






Climate Change Draft Scoping Plan

a framework for change

June 2008 Discussion Draft

Pursuant to AB 32

The California Global Warming Solutions Act of 2006

Prepared by
the California Air Resources Board
for the State of California

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EXECUTIVE SUMMARY

California strengthened its commitment to develop a comprehensive approach to address climate change when Governor Schwarzenegger signed Assembly Bill 32, the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006). By requiring in law a reduction in greenhouse gas emissions to 1990 levels by 2020, California set the stage for its transition to a clean energy future. This historic step helped put climate change on the national agenda, and has spurred action by many other states.

The California Air Resources Board (ARB) is the lead agency for implementing AB 32, which set the major milestones for establishing the program. ARB met the first milestones in 2007: developing a list of early actions to begin sharply reducing greenhouse gas emissions; assembling an inventory of historic emissions; and establishing the 2020 emissions limit.

ARB must develop a Scoping Plan to lower the state's greenhouse gas emissions to meet the 2020 limit. This Draft Scoping Plan, developed by ARB with input from the Climate Action Team, proposes a comprehensive set of actions designed to reduce overall carbon emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, and enhance public health while creating new jobs and enhancing the growth in California's economy. ARB will revise this Draft Plan based on continuing analysis and public input, and will take the Proposed Scoping Plan, which will be released in early October, to the Board for consideration at its meeting in November, 2008. The measures in the Scoping Plan adopted by the Board will be developed over the next three years and be in place by 2012.

Reduction Goals

This Draft Plan calls for an ambitious but achievable reduction in California's carbon footprint. Reducing greenhouse gas emissions to 1990 levels means cutting approximately 30 percent from business-as-usual emission levels projected for 2020, or about 10 percent from today's levels. On a per-capita basis, that means reducing our annual emissions of 14 tons of carbon dioxide for every man, woman and child in California down to about 10 tons per person by 2020. This challenge also presents a magnificent opportunity to transform California's economy into one that runs on clean and sustainable technologies, so that all Californians are able to enjoy their rights to clean air, clean water, and a healthy and safe environment.

Significant progress can be made toward the 2020 goal relying on existing technologies and improving the efficiency of energy use. A number of the solutions are "off the shelf," and many – especially investments in energy conservation and efficiency – have proven economic benefits. Other solutions involve improving our state's infrastructure, transitioning

to cleaner and more secure sources of energy, and adopting 21st century land use planning and development practices.

A Clean Energy Future

Getting to the 2020 goal is not the end of the State's effort. According to climate scientists, California and the rest of the developed world will have to cut emissions by 80 percent from today's levels to stabilize the amount of carbon dioxide in the atmosphere and prevent the most severe effects of climate change. This long range goal is reflected in Executive Order S-3-05 that requires an 80 percent reduction of greenhouse gases from 1990 levels by 2050.

Reducing our greenhouse gas emissions by 80 percent will require California to develop new technologies that dramatically reduce dependence on fossil fuels, and shift into a landscape of new ideas, clean energy and green technology. The measures and approaches in this Draft Plan are designed to accelerate this necessary transition, promote the rapid development of a cleaner, low-carbon economy, create vibrant livable communities, and improve the ways we travel and move goods throughout the state. This is the firm commitment that California is making to the world, to its children and to future generations.

Preliminary Recommendation

The preliminary recommendation in this Draft Plan has been developed by ARB staff after considering public comment and input from the Climate Action Team, the Environmental Justice Advisory Committee (EJAC), the Economic and Technology Advancement Advisory Committee (ETAAC), and the Market Advisory Committee (MAC). The Proposed Plan, which will be released in October, 2008, will be based on additional staff modeling and analysis, consideration of public comment on the Draft Plan, recommendations from the advisory committees and other experts. All of the measures in the Proposed Plan will be analyzed for the impacts they will have on the economy, public health and the environment, including effects on low-income communities. The Proposed Plan will have a 45-day comment period before the Board considers adoption at its November meeting. The Scoping Plan, even after Board approval, will remain a *plan*. The measures in the Scoping Plan must be adopted through the normal rulemaking process, with the necessary public input.

Key elements of ARB's preliminary recommendation for reducing California's greenhouse gas emissions to 1990 levels by 2020 include:

- **Expansion and strengthening of existing energy efficiency programs and building and appliance standards;**
- **Expansion of the Renewables Portfolio Standard to 33 percent;**
- **Development of a California cap-and-trade program that links with other WCI Partner programs to create a regional market system;**
- **Implementation of existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard;**
- **Targeted fees to fund the State's long-term commitment to AB 32 administration.**

The complete list of recommended measures is shown in Table 2 of the main text.

A Comprehensive Approach

Meeting the goals of AB 32 will require a coordinated set of solutions to reduce emissions throughout the economy. The preliminary recommendation includes a mix of strategies that combine market mechanisms, regulations, voluntary measures, fees, and other policies and programs to reduce greenhouse gas emissions. Many of the measures complement one another, and provide a comprehensive framework of emissions accounting, tracking, and enforcement. For instance, the Low Carbon Fuel Standard, which reduces the carbon intensity of transportation fuels sold in California, will complement technology-forcing regulations designed to reduce greenhouse gas emissions from cars and trucks. Improvements in land use and the ways we grow and build our communities will further reduce emissions from the transportation sector.

Many of the measures build on highly successful long-standing practices in California, such as energy efficiency and use of renewable energy resources, that can be accelerated and expanded. Increasing the amount of energy we get from renewable energy sources, including placing solar arrays and solar water heaters on houses throughout California, will be supported by an increase in building standards for energy efficiency. Other measures address the transport and treatment of water throughout the state, lower greenhouse gas emissions from ships in California's ports, and make changes to agricultural and forestry practices. Some measures address ways to safely reduce or recover a range of very potent greenhouse gases, including refrigerants and other industrial gases, that contribute to global warming at a level many times greater per ton emitted than carbon dioxide.

The preliminary recommendation places 85 percent of California's total greenhouse gas emissions under a declining emissions cap by 2020, which will reduce emissions from the covered sectors by almost 30 percent from business as usual. Many of the emission sources covered within this cap-and-trade program are also addressed under other recommended measures, which will account for a majority of the reductions needed to comply with the cap. Sources within the cap-and-trade program will need to meet other regulatory requirements, but will then have the flexibility to reduce emissions further or purchase allowances to cover their compliance obligations. Initial reductions in greenhouse gases, beginning as early as 2010, will be achieved by new and existing regulations and other measures. By 2012, the cap-and-trade program will begin delivering reductions, and by 2020 it will achieve a significant portion of the required reductions under AB 32. Beyond 2020, all the mechanisms, including cap and trade and innovations in technology, will be needed to meet California's long-term greenhouse gas reduction goals.

Working with the Western Climate Initiative

California is working closely with six other states and three Canadian provinces in the Western Climate Initiative (WCI) to design a regional greenhouse gas emission reduction program that includes a cap-and-trade approach. ARB will develop a cap-and-trade program for California that will link with the programs in the other partner states and provinces to create this western regional market. California's participation in WCI creates an opportunity to provide substantially greater reductions in greenhouse gas emissions from throughout the region than could be achieved by California alone. The larger scope of the program also

expands the market for clean technologies and helps avoid leakage, that is, the shifting of emissions from sources within California to sources outside the state. ARB will continue to work with WCI partners to ensure that the final program design provides real and enforceable emission reductions in the region. ARB will also design the California program to meet the requirements of AB 32, including the need to address potential localized impacts, ensure market security (avoid gaming), and ensure enforceability. Significant technical work and consensus building remain before the WCI partners agree on the design of a regional market program. The creation of a robust regional trading system can complement the other policies and measures included in this Draft Plan, and provide the means to achieve the emission reductions needed from a wide range of sectors as cost-effectively as possible.

California's Economy, Environment and Public Health

The Scoping Plan is designed to maximize the total benefits that can accompany the transition to a clean energy economy. California has a long and successful track record of implementing environmental policies that also deliver economic benefits. ARB is continuing to conduct economic modeling, including impacts on low-income households, and evaluation of related public health and environmental benefits for the measures under evaluation. The results of this ongoing analysis will be provided as a supplemental report in the summer of 2008. These results will be used to refine the overall program design, including identifying any economic, environmental and public health safeguards that should be included in the Plan.

Evaluating the Economic Effects

ARB has developed preliminary estimates of the costs and savings of the various measures considered in this Draft Plan. These estimates indicated that the overall savings from improved efficiency and developing alternatives to petroleum will, on the whole, outweigh the costs. This balance is largely driven by current high energy costs and the degree to which measures increase energy efficiency throughout the economy and move California toward ultimately cheaper alternatives to fossil fuels. Summary information on costs is included in the measure descriptions in Appendix C. The economic modeling completed to date is preliminary and does not reflect all measures under evaluation. These estimates will be further refined as the evaluation is completed during the coming months, and ARB will provide a supplement to this Draft Plan with the results of the economic and other evaluations later this summer.

The potential costs of implementing the Plan pale beside the cost of doing nothing. Looking globally, the Stern Review issued by the Treasury of the United Kingdom estimated that "…if we don't act, the overall costs and risks of climate change will be equivalent to losing at least five percent of global [gross domestic product (GDP)] each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20 percent of GDP or more. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around one percent of global GDP each

year."[1] Programs to reduce greenhouse gases under AB 32 are a prudent investment in the future, addressing future costs and significant environmental risks.

