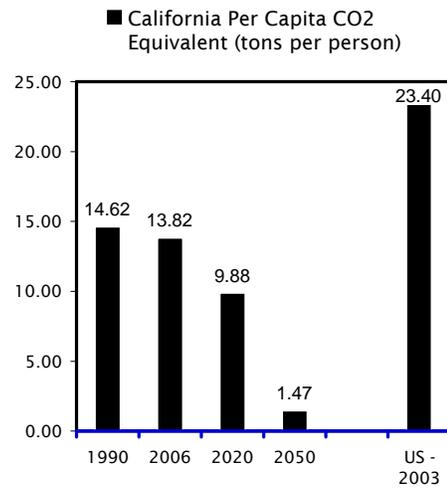


1. INTRODUCTION AND EXECUTIVE SUMMARY

I. The Challenge and The Opportunity

Global climate change presents California with serious challenges to the health of its ecosystems and the vitality of its economy. Properly implemented, the solutions to climate change can also present enormous opportunities. The California Legislature and Governor Schwarzenegger approved AB 32, the California Global Warming Solutions Act of 2006 that requires the state to cut total greenhouse gas (GHG) emissions such as carbon dioxide (CO₂) by 25 percent by 2020, compared to “business as usual”.

Prior to the passage of AB 32, Governor Schwarzenegger issued a 2005 Executive Order that set an even more ambitious climate change response program: an 80 percent GHG emission reduction by 2050. Other nations and states are now adopting this aggressive reduction target in light of recent scientific findings that suggest the world may soon be reaching a tipping point on climate change impacts. Given California’s expected population growth, this 2050 reduction target creates great challenges for the state, as it requires a 90 percent GHG reduction per capita. Meeting this target will require vastly more efficient use of energy and the virtual elimination of all GHG emissions from the state’s energy infrastructure.

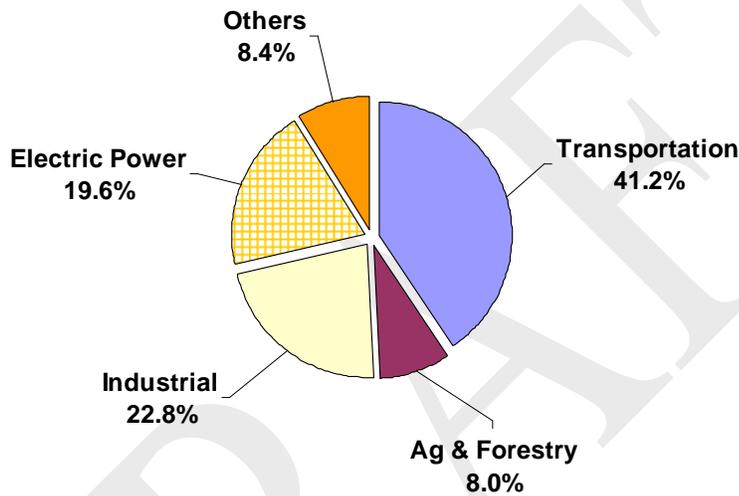


Despite these seemingly daunting challenges, California’s climate change policies can benefit the state’s economy, environment, and the health of its citizens. Developing cleaner energy and transportation systems will give California a chance to improve the security of fuel supplies, address stubborn air pollution concerns, and develop better designed communities. The development of better methods of moving people and goods throughout the state is another golden opportunity to improve economic efficiency and reduce pollution and congestion in the implementation of our climate change response program. In many cases, these solutions provide important co-benefits by addressing difficult and long-standing problems. Among them is the inequitable distribution of the environmental costs associated with California’s electric power and transportation infrastructure.

Continuing California’s long-standing tradition of eco-innovation, AB 32 has given the California Air Resources Board (CARB) a leadership role in forging new approaches to diminishing the state’s carbon footprint. Existing California programs have demonstrated that major air pollution reductions can be achieved through economic and technological advancements. For example, new electric power plants in California now emit 90 percent less ozone-forming Nitrogen Oxides (NO_x) than they did two decades ago. California’s greenest new passenger cars emit 99 percent less Volatile Organic Compounds (VOC) and Nitrogen Oxides than in 1970. Policies supporting aggressive energy efficiency upgrades, as well as higher energy prices and a transition toward a service-oriented economy, have all helped California keep its per

capita electricity consumption flat for the past few decades. California has achieved this feat, in part, through a balanced portfolio of policies, performance standards and market-based incentives. These state policies addressed important market failures: pollution externalities; market barriers to private sector Research, Development & Demonstration (RD&D); misplaced financial incentives; and imperfect information for energy consumers. As California turns its attention to combating global climate change, new state policies designed to surmount these and other market failures must expand in scope and creativity.

