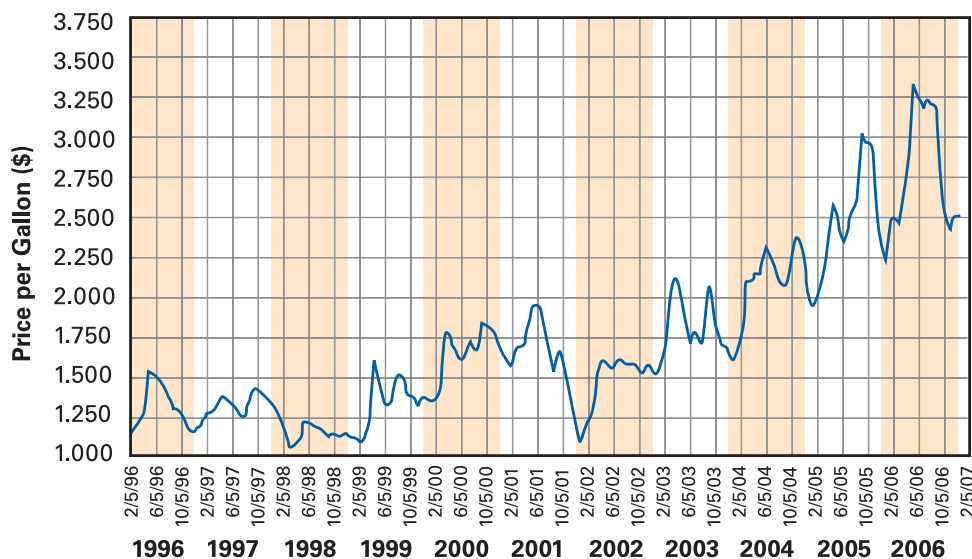
To facilitate the practicality of this requirement, the AFPS proposal would direct the California Energy Commission (CEC) to design and implement a credit trading program that allows obligated parties to comply with the AFPS standard through the purchase of tradable credits if they cannot or do not wish to blend or sell alternative fuels.

Market-based Energy Security Tax Relief and Realignment

CalSTEP believes that for significant progress to be made on fuel diversity and vehicular efficiency, Californians and the automobile industry need to have clear signals of the costs of fuel as well as access to markets that reward efficiency. Concurrently, California's governor and legislature will seek to develop market-based solutions to global warming to support the state's AB 32 Global Warming Solutions Act activities, as directed by Executive Order S-17-06.⁴ Accordingly, CalSTEP recommends that the state explore and implement an Energy Security Tax Relief and Realignment (ESTRR) program that would use market mechanisms and price signals to significantly increase the efficient use of petroleum and protect efficient-transportation capital investments while helping to satisfy both of the aforementioned goals.

Under ESTRR, the state would couple a revenue-neutral California Foreign Oil Security fee with a tax rebate or credits that would return all collected funds to all California taxpayers, who could use the money however they wish. The fee would be implemented if retail prices of petroleum fuels drop below an initial price floor of \$2 per gallon or the average price of fuel over the six months prior to implementation, whichever is greater, thereby stabilizing the price. This price floor would increase by \$0.01 per month for ten years to a maximum level of \$1.20 above the initial price floor, while each step of the way returning all collected funds to Californians. Alternatively, if it were easier to implement, the fee could be applied to barrels of oil at a level that stabilizes prices to refiners at an average of the price over the six months prior to implementation, and then raises it by 40 cents per barrel each month for ten years to approximate the per-gallon prices paid for petroleum fuels.

⁴ Among other things, S-17-06 calls for the creation of a Market Advisory Committee to make recommendations to the Air Resources Board on or before June 30, 2007, on the design of a market-based compliance program to support AB 32.



Graph 3: California Gasoline Prices 1996–2006

The rise and fall of gasoline prices in California creates an unpredictable investment environment for transportation capital.

Source: California Energy Commission

The Foreign Oil Security fee would provide stability to petroleum prices (see Graph 3) that has so often killed off investments in alternative fuels and efficient technologies. This price floor would also signal the long-term, steady increase in the cost of petroleum necessary for the automobile industry to justify investment in and speed the offering of more fuel-efficient vehicles, while protecting travelers by returning collected funds in the form of tax rebates or credits. The fee would not apply to alternative fuels, but motorists who use alternative fuels would receive the same tax rebates, thereby encouraging the use of such fuels. Altogether, CalSTEP believes this option would prompt automotive fuel efficiency gains across the board as well as spur the overall efficient use of fuel in existing vehicles, leading to annual savings of at least 2.9 BGGE and 29 million tons of GHG emissions in 2020⁵ while maintaining consumer choice and safety.

A growing chorus of bipartisan leaders and the public are rallying behind and voicing support for measures like ESTRR, including such luminaries as Alan Greenspan, N. Gregory Mankiw, and Andrew A. Samwick, among others. In fact, a Council on Foreign Relations independent task force chaired by John Deutch and

James R. Schlesinger mentioned a similar measure as a way to minimize the national security consequences of oil dependence. The public is looking for smart action on this issue, with as much as 59 percent in favor of an ESTRR-type measure to fight our oil dependence and increasing level of GHG emissions.

It is clear that significant progress on vehicular efficiency—progress that goes beyond the current national approach and that meaningfully assists the state in achieving its transportation energy and GHG goals—won't be achieved unless there is a significant increase in the introduction of efficient technologies in vehicles prompted by a decrease in some of these technologies' costs and greater public demand for efficient vehicles. For this reason, it is in California's interest to address these issues by adopting a market-based program like ESTRR to reduce petroleum use.

Smart Communities

Beyond vehicle technologies and fuels, it is essential that the state find ways to reward energy-efficient and climate-friendly land-use planning. California's current development patterns cause congestion and traffic that cost consumers and businesses approxi-

⁵ This number depends on how high the price floor is above normal retail petroleum fuel prices. This calculation assumes a price floor that is \$1.20/gallon above unadjusted retail price levels beginning in 2020 and a corresponding short-term petroleum demand elasticity of -0.25. A long-term petroleum demand elasticity of -0.6 indicates this measure would yield even greater petroleum and GHG reductions over time.



mately \$17 billion annually and result in more than 665 million gallons of wasted fuel per year. Unless significant changes are made in the way the state funds its transportation system, these problems will only increase as the state's population continues to grow.⁶

Accordingly, CalSTEP recommends that California establish a Smart Communities program that upgrades the state's transportation models so that the cost savings associated with energy-efficient and climate-friendly land-use planning can be fully realized. The recommended program takes a comprehensive approach that links new state infrastructure spending—such as that authorized in the recently passed Housing Bond and the Water Quality, Parks, and Conservation Bond—to the implementation of regional blueprints that will not only prevent sprawl, but will actively reduce the need to drive and cut the overall miles traveled by 10 percent over approximately twenty-five years.

A primary means of accomplishing this goal could be the greater use of smart growth, defined as a set of characteristics associated with well-designed transportation systems and land use that allows people to live closer to where they work and provides convenient transit options. Many communities, such as San Francisco, Atlanta, Portland, and Maryland, have already adopted smart growth strategies to significantly reduce the need to drive. Various reports cite the potential smart growth has to reduce the need to drive and save motorists fuel and other costs, which could add up to \$10 billion a year or more. The flexibility of the Smart Communities program would allow additional options that have demonstrated significant vehicle miles traveled (VMT) reductions to also be implemented to meet regional targets.

In all cases, funding priority under Smart Communities would be based on criteria including the expected level of VMT reduction. The state could even issue grades to regions and municipalities based on their VMT reduction plans, ranking those regions whose blueprints demonstrate the greatest level of VMT reduction highest. The program would be

administered by the Department of Business, Transportation, and Housing, the California Transportation Commission, and local councils of governments.