California is particularly vulnerable to the costs associated with unmitigated climate change. A warming California climate would generate more smoggy days by contributing to ozone formation while also fostering more large brush and forest fires. Continued increases in global emissions at business-as-usual rates would result in California losing 90 percent of the Sierra snow pack, sea level rising by more than 20 inches, and heat wave days increasing three- to four-fold by late in the century.[2] These impacts will translate into real costs to California. A 12-inch sea level rise by 2050 would translate into $1.2 billion in levee improvements needed in the San Francisco Bay Delta and the San Joaquin Valley.[3] Water supply costs due to scarcity and increased operating costs would increase by as much as $689 million per year by 2050.[4] Due to snow pack loss, California's winter sports businesses would shrink by $1.4 billion annually by 2050, and lose 14,500 jobs, and many other sectors of California's economy would suffer. California cannot avert these impacts of global climate change by acting alone, but failing to act now will slow action around the world. The costs of implementing the Scoping Plan will be a necessary investment in California's future and will spur action in other states and at the federal level.

Providing Savings for Households and Businesses

The Plan's emphasis on increasing energy efficiency throughout the economy will help mitigate impacts from the likely moderate increases in the prices of energy and fuels that result from moving away from more polluting fuels. More efficient homes and buildings that require less energy to heat and cool, and cars and trucks that use less fuel will result in utility bills and vehicle fuel costs that are below the projected rise in actual fuel prices and energy rates. Revenues generated as part of the program could also be distributed in a way to substantially mitigate any price increases.

The Plan will build on California's 30-year track record of pioneering energy efficiency programs that have already delivered significant savings to California's customers. Energy efficiency will continue to provide significant savings that can be reinvested into the California economy. California's energy efficiency policies, including standards, research and development, and utility programs, have helped hold per capita electricity use constant while in the U.S. as a whole per-capita electricity has use increased by nearly 80 percent since the mid-1970s.[5] Under the Plan, homeowners can achieve electricity savings between 1,500 and 1,800 kWh per year for older and newer homes, respectively, and over 300 therms of natural gas per

[1] Stern, N. (2006). The Economics of Climate Change: The Stern Review. Cambridge, UK: Cambridge University Press.
[2] Our Changing Climate: Assessing the Risks to California (2006), www.climatechange.ca.gov
[3] Jeffrey Mount, professor of geology at UC Davis.
[4] "Climate Warming and Water Supply Management in California," California Climate Change Center March 2006 CEC-500-2005-195-SF, pp. 13-14.
[5] Commissioner Art Rosenfeld, California Energy Commission Presentation, "California's Success in Energy Efficiency and Climate Change: Past and Future," May 24, 2007.

year. This will be accomplished through improving energy efficiency by 25 percent.[6] These energy efficiency improvements translate into savings of about $200 per year for the average homeowner.[7] Over the past three decades, California consumers have saved more than $50 billion from appliance and building efficiency policies alone.

Business owners will benefit, too. By upgrading existing facilities to improve energy efficiency, they can save approximately $0.60 per square foot, reducing per-square-foot energy costs (currently $1.50 to $2.50[8]) by as much as 40 percent. Similarly, if commercial buildings in California adopted measures to save water equivalent to current energy efficient building guidelines, buildings would save an additional $0.10 per square foot annually.[9]

Similar savings can be achieved in the transportation sector. By reducing greenhouse gas pollution from more efficient and alternatively-fueled cars and trucks under California's clean car laws (the Pavley greenhouse gas standards), consumers will save on operating costs through reduced fuel use. Although cars will be marginally more expensive, owners will be paid back with savings over the lifetime of the car, and the average new car buyer will have an extra $30 each month for other expenditures.

Driving Investment and Job Growth

Addressing climate change also provides a strong incentive for investment in California. California's leadership in environmental and energy efficiency policy has already helped attract a growing share of the nation's venture capital investment in green technologies. As California continues to improve on its environmental record with programs under AB 32, this is very likely to continue. According to statistics from PriceWaterhouseCoopers and the National Venture Capital Association, California's share of national venture capital investment in innovative energy technologies more than tripled from 1995 to 2007. In 2006, approximately 40 percent of all clean tech venture capital investment was made in California, just over $1 billion.

These investments in building a new clean tech sector also translate directly into job growth. A study by UC Berkeley's Energy and Resources Group and Goldman School of Public Policy found that investments in green technologies produce jobs at a higher rate than investments in comparable conventional technologies.[10] And the National Venture Capital Association estimates that each $100 million in venture

[6] Projections based on average electricity and gas usage per California household. California Energy Commission, "Options for Energy Efficiency in Existing Buildings," Publication 400-2005-039-CMF.
[7] Energy Information Administration (EIA), Annual Energy Review 2006, DOE/EIA-0384(2006) (Washington, DC, June 2007) and supporting databases.
[8] http://www.cool-companies.org/profits/
[9] http://www.earth-policy.org/Updates/2007/Update64.htm
[10] Kammen, D, Kapadia, K. & Fripp, M. "Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?" Energy and Resources Group/Goldman School of Public Policy at University of California, Berkeley, 2004

capital funding helps create 2,700 jobs, $500 million in annual revenues for two decades and many indirect jobs.[11]

Green technology businesses are already contributing to California's economy. According to the California Green Innovation Index (2008), between 1990 and 2006 green technology businesses in California grew by 84 percent.[12] Much of this growth came in the solar energy, energy efficiency and green transportation sectors. By creating a policy landscape that favors low-carbon energy and efficient technology, the implementation of AB 32 will accelerate this trend.

Improving Public Health

The Plan will also provide a wide range of public health and environmental benefits anticipated from reducing greenhouse gases. Preliminary analysis indicates that the total economic value associated with public health benefits is likely to be on the order of $2 billion in 2020. The estimated reduction of combustion-generated soot (PM 2.5) associated with the recommended regulatory measures is 10 tons per day, and the estimated reduction of oxides of nitrogen (a precursor to smog) total 50 tons per day. These reductions in harmful air pollution lead to the following estimated health benefits in 2020:

- 340 fewer premature deaths
- 9,400 fewer cases of asthma-related and other lower respiratory symptoms
- 780 fewer cases of acute bronchitis
- 57,000 fewer work days lost
- 330,000 fewer restricted activity days

State Leadership

California is committed to once again lead and support a pioneering effort to protect the environment and improve public health while maintaining a vibrant economy. Every agency, department and division will bring climate change considerations into its policies, planning and analysis, building and expanding current efforts to green its fleet and buildings, and managing its water and natural resources and infrastructure to reduce greenhouse gas emissions.

In all these efforts, California is exercising a leadership role in global action to address climate change. It is also exemplifying the essential role states play as the laboratories of innovation for the nation. As California has done in the past in addressing emissions that caused smog, the State will continue to develop innovative programs that benefit public health and improve our environment and quality of life.

[11] Global Insight, National Venture Capital Association, "Venture Impact 2004: Venture Capital Benefits to the U.S. Economy," 2004

[12] Next 10, "California Green Innovation Index, 2008 Inaugural Issue," 2008, p.48

A Shared Challenge

Californians are already responding to the challenge of reducing greenhouse gases. Over 100 California cities and counties have signed on to the U.S. Conference of Mayors Climate Protection Agreement[13] and many have established offices of climate change and are developing comprehensive plans to reduce their carbon footprint. Well over 300 companies, municipalities, organizations and corporations are members of the California Climate Action Registry, reporting their greenhouse gas emissions on an annual basis. Many other businesses and corporations are making climate change part of their fiscal and strategic planning. ARB encourages these initial efforts and has set in place a policy to support and encourage other voluntary early reductions.

Successful implementation of AB 32 will depend on a growing commitment by a majority of companies to include climate change as an integral part of their planning and operations. Individuals and households throughout the state will also have to take steps to consider climate change at home, at work and in their recreational activities. To support this effort, the Draft Plan includes a comprehensive statewide outreach program to provide businesses and individuals with the widest range of information so they can make informed decisions about reducing their carbon footprint.

Californians will not have to wait for decades see the benefits of a low-carbon economy. New homes can achieve a near zero-carbon footprint with better building techniques and existing technologies, such as solar arrays and solar water heaters. Many older homes can be retrofit to use far less energy than they currently consume. A new generation of vehicles, including plug-in hybrids, is poised to appear in dealers' showrooms, and the development of the infrastructure to support hydrogen fuel cell cars continues. Cities and new developments will be more walkable, public transportation will improve, and high-speed rail will give travelers a new, clean transportation option.

That world is just around the corner. What lies beyond is even more exciting. Where will California be in 2050? By harnessing the ingenuity and creativity of our society and sparking the imagination of the next generation, California will make the transition to a clean-energy, low-carbon society and become a healthier, cleaner place to live.

Release of the Draft Scoping Plan is a major milestone in the development of the Proposed Scoping Plan. This summer, ARB will release an evaluation supplement which will provide the results of the economic, environmental and public health evaluations of the Draft Scoping Plan. Throughout the summer, ARB will hold workshops and community meetings statewide to solicit public comment on the Draft Plan and the evaluation supplement. ARB will release the Proposed Scoping Plan in early October for consideration at the November Board meeting. The Proposed Plan will be shaped by the public input on this Draft Plan. Once the Scoping Plan is approved the Board, the State has two years to develop and adopt regulations to implement the Plan. This regulatory development will follow normal rulemaking processes with focused workshops and stakeholder involvement for each measure.

[13] http://www.usmayors.org/climateprotection/agreement.htm

This Draft Plan offers a preliminary recommendation on how best to achieve the goals of AB 32. ARB invites comment and input from the broadest array of the public and stakeholders in the coming months as this Plan is finalized. Your participation will help craft California's framework for the future.

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I. INTRODUCTION: A Framework for Change

California strengthened its commitment to address climate change when Governor Schwarzenegger signed Assembly Bill 32, the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006). Because of the need for immediate and effective action to counter the growing threat of global warming, the legislation sets forth an aggressive timetable for achieving results. Virtually every sector of California's economy will play a role in reducing greenhouse gases. Central to the success of AB 32 is the development of the Scoping Plan, which will lay out the comprehensive approach that California will take to address climate change while protecting and improving public health and helping the economy flourish.

As the lead agency for implementation of AB 32, the Air Resources Board (ARB) has undertaken a multi-track series of meetings, workshops, and seminars with stakeholders to get the Plan to this point. This process will continue, with workshops and seminars planned throughout the summer.