Carbon Emissions by Sector



As shown above, GHG emissions result from many activities ranging from transportation to manufacturing and agriculture. Policies implemented under AB 32 and the Governor’s Executive Order for 2050 must address all sectors of California’s economy so that all significant sources of GHG emissions participate in both the challenges and opportunities afforded by this critical piece of state legislation. This broad-scaled approach is the most likely to create a level playing field, and address new alternative energy sources that could be used in multiple sectors. *For example, policies need to recognize that electricity and biofuels will likely compete with more traditional transportation fuels in the future; therefore, policies that address only the electric sector or only the petroleum refining sector are unlikely to achieve the goals of AB 32.*

Government policy should not attempt to pick technology winners. Rather, performance-based programs—whether market-based, command-and-control, or incentive oriented—should be the normal course of business. ETAAC makes a number of recommendations based on the need to help emerging technologies move through demonstration phases to achieve full commercial viability. For instance, policies shaping development and demonstration of innovative technologies may differ from those focused on introducing technologies into the marketplace on a commercial scale. The best approach may be to support new technologies to the point where they can stand-alone within a market structure characterized by performance standards and carbon prices that become a part of everyday decision-making by consumers and businesses. For

instance, full performance battery electric and fuel cell vehicles are two major zero tailpipe emission technologies currently under development. While both technologies will require significant government involvement to become fully commercialized, ETAAC does not advise selecting one or the other as the preferred future technology. In the shorter term, plug-in hybrids using electricity as part of their vehicle fuel are likely to compete with other vehicle technologies using lower carbon advanced vehicle fuels. Thus, standards, policies, and incentives should be aimed towards establishing a level playing field and lowering barriers to technologies that can then compete based on price, efficiency, emissions, convenience, and other factors.

Flexibility in program design and implementation will be necessary to minimize the negative economic impacts that might result from AB 32 implementation and to recognize the need to phase-in new, low-carbon technologies into the state's economy. Preserving flexibility for changing circumstances in the future is yet another important goal embedded in the work of ETAAC. Electric power generation stations and other forms of capital intensive infrastructure being planned today may become the primary energy source for advanced vehicles of the future. The crossover and spillover effects of today's investment decisions will present significant challenges and opportunities for both energy and transportation sectors.

The initial AB 32 target of reducing California's GHG emissions back to 1990 levels by 2020 is the critical first step toward reducing GHG and placing the state on a trajectory to meet long-term GHG reduction goals. In some cases the state will encounter tradeoffs between the actions necessary to bring about the wide scale transformation of a carbon-free economy and those that may bring about the lowest cost emissions reductions in the short term. The long-term reduction goals for 2050 and beyond are equally important and will require fundamental changes in consumer behavior, in energy use, and in the infrastructure that supports virtually all economic activity. This report identifies recommendations to achieve both short-term and long-term goals.

II. Major Strategies and Opportunities

AB 32 instructs CARB to create the Economic and Technology Advancement Advisory Committee (ETAAC) and instructs ETAAC to do the following:

“Advise on activities that will facilitate investment in and implementation of technological research and development opportunities including, but not limited to, identifying new technologies, research, demonstration projects, funding opportunities, developing state, national, and international partnerships and technology transfer opportunities, and identifying and assessing research and advanced technology investment and incentive opportunities that will assist in the reduction of greenhouse gas emissions. The committee may also advise the CARB on state, regional, national, and international economic and technological developments related to greenhouse gas emission reductions.”

In this report, ETAAC has identified five major strategies that will help achieve five major opportunities for cost effective GHG emission reduction technologies. A general description of

each of these strategies and opportunities follows. A map of how each recommendation in the report reflects these major themes is included in a chart at the end of this introductory chapter.