Supporting Actions

Each of these supporting actions complements and further enables the progress that can be made through the primary actions while leading to additional statewide economic, educational, and other benefits and reducing statewide petroleum consumption even if they are pursued independently.

California Alternative Fuels Infrastructure Partnership

CalSTEP recommends a California Alternative Fuels Infrastructure Partnership between the state government, automobile manufacturers, and fuel retailers that provides incentives for the concurrent rollout of alternative refueling stations and alternative fuel-capable vehicles.

This program would make state-sponsored financial support for a California Air Resources Board-approved dedicated alternative refueling infrastructure contingent upon vehicle population growth, thereby ensuring that alternative fuel vehicles (AFVs) won't be introduced without infrastructure development, and that the state won't waste money supporting infrastructure for nonexistent vehicles. This approach spreads the responsibility for alternative fuel development among the state, automakers, and fuel retailers, but recognizes and mitigates the financial risk that retailers take on.

The program would provide a state grant averaging \$50,000 for a specific alternative fuel's infrastructure development whenever 6,000 vehicles, on average, that can run on the fuel are sold in the state, with a cap in total funding of \$9 million per year over ten years. The goal is to match a sufficient quantity of alternative fuel stations with vehicles by 2020 to make a tangible difference in petroleum and GHG reduction and help establish a business case that encourages fuel retailers to continue adopting

⁶ California's population is predicted to grow nearly 40 percent by 2025.



alternative fuels even after the subsidies run out. Incentives for early station adoption and vehicle production are provided by front-loading the program.

If fully exercised, this program would help promote the creation of 1,800 alternative fueling stations and 11 million alternative fuel-capable vehicles, totaling approximately 20 percent of the transportation refueling infrastructure and approximately 33 percent of the state's light-duty vehicle fleet by 2020.

California Renewable Fuel Production Initiative

CalSTEP recommends a California Renewable Fuel Production Initiative that overcomes barriers to in-state conventional and advanced renewable fuel production and feedstock use, thereby promoting industry growth and economic prosperity as the state increases its renewable fuel consumption.

Under this program, the state would create (and the CEC would administer in coordination with the Department of Food and Agriculture and Integrated Waste Management Board) \$20 million worth of competitive research and outreach grants over five years focused on high-priority areas and objectives that overcome the key barriers to sustainable production of renewable transportation fuels from crops and waste sources in California.

This program also would direct the state to mirror a program initiated by New York Governor George Pataki that jump-starts advanced renewable fuel production from in-state resources by providing up to \$20 million to as many as four applicants or teams of applicants that successfully demonstrate the technical, financial, business, and organizational capability to construct a pilot-scale or first-production scale enzymatic-hydrolysis, gasification lignocellulose-to-ethanol, or biomass-to-liquid facility that utilizes in-state plants and materials. Recipients must use the information derived from their facilities' operation to develop commercial-scale production facilities.

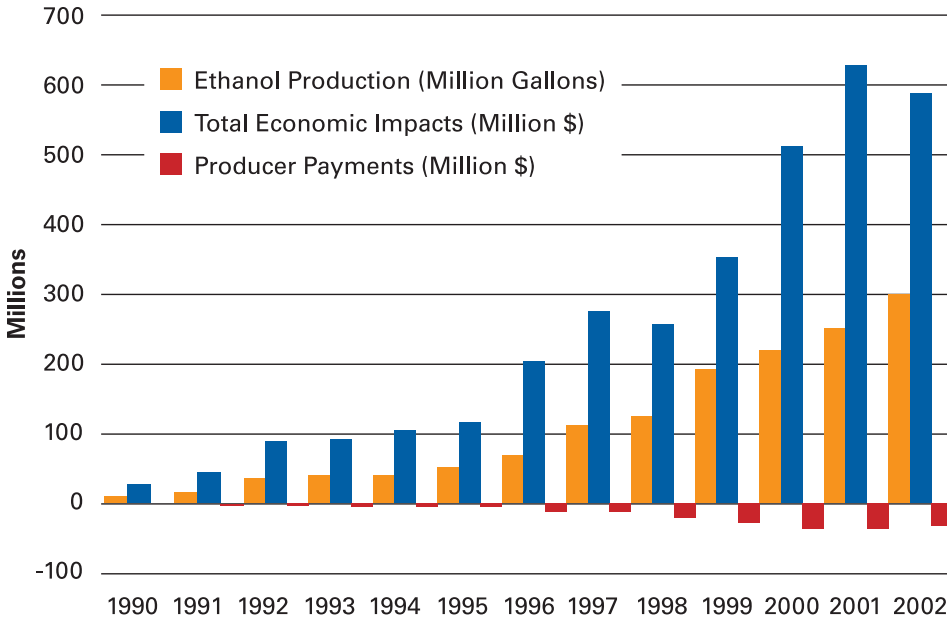
Such a California-based program would harness the state's ability to overcome first-mover risks asso-

ciated with early advanced renewable fuel production from in-state feedstocks and solve early production problems and logistics, both of which are necessary before investors can be expected to commit large-scale capital. While not directly responsible for reductions in petroleum use or GHG emissions, the California Renewable Fuel Production Initiative would complement and augment CalSTEP's other alternative and renewable fuel-related programs. A future action incorporated into this program could be financial incentives for use of in-state feedstocks from underutilized land or waste resources. Incentives could be production tax credits or even abatement for biofuel growers or biorefinery operators on the proportion of the fuel they produce from these preferred feedstocks.

California can expect significant economic benefits from helping to develop an in-state renewable fuels industry.

The state that took the most aggressive action to develop its own renewable fuels, Minnesota, today receives a sixteen- to twenty-fold return on investment for its ethanol program (see **Graph 4 on page 10**).⁷ Its drive to greater use of renewable fuels led or is leading to the creation of dozens of plants that produce over 600 million gallons each year, as much as \$1 billion in output, as many as 5,000 jobs, and over \$1.3 billion in net annual benefit to the state. California can follow this same path: A CEC report states that, at 2005 consumption levels, a California ethanol industry alone would create approximately 8,000 jobs and provide statewide economic benefits of \$5 billion over a twenty-year period.

⁷ For every \$1 paid for ethanol producer incentive payments, the state receives \$16 to \$20 in economic impact.



Graph 4: Minnesota Ethanol Production, Producer Payments, and Economic Impacts

As of 2001, Minnesota not only had met its ethanol needs, but also had become a net exporter of the fuel.

Source: Minnesota Department of Agriculture

State Fleet Leadership Challenge

CalSTEP recommends that the state issue a State Fleet Leadership Challenge whereby the state would live up to the spirit of the federal Energy Policy Act, use its formidable buying power to expand market size, and lead others to reduce petroleum consumption by 20 percent by 2020 by setting an example with the state fleet.

Based on a similar challenge issued by North Carolina, this program prescribes a goal—not the methods for achieving the goal. The advantage of such a structure is that a variety of methods can be utilized. The state can meet the target by fuel swapping, blending renewable fuels with petroleum fuels, adopting AFVs, phasing in more fuel-efficient vehicles, or some other innovative method. The state has ample opportunity to reduce its petroleum consumption, given the fact that of California’s over 5,200 alternative fuel-capable vehicles in the 2002 state fleet, only 63 (1.2 percent) were fueled with alternative fuels, leaving the remaining 98.8 percent to be fueled with conventional gasoline.

By taking a leadership role, state fleets are not only using their formidable purchasing powers to expand markets, but are actively engaged in the search for creative and cost-effective techniques for reducing petroleum consumption.

If North Carolina can employ these methods and set a goal for 2010, surely California can adopt the goal of 20 percent petroleum-use reduction by 2020.