AB 32 embodies the idea that California's economy, the eighth largest in the world,[14] can continue to grow and flourish while reducing its greenhouse gas emissions and meeting the long-standing goal of healthy air. Achieving these goals will involve every sector of the state's $1.7 trillion economy and touch the lives of every Californian. Release of this Draft Scoping Plan is a key step in this unprecedented initiative. ARB invites full participation, and will consider public input in the development of the Proposed Scoping Plan that ARB will release in early October 2008. The Board will consider the Proposed Scoping Plan for adoption at its November meeting.

A. Background

1. Climate Change Policy in California

California first addressed climate change in 1988 with the passage of AB 4420 (Sher, Chapter 1506, Statutes of 1988) directing the California Energy Commission (CEC) to study global warming impacts to the state and develop an inventory of greenhouse gas emission sources. In 2000, SB 1771 (Sher, Chapter 1018, Statutes of 2000) established the California Climate Action Registry to allow companies, cities and government agencies to voluntarily record their greenhouse gas emissions in anticipation of a possible program that would allow them to be credited for early reductions.

[14] Legislative Analyst's Office. Cal Facts 2006. www.lao.ca.gov/2006/cal_facts/2006_calfacts_econ.htm

In 2001 the United Nations' Intergovernmental Panel on Climate Change (IPCC) reported that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." The following year, AB 1493 (Pavley, Chapter 200, Statutes of 2002) was signed, requiring the Air Resources Board to develop regulations to reduce greenhouse gas emissions from vehicles sold in California. The governors of California, Washington, and Oregon adopted a Global Warming Initiative in 2003 with provisions for the states to work together on climate change related programs.

Two years later Governor Schwarzenegger signed Executive Order S-3-05, calling for the state to reduce greenhouse gas emissions to 1990 levels by 2020 and to reduce greenhouse gas emissions to 80 percent below 1990 levels by 2050. The 2020 goal was established to be an aggressive, but achievable, mid-term target, and the 2050 greenhouse gas emissions reduction goal represents the level scientists believe is necessary to reach levels that will stabilize climate. In 2006, SB 1368 (Perata, Chapter 598, Statutes of 2006) created important greenhouse gas performance standards for new long-term financial investments in base-load electricity generation serving California customers.

2. AB 32: The Global Warming Solutions Act

In 2006, the Legislature passed and Governor Schwarzenegger signed Assembly Bill 32, the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006), which set the 2020 greenhouse gas reduction goal into law. It directed ARB to begin developing early actions to reduce greenhouse gases while also preparing a Scoping Plan to identify how best to reach the 2020 limit. The measures and regulations to meet the 2020 target are to be in effect by 2012.

AB 32 is as a groundbreaking measure that represents a turning point for California, setting in place statutory deadlines to change forever the business-as-usual approach to greenhouse gas emissions.

AB 32 includes a number of specific requirements for ARB:

- Identify the statewide level of greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020 (Health and Safety Code (HSC) §38550). In December of 2007, the Board approved this 2020 emission limit of 427 million metric tons of carbon dioxide (CO_2) equivalents ($MMTCO_2E$) of greenhouse gases.
- Adopt a regulation requiring the mandatory reporting of greenhouse gas emissions (HSC §38530). In December 2007, the Board adopted a regulation requiring the largest industrial sources to report and verify their greenhouse gas emissions. The reporting regulation serves as a solid foundation to determine greenhouse gas emissions and track future changes in emission levels.
- Identify and adopt regulations for Discrete Early Actions that could be enforceable on or before 2010 (HSC §38560.5). The Board identified 44 Early Action measures including potential regulations affecting landfills, motor vehicle

fuels, refrigerant in cars, port operations and many other sources in 2007, including nine Discrete Early Action measures for which the Board will adopt regulations by the end of 2009. The Board has already approved a Discrete Early Action measure to require electrification at ports, and will consider a greenhouse gas measure for consumer products in June 2008. Regulatory development for the remaining measures is on-going.

- Ensure early voluntary reductions receive appropriate credit in the implementation of AB 32 (HSC §38561(f), HSC §38562(b)(3)). In February 2008, the Board approved a policy statement encouraging voluntary early actions and establishing a procedure for project proponents to submit quantification methods to be evaluated by ARB. Staff is working with California's local air quality districts and the California Climate Action Registry to implement this program. Voluntary programs are discussed further in Chapter II under the Role of Offsets and in Chapter IV under Personal Action.
- Convene an Environmental Justice Advisory Committee (EJAC) to advise the Board in developing the Scoping Plan and any other pertinent matter in implementing AB 32 (HSC §38591). EJAC has met ten times since early 2007, providing comments on the proposed Early Action measures and the development of the Scoping Plan. ARB will continue to work with EJAC over the next several months as ARB develops the final staff recommendation for the Proposed Scoping Plan.
- Appoint an Economic and Technology Advancement Advisory Committee (ETAAC) to provide recommendations for technologies, research and greenhouse gas reduction measures (HSC §38591). After a year-long public process, ETAAC submitted a report of their recommendations to the Board in February 2008. ETAAC plans to review and provide comments on the Draft Scoping Plan.

3. Climate Action Team

Executive Order S-3-05 also established the Climate Action Team (CAT) for State agencies in 2005. Chaired by the Secretary of the California Environmental Protection Agency (CalEPA), the CAT has helped to direct State efforts on greenhouse gas reductions and engage key State agencies. The input from the CAT has provided the State with a starting point on how to achieve its goals. Based upon numerous public meetings and the review of thousands of submitted comments, the CAT released its first report in March 2006, identifying key carbon reduction recommendations for the Governor and Legislature.

In April 2007, the CAT released a second report, "Proposed Early Actions to Mitigate Climate Change in California," which details numerous strategies that should be initiated prior to the 2012 deadline for other climate action regulations and efforts. State agencies are moving ahead on many of these Early Actions.

In October 2007, the CAT released the report, "Updated Macroeconomic Analysis of Climate Strategies," providing an update of the macroeconomic analysis presented in the March 2006 CAT report to Governor Schwarzenegger and the Legislature. This

report updates the climate strategies presented in the 2006 CAT report and refined methodologies for analyzing the strategies and estimating macroeconomic impacts.

ARB worked closely with the CAT, the CAT sector subgroups, and staff from other State agencies to develop this Draft Scoping Plan. Input from the CAT subgroups was then compiled, evaluated and analyzed by ARB staff.

Climate Action Team Members

California Environmental Protection Agency
Business, Transportation and Housing Agency
Resources Agency
State and Consumer Services Agency
Governor's Office of Planning and Research
Air Resources Board
California Energy Commission
California Public Utilities Commission
Department of Food and Agriculture
Department of Forestry and Fire Protection
Department of General Services
Department of Parks and Recreation
Department of Transportation
Department of Water Resources
Integrated Waste Management Board
State Water Resources Control Board

There are 12 subgroups within the CAT, nine that address specific economic sectors, and three that were formed to analyze broad issues related to implementing a multi-sector approach to greenhouse gas reduction efforts. The CAT subgroups include: Agriculture, Cement, Energy, Forest, Green Buildings, Land Use, Recycling and Waste Management, State Fleet, and Water-Energy. The members of these subgroups are drawn from departments that work with or regulate industries in the sector. (Some subgroups adopted different names to more closely match their roles.) All of the subgroups held public meetings and solicited public input, and many had multiple public workshops, before recommending potential measures to ARB for consideration in this Draft Plan.

Early in 2008, ARB staff provided a guidance document to ensure that recommendations from the subgroups were submitted under a uniform protocol. In March 2008, the subgroups collectively submitted more than 100 greenhouse gas reduction measures to ARB for consideration in this Draft Scoping Plan.

Many of the CAT subgroup recommendations are reflected in the measures to reduce emissions from energy production and use. For example, through the Energy Subgroup, the CEC and the California Public Utilities Commission (CPUC) are conducting a joint proceeding to provide recommendations on how best to address electricity and natural gas in implementation of AB 32, including evaluation of how the Electricity sector might best participate in a cap-and-trade program. The two Commissions forwarded interim recommendations to ARB in March that supported inclusion of the Electricity sector in a multi-sector cap-and-trade program, and measures to increase the penetration of energy efficiency programs in both buildings and appliances and to increase renewable energy sources. ARB has considered those recommendations in developing the preliminary recommendation in this Draft Plan, and expects to receive additional input this summer that will be considered for the Proposed Scoping Plan that will be released in October, 2008.

Other subgroups have also provided recommendations that affect the use of electricity and natural gas. The Water-Energy Subgroup recommendations for increased water recycling are reflected in the Electricity and Commercial and Residential sectors. Recommendations from the Agriculture, Forest, and Recycling and Waste Management Subgroups include using agricultural, forest, and waste byproducts to generate electricity and/or transportation fuels. Recommendations from the Green Buildings Subgroup are aimed at making our buildings more energy efficient, environmentally-friendly and sustainable.

The Land Use Subgroup tackled the historically challenging problem of encouraging better land-use planning and transportation design. After an extensive stakeholder process, the Land Use Subgroup provided numerous recommendations to ARB, which provide the foundation for the recommendations in this Draft Plan.

The Cement Subgroup's recommendations also helped design measures considered for the Cement sector. ARB is continuing to work closely with the State Fleet Subgroup as part of the State of California's overall effort to ensure that state government leads by example.

There are three subgroups which are not sector-specific. The Economic Subgroup reviewed cost information associated with potential measures that were included in the 2006 CAT report. The Scenarios Subgroup is developing a report on the impacts of climate change and potential adaptation strategies. The newly-formed Research Subgroup is working on an upcoming CAT report to the Governor. The goals of the Research Subgroup are to coordinate climate change research and identify opportunities for collaboration.