Strategy #1: Accelerate GHG Emission Reductions

AB 32 establishes a fixed timeframe for California to achieve a 25 percent reduction in GHG emissions relative to current levels. This 2020 timeframe is useful because it provides business and policy makers specific targets for long-term planning. However, the competing interests of many different stakeholders - including industry, labor, environmentalists, land owners, and others - has led to a regulatory system for project approval that can be complex, time-consuming, costly, and often litigious. Gridlock would not serve California as it looks to future solutions to the climate change conundrum. ETAAC has identified areas (for example the deployment of advanced large scale renewable energy – section 5.III.B and methane digesters – section 6.II.A, etc.) where the project approval process could be improved without compromising environmental integrity. To competently complete this task, however, will require addressing the special interests that created the existing system to begin with. Leadership and skill to help design politically acceptable compromises will be needed.

There is an urgent need for investments in GHG emission reductions before the AB 32 cap goes into effect in 2012 because some investments in particular technologies may preclude other choices that would lead to even greater GHG emission reductions. In many cases, delaying these investments will also delay the total benefit of actions that could be taken today to reduce GHG emissions.

Lingering regulatory uncertainty has stymied some potential investments. These “early actions” by the private sector could proceed at a faster pace if the potential economic benefits of early actions were made explicit. The actual economic value of “credits” for early action depends on market and regulatory decisions that may not occur immediately. If ownership and quantification of these “early action” credits were more clearly defined, increased investment in GHG emission reduction projects would begin to flow, leaving California in a much better position to cost effectively meet the AB 32 GHG emission reduction targets.

Strategy #2: Balance a Portfolio of Economic and Technology Policies

Placing a price on carbon and other GHG emissions is a critical step towards responding to the climate change threat as it allows private markets to incorporate the value of reducing these emissions into their everyday business decisions. One potential option is a market based “cap and trade” system, which establishes a cap on allowable GHG emissions that would ratchet down over time. A declining cap can send the right price signals to shape the behavior of consumers when purchasing products and services. It would also shape business decisions on what products to manufacture and how to manufacture them. Establishing a price for carbon and other GHG emissions can efficiently tilt decision-making toward cleaner alternatives. This “cap and trade” approach (complimented by technology-neutral performance standards) avoids the danger of having government or other centralized decision-makers choose specific technologies, thereby limiting the flexibility to allow other options to emerge on a level playing field.

If markets were perfect, such a “cap and trade” system would bring enough new technologies into the market and stimulate the necessary industrial R&D to solve the climate change challenge in a cost effective manner. As the Market Advisory Committee notes, however, placing a price on GHG emissions addresses only one of many market failures that impede solutions to climate change. Additional market barriers and co-benefits would not be addressed if a “cap and trade” system were the only state policy employed to implement AB 32. Complementary policies will be needed to spur innovation, overcome traditional market barriers (e.g., lack of information available to energy consumers, different incentives for landlords and tenants to conserve energy, different costs of investment financing between individuals, corporations and the state government, etc.) and address distributional impacts from the higher prices for goods and services in a carbon-constrained world. Investing revenues from any allowance auctions in low GHG technology development & deployment will greatly increase the benefit of putting a price on carbon. Performance standards (i.e. emissions per kilowatt or per mile traveled) also have a proven history of success and need to continue to be part of California’s strategy. In addition, California can consider revenue-neutral fee shifting to reward the purchase of lower GHG products (see sections 2.III.E and 3.IV.G).

These complementary economic and technology development strategies form the core of ETAAC’s policy recommendations found in this report. Many of the strategies outlined in the following pages of this report would be much more effective with appropriate price signals that flow from a declining cap on GHG emissions combined with near and long-term development of low and zero carbon alternatives. A well conceived diverse portfolio featuring both market-based policies and regulatory measures will be more efficient and less costly than relying exclusively on options from either category of potential solutions on their own.