This program can extend itself by serving as a beacon and a challenge to county and municipal fleets, many of which purchase vehicles based on a state specification, and eventually to private fleets, including those doing business with the state.

New Transportation Future and Revolving Loan Programs

CalSTEP recommends an increase in state-level investment in vehicle technologies that can reduce vehicular petroleum consumption and GHG emissions while making the air cleaner. California must serve as a leader and encourage industry innovation, which such investment would demonstrate. Specifically, CalSTEP recommends the creation of:



- A \$140-million-per-year New Transportation Future program that provides competitive grants and/or creates inducement prize competitions focused on facilitating the commercialization of advanced, low-GHG transportation technologies and fuels that reduce oil consumption and overall emissions in light-, medium-, and heavy-duty vehicles, while also providing assistance for these technologies' adoption.
- A \$25 million low-interest revolving loan or loan guarantee fund to reduce heavy-duty vehicle (Classes 3–8) petroleum consumption and GHG emissions.

This program recognizes that there is a shortfall of public investment in advanced transportation technologies and that continued leadership is needed for all types of vehicles, including light, medium, and heavy duty, to overcome risks and speed development. It creates a New Transportation Future program that would invest \$70 million per year in competitive grants for research, development, and demonstration of these technologies. By ranking grant applications based on the level of petroleum and GHG and other emissions reduced per dollar invested, these competitive grants would replicate the success of the current Carl Moyer program (which has become famous for its cost-effective reduction of criteria pollutant emissions), in the area of petroleum and GHG reduction and on a broader scale by applying it to light-, medium-, and heavy-duty vehicles. If the track record of the Moyer program is a guide, a similar program focused on transportation energy and GHG emissions would provide cost-effective petroleum and GHG reductions while utilizing technologies capable of rapid deployment.

A portion of the funds allocated under this program could be used to initiate a series of high-profile inducement prize competitions and/or a series of smaller targeted competitions that identify criteria for meeting goals and targets (including product characteristics and sales requirements) and then reward winners that achieve the goals with a cash prize and/or advanced market commitments. This

model could be used to overcome numerous large and small barriers to reducing petroleum consumption and spurring alternative fuel use in California. Benefits could include:

- The creation and deployment of efficient transportation technologies and vehicles;
- The production and sale of various alternative fuels or fuel-related technologies;
- The creation and deployment of mass transportation technologies and platforms;
- The demonstrated reduction of various communities' need to drive;
- Positive national media exposure; and
- Increased private investment in California companies.

Inducement prize competitions have a long track record of spurring innovation. For example, the 1927 Orteig Prize prompted Charles Lindbergh's solo flight across the Atlantic Ocean and revolutionized modern aviation; the 2004 Ansari X PRIZE revolutionized personal space flight; and NASA's Centennial Challenges will provide a total of \$250 million to generate innovative solutions to space technology problems. Inducement prize competitions also regularly demonstrate superior cost-effectiveness, leveraging as much as a 50:1 private/public investment ratio.

Whether a competitive Moyer-like grant or an inducement prize competition is employed, the prime contractors or recipients of the investments allocated under the New Transportation Future program would be California companies, universities, and/or nongovernmental organizations and their partners.

The New Transportation Future program would provide \$70 million per year for incentives to adopt climate-friendly transportation technologies, such as dramatically more fuel-efficient vehicles, technologies spurred by the inducement prize competitions, and incentives to build alternative refueling stations (as described in the California Alternative Fuels Infrastructure Partnership). The funding could include incentives similar to those offered by the



Environmental Protection Agency's (EPA) Smart-WaySM program to reduce heavy-duty vehicle fuel consumption and GHG emissions.

Because heavy-duty vehicle operators can receive a direct financial payback by adopting efficiency-enhancing technologies, CalSTEP recommends the creation of a \$25 million revolving low-interest loan program to complement the New Transportation Future program and assist with the further adoption of these technologies. Under this program, any heavy-duty vehicle owner or operator, including fleets and independent operators, would be eligible to apply for funding. Such a program could be particularly helpful to independent truck operators, who usually purchase new trucks from fleets once the trucks are about five years old and then drive them for another twenty years or so.

Energy Independent Vehicle Labeling Program

CalSTEP recommends the creation of a voluntary vehicular labeling program that quickly and clearly informs shoppers about new low-petroleum/GHG vehicles at dealerships, thereby educating people about, increasing the demand for, and prompting manufacturers to produce more of these types of vehicles. This label would provide quick and easy identification of those vehicles that meet established efficiency and GHG-reduction goals.

Repeatedly, "green" labeling has effectively curbed the purchase and use of products that are associated with various social issues or encouraged the purchase

and consumption of those products that are more socially desirable. Some notable examples include the "dolphin safe" tuna label, the EPA's Energy Star[®] label, and the Forest Stewardship Council's seal of approval. The Energy-Independent Vehicle Labeling program would parallel these efforts by creating a single qualifying label with two grades: A Platinum label, which focuses on a vehicle's absolute GHG emissions and oil consumption, and a Gold label, which focuses on a vehicle's relative emissions and consumption by footprint size. This dual-grade labeling approach encourages people to drive the most energy-independent vehicles on the road, or encourages them to select the most energy-independent vehicles that meet their needs.

It's important to note that the program establishes a standard that increases over time. Every vehicle could achieve this standard; there is no limit on the number, as long as vehicles meet the pre-established goal for each model year.

The success of this program largely depends on the design and differentiation of the logos, plus consumers' knowledge of their existence and subsequent understanding of their meaning. To begin addressing these issues, the state would hold a design competition for the labels as part of the program's initial launch and publicity campaign. Such a competition has precedent in California: In 2002, the state challenged its residents to come up with a design for the state quarter. Over 8,000 people submitted designs (see **Picture 1**) within three months, from which



Picture 1: State Quarter Design Competition Submissions

Within three months, the state quarter design competition generated over 8,000 submissions, from which a winner was selected. CalSTEP believes a vehicular labeling design competition could achieve even better results.

Source: <http://www.quarterdesigns.com/proposed/californ.html>



a twenty-member commission selected the ultimate winner. A vehicular labeling design competition could achieve even better results by generating awareness of the problems of GHG emissions and oil dependence, enthusiasm for addressing them, superior out-of-the-box designs, publicity, and a grass-roots source for the designs' origination.

Automakers would have the option of whether to affix labels to their vehicles that are recognized under the program, but would most likely do so in order to associate their vehicles with the superior performance standards of the program and the labels' growing prestige.

Neighborhood Planning Revolving Loan and Transit Use Assistance Program

Like other CalSTEP programs, the Smart Communities program is inherently flexible. The focus of the program is VMT reduction, but it allows regions to determine their preferred method. The program also seeks to provide multiple tools to achieve the outlined goals. Accordingly, CalSTEP proposes a Neighborhood Planning Revolving Loan program, to be administered by the Department of Housing and Community Development, which will assist with the preparation and implementation of regional blueprints that meet the Smart Communities program goal of reducing driving by 10 percent.

The state's creation of a revolving loan fund that is replenished by the fees developers would have paid for project-level environmental impact reviews (EIRs) provides communities with the resources for programmatic rather than parcel-only planning, but without costing developers more money or time. Such planning would help account for the ways in which properties and neighborhoods interact, adjust for driving increases, and streamline the process by which developers can obtain approval to implement smart growth development.

By developing overall plans for blocks of properties in advance, communities can streamline the development process while maintaining neighborhood goals. Developers would pay back the costs of the planning as part of their existing fees for devel-

oping properties within the blocks.

At a funding level of \$20 million per year for five years, the state would help overcome the largest barrier to community planning on a programmatic level and, at its fully funded level, enable more than thirty concurrent programmatic EIRs, thereby significantly assisting with smart growth development.