4. Development of the GHG Emission Reduction Strategy

In developing this Draft Scoping Plan, ARB also considered the State's existing climate change policy initiatives, the Early Action measures identified by the Board, the recommendations of the Economic and Technology Advancement Advisory Committee, the Environmental Justice Advisory Committee, the Market Advisory Committee, input from the CAT Subgroups, submittals to a public solicitation, written public comments, and numerous comments received during public workshops, workgroup meetings, community meetings, and meetings with stakeholder groups. ARB convened workshops on the Scoping Plan and workgroup meetings focused on program design and economic analysis. Also, ARB and other involved State agencies held sector-specific technical workshops to look in greater detail at potential emission reduction measures.

Through the summer of 2008, further public comment will be solicited. ARB will hold a series of workshops around the state and meetings with stakeholders. Community meetings will be held to solicit input from residents of regions that have the most significant exposure to air pollutants, including communities with minority and/or low-income populations. Based on consideration of public input and further analysis, ARB will revise the Draft Plan, and will release the Proposed Scoping Plan

in early October, 2008, that will be considered for adoption by the Board at its November meeting. The Scoping Plan, even after Board approval, will remain a *plan*. The measures in the Scoping Plan must be adopted through the normal rulemaking process, with the necessary public input. In some cases, legislative action may be necessary.

5. Climate Change in California

AB 32, and the actions proposed in this Draft Plan, focus on reducing California's contributions to global warming.

In the Findings and Declarations for AB 32, the Legislature found that:

> "The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to the marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other health-related problems."

The Legislature further found that global warming would cause detrimental effects to some of the state's largest industries, including agriculture, winemaking, tourism, skiing, commercial and recreational fishing, forestry, and the adequacy of electrical power.

The impacts of global warming are already being felt in California. The Sierra snowpack, an important source of water supply for the state, has shrunk 10 percent in the last 100 years. It is expected to continue to decrease by up to 25 percent by 2050. World-wide changes are causing sea levels to rise – about 8 inches of increase has been recorded at the Golden Gate Bridge over the past 100 years – threatening low coastal areas with inundation and serious damage from storms. The Scenario Subgroup of the CAT is currently developing a report on climate change impacts to be released later this year.

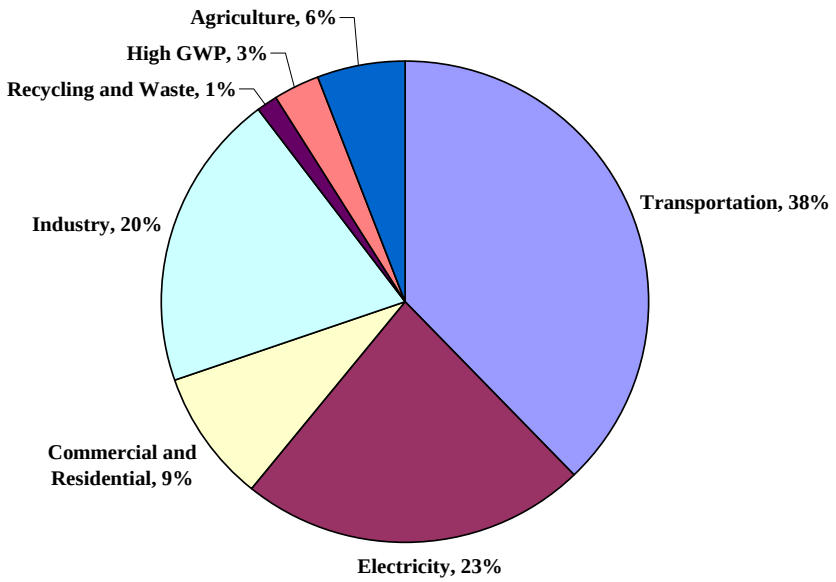
B. California's Greenhouse Gas Emissions and the 2020 Target

California is the fifteenth largest emitter of greenhouse gases on the planet, representing about two percent of the worldwide emissions. Although carbon dioxide is the largest contributor to climate change, AB 32 references six greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). Many other gases contribute to climate change and are also being addressed by some measures in this Draft Scoping Plan.

Figure 1 and Table 1 show 2002 to 2004 average emissions and estimates for projected emissions in 2020 without any greenhouse gas reduction measures (business-as-usual case). The 2020 forecast does not take credit for reductions from

the Pavley greenhouse gas emission standards for vehicles or from full implementation of the Renewables Portfolio Standard. Credit for these programs is accounted for as Plan measures. Additional information about the assumptions in the 2020 forecast is provided in Appendix F.

Figure 1: California's Greenhouse Gas Emissions (2002-2004 Average)[15]



As seen in Table 1, the Transportation sector – largely the cars and trucks that move goods and people – is the largest contributor with 38 percent of the state's total greenhouse gas emissions. Table 1 also shows that if we take no action, greenhouse gas emissions in the Transportation sector are expected to grow by approximately 25 percent (an increase of 46 $MMTCO_2E$).

The Electricity and Commercial/Residential Energy sector is the next largest contributor with over 30 percent of the greenhouse gas emissions. Although electricity imported into California accounts for only about 22 percent of our electricity, imports contribute nearly half of the greenhouse gas emissions from electricity because much of the imported electricity is generated at coal-fired power plants. AB 32 specifically requires ARB to address emissions from electricity sources both inside and outside of the state.

California's Industrial sector includes refineries, oil and gas production, food processors, and other large industrial sources. This sector contributes almost 20 percent of California's greenhouse gas emissions, but the sector's emissions are not projected to grow significantly in the future. Greenhouse gas emissions from

[15] Source: ARB Inventory

recycling and waste also are expected to grow substantially, but are expected remain a relatively small part of the state's overall emissions through 2020.

Although high global warming potential (GWP) gases are a small contributor to the historic greenhouse gas emissions, levels of these gases are projected to increase sharply over the next several decades, making them a significant source by 2020. The Forest sector is unique in that forests both emit greenhouse gases and uptake CO_2. While the current inventory shows forests as a sink of 4.7 $MMTCO_2E$, carbon sequestration has declined since 1990. For that reason, the 2020 projection assumes no net emissions from forests. The agricultural greenhouse gas emissions shown are largely methane emissions from livestock, both from the animals and their waste. Emissions of greenhouse gases from fertilizer application are also important contributors from the Agricultural sector. ARB has begun a research program to better understand the variables affecting these emissions. Opportunities to sequester CO_2 in the Agricultural sector may also exist; however, additional research is needed to identify and quantify potential sequestration benefits.

In December 2007, ARB approved a greenhouse gas emissions target for 2020 equivalent to the state's calculated greenhouse gas emissions level in 1990 (HSC §38550). ARB developed the 2020 target after extensive technical work and a series of stakeholder meetings. The 2020 target of 427 $MMTCO_2E$ requires reductions of 169 $MMTCO_2E$, or approximately 30 percent, from the state's projected 2020 emissions of 596 $MMTCO_2E$ (business-as-usual) and reductions of 42 $MMTCO_2E$, or almost 10 percent, from 2002-2004 average emissions.

Table 1: 2002-2004 Average Emissions and 2020 Projected Emissions[16]

($MMTCO_2E$)

Sector	2002-2004 Average Emissions	Projected 2020 Emissions
Transportation	179.3	225.4
Electricity	109.0	139.2
Commercial and Residential	41.0	46.7
Industry	95.9	100.5
Recycling and Waste	5.6	7.7
High GWP	14.8	46.9
Agriculture	27.7	29.8
Forest Net Emissions	-4.7	0
Emissions Total	**469**	**596**

[16] Ibid.

II. Preliminary Recommendation

Achieving the goals of AB 32 will require a wide range of approaches, with emission reductions needed from throughout the California economy. The comprehensive greenhouse gas emissions inventory, compiled by ARB in 2007, lists emission sources ranging from the largest refineries and power plants to small industrial processes and farm livestock. Californians own 26 million cars and trucks and drive over 330 billion miles a year. How do we develop solutions to reducing the emissions from these sources and activities while making sure we also improve public health, promote a cleaner environment, preserve our natural resources, and ensure that the impacts of the reductions are equitable and do not disproportionately impact low-income communities? The scale of this effort is considerable, but California is well-equipped to handle this challenge.

ARB is evaluating a comprehensive array of approaches and tools that can provide these reductions. Reducing GHG emissions for the wide variety of emission sources can best be accomplished though a mix of strategies that combine market mechanisms, regulations, voluntary measures, fees, policies, and programs. ARB will monitor implementation of this recommendation to ensure that the adopted program allow the State to meet the 2020 limit on greenhouse gas emissions.

Key elements of ARB's preliminary recommendation for reducing California's greenhouse gas emissions to 1990 levels by 2020 include:

- **Expansion and strengthening of existing energy efficiency programs and building and appliance standards;**
- **Expansion of the Renewables Portfolio Standard to 33 percent;**
- **Development of a California cap-and-trade program that links with other WCI Partner programs to create a regional market system;**
- **Implementation of existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard;**
- **Targeted fees to fund the State's long-term commitment to AB 32 administration.**

The recommended mix of measures is listed in Table 2, and is summarized in Section B below.

This preliminary recommendation is a key step in creating the program to reduce California's emissions, but is only the first stage in a multi-year process. The Proposed Scoping Plan, which will be published in early October 2008, will be shaped by the public input on this Draft Plan. ARB will review this recommendation based on additional staff analysis and

public input. The measures in the Scoping Plan adopted by the Board will undergo further analysis as they are developed into more detailed regulatory proposals over the next few years.