Strategy #3 Create Innovative Public Funding to Complement Private Investment

One of the most important market failures not addressed by setting a price on carbon is the current inadequate level of RD&D for new low- and zero-carbon technologies. Companies invest much less in R&D than is socially optimal because they expect a high return on their capital investments, may not capture all the benefits of RD&D investments, and RD&D is an inherently risky undertaking. Stimulating innovation in new technologies is the goal of RD&D. Broadly speaking, there are two ways to foster innovation: by funding RD&D directly or by requiring improved performance in the marketplace. In the energy sector, where new technologies are often very capital intensive and integrated into complex production systems, a balanced approach that uses both methods is clearly desirable.

The policies created to support AB 32 will galvanize significant private sector investment in California, but this expected investment will not be enough to reach all areas necessary to achieve the overall GHG emission reduction goals. The ETAAC committee reviewed areas where public financing, possibly leveraged with private capital, can stimulate innovation and accelerate adoption of cleaner products. ETAAC has identified the technology demonstration/pre-commercialization phase in a product’s life cycle as a critical stage for this type of investment. If California decides to adopt a cap & trade system that includes the auction of emission allowances, ETAAC proposes that a California Carbon Trust – discussed in greater

detail in section 2.II.A – can direct investments in RD&D and finance technology pilot projects in disadvantaged communities and throughout the state of California. Often, these projects offer co-benefits such as improved air quality or employment. Investments from the California Carbon Trust can fill R&D funding gaps by leveraging the capabilities of universities, state agencies, non-profits and other pioneering research leaders throughout the state.

If GHG auction revenues from a “cap and trade” system are large enough, they can also be used to reduce the negative impacts of some of the more distortionary elements of California’s current taxation system in addition to providing resources for GHG emission reductions. This represents another potentially important policy option because it could improve the economic efficiency of the overall California economy. Alternatively, these revenues could address Environmental Justice issues by assisting communities or industries that are disproportionately affected by climate change or by climate change mitigation programs. Any such assistance should not eliminate the incentive created by placing a price on carbon, but instead should help with short-term transitions to a more competitive, low-carbon economy.

California does have a variety of existing incentive fund programs underwriting R&D and related research activities (outlined in Appendix III). They typically serve specific functions. At present, none of them specifically target GHG emission reductions and they also are not currently coordinated to achieve the maximum amount of co-benefits. ETAAC recommends that the State of California make an affirmative commitment to RD&D programs geared toward GHG abatement (see section 2.II.B), and examine how to best integrate these GHG emission reduction priorities with existing environmental and energy policy goals. The state should also consider creating a new organization to house these and other programs. By not just supporting but actively promoting clean energy innovation, California has the opportunity to seed the marketplace with promising new technologies that may provide critical tools to achieve AB 32’s reduction targets as well as bring to market solutions necessary to meet the 2050 goal of a carbon-free economy. This will also drive new investment dollars to California and better enable our state to attract and nurture the most promising clean energy start-up businesses.

Strategy #4: Foster International and Domestic Partnerships

Success on the climate change front domestically can benefit greatly from partnerships between the public and private sector (see section 4.III.H), between state and local governments, and between the state and other nations. Broad deployment of clean technology will generally drive down costs and lead to subsequent generations of innovation. California must leverage agreements with western US states, Canadian provinces, the European Union, the United Kingdom and other countries and integrate with federal programs (such as the recently signed “Energy Independence and Security Act” – H.R. 6) if AB 32 is to accomplish its expressed intent. Achieving genuine success on climate change will also require the transfer of clean technology to developing nations, including China, India, Mexico and Latin America. Exporting both information on public policy solutions and the benefits of a strong Cleantech industry is one example recommended by ETAAC (see section 2.II.B); partnering with other states, the federal government, and other nations on low and zero tailpipe emission vehicles is another (see section 3.IV.E).

Within the state, leveraging and coordinating RD&D efforts of state and federal labs, private research institutes, universities and non-profit organizations is a major opportunity for California to garner cost-effective emissions reductions and co-benefits. At present, there is no single source of information about what the California's centers of innovation are working on or how their research priorities are established. A coordinated effort would ensure that market and policy signals reach and influence RD&D being funded at these innovation centers (see section 2.II.B). Such an effort may facilitate policy initiatives that reflect real technological progress and may help individual innovations achieve the necessary scale more quickly. This could be accomplished by a new entity charged with coordinating low carbon research efforts, or it could be accomplished by an existing private or public entity. The CPUC recently acknowledged a similar need and opened a proceeding to consider creating a "California Institute for Climate Solutions" to be administered within California universities.