Finally, because of the significant petroleum and GHG reduction potential of public transportation, CalSTEP also proposes that the state examine and offer incentives that spark greater use of public transit, and take steps in this area to further align state spending with the goal of reducing the need to drive. Such incentives and alignment actions could include tax incentives for employer-sponsored transit commute programs, the establishment of privately funded amenities to public transit development projects, the construction of thoroughfares designed for multiple transportation modes, and the location of state-funded buildings close to public transit.

Usage-Based "Pay As You Drive" Insurance

Typical automotive insurance rates are fixed, often poorly reflect how many real-world miles a motorist drives, and fail to provide incentives for motorists to reduce their amount of driving. Usage-based automotive insurance, however, recognizes actual miles driven and reduces premiums for motorists who drive fewer miles than their plans allow. This type of insurance is also known as "pay-as-you-drive," and it can be a powerful incentive to reduce driving by providing a financial reward to motorists who do so.

Various regions are taking steps to enable usage-based automotive insurance. Cities such as Philadelphia; states such as Oregon, Massachusetts, and Minnesota; and countries such as the United Kingdom realize the benefits of usage-based insurance. These benefits include providing incentives to reduce VMT due to savings of \$50 to \$100 or more on motorists' insurance premiums as well as a 12- to 15-percent reduction in vehicle crashes.

CalSTEP recommends modifying the California Code of Regulations to permit insurance providers



to implement voluntary programs and technologies that more accurately track vehicular mileage, and to provide these insurers with the authority to offer discounts based on the adoption of such programs, the reporting of miles traveled, and the reduction of VMT. Such action would allow companies that are currently offering usage-based auto insurance policies, such as Progressive Insurance and GMAC Insurance, to offer such policies in California. It would also, through competition, encourage other automotive insurers to develop and implement usage-based policies, thereby allowing participating drivers to keep more money in their pockets should they decide to drive less.

While petroleum will remain an important component of California transportation fuels into the future, using it more efficiently, increasing the availability of alternatives, and reducing the overall need to drive will buffer the state from dependence on unpredictable and unstable foreign sources of energy, expand its economic opportunities, and improve Californians' quality of life.

In the future, after insurance providers' and motorists' responses to these modifications to the California Code of Regulations can be gauged, the state could explore providing incentives to entice insurance companies to offer consumers a choice between time-based and mile-based premiums.

Net Outcome: A Stronger Economy through Reduced Oil Dependence and Higher Efficiency

Taking these actions requires leadership and a long-term vision for the state. Yet the benefits are tangible, significant, and long lasting.

While petroleum will remain an important component of California transportation fuels into the future, using it more efficiently, increasing the availability of alternatives, and reducing the overall need to drive will buffer the state from dependence on unpredictable and unstable foreign sources of energy, expand its economic opportunities, and improve Californians' quality of life.

The individual pursuit of each of these components can seem daunting. However, comprehensively addressing them rather than implementing a piecemeal vision will have a positive impact on the system in which they operate and maximize the benefits to the state.

Such a comprehensive approach takes the shape of market-based mechanisms that reward efficiency and diversity as well as investments that benefit the state's industry and consumers while meeting the overall goals. By committing itself to this longer-term approach, California can create a different atmosphere in 2020 than the one it faces today, and create a model that other states and the nation can follow.

Rather than supply constraints, price volatility, and petroleum dependence, California can instead create diversity of choice and greater economic growth, and it can demonstrate the benefits of efficiency and clean fuels for both greater security and a sustainable environment.

Table of Outcomes and Benefits

Recommended Actions	Outcomes in 2020	Annual BGGE Petroleum Reduction	GHG (Millions of Tons/Year) Reduction
Primary Actions	15% less petroleum consumed (from 2003 levels); 20% of all transportation fuel in California is from alternatives	76	62
Alternative Fuels Portfolio Standard	20% of all transportation fuel in California is from alternatives	2.9	15
Market-based petroleum reduction through ESTRR	Petroleum fuels are used more efficiently due to an increasingly fuel-efficient vehicle population and incentives to use existing vehicles more efficiently	2.9	29
Smart Communities	VMT reduced by 10%	1.8	18

Supporting Actions (within Categories)			
Diversify the state's fuel supply	California Alternative Fuels Infrastructure Partnership	20% of all transportation fuel in California is from alternatives	1 BGGE on its own
	California Renewable Fuel Production Initiative		Goal enabler, economic growth driver
Improve vehicular efficiency	State Fleet Leadership Challenge	Petroleum fuels are used more efficiently due to an increasingly fuel-efficient vehicle population and incentives to use existing vehicles more efficiently	Enabler; education tool
	New Transportation Future and Revolving Loan programs		0.3 on its own
	Energy-Independent Vehicle Labeling		Enabler;
Reduce the need to drive	Neighborhood Planning Revolving Loan and Transit Use Assistance program	VMT reduced by 10%	1.8*
	Usage-based "pay as you drive" insurance		

*These actions support the overall reduction





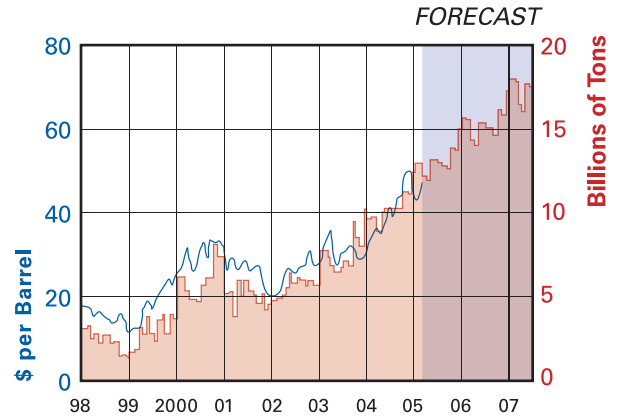
California Can Secure Its Transportation Energy Future

Increasing competition for global oil, a strained economy and increasing trade deficit, limited refining capacity, and growing dependence on imported oil that strengthens undesirable regimes around the world all lead to an urgent need for action to secure California's transportation energy future.

Transportation energy security is a goal and responsibility that is typically thought of as one that should be pursued by the federal government. However, with these associated problems, and a national dependence on foreign oil that has climbed from 40 to 60 percent since President Richard Nixon's 1973 Project Independence was announced,⁸ this goal and responsibility is falling on other shoulders. In the absence of federal leadership, California has stepped up to define the parameters of such a goal; and it has forty years of precedent to indicate that not only will pursuing this goal be successful, but also that it can lead the rest of the nation to follow its path.

The CEC and Governor Schwarzenegger have already established the urgent need and feasible targets for petroleum reduction to protect the state from energy supply and price risks. Yet there are other reasons for and benefits to reducing petroleum consumption. By significantly increasing its transportation energy efficiency and diversifying its transportation fuel sources, California would support or fully achieve its adopted transportation energy security and AB 32 GHG goals, follow precedent established by its successful stationary energy programs, create a "California advantage" to buffer the state against the negative consequences associated with an excessive reliance on oil, and help grow the economy through new technologies and fuels in which the state can be a worldwide leader.

The Current Transportation Energy Outlook: A Need for Action



Increased Chinese Demand Helps Drive Up Worldwide Oil Prices

Source: UBS, reprinted in *The Economist*

The world is consuming ever-greater quantities of oil. Thanks to the United States' high and increasing consumption as well as a steady and significant increase in demand from emerging economies such as China and India, overall demand for transportation energy over the next twenty years is expected to increase by more than 50 percent.⁹ California is a part of this problem: In 2004 California drivers paid \$35 billion to travel 330 billion miles and consumed 18.1 billion gallons of fuel.¹⁰ Over the long term, this increase in demand from California and elsewhere, will inflate the price of oil, which will weaken California's economy.