Expanded economic modeling, including impacts on low-income communities, and evaluation of related public health and environmental benefits of the various measures is still underway. The results of this ongoing analysis will be provided as a supplemental report in the summer of 2008. Because ARB's first mandate is the protection of public health, ARB will examine the potential effects the preliminary recommendation in this Draft Plan could have on criteria pollutants and toxic air contaminants. AB 32 includes specific criteria that ARB must consider before adopting regulations for market-based measures to implement AB 32, and directs the Board, to the extent feasible, to ensure market-based compliance mechanisms prevent any increase in the emissions of toxic air contaminants or criteria air pollutants. ARB's evaluation of the cap-and-trade program, other measures that incorporate market mechanisms, and related program design issues is ongoing, and will consider the economic, environmental and public health effects, including the evaluation of potential localized impacts. These results will be used to help design appropriate environmental and public health safeguards or additional measures that provide both cost-effective GHG reductions and localized air quality benefits.

Transportation and energy account for the majority of the state's emissions; accordingly, the recommended measures focus on these sectors. Measures include the Low Carbon Fuel Standard to reduce the carbon intensity of transportation fuels sold in our state, enforcement of regulations that reduce greenhouse gas emissions form vehicles, and policies to reduce transportation emissions by changing how we grow and build our communities. In the Energy sector, the recommended measures would increase the amount of electricity we get from renewable energy sources, improve the energy efficiency of homes and buildings, add more rooftop solar electric systems, and install solar water heaters in homes and businesses throughout California.

In other sectors, the proposed measures would require industrial processes to be more energy efficient and ships in California's ports to lower their greenhouse gas emissions. Other measures address waste management, agricultural and forestry practices, as well as the transport and treatment of water throughout the state. Finally, the recommended measures address ways to reduce use and prevent emissions of very potent greenhouse gases that contribute to global warming at a level many times greater than carbon dioxide. As with most of ARB's existing regulations, many AB 32 regulations are likely to incorporate flexible market-based compliance approaches to reduce emissions while lowering cost.

In addition to recommended measures, ARB is considering a number of other measures with respect to the role that they should play in achieving the State's climate goals. The recommendations in the Proposed Plan will reflect the results of these ongoing evaluations. The recommended measures are summarized in Section B, and the additional measures and methods are discussed in the remainder of this chapter.

Table 2: Recommended Greenhouse Gas Reduction Measures

Recommended Reduction Strategies	Sector	2020 Reductions ($MMTCO_2E$)
The Role of State Government • Reduce carbon footprint • Set an example	Various	1-2[17]
California Cap-and-Trade Program Linked to WCI: Emissions cap of 365 $MMTCO_2E$ covering electricity, transportation, residential/commercial and industrial sources by 2020. Shaded reductions contribute to achieving the cap.		
California Light-Duty Vehicle GHG Standards • Implement Pavley standards • Develop Pavley II light-duty vehicle standards	Transportation	31.7

Energy Efficiency
• Building and appliance energy efficiency and conservation
  • 32,000 GWh reduced electricity demand
  • 800 million therms reduced gas use
• Increase Combined Heat and Power (CHP) electricity production by 30,000 GWh
• Solar Water Heating (AB 1470 goal)
	Electricity & Commercial and Residential	26.4

Renewables Portfolio Standard (33% by 2020)	Electricity	21.2
Low Carbon Fuel Standard	Transportation	16.5
High Global Warming Potential Gas Measures	High GWP	16.2
Sustainable Forests	Forests	5
Water Sector Measures	Water	4.8[18]
Vehicle Efficiency Measures	Transportation	4.8
Goods Movement • Ship Electrification at Ports • System-Wide Efficiency Improvements	Transportation	3.7
Heavy/Medium Duty Vehicles • Heavy-Duty Vehicle GHG Emission Reduction (Aerodynamic Efficiency) • Medium- and Heavy-Duty Vehicle Hybridization • Heavy-Duty Engine Efficiency	Transportation	2.5
Million Solar Roofs (Existing Program Target)	Electricity	2.1
Local Government Actions and Regional GHG Targets	Land Use and Local Government	2
High Speed Rail	Transportation	1
Landfill Methane Control	Recycling & Waste	1
Methane Capture at Large Dairies	Agriculture	1[19]
Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	Industrial	TBD
Additional Emissions Reduction from Capped Sectors		35.2
	Total Reductions	**169**

[17] ARB is evaluating emission reduction estimates for this measure, and therefore are not counted in the total.
[18] GHG reductions from the water sector may already be incorporated in the 2020 forecast. They are not currently counted toward the 2020 goal. ARB will work with the appropriate agencies to determine whether these reductions are additional.
[19] Because the emission reductions from this measure are not required, they are not counted in the total.

A. The Role of the State: Setting an Example

For many years California State government has strived to incorporate environmental principles in managing its resources and running its business. Recent Executive Orders[20] have directed State agencies to sharply reduce their energy use and encourage our State-run pensions to invest in energy efficient and clean technologies. The State also has been active in procuring low-emission, alternative fuel vehicles in its large fleet.

While the State has already accomplished much to reduce its greenhouse gas emissions, it can and must do more. Recognizing that responsibility lies with all Californians, the State must lead by example by sharply reducing its greenhouse gas emissions. Therefore, California State government is establishing a target of reducing its greenhouse gas emissions by a *minimum* of 30 percent by 2020 below its estimated business-as-usual emissions – approximately a 15 percent reduction from current levels.

As an owner-operator of key infrastructure, the State has the ability to ensure that the most advanced, cost-effective environmental performance requirements are used in the design, construction, and operation of State facilities. As a purchaser with significant market power, State government has the ability to demand that the products and services it procures contribute positively toward California's greenhouse gas emission reduction targets. As an investor of more than $400 billion,[21] State government has the ability to prioritize low-carbon investments. And, as an employer of more than 350,000 Californians, State government is uniquely situated to adopt and implement policies that give State workers the ability to decrease their individual carbon impact, including encouraging telecommuting, siting facilities to encourage jobs/housing balance, and use of alternative work schedules. In partnership with business in downtown Sacramento, the State is currently encouraging alternative commute and work options, such as transit, carpooling, telecommuting and flexible schedules, to minimize traffic during major construction on Interstate 5 in downtown Sacramento. Information about employees' response for this project can be used by government and the private sector to evaluate options for future employee commute policies.

Myriad opportunities exist for California State government to operate more efficiently. These opportunities will not only reduce greenhouse gas emissions but also will produce savings for California taxpayers. Initiatives now underway that will contribute to the State government reduction target include the Governor's Green

[20] Governor Schwarzenegger signed Executive Order Executive Order S-20-04 on December 14, 2004. This Order, among other things, set aggressive goals for reducing state building energy use and requested the California Public Employees Retirement System (CalPERS) and the California State Teachers Retirement System (CalSTRS) to target resource-efficient buildings for real estate investments and commit funds toward clean, efficient and sustainable technologies.

[21] CalPERS and CalSTRS are the two largest pension systems in the nation with investments in excess of $400 billion as of April 2008.

Building Initiative and the Department of General Services' efforts to increase the number of fuel-efficient vehicles in the State fleet.

Major efforts to expand renewable energy use and divest from coal power plants are currently underway. Together with energy conservation strategies on water projects, roadways, parks, and bridges, these efforts all play a major role in reducing the state's greenhouse gas emissions. The State should review its travel practices and make, where possible, greater use of teleconferencing and videoconferencing to reduce the need for business travel, particularly air travel.

All State agencies are now examining their policies and operations to determine how they can reduce their greenhouse gas emissions, in addition to each cabinet-level agency registering with the California Climate Action Registry to record and report their individual carbon footprints. CalEPA will coordinate with other agencies to review the State government greenhouse gas emissions and determine how to best achieve a 30 percent reduction. Finally, State government must also begin to identify and evaluate its "carbon shadow;" that is, addressing the potential for climate change impacts in all legislative, executive, and financial actions that affect Californians now and in the future. For the benefit of the environment, the State will retain ownership of and subsequently retire greenhouse gas reductions generated as a result of projects funded with State bond funds.

B. Emission Reduction Measures

The Scoping Plan will build on ARB's successful history of balancing effective regulations with economic progress. Three types of measures have been recommended. First is the regional cap-and-trade program. Second are transformational measures that provide vital steps toward California's clean energy future. For example, the Low Carbon Fuel Standard (LCFS) will incent a diverse set of clean transportation fuel options. Similarly, local government leadership is needed to ensure that California's land use and transportation planning processes comprehensively support State goals, including greenhouse gas emission reduction.

Third are measures that address barriers that would not be overcome solely by means of a market approach. Barriers could result from a lack of information, lack of coordination, or regulatory and institutional factors. Energy efficiency is a classic example where cost-effective action is often not taken due to lack of complete information, relatively high initial costs, and mismatches between who pays and who benefits from efficiency investments. California has a long history of success in implementing regulations and programs to encourage energy efficiency and will need to greatly expand those efforts to meet our greenhouse gas emission reduction goals.

The recommended measures often complement each other. For example, the LCFS will provide clean transportation fuel options. The Pavley I and II performance standards help deploy vehicles that can utilize many of the low-carbon fuels, including advanced biofuels, electricity and hydrogen. The existence of both

programs will make it more likely that more efficient, less polluting vehicles will use the cleanest possible fuels. In addition, both of these programs must coordinate with and advance ARB's zero-emission vehicle program, which focuses on deployment of battery-electric and fuel cell vehicles. ARB is currently in the process of determining how the ZEV program can best be expanded to help meet the GHG reduction goals of AB 32. All of these strategies are expandable beyond 2020, and are needed as vital components to reach the State's 2050 goal.

ARB will continue to evaluate the measures presented in this chapter, including analyses of their economic costs and economic, environmental, and public health benefits. As ARB develops the Proposed Scoping Plan and regulations to implement specific measures, the details of the specific measures will evolve.

Release of the Draft Scoping Plan is a major milestone in the development of the Proposed Scoping Plan. This summer, ARB will release an evaluation supplement which will provide the results of the economic, environmental and public health evaluations of the Draft Scoping Plan. Throughout the summer, ARB will hold workshops and community meetings statewide to solicit public comment on the Draft Plan and the evaluation supplement. ARB will release the Proposed Scoping Plan in early October for consideration at the November Board meeting. The Proposed Plan will be shaped by the public input on this Draft Plan. Once the Scoping Plan is approved the Board, the State has two years to develop and adopt regulations to implement the Plan. This regulatory development will follow normal rulemaking processes with focused workshops and stakeholder involvement for each measure.