Strategy #5: Leadership Across State Agencies

There must be effective leadership across all state agencies to reduce GHG emissions from their own governmental operations and from the stakeholders they oversee and/or regulate. Just as all sectors of the state's economy need to participate in the opportunities and challenges of meeting California's GHG emission reduction goals, all state agencies must also participate (with Cal/EPA playing a key government coordination role). This sort of coordination will also be important for planning efforts to adapt to the climate change effects that could still potentially occur even if atmospheric GHG levels are stabilized to avoid the most severe negative impacts (see sections 3.IV.H and 5.V.H).

Many new technologies and practices to lower GHG emissions will also have co-benefits such as less air pollution or lower water consumption. But some will also lead to higher costs and may even exacerbate other policy challenges. It will be necessary for California to identify and manage tradeoffs that will occur as it addresses climate change. Tradeoffs among different public policy objectives should be integrated across all state agency decisions - those associated directly with AB 32 as well as other air pollution regulations, infrastructure development, and so forth. Such reciprocity is needed to avoid an unbalanced set of regulatory and project decisions that would result in missed opportunities to help meet climate change goals and integrate these goals into other state programs

Opportunity #1: Accelerate Efficiency Measures

The most cost-effective GHG emission reduction opportunities continue to be investments in energy efficiency. Whether it is more efficient buildings, appliances or motor vehicles, initial up-front investment is rewarded - often very quickly - with reduced energy use and lower overall costs. While California has led the nation in building and appliance efficiency, the state has significant opportunities to do much more.. In some cases, further technological innovation is needed to create more efficient products. In other cases faster adoption of existing and emerging technology needs to be encouraged (see sections 3.III.C, 3.IV.E, 4.III.F, 5.II.A).

ETAAC believes that new types of financing will increase the development and adoption of energy efficient technologies and practices. Consequently, financing policies that can be

implemented through utilities or municipalities to increase efficiency are recommended (see sections 2.III.F, G). The potential use of auction proceeds to help finance efficiency upgrades to lower energy bills in historically disadvantaged communities is another opportunity to achieve efficiency, while also meeting AB 32's Environmental Justice goals.

Opportunity #2: Remove Carbon from Energy Sources

California's future sources of electricity, transportation fuels and heating fuels will need to be zero or near-zero carbon by 2050. Renewable energy technologies such as wind, solar, and others offer the technical potential to generate all of California's electricity, but there are a number of technical and implementation challenges that will not be simple to overcome. ETAAC examined the opportunity of how to quickly scale up these sources of renewable energy, both on-site distributed generation and central utility-scale power plants. Biomass sources, if coupled with carbon sequestration, could produce renewable energy supplies and permanently remove carbon from the atmosphere (see sections 4.II.D, 5.III.C and 6.II.A).

Electricity storage has the potential to enable higher penetrations of renewable energy in California's power supply portfolio. Technologies such as pumped hydro storage, compressed air, thermal storage or batteries can transform intermittent renewable generation into a reliable resource for energy planning (see section 5.IV.D). Electricity storage in the form of plug-in electric vehicles has the potential to both reduce reliance on fossil fuels in the transport sector and allow for even greater utilization of existing and future renewable electricity generation (see section 5.IV.E).

In the AB 32 timeframe, ETAAC believes fossil fuels, including natural gas, can play an important role for both power generation and heating. In the long term, fossil fuels such as natural gas are most likely to play a valuable role for traditional uses and as a feedstock for vehicle energy supplies if carbon can be separated and permanently stored. Large scale deployment of low carbon, zero carbon and even negative carbon biomass energy will likely require methods to permanently sequester carbon. California should continue to partner with other states, federal agencies and international partners to encourage RD&D to find cost-effective and safe methods of sequestering CO₂ streams from power generation (see sections 4.II.C, 5.V.G).

Opportunity #3: Rethink Transportation to Lower Demand and Carbon Emissions

Transportation accounts for the largest fraction of GHG emissions in California by far, roughly 40 percent of the state's total inventory. In order to meet 2050 GHG goals, the transportation sector will need to accomplish a dramatic transition to new zero and near zero technologies.