This problem could be significantly compounded if geologists' global "peak oil" predictions come true. A recent report supported by the U.S. Department of Energy states that peak oil production, which is the singular event indicating the halfway point of the entire planet's oil production, could come within five years, and almost certainly will come by 2020; after that, production will inexorably decline.¹¹ This report warns that the world should be spending \$1 trillion each year to develop alternative energy sources and avoid peak oil's associated

⁸ Energy Information Administration

⁹ Annual Energy Outlook 2005. Energy Information Administration. DOE/EIA-0383(2005) February 2005.

¹⁰ Navai, Reza. State's Perspective on Land Use, Transportation, Energy/Greenhouse Gas Emissions Connection. Presentation delivered to the CEC IEPR Workshop, September 22, 2006. [Online] http://energy.ca.gov/2007_energypolicy/documents/2006-09-22_workshop/presentations/Navai.pdf

¹¹ Hirsch, Robert L., et al. Peaking of World Oil Production: Impacts, Mitigation, and Risk Management. February 2005. And Hirsch, Robert L., et al. Economic Impacts of Liquid Fuel Mitigation Options. National Energy Technology Laboratory. Department of Energy. May 2006.



crippling economic effects and resulting chaos.¹² Some speculate that the production of light, sweet crude oil, the type most favored by oil refiners, may have already peaked and now must be replaced by more expensive and harder-to-extract sources. The results of this prognosis include uncertain and tight levels of worldwide petroleum supplies and further price volatility.

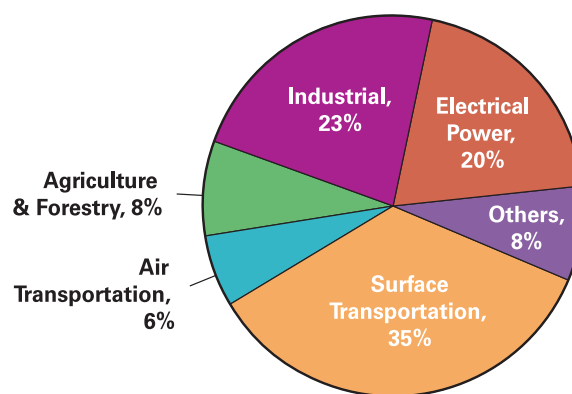
Excessive consumption, peak oil, and high and volatile prices are prompting an international race to discover and develop new oil fields. California already imports over 40 percent of its oil,¹³ which sends a significant portion of its money overseas, expands the state's trade deficit, weakens its economy, and often helps support regimes such as those in Saudi Arabia, Venezuela, Russia, and Iran¹⁴ that are either politically unstable, hostile to the United States, undemocratic, or a combination of the above.

Furthermore, nations that aren't bound by human rights considerations, such as China, are dealing with and investing in unstable and undemocratic countries, such as Sudan. Because of the globalized nature of the oil industry, such a trend to utilize oil from unstable and undemocratic countries magnifies the United States' and California's vulnerability, geopolitical positioning issues, and support of questionable regimes. In fact, an independent task force established by the U.S. Council on Foreign Relations recently came to the stark conclusion that "the lack of sustained attention to energy issues is undercutting U.S. foreign policy and national security."¹⁵

Another result of this race to discover and develop new oil fields is the rapid development of nontraditional hydrocarbons, such as oil shale and sands. At first glance this may appear to be a positive result, given that the United States has the world's largest reserves of oil shale and Canada has

close to the world's largest reserves of oil sands.¹⁶ Transportation energy from these sources therefore reduces the flow of money to geopolitically undesirable and unstable parts of the world. However, there are real problems with obtaining energy from these nontraditional hydrocarbons. Because these fuels come in the form of semisolid mixtures of bitumen, clay, sand, and water, or in the form of rocks rich in organic material, tremendous amounts of energy and resources are required to process them and yield petroleum. It takes about 1,200 cubic feet of natural gas and two to four barrels of water to produce one barrel of synthetic oil from two tons of oil sand.¹⁷ Furthermore, the extraction of these fuels through surface mining can leave permanent scars on landscapes and vegetation.

Oil shale and sands production is also a significant source of GHG emissions. A recent report from Canada's Office of the Auditor General stated that oil sand operations' contribution to annual



Graph 5: California's 2002 Total CO₂ Emissions from Fossil Fuel Consumption (360 million metric tons)

Source: California Department of Transportation

¹² Ibid.

¹³ CEC. [Online] http://www.energy.ca.gov/gasoline/gasoline_q-and-a.html

¹⁴ According to the Central Intelligence Agency's The World Factbook, Saudi Arabia, Venezuela, Russia, and Iran together have approximately 40 percent of the world's proven oil reserves.

¹⁵ National Security Consequences of U.S. Oil Dependency. Council on Foreign Relations. October 12, 2006: p. 9.

¹⁶ The United States has 3.3 trillion tons of oil shale deposits, and Canada has between 1.7 and 2.5 trillion barrels of oil reserves in the form of tar sands.

¹⁷ Canadian National Energy Board. Canada's Oil Sands: Opportunities and Challenges to 2015: An Update June 2006. [Online] http://www.neb-one.gc.ca/en-energy/EnergyReports/EMAOilSandsOpportunitiesChallenges2015_2006/EMAOilSandsOpportunities2015QA2006_e.htm. And Government of Alberta. Department of Energy. What is Oil Sands? [Online] <http://www.energy.gov.ab.ca/100.asp>



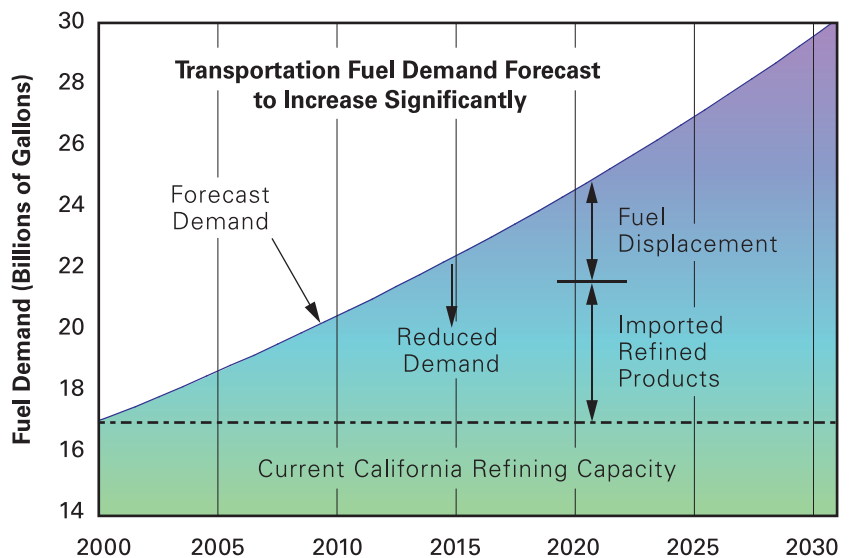
GHG emissions could double between 2004 and 2015.¹⁸ And even without the increased production of synthetic oil from oil shale and sands, excessive consumption of fossil fuels is the leading source of GHG emissions. In California, transportation fueled almost entirely by petroleum fossil fuels is responsible for approximately 41 percent of the state’s overall GHG emissions, as indicated in **Graph 5 (page 17)**.¹⁹