Early Actions

In September 2007, the ARB approved a list of nine Discrete Early Actions and 35 Early Action measures to reduce greenhouse gas emissions and is currently in the process of developing regulations and programs based on these measures. Regulations implementing the Discrete Early Action measures must be adopted and in effect by January 1, 2010 (HSC §38560.5 (b)). All the Discrete Early Actions are included in the recommended measures. ARB has already adopted one Discrete Early Action measure, port electrification, and will be considering additional regulatory measures over the next year. Table 3 shows the Discrete Early Action items and their anticipated date for consideration by the Board.

Table 3: Anticipated Board Consideration Dates for Discrete Early Actions

Discrete Early Action	Anticipated Board Consideration
Green Ports – Ship Electrification at Ports	December 2007 - Adopted
Reduction of High GWP Gases in Consumer Products	June 2008
SmartWay – Heavy-Duty Vehicle GHG Emission Reduction (Aerodynamic Efficiency)	October 2008
Low Carbon Fuel Standard	December 2008
Reduction of Perfluorocarbons from Semiconductor Manufacturing	December 2008
Improved Landfill Gas Capture	January 2009
Reduction of HFC-134a from Do-It-Yourself Motor Vehicle Servicing	January 2009
SF_6 Reductions from the Non-Electric Sector	January 2009
Tire Inflation Program	March 2009

The following sections describe the recommended measures in this Draft Scoping Plan and constitute ARB's preliminary recommendation. Additional information about these measures is provided in Appendix C.

1. California Cap-and-Trade Program Linked to Western Climate Initiative

Implement a broad-based cap-and-trade program that links with other Western Climate Initiative Partner programs to create a regional market system. Ensure California's program meets all applicable AB 32 requirements for market-based mechanisms.

California is working closely with other states and provinces in the Western Climate Initiative (WCI) to design a regional cap-and-trade program that can deliver GHG reductions throughout the region. ARB will develop a cap-and-trade program for California that will link with the programs in the other WCI Partner states and provinces to create this western regional market. ARB will continue to work with the WCI Partners to ensure that the resulting market design is one that provides real emission reductions in the region. ARB will also design the California program to meet the requirements of AB 32, including the need to consider any potential localized impacts, ensure market security (avoid gaming), and ensure enforceability. While WCI has significant technical and consensus building still to come before the diverse partners can establish a regional market system, ARB intends to implement a California cap-and-trade program consistent with the regional effort.

Regulations to implement the cap-and-trade system would need to be developed by January 1, 2011, based on the authority and requirements of AB 32, with the program beginning in 2012. This rule development schedule will be coordinated with the WCI timeline for developing a regional cap-and-trade program. Any market-based compliance mechanism that California adopts as part of this regional program must

comply with the requirements specified in Health and Safety Code section 38570, related to market-based mechanisms under AB 32.

Cap and trade is a market-based approach to reduce pollution from sources such as industrial processes and power generation. The approach caps the total amount of GHG emissions and allows covered sources to find the least expensive way to comply. Excess emission reductions can be banked for future use or traded with other firms. The emissions in the cap would be denominated in metric tons of CO_2E. The currency would be in the form of allowances which the State would issue based upon the total emissions allowed under the cap during any specific compliance period. These allowances could be freely distributed to capped firms or auctioned in the trading market.

Provisions could be made to allow a limited use of surplus reductions that occur outside of the cap. These additional reductions are known as offsets and are discussed further in Section C. In order to be used to meet a source's compliance obligation, offsets would be subject to stringent criteria and verification procedures to ensure its enforceability and consistency with AB 32 requirements.

The WCI was launched in 2007 and consists of California, Arizona, New Mexico, Oregon, Washington, Utah, and Montana, and the Canadian provinces of British Columbia, Manitoba, and Quebec. The WCI Partner states and provinces have set an overall regional goal for reducing GHG emissions. A cap-and-trade program is one element of the effort by the WCI partners to identify, evaluate, and implement ways to reduce GHG emissions and achieve related co-benefits. California is working with the other WCI partners to develop a framework for a regional cap-and-trade program. The partners plan to release the program design framework in September 2008.

WCI released draft recommendations for a regional cap-and-trade program in May 2008, which are presented in Appendix D. These recommendations were developed collaboratively by the WCI Partners, including California, with a goal of achieving regional GHG reduction targets equitably and effectively. The WCI's draft recommendations are consistent with the recommendations provided in June 2007 by the California Market Advisory Committee,[22] and with the recommendations provided to ARB by the California Public Utilities Commission and the California Energy Commission in March 2008.

The Scoping Plan must be designed to meet the AB 32 goal of reducing statewide emissions to 1990 levels by 2020. To meet that target, the limit on emissions allowed under a cap-and-trade program, plus expected emissions from uncapped sources, must

[22] The Report, "Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California," was released in June 2007 and can be found online at: http://climatechange.ca.gov/market_advisory_committee/index.html. The Market Advisory Committee (MAC) consisted of a consortium of economists, policy makers, academics, government sector public servants, and environmental advocates who came together through the auspices of Cal/EPA, pursuant to Executive Order S-20-06 from Governor Arnold Schwarzenegger.

be no greater than the 2020 emissions goal. This cap must also be realistic in terms of the emission reduction opportunities within the capped sectors. By setting a limit on the quantity of greenhouse gases emitted, a well-designed cap-and-trade program will complement regulatory measures for covered sectors and achieve additional reductions in greenhouse gases that would not have occurred otherwise.

As shown in Table 4, the preliminary estimate for the capped sectors GHG emissions is 365 $MMTCO_2E$ in 2020 for the broadest program under consideration, which covers about 85 percent of California total GHG emissions. Capped sectors would include electricity, transportation fuels, natural gas, and large industrial sources[23]. Emissions or energy use from most of the sectors covered by a cap-and-trade program would also be governed by other measures, including performance standards, efficiency programs, and direct regulations.

Table 4: Sector Responsibilities Under Cap-and-Trade Program

($MMTCO_2E$ in 2020)

Sector	Projected 2020 Business-as-Usual Emissions		Projected 2020 Emissions After Implementation of Other Recommended Measures		Preliminary 2020 Emissions Limit under Cap-and-Trade Program
	By Sector	Total	By Sector	Total	
Transportation	225	512	163	400	365
Electricity	139		94		
Commercial and Residential	47		42		
Industry	101		101		

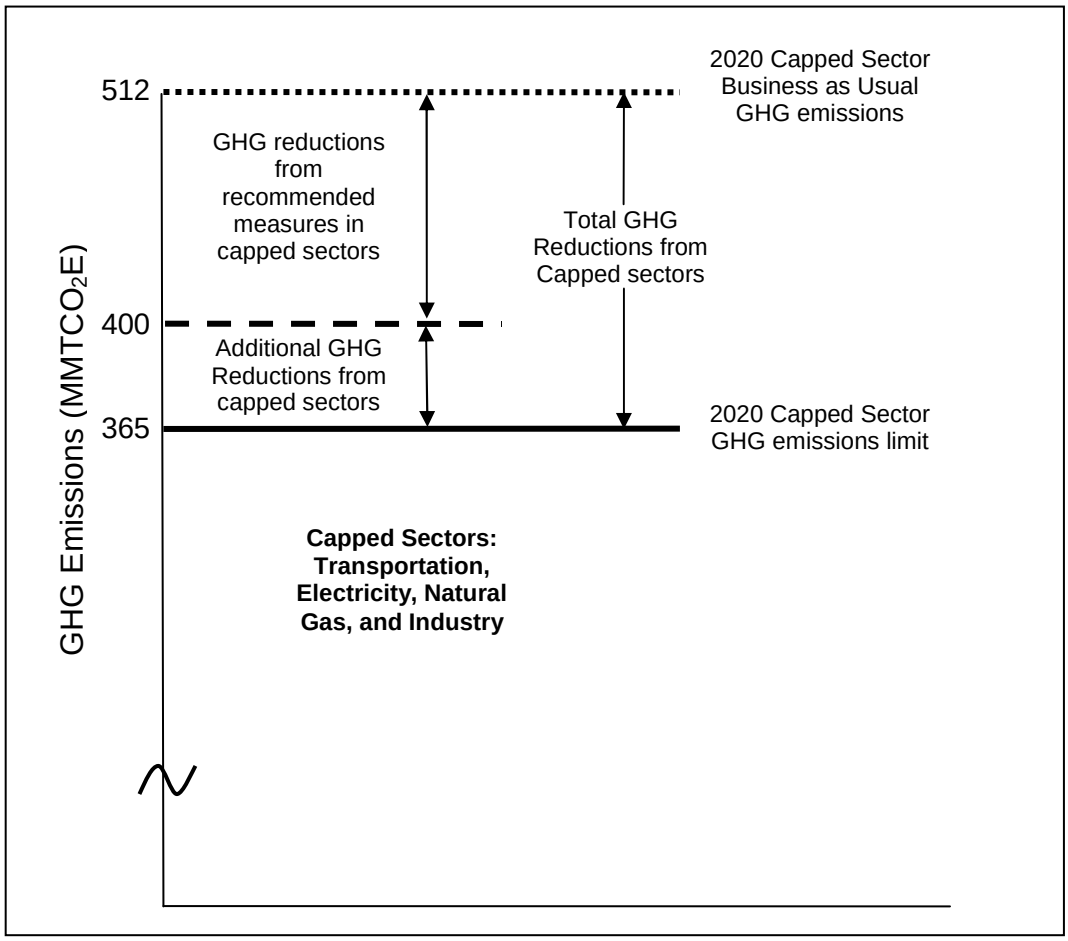
Figure 2 illustrates the relationship between the emission limit established by the cap-and-trade program and the emission reductions obtained through other recommended measures. By 2020, the business-as-usual emissions forecast for these sectors is projected to be 512 $MMTCO_2E$, as depicted by the top line. Implementation of the Draft Scoping Plan's recommended measures for these sectors is expected to reduce emissions by 112 $MMTCO_2E$, resulting in total GHG emissions of 400 $MMTCO_2E$, as depicted by the heavy-dashed line. To ensure compliance with AB 32 goals, the allowable emissions from the capped sectors would be about 365 $MMTCO_2E$ in 2020. The additional reduction requirement of 35 $MMTCO_2E$ are the responsibility of the capped sector to reduce and are shown directly below the heavy-dashed line. These additional reductions will come from capped sources that are able to reduce emissions in the most cost-effective manner.[24] All measures for capped sectors will

[23] While WCI has not yet made a decision that transportation fuels will be included in the cap-and-trade program design, California shares a strong interest with other WCI members in phasing transportation fuels into the cap-and-trade program before 2020.