ETAAC recommends that California build upon existing state programs to reduce air pollution and "decarbonize" the state's transportation system. These existing programs include the Pavley – Schwarzenegger vehicle GHG regulations, the Low Carbon Fuel Standard, the Low/Zero Emission Vehicle program and the Zero-Emission Bus program. California should also initiate a near-term program to reduce GHG emissions from Heavy-Duty Vehicles (HDV). The

infrastructure to deploy technologies emerging from these state programs must also be based on low or zero emission fuel supplies.

In addition to transportation technology itself, it is time to rethink current methods of mobility for both freight and people. California's growth in motor vehicle purchases and state investments in road infrastructure occurred largely during a period in time when transportation fuels were inexpensive. This is no longer the case. Decreasing Vehicle Miles Traveled (VMT) is critical to meeting AB 32 GHG emission reduction goals. Reducing this growth will also yield important co-benefits such as diminishing the time lost in traffic congestion and the corresponding improved quality of life. Putting a price on carbon is one way to help reduce vehicle use and congestion. Yet these approaches are limited in scope. They must be complemented by pricing for other currently unpriced transportation costs, alternative transit options, such as electric rail, and urban and suburban designs that provide better and affordable alternatives to the internal combustion engine (see section 3.IV). Local government land use planning decisions will need to be coordinated with state-wide priorities to encourage transit-oriented residential and commercial development. Without such coordination, overall VMT will climb due to current population growth rates. This is just one of many ways in which local governments are a key partner with the state in complying with AB 32.

California's freight systems will need a similarly dramatic overhaul. The state's coastal ports and Central Valley freeways have become increasingly congested. Alternative modes of goods movement have become both a necessity and an opportunity to reduce GHG emissions and other criteria air pollutants.

Opportunity #4: Reduce GHG Emissions from Industry, Agriculture, Forestry and Water

Greenhouse gases are also emitted from forest, agricultural and industrial practices from both energy consumption and other activities. Significant opportunities exist to reduce GHG emissions through established best practices, for example the expanded use of combined heat and power in industry (see section 4.II.C). In addition, both agriculture and forest sectors hold the long term potential to sequester carbon in biomass and soil (see soil carbon sequestration 6.II.E and forest management 7.II.B).

Water use in California is extremely energy intensive. Today, more than 19 percent of electricity, 32 percent of natural gas not used for electricity generation, and 100 million gallons of diesel fuel per year are used to treat, deliver and heat water in California each year. Policies and technologies that increase the efficiency of the state's water delivery systems and reduce end-use will produce multiple benefits. Less demand for water resources translates into reduced emissions of GHG and other air pollutants since less energy is used to pump, treat and move water, as well as other economic and environmental benefits (*see sections 9.II.A and 9.II.B*).

Opportunity #5: Capture Economic, Health, and Environmental Justice Co-Benefits

Many policies designed to combat climate change can also bring about substantial economic, health and environmental co-benefits for the state of California. For example, climate policies will stimulate the Cleantech industry in California providing both economic growth and jobs.

The Cleantech industry encompasses everything from alternative energy generation to wastewater treatment to more resource-efficient industrial processes. Although each of these industries is unique, they all share a common thread: they rely upon new and innovative technology to create products and services that compete favorably on price and performance while reducing our collective environmental footprint. Given its legacy of entrepreneurship and eco-innovation, California is well positioned to attract venture capital investments in Cleantech companies. In 2006, California led the nation in Cleantech venture capital with \$1.13 billion, representing 44 percent of total U.S. Cleantech investments.

Cleantech represents a new export opportunity, too. Cleantech products will increasingly be needed worldwide to address climate change and other challenges associated with the decreasing availability of water and other natural resources. Furthermore, Cleantech is spurring new employment opportunities in such fields as solar energy and energy efficiency device installation. ETAAC proposes state supported training programs to encourage the development of these kinds of green-collar jobs (2.III.D).