If current growth trends continue, gasoline use and related CO₂ emissions in the state will increase approximately 40 percent over the next twenty years.²⁰ Under a business-as-usual scenario, the global warming effects will particularly affect Californians’ way of life. Global warming is expected to have adverse impacts upon the state’s water supplies, the Sierra snowpack, and agriculture and food production. In addition, it is expected to cause significant increases in pestilence outbreaks, a projected doubling of catastrophic wildfires, and damage to the state’s extensive coastline and ocean ecosystems.²¹ If no major actions are taken to reduce GHGs, the state can also expect higher food, water, energy, insurance, and public health costs. In addition, global warming is expected to create significant environmental damage to the state and could result in the loss of many species.²²

California’s newly enacted AB 32 process calls for significantly reduced GHG emissions from

all sectors. A secure transportation energy future can make significant contributions to this process by decreasing transportation’s share of GHG emissions. This effort can help protect the economy: The recently released Stern Review report, *The Economics of Climate Change*, commissioned by the British Government, estimates that while the cost of GHG stabilization could be 1 percent of global gross domestic product (GDP) by 2050, the dangers of inaction could be equivalent to 20 percent of global GDP or more.²³

Excessive consumption, peak oil, high and volatile fuel prices, and GHG emissions are all sources of actual or potential economic destabilization in California. Yet another contributing factor is the demand for finished product (i.e., gasoline and diesel fuel), the production of which requires oil refinement. California’s lack of spare refining capacity and the gap



Graph 6: California’s Refining Capacity Is Maxed Out, Gasoline Imports Make Up for Supply Shortages

Source: California Energy Commission

¹⁸ 2006 Report of the Commissioner of the Environment and Sustainable Development. Office of the Auditor General of Canada. September 28, 2006: Chapter 3, p. 19.
¹⁹ CEC. Inventory of California Greenhouse Gas Emissions and Sinks: 1990–2004. Publication # CEC-600-2006-013. 2004.
²⁰ Navai, Reza. State’s Perspective on Land Use, Transportation, Energy/Greenhouse Gas Emissions Connection. California Department of Transportation. Presentation delivered to the CEC IEPR Workshop, September 22, 2006. [Online] http://energy.ca.gov/2007_energypolicy/documents/2006-09-22_workshop/presentations/Navai.pdf
²¹ California Air Resources Board.
²² Ibid.
²³ Stern, Sir Nicholas. *The Economics of Climate Change. The Stern Review.* Cabinet Office – HM Treasury, United Kingdom. October 2006.



between California's refining capacity and demand (see Graph 6), which will expand considerably over the coming decades, adds another degree of insecurity to this market. This situation is currently remedied by the importation of refined products.²⁴ However, should a California refiner or an out-of-state supplier experience difficulties and be taken offline, California's economy could suffer significantly. Tankers would have to ship gasoline from the half-dozen refiners around the world that can produce the state's clean-burning gasoline, a process that takes seven to ten days at a minimum.²⁵ Graph 6 illustrates that, under a business-as-usual scenario where no action is taken to reduce California's oil consumption, this problem is poised to grow worse over time.

Under business as usual, the oil industry would need to devote between \$8 billion and \$18.6 billion worth of petroleum infrastructure to meet the state's additional transportation fuel demand solely from petroleum sources.

The state's limited refining capacity also illustrates that the business-as-usual pathway does not imply little or no additional costs. Under business as usual, the oil industry would need to devote significant petroleum infrastructure, totaling approximately 323 million barrels of refining capacity, if it wished to meet the state's estimated transportation fuel

demand of 23 billion gallons per year in 2020 solely from petroleum sources. The value of this capacity, either within California or elsewhere, could range between \$8 billion and \$18.6 billion.²⁶ Therefore, any considerations about whether to move forward with aggressive petroleum reduction policies should, at a minimum, be weighed against this cost.

The State's Stationary Energy Model: Diversify and Consume Efficiently

When faced with energy challenges on the stationary side, the state applied a straightforward strategy: Diversify and consume efficiently. Today, California is powered by the most diverse electricity fuel sources in the world, including natural gas, coal, hydroelectric, nuclear, and a significant amount of renewables such as wind. This diversification is the result of effective policies and public investment. One policy example, known as a public goods charge (PGC), created a fund of more than \$690 million per year fund that the state uses to invest in energy efficiency measures, renewable energy, and research and development projects that play large roles in the efficient growth and diversification of the state's energy supplies. This fund specifically targets adding renewable energy sources to the state's supply. In fact, it provides over \$140 million each year to do so.

The PGC's renewable energy target is augmented by the state's Renewables Portfolio Standard (RPS), which is another example of effective policy. This standard requires that all major utilities in the state generate at least 20 percent of their total electric supply portfolio from renewable sources by 2010. This requirement could result in the procurement of up to an additional 20,000 or more GWh of renewable energy each year.

California's leadership on energy policy and diversification has helped Californians' per-capita use of electricity remain more or less constant over the past thirty

²⁴ Currently, California imports more than 10 percent of its gasoline.

²⁵ CEC. Questions and Answers: California Gasoline Price Increases. [Online] http://www.energy.ca.gov/gasoline/gasoline_q-and-a.html

²⁶ State refineries currently refine 730 million barrels/year. Assuming a 52 percent conversion rate for crude oil into gasoline, the state will need 1.05 billion barrels/year of refining capacity to meet its business-as-usual 23 BGGE/year scenario, yielding a refining capacity shortfall of approximately 323 million barrels/year, or 885,000 barrels/day. The National Petrochemical Refiners Association estimates the cost of expanding capacity at existing refineries, and \$21,000 per barrel/day to build new refineries, yielding a total required state refinery investment between \$8 billion and \$18.6 billion.



years, while use has grown by 50 percent nationally. Accordingly, Californians have saved more than \$20 billion in electricity and natural gas costs since the PGC and RPS were established, a number that is predicted to climb an additional \$57 billion by 2011. One can predict that an increase in transportation efficiency measures that focus on diversifying California's transportation energy sources and increase the use of preferred fuels would contribute to this effect.

California Adopts Transportation Energy and AB 32 GHG Goals

California already has in place goals and legislation that can provide the framework for development of a diverse, efficient, and secure transportation energy model.

In 2000, the California legislature passed AB 2076.²⁷ This legislation directed the CEC and the Air Resources Board (ARB) to investigate and develop recommendations for the governor and the Legislature on a California strategy to reduce petroleum dependence. Based on this evaluation, they recommended that California adopt a policy to, by 2020, reduce petroleum use by 15 percent and increase use of alternative fuels to 20 percent (compared with 2003 levels). The process of transportation energy analysis and review related to these goals continues through Integrated Energy Policy Reports (IEPRs) released every other year by the CEC.

In Governor Schwarzenegger's response to the 2005 IEPR, he expressed his agreement that the state "should improve vehicle efficiency and diversify fuels." In particular, he asserted that the state should "adopt a goal of increasing 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" and expressed his particular support for state fleet leadership on this issue and programs that inform and educate consumers on vehicular efficiency techniques.

The California legislature also passed and the governor signed the Global Warming Solutions Act²⁸ in early fall 2006. This act establishes a first-in-the-world comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of statewide GHG emissions. It codifies the governor's previously expressed goal by requiring the state's global warming emissions to be reduced to 1990 levels by 2020, which represents a 25 percent reduction below business as usual.²⁹ The Act can apply to a wide range of GHG sources and will most likely help drive the use of innovative, low-carbon methods of energy production such as renewable approaches. One thing is certain: If the state is to meet this ambitious AB 32 GHG goal and the IEPR goals, transportation energy diversity and efficiency will have to play a significant role.

The State Can Once Again Lead the Nation

More than forty years of leadership and precedent indicate California not only can succeed in securing its transportation energy future without waiting for federal action, but also can reap multiple benefits by doing so and prompt the rest of the nation to follow its lead.