[24] For a further discussion of this issue, see Box 2-2, page 13 of the California Market Advisory report at: http://www.climatechange.ca.gov/market_advisory_committee/index.html

contribute to achieving the cap by reducing their need to surrender allowances under the cap-and-trade program. Overall, the cap represents a 147 $MMTCO_2E$ reduction from projected business-as-usual (BAU) emissions from covered sources.

Figure 2: Relationship of Cap-and-Trade Program with Other Recommended Measures



California's cap will be based on the requirements of AB 32, and will also be consistent with efforts of other WCI partners. The WCI has set a regional goal of 15 percent reduction in GHG emissions below 2005 levels to be achieved by 2020. This is very close to the 2020 goal for California established under AB 32. To achieve that goal, both the California cap and the Western regional cap must decline over time. Each WCI Partner would have an allowance budget within the cap. Allowances could be traded across state and provincial boundaries, so actual emissions could vary from a state's initial allowance budget. California's budget would be based on meeting the AB 32 target for 2020, as described above. The number of allowances issued in a given year by the WCI partners overall would set a limit on emissions from the region. The distribution of allowances would quickly transition from a system in which the State provides some free allowances, to a system in which majority of allowances are auctioned in the trading market.

The ultimate success of the WCI program will depend on the commitments of all partners to maintain their economy-wide GHG emission reduction goals. A firm regional cap with strong reporting and enforcement rules will provide a high degree of environmental certainty that emissions will not exceed targeted levels. ARB will need to ensure there is integrity in the system as a whole before California can participate in the WCI market system.

Participating in a regional system has several advantages for California. It can reduce the potential for "leakage," i.e., a shift of economic and emissions activity out of California that hurts the state's economy without reducing global GHG emissions. Harmonizing the approach and timing of California's GHG emission reduction requirements with other states and provinces in the region could reduce the possibility that local businesses will shift production out of state. Further, by working to create a cost-effective regional market system, California and the other WCI partners will gain an important advantage in preparing for any future action at the federal level, which is likely to also include a cap-and-trade program as a key element of the overall program.

A cap-and-trade program is generally expected to be a significant element in any future federal action on reducing GHG emissions. ARB's efforts to design a cap-and-trade system that works in concert with regulatory measures and meets the requirements of AB 32 can serve as a model for a federal program. Efforts under AB 32 to establish an effective, enforceable regional cap-and-trade program will greatly assist California and the region promote the type of federal legislation that is needed.

The opportunity to continue to reduce the cap over time beyond 2020 and the opportunity to link our program with others (including a federal program) are additional reasons why it is important to get this program started early.

ARB would need to design the specific elements of the cap-and-trade program through a public rulemaking process in the next two years. These elements would include setting the cap and determining the method of distributing allowances. ARB will also consider potential constraints on the system, including trading in communities with disparate environmental impacts. The rulemaking would also need to establish appropriate rules for use of offsets. A limit on offsets, such as 10 percent of the compliance obligation for an individual firm, would allow ARB and WCI to test the viability of the offset system while limiting the risk that unconstrained offsets could weaken the stringency of the overall cap-and-trade program. Even with this type of limit, the use of offsets would provide an outlet to relieve cost pressure. In conducting this rulemaking, ARB will continue to work within the WCI to ensure that California's program can link with other partner's programs to create a regional market system.

Appendix C provides further description of the fundamentals of a cap-and-trade program, the Western Climate Initiative recommendations, and draft program design elements.

2. California Light-Duty Vehicle GHG Standards

Implement adopted Pavley standards and planned second phase of the program.

Assembly Bill 1493 (Pavley, 2002) directed ARB to adopt vehicle standards that lowered greenhouse gas emissions to the maximum extent technologically feasible, beginning with the 2009 model year. ARB adopted regulations in 2004 and applied to the U.S. Environmental Protection Agency (U.S. EPA) for a waiver under the federal Clean Air Act to implement the regulation. The Pavley regulations incorporate both performance standards and market-based compliance mechanisms. ARB plans to adopt a second, more stringent, phase of the Pavley regulations. Table 5 summarizes the estimated emission reductions for the Pavley regulations. In addition to delivering greenhouse gas reductions, the standards will benefit California drivers by ultimately saving them an estimated $30 each month in avoided fuel costs.

To date, 13 other states have adopted California's existing greenhouse gas standards for vehicles. Under federal law, California is the only state allowed to adopt its own vehicle standards (though other states are permitted to adopt California's more rigorous standards), but California cannot implement the regulations unless U.S. EPA grants an administrative waiver. In December 2007, U.S. EPA denied California's waiver request to implement the Pavley regulations; California and others are challenging that denial in federal court. The regulations have also been challenged by the automakers in federal courts, although to date, those challenges have been unsuccessful.

It is highly likely that ARB will ultimately be permitted to implement the Pavley regulations. However, AB 32 specifically states that if the Pavley regulations do not remain in effect, ARB shall implement alternative regulations to control mobile sources to achieve equivalent or greater greenhouse gas reductions (HSC §38590). ARB currently plans to pursue one of two possible strategies to backstop the Pavley regulations if they cannot be implemented.

The first strategy requires the original equipment manufacturers (OEMs) to meet the equivalent of the emission reductions expected under the current Pavley regulations as a condition of vehicle certification in California. Before vehicles could be certified for sale in California, the OEM would need to submit verified greenhouse gas emission reductions from mobile sources equivalent to those of the Pavley reductions. This obligation would cover the life of the current regulations, from model year 2009 through 2016, and would also need to replace the anticipated reductions from the second phase of the Pavley regulations. However, until U.S. EPA grants California's waiver request, OEMs would not be required to certify individual engine families to the Pavley regulations. The second strategy is a feebate proposal in which fees on the purchase of high greenhouse gas emitting vehicles would be returned as rebates to

buyers of low greenhouse gas emitting vehicles. The fee schedule would need to be designed to obtain cumulative emission reductions equivalent to those that would have been achieved under the Pavley regulations.

Greenhouse gas emissions from California light-duty vehicles will be reduced under the AB 32 program, whether via the Pavley regulations or one of the other strategies described above.

Table 5: California Light-Duty Vehicle GHG Standards Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-1	Pavley I and II – Light-Duty Vehicle GHG Standards	31.7
	Total	**31.7**

3. Energy Efficiency

Maximize energy efficiency building and appliance standards, and pursue additional efficiency efforts.

In 2003, the CPUC and CEC adopted an Energy Action Plan that prioritized resources for meeting California's future energy needs, with energy efficiency being first in the "loading order," or highest priority. Since then, this policy goal has been codified into statute[25] through legislation that requires electric utilities to meet their resource needs first with energy efficiency. This measure would set new targets for statewide energy demand reductions of 32,000 Gigawatt hours and 800 million therms from business-as-usual projections for 2020 – enough to power more than 5 million homes, or replace the need to build about ten new large power plants (500 Megawatts each). This is the high end of what the CPUC is currently considering for investor-owned utility energy efficiency targets. ARB has applied these targets to both investor- and publicly-owned utilities to generate the estimated reductions. These reductions could be achieved through enhancements to existing programs such as increased incentives and even more stringent building codes and appliance efficiency standards. Achieving these energy efficiency targets will require cooperation from the State, the federal government, energy companies and customers. ARB will work with the CEC and the CPUC to facilitate these partnerships.

In addition, the use of solar water heaters can reduce natural gas use in homes and businesses. The State will be instituting incentives for up to 200,000 solar water heating systems, which would save as much as 26 million therms of natural gas per year (AB 1470, Huffman, Chapter 536, Statutes of 2007). The State should also pursue efforts to encourage combined heat and power systems that make use of both

[25] Senate Bill 1037 (Kehoe, Chapter 366, Statutes of 2005) and AB 2021 (Levine, Chapter 734, Statutes of 2006) directed electricity corporations subject to the CPUC's authority and publicly-owned electricity utilities to first meet their unmet resource needs through all available energy efficiency and demand response resources that are cost effective, reliable and feasible.

the electricity and the heat generated to maximize efficiency. These efforts will address institutional barriers to installing combined heat and power systems. Energy-efficiency measures for both electricity and natural gas can reduce greenhouse gas emissions on a scale second only to the Pavley regulations. Tables 6 and 7 summarize the estimated reductions. ARB is continuing to work with the CEC and the CPUC to ensure that these emission reductions are not counted elsewhere or already assumed in the 2020 forecast.

A number of these measures also have the potential to deliver significant economic benefits to California consumers. California's energy efficiency programs for buildings and appliances have generated more than $50 billion in savings over the past three decades.