At present, the state is doing little to encourage the manufacturing of Cleantech products within state borders. In fact, it is quite possible that many Cleantech companies will locate their manufacturing operations out-of-state, while keeping their corporate headquarters and RD&D facilities in California. The state may want to consider a variety of policy recommendations to make it more economically attractive to both invent *and* manufacture solutions to climate change in California. Such incentives would allow California to more fully reap the economic benefits of the rapidly expanding Cleantech industry (2.III.C).

Some policies designed to combat climate change can reduce pollutants affecting local public health. Ground level ozone and black carbon (a type of fine particulate) contribute to both climate change¹ and major public health problems that exist in California.² Assessing existing regulations for public health pollutants such as ozone and fine particulate regulations were outside the scope of the ETAAC report. Nevertheless, ETAAC acknowledges the importance of existing programs to achieve public health standards and welcomes innovations that would further these goals while also meeting AB 32's GHG emission reduction targets. In addition, ETAAC has identified a number of opportunities to reduce GHG such as CO₂ along with reducing ozone and fine particulates (such as zero emissions technologies).

In evaluating potential policy and technological fixes to GHG emission challenges, ETAAC recognized the need to develop solutions that do not shift burdens of compliance to disadvantaged communities suffering from historic pollution trends. Many recommendations were designed in part to specifically reduce pollutions in Environmental Justice areas (see 2.II.A). In other cases, further evaluation of any Environmental Justice effects may need to occur when specific implementation measures are developed by CARB or other agencies or organizations to maximize Environmental Justice benefits and minimize and disadvantages.

III. Summary Message

California has a prime opportunity as it seeks to meet the challenges embodied in AB 32. By acting sooner rather than later, California can lower the costs of transitioning to an economy less

dependent upon carbon and other GHG emitting energy sources.³ At the same time, it can reap the rewards of a more sustainable, efficient and competitive economic system. The opportunities linked to AB 32 cut across all sectors examined in this ETAAC report – transportation, industrial/commercial/residential, electricity/natural gas, agriculture, forestry and water. Renewable energy, alternative fuels, and energy efficiency could create environmental benefits and jobs in all stages of economic development, ranging from RD&D to manufacturing and the rest of product and equipment lifecycles.

Policy makers, industry and consumers must bear in mind that the long-term effects of decisions made today will still be with us in 2020, and in many cases, in 2050 and beyond. Land-use decisions and choices about new electric power generation infrastructure will either help or hinder California's efforts to meet both the 2020 and 2050 GHG emission reduction targets. Development of new kinds of clean vehicles and other transportation technologies over the next decade may dictate whether the state is on a trajectory toward meeting the AB 32 mandates or falling behind the curve on achieving these critical long-range goals.

Californians are ready to respond to the climate change challenge. Meeting the timeframe outlined in AB 32, however, California must do the following:

- Continue the state's long-standing commitment to environmental policy and build on the success of existing programs and regulations in order to develop low and zero carbon solutions;
- Establish a clear market price on carbon to provide the incentives for business and consumers to reduce their carbon emissions efficiently and invest the value of any resulting auction or fee revenues to achieve additional reductions;
- Attract and leverage private capital;
- Develop and retain new green collar jobs;
- Adopt policies and measures that facilitate the kind of business and technology innovations that have made California world renowned.
- Develop and maintain a capability to assess and adjust policies and measures over time as new conditions emerge and new technologies are developed.

In addition to mitigating the dire impacts of climate change, effective action on AB 32 can also yield the co-benefits of cleaner air, new industries and jobs here in California. The knowledge and products created in response to AB 32 will strengthen both the California economy and the state's international leadership on environmental issues.

IV. The Role of ETAAC

ETAAC was created to facilitate the development of new policies and technologies as quickly and economically as possible, including initiatives that reach outside of direct GHG emission regulations. CARB provided several specific areas of focus for ETAAC and requested that the Committee look broadly at issues that relate to CARB, other state agencies and the State Legislature:

- Review and prioritize incentive proposals for industry compliance with AB 32, identifying potential funding sources to underwrite these fiscal incentives;
- Identify the areas where public sector investment is critical to overcoming barriers to achieving the California's climate protection objectives in 2020 and 2050 and discuss whether those investments should be at the local, state or federal level, or some combination thereof;
- Identify advanced technologies with the greatest GHG emission reduction potential, their commercial status, and the steps necessary to accomplish significant market penetration;
- Identify export opportunities for California businesses that specialize in GHG reduction technologies and services;
- Recommend key demonstration projects for early success and assist CARB in formulating proposals for public/private partnerships and the potential involvement of national and international organizations;
- Review and comment on the findings and recommendations of the Cal/EPA Market Advisory Committee, to the extent that report affects deliberations of ETAAC.