Because of California's severe environmental problems and historical actions to address them, the state was granted a waiver under the 1970 Clean Air Act that allows it to pursue clean air policies that are more aggressive than the federal government's. Since then, California has repeatedly passed automotive standards that exceed federal standards and set the model for national action.

In the 1960s, California's actions to control automotive pollution prompted the federal government not only to set automotive emission standards, but also to model them after the state's. This demonstration of leadership was repeated in the early 1990s and again in the late 1990s when, frustrated by a

²⁷ AB 2076, Shelley, Chapter 936, Statutes of 2000

²⁸ AB 32, Nunez and Pavley, Chapter 488, Statutes of 2006

²⁹ California Air Resources Board. AB 32 Fact Sheet. [Online] <http://www.arb.ca.gov/cc/factsheets/ab32factsheet.pdf>



lack of federal action, a handful of northeastern states adopted California's Low Emission Vehicle 1 and 2 programs, an action that prompted the creation of the National Low Emission Vehicle program and eventually the stringent Tier 2 national program, which significantly reduced vehicular emissions and air pollution nationwide.

One of California's influential acts regarding automotive standards was passed in 2002. Dubbed the Vehicle Global Warming Law,³⁰ this legislation places caps on average fleet vehicular GHG emissions. While the regulation is currently facing legal challenge, California's leadership was once again demonstrated by the fact that ten other states, representing one-third of the U.S. population, adopted this program. If previous experience serves as an indicator, one might predict that it's only a matter of time until the federal government implements a similar national program.

Other examples of independent California action and leadership are plentiful. In the late 1980s, Governor George Deukmejian signed the California Clean Air Act and the ARB approved the reformulated gasoline program, paving the way for federal adoption of the Clean Air Act Amendments and a national reformulated gasoline program in the early 1990s. California also leads the nation on appliance efficiency, building efficiency, coastal protection standards, and, as previously mentioned, stationary energy policy.

Today, the state is establishing partnerships around the country and the world in order to meet its AB 32 GHG goals. In October 2006, Governor Schwarzenegger announced that he will work with New York and other eastern states to create markets to cut GHG emissions. In August 2006, the governor signed an agreement with British Prime Minister Tony Blair to collaborate on technologies, scientific development, and the creation of market-based mechanisms as well as to engage rapidly grow-

ing countries such as China and India in combating global warming. Clearly, Governor Schwarzenegger is following California's tradition of environmental and energy leadership.

Solutions Are Ready to Go, Can Support a "California Advantage"

With such a track record, California is ideally situated to aggressively pursue a comprehensive transportation energy policy, to reap the "early adopter" rewards commonly associated with first-mover status, and to shape a national transportation energy policy in its vision. Fortunately, California doesn't have to wait for technological solutions or "silver bullets" to be discovered before it moves forward with its transportation energy security goals. The solutions that can make a difference are here today and ready to go, and their increased use can inoculate and grow California's economy while buffering the state against the negative consequences associated with an excessive reliance on oil, thereby establishing a "California advantage."

The solutions that can make a difference in the 2020 time frame range from conventional vehicular technologies that can be improved with relatively minor and inexpensive modifications to more advanced solutions such as the following: Hybrid electric systems that combine conventional fuel engines with electric motors for superior efficiency; renewable fuels that are produced from organic matter like crops and waste material; natural gas that comes from North America and reduces GHG emissions by over 20 percent compared with gasoline; smart growth development that builds more efficient ways to live; advanced transit technologies like Bus Rapid Transit that creates stylish "rails on wheels"; and many others.

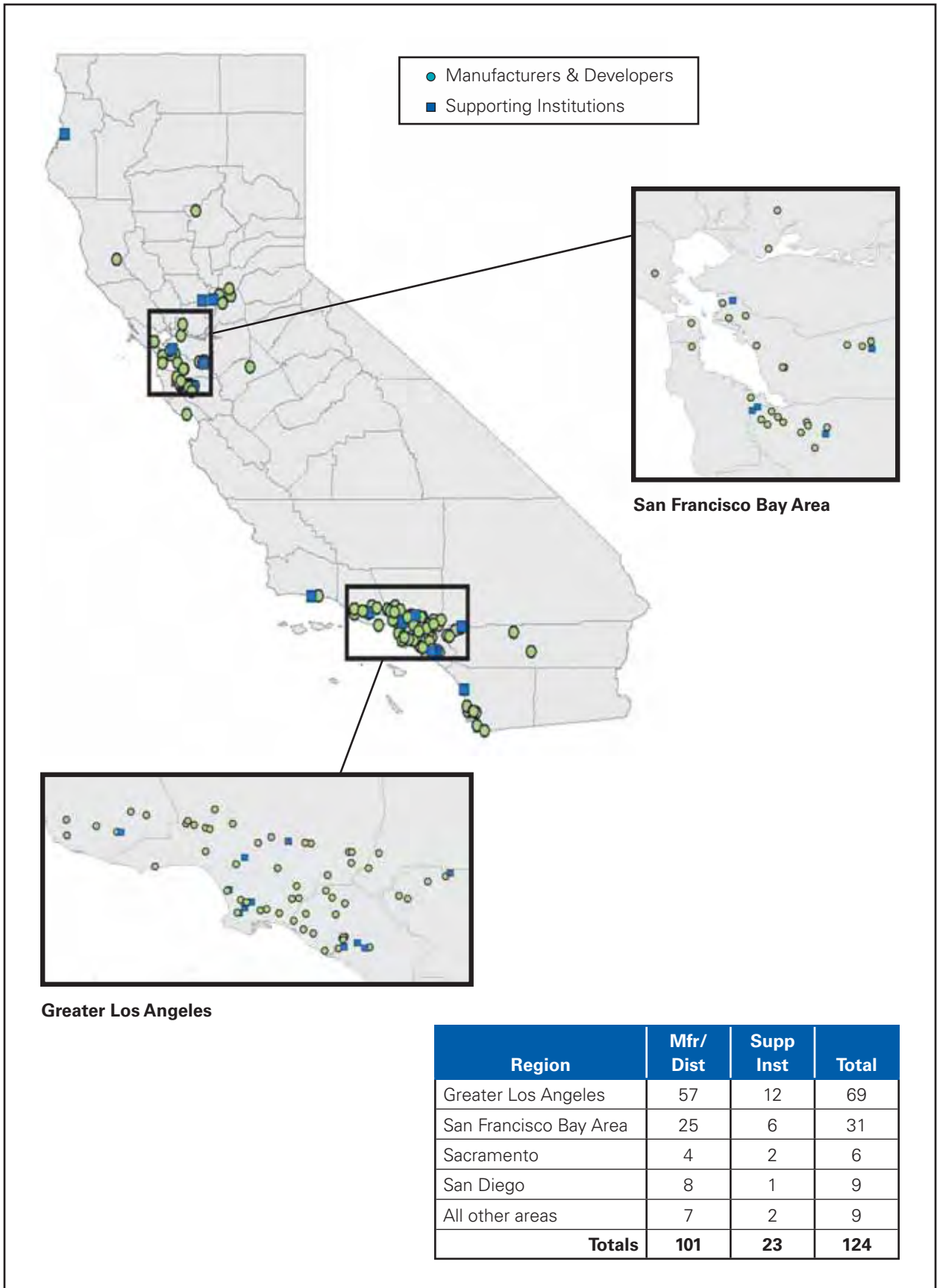
Furthermore, greater use of these technologies can assist in the creation of a "California advantage" by buffering the state against the negative conse-

³⁰ AB 1493 Pavley, Chapter 200, Statutes of 2002

³¹ Peak, Matt, et al. California's Clean Vehicle Industry. CALSTART, Inc. 2004. [Online] http://www.calstart.org/info/publications/Californias_clean_vehicle_industry/Californias_Clean_Vehicle_Industry.php



Picture 2: 124 Clean Car Technology Cluster Manufacturers, Developers, and Supporting Institutions Identified in California





quences associated with an excessive reliance on one type of fuel, such as oil, while growing the economy. A 2004 CALSTART study found that California has key competitive advantages in clean vehicle technologies.³¹ Specifically, the report found that California is already an acknowledged world leader in advanced technologies, electronics, software, and engineering and design. These skills and demonstrated strategic strengths align closely with the skill sets needed to create the new technologies and products required for more efficient and AFVs.

The CALSTART study, titled *California's Clean Vehicle Industry*, surveyed over 100 clean vehicle technology companies and supporting institutions that are currently doing business in the state. The location of these companies, termed the Clean Car Technology Cluster, is illustrated in **Picture 2**. When asked to assess the effect on their business of implementing more efficient and/or alternative fuel technologies in vehicles, the companies surveyed overwhelmingly responded that such a requirement would benefit them by increasing both job growth and investment.

The study also highlights the market potential that comes with being a recognized leader in

a growing industry. For example, on automotive emission standards, California's LEV II automotive emission standards (adopted in 1998) served as the model for national standards. LEV II spurred innovation that resulted in an estimated \$550 million in additional revenues to the California air pollution control industry from 1999 to 2002, equaling nearly \$140 million per year.³²

Accordingly, the study cites a potential \$20 billion automotive technology market that would be made possible by aggressively pursuing transportation energy security measures. It also illustrates further growth opportunities prompted by developing countries' increasing interest and involvement in solving their petroleum dependence problems. For example, China has a rapidly growing car market that will equal current U.S. sales by 2015, and the country already has policies in place to promote clean and efficient vehicle technologies.

With global trends driving new technologies to market, California's Clean Car Technology Cluster is well positioned to add high-quality jobs and investments to California's economy. All that's needed to make this happen are appropriate state leadership, smart policies, and targeted investment.

³² Ferrier, Grant, and Killion, Mariko. *The Economic Contribution of the California Air Pollution Control Industry*. Environmental Business International, Inc. October 2004; p. 36.



Overall California Advantage: Transportation Energy Diversification and Efficiency • Reduced Price Volatility • Economic Stability and Growth

Category	Technology	Technology Description/Status	Additional California Advantages
Vehicular Efficiency	Conventional technologies	<ul style="list-style-type: none"> · Variable valve timing, continuously variable transmissions, turbochargers, 6–8 speed automatic transmissions, lightweight materials, efficient tires, aerodynamic designs, and diesel engines are already used in some vehicles. 	<ul style="list-style-type: none"> · Greater use in California could significantly increase vehicles' efficiency (diesel engines are 30% more efficient than gasoline engines). · California is home to many conventional technology suppliers, such as Honeywell Turbo Technologies in Torrance.
Vehicular Efficiency	Electrically driven vehicles	<ul style="list-style-type: none"> · Mild and full hybrids are becoming increasingly common. · By 2008, California will have about 110,000 regular hybrids on its roadways. Demand for these vehicles is strong and growing. · Hybrid technology is emerging in the trucking industry; every major truck manufacturer has at least produced a working prototype vehicle. Hybrid buses are the fastest growing segment in the transit industry. · Plug-in hybrid-electric vehicle (PHEV) concept in demonstration; General Motors will unveil a PHEV prototype at the Detroit auto show in January 2007. · New technologies make battery electric vehicle resurgence possible. · Fuel cell technology cost, efficiency, and durability are progressing. · Honda, GM, and DCX are all planning large-scale fuel cell vehicle demonstration programs; fuel cell bus programs are expanding in Europe and North America. 	<ul style="list-style-type: none"> · The North American headquarters of the two largest hybrid vehicle manufacturers, Toyota and Honda, are located in California. · The PHEV movement originated in California; UC Davis has nation's leading PHEV engineering program. · Tesla, Wrightspeed, and other battery electric vehicle and component manufacturers call California home. · California-based ISE, Enova Systems, and Maxwell Technology are leading suppliers to the emerging heavy-duty hybrid-electric vehicle industry. · The California Fuel Cell Partnership and the Hydrogen Highway combined represent the largest single state fuel program in the nation; California has the largest fuel cell bus program as well.
Fuel Diversity	Natural gas and propane	<ul style="list-style-type: none"> · The technology is well developed and proven. · CO₂ emissions are about 23% lower than equivalent gasoline vehicles. · 26,700 natural gas vehicles are on the road in California today; in 2004, there were 365 public and private compressed natural gas refueling stations. · California is home to the largest natural gas transit fleet. · Represents a small fraction of California's total overall transportation energy consumption. · Sweden and other nations have demonstrated the economic feasibility of converting biomass into renewable methane; there are more than 8,000 vehicles operating on biomethane in Sweden today; the gas utility in Gothenburg set a goal of 100% renewable methane by 2050. 	<ul style="list-style-type: none"> · California is the state with the most public natural gas refueling stations. · The largest provider of natural gas for transportation in North America, Clean Energy, is based in Seal Beach. · Interest in renewable methane (biomethane) is growing among businesses and agriculture. · California utilities are seriously exploring the development of biomethane from dairy cows and other sources; California has the largest dairy cow population in the country. · California signed a memorandum of understanding with Sweden to pursue biomethane.

	<p>Fuel Diversity</p>	<p>California already blends over 1 billion gallons of conventional ethanol each year into its gasoline. Production level is expanding rapidly.</p> <ul style="list-style-type: none"> Ethanol vehicle technology is currently simple and the cost is negligible. Advanced ethanol technologies are making progress and could displace significant levels of petroleum. “Clean diesel” vehicles will be sold in California in 2009, and are highly compatible with renewable diesel fuels. Long-term prospects indicate that “biomass to liquid” (BTL) fuels can be cost-effective with oil priced above \$50 per barrel. Hydrogen produced from renewable energy sources such as solar and wind is becoming increasingly cost competitive with other methods of hydrogen production. 	<ul style="list-style-type: none"> California’s cellulosic resources could support production of 1.5 billion gallons/year now and potentially 3 billion gallons/year of renewable fuels. Potential economic benefits to California from ethanol production are estimated at \$5 billion over a twenty-year period; could create 8,000 new jobs. California is the number-one agricultural state in the nation, receiving \$31.8 billion for its products in 2004. California’s strong biotech industry is poised to help solve production issues. California’s venture capital community understands the value of biofuels and is investing record sums in the field.
<p>The Need to Drive</p>	<p>Smart Growth</p>	<ul style="list-style-type: none"> Various communities in the United States have already implemented smart growth policies. Some California communities that have implemented smart growth to some extent are Windsor, Oakland, San Mateo, and San Francisco. Smart growth is not pervasive in California. The norm is sprawl, which leads to congestion. 	<ul style="list-style-type: none"> Recently passed state bonds provide substantial opportunities to promote smart growth: Housing Bond contains \$850 million for local infrastructure, infill, and parks and \$300 million in grants for “transit-oriented development”; there is \$90 million for sustainable communities in the Water Quality, Parks, and Conservation Bond. Reduced congestion could save people and businesses approximately \$17 billion and more than 665 million gallons of fuel annually.
<p>The Need to Drive</p>	<p>Bus Rapid Transit</p>	<ul style="list-style-type: none"> New corridors are under development in Northern and Southern California. Allows high-load and improved performance for relatively low initial investment. Stylish and convenient designs and features are popular with riders. 	<ul style="list-style-type: none"> Allows faster introduction of transit alternatives to passenger cars in California. Various reports show that encouraging people who would normally drive to use public transportation (such as Bus Rapid Transit), bicycle, or to walk would significantly reduce GHGs.






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