To meet these objectives, CARB appointed members to the ETAAC in January 2007. Members were selected based on their knowledge and expertise in fields of business, technology research and development, climate change and economics. (Brief biographies of members are listed in Appendix I.) The Committee is chaired by former CARB chairman and former Cal-EPA Secretary Alan Lloyd, Ph D. The Committee vice-Chair is Bob Epstein, Ph D., noted engineer and entrepreneur, and co-founder of Environmental Entrepreneurs.

ETAAC has endeavored to adhere to the following general principles:

1. Address near, medium and long-term goals
2. Encourage early action
3. Foster collaboration at all levels of government
4. Encourage public and private research, demonstration and development
5. Leverage California's centers of innovation
6. Establish a level playing field and do not pick winners and losers
7. Maximize public health and socio-economic benefits
8. Address Environmental Justice concerns
9. Participation across all sectors
10. Flexible approaches

This final ETAAC report reflects consensus views when consensus was reached, and reflects a range of differing points-of-views when there was general support that fell short of a consensus. Each recommendation may not necessarily reflect the views of every ETAAC member.

ETAAC met several times throughout California (see Appendix II) and received presentations by members of California's technology community. Meetings were subject to the Bagley-Keene Open Meeting Act and webcast to allow significant opportunities for public comments and input. ETAAC also received XXX suggestions from the general public for ways to reduce climate change emissions (a summary table of the suggestions is presented in Appendix VI). ETAAC has also agreed to develop an Internet website at www.etaac.org to provide access to details of the technologies ETAAC is reviewing as mechanisms to comply with AB 32.

The work of ETAAC is designed to complement ongoing efforts to reduce GHG emissions in California. The recommendations contained in this report do not replace or supersede existing state regulatory programs, or any adopted future policies authorized under AB 32. However, the ETAAC report may facilitate the development of technologies that help meet, or even exceed, the GHG reduction goals outlined in AB 32. Comments received by ETAAC regarding the development of specific rules have been collated outside of this report for consideration during the appropriate regulatory development process.

V. Organization of ETAAC report

Broad participation by all sectors of California’s economy will be necessary to achieve the AB 32’s reduction targets. This ETAAC report contains a chapter offering economic/financial strategies for climate change solutions that stretch across sectors, followed by one chapter for each of the six specific sectors analyzed from a stand-point of policy and technology strategies and opportunities (transportation, industry/commercial/residential, electricity/natural gas, agriculture, forestry sector, and water). ETAAC’s comments on the Market Advisory Committee report also comprise a chapter in this report. In addition, detailed information on energy and transportation technology advances is included in the Appendix V and VI, respectively.

Developing solutions of the scale required by the climate change challenge will be a complex endeavor. It is therefore important to recognize that each of the proposed policies included in this ETAAC report will inevitably interact with one another. Each recommendation put forward by each ETAAC sector subgroup contains critical information on expected GHG reductions and an expected timeframe for achieving these reductions when each policy is considered as a stand-alone option. ETAAC did not prepare a full scale implementation analysis for these recommendations individually, or as an integrated program (which would depend on the menu of choices selected). ETAAC did, nonetheless, identify major co-benefits and mitigation requirements when such information was known and available. ETAAC believes that the benefits, costs, risks, trade-offs and uncertainties associated with climate change response policies must be made transparent as California moves forward with the implementation of AB 32. In the final analysis, it is vitally important to understand and fully communicate the rich diversity of information included in this ETAAC assessment so that California policy makers and the general public can identify solutions to AB 32 that are fair, balanced, and effective.

¹ IPCC, Fourth Assessment Report (AR4), Working Group 1 Report “The Physical Science Basis,” Summary for Policymakers, 2007

² The California Almanac of Emissions and Air Quality - 2007 Edition

³ Stern Review, 2006, Cabinet Office - HM Treasury