Green Buildings

Buildings are the second largest contributor to California's greenhouse gas emissions. Approximately one-quarter of the greenhouse gases emitted in 2004 can be attributed to buildings[26]. As the Governor recognized in his Green Building Initiative (Executive Order S-20-04), significant greenhouse gas emission reductions can be achieved through the design and construction of new green buildings as well as the sustainable operation and renovation of existing buildings. Green buildings offer a comprehensive approach to reducing greenhouse gas emissions that cross-cut multiple sectors including Energy, Water, Waste, and Transportation. As such, green buildings provide an opportunity to consolidate a variety of greenhouse gas reduction strategies under one roof. Green buildings are constructed, renovated, operated, and maintained using an integrated design process that creates and ensures a healthy and comfortable environment while maximizing energy and resource efficiency. Employing a whole-building design approach can create tremendous synergies that result in multiple benefits at little or no cost, allowing for efficiencies that would never be possible on an incremental basis.

Green buildings exceed minimum energy efficiency standards, decrease consumption of potable water, reduce solid waste during construction and operation, and incorporate sustainable and low-emitting materials that contribute to healthy indoor air quality, which protects human health and minimizes impacts to the environment. Siting buildings close to public transportation and services, and providing amenities that encourage walking and cycling, offer further potential to reduce transportation-related greenhouse gas emissions. All of these features work together to offer substantial greenhouse gas reductions.

Achieving significant GHG emissions from the building sector would require a combination of green building measures for new construction and existing buildings. The State of California should set an example by requiring all new State buildings to exceed existing energy standards and meet nationally-recognized building sustainability standards such as Leadership in Energy and Environmental Design

[26] GHG estimates only account for electricity, natural gas, and water use in homes and commercial buildings.

(LEED) Gold standards. Existing State buildings would also be retrofit to achieve higher standards equivalent to LEED-EB Silver. Starting in 2010, all new schools would be required to meet Collaborative for High Performance Schools (CHPS) criteria. Existing schools applying for modernization funds would also be required to meet CHPS criteria. For all buildings, the State is developing a mandatory Green Building Standards Code that will institute minimum environmental performance standards for all buildings in 2010.

The Draft Scoping Plan considers using the green building framework as a mechanism that enables greenhouse gas reductions in other sectors. For example, green building strategies are what make it possible to reach the targets set for electricity and natural gas reductions. In order to avoid double counting, the Plan does not count the green building measures as additional greenhouse gas reductions, but this may change as further evaluation of the interactions between green buildings and other sectors is conducted.

Table 6: Energy Efficiency Preliminary Recommendation - Electricity

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
E-1	Energy Efficiency (32,000 GWh of Reduced Demand) • Increased Utility Energy Efficiency Programs • More Stringent Building & Appliance Standards	15.2
E-2	Increase Combined Heat and Power Use by 32,000 GWh (Net reductions include avoided transmission line loss)	6.9
	Total	**22.1**

Table 7: Energy Efficiency Preliminary Recommendation - Commercial and Residential

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
CR-1	Energy Efficiency (800 Million Therms Reduced Consumption) • Utility Energy Efficiency Programs • Building and Appliance Standards • Additional Efficiency and Conservation	4.2
CR-2	Solar Water Heating (SB1470 goal)	0.1
	Total	**4.3**

4. Renewables Portfolio Standard

Achieve 33 percent Renewables Portfolio Standard by both investor-owned and publicly-owned utilities.

The California Energy Commission (CEC) estimates that about 12 percent of California's retail electric load is currently met with renewable resources, including wind, solar, geothermal, small hydroelectric, biomass, and biogas. California's current Renewables Portfolio Standard (RPS) is intended to increase that share to 20 percent by 2010. Increased use of renewables will decrease California's reliance on fossil fuels, thus reducing emissions of GHGs from the Electricity sector. Based on Governor Schwarzenegger's call for a statewide 33 percent RPS, the Draft Plan anticipates that California will have 33 percent of its electricity provided by renewable resources by 2020, and includes emission reductions based on this level in the Draft Plan.

Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006) obligates the investor-owned utilities to increase the share of renewables in their electricity portfolios to 20 percent by 2010. Meanwhile, the publicly-owned utilities (POUs) are encouraged but not required to meet the same RPS. The governing boards of the state's three largest POUs, the Los Angeles Department of Water and Power (LADWP), the Sacramento Municipal Utility District (SMUD), and the Imperial Irrigation District (IID), have adopted policies to achieve 20 percent renewables by 2010 or 2011. LADWP and IID have established targets of 35 and 30 percent, respectively, by 2020.

A more aggressive RPS goal of 33 percent by 2020 has also been proposed but is not yet codified into statute. In 2005, the CEC and the CPUC committed in the Energy Action Plan II to "evaluate and develop implementation paths for achieving renewable resource goals beyond 2010, including 33 percent renewables by 2020, in light of cost-benefit and risk analysis, for all load serving entities." As with the energy efficiency target, achieving the 33 percent goal will require cooperation from many parties. ARB will work with the CEC and the CPUC to facilitate these partnerships.

For the purposes of calculating emission reductions in this Draft Plan, ARB is counting emissions avoided by increasing the percentage of renewables in California's electricity mix from the current level of 12 percent to the 33 percent goal, as shown in Table 8.

Table 8: Renewables Portfolio Standard Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
E-3	Renewables Portfolio Standard (33% by 2020)	21.2
	Total	**21.2**

5. Low Carbon Fuel Standard

Develop and adopt the Low Carbon Fuel Standard.

Because transportation is the largest single source of greenhouse gas emissions in California, the State is taking an integrated approach to reducing emission from this sector. Beyond including vehicle efficiency improvements and lowering vehicle miles traveled, the State is reducing the carbon intensity of motor fuels consumed in California. In Executive Order (S-1-07), Governor Schwarzenegger called for the development of a Low Carbon Fuel Standard (LCFS), which would reduce the carbon intensity of California's transportation fuels by at least ten percent by 2020. The LCFS will incorporate market-based compliance mechanisms to provide flexibility to fuel providers while meeting the emission reduction goals. The LCFS will examine the full fuel cycle impacts of transportation fuels (including multi-media impacts), and the staff analysis will take into account issues raised by the Environmental Justice Advisory Committee and other stakeholders. ARB identified the LCFS as a Discrete Early Action item, and staff is actively developing a regulation for Board consideration in late 2008. Table 9 provides estimated emission reductions from this measure.

Table 9: Low Carbon Fuel Standard Preliminary Recommendation

($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-2	Low Carbon Fuel Standard (Discrete Early Action)	16.5
	Total	**16.5**

6. High GWP Gases

Adopt measures to reduce high global warming potential gases.

High global warming potential (GWP) gases are substances that pose a unique challenge. Just a few pounds of some high GWP materials can have the equivalent effect on global warming as thousands of pounds of carbon dioxide. For example, the average refrigerator has about a half-pound of refrigerant and about one pound of "blowing agents" used to make the insulating foam. If these gases were released into the atmosphere, they have a global warming potential equivalent to five metric tons of carbon dioxide.

High GWP chemicals are very common and are used in many different applications such as refrigerants, in air conditioning systems, in fire suppression systems, and in the production of insulating foam. Because these gases have been in use for years, old refrigerators, air conditioners and foam insulation represent a significant "bank" of these materials yet to be released. High GWP gases are released in two primary ways. The first is through leaking refrigeration systems. The second is during the disposal process. Once high GWP materials are released, they persist in the atmosphere for tens or even hundreds of years.

Measures to address this growing problem may take the form of regulations and/or fees. ARB identified four Discrete Early Action measures to reduce greenhouse gas emissions from the refrigerants used in car air conditioners, semiconductor manufacturing, and consumer products. Potential reduction opportunities have been identified based on specifications for future commercial and industrial refrigeration, changing the refrigerants used in auto air conditioning systems, and ensuring that existing car air conditioning systems do not leak. Recovery and destruction of high GWP materials in the "bank" described above could also provide significant reductions. Table 10 summarizes the preliminary recommendation for measures in the High GWP sector. These measures address both high GWP gases identified in AB 32 and also other high GWP gases, such as ozone-depleting substances that are only partially covered by the Montreal Protocol. Table 10 shows emission reductions from only the six greenhouse gases explicitly identified in AB 32.

Table 10: High GWP Gases Sector Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
H-1	Motor Vehicle Air Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Servicing (Discrete Early Action)	0.5
H-2	SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)	0.3
H-3	High GWP Reduction in Semiconductor Manufacturing (Discrete Early Action)	0.15
H-4	Limit High GWP Use in Consumer Products (Discrete Early Action)	0.3
H-5	High GWP Reductions from Mobile Sources • Low GWP Refrigerants for New Motor Vehicle Air Conditioning Systems • Air Conditioner Refrigerant Leak Test During Vehicle Smog Check • Refrigerant Recovery from Decommissioned Refrigerated Shipping Containers • Enforcement of Federal Ban on Refrigerant Release during Servicing or Dismantling of Motor Vehicle Air Conditioning Systems	3.3
H-6	High GWP Reductions from Stationary Sources • High GWP Recycling and Deposit Program • Specifications for Commercial and Industrial Refrigeration • Foam Recovery and Destruction Program • SF_6 Leak Reduction and Recycling in Electrical Applications • Alternative Suppressants in Fire Protection Systems • Residential Refrigeration Early Retirement Program	11.6
	Total	**16.2**

7. Sustainable Forests

Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation.

The 2020 target for California's forest lands is to achieve a 5 $MMTCO_2E$ reduction through sustainable management practices, including reducing the risk of catastrophic wildfire, and the avoidance or mitigation of land-use changes that reduce carbon storage. California's Board of Forestry and Fire Protection has the regulatory authority to implement the Forest Practice Act to provide for sustainable management practices and, at a minimum, to maintain current carbon sequestration levels. The federal government must do the same for lands under its jurisdiction in California. California forests are now a net carbon sink. The 2020 target would provide a mechanism to help ensure that this carbon stock is not diminished over time. The 5 $MMTCO_2E$ emission reduction target is set equal to the current estimate of the net emission reduction from California forests. As technical data improve, the target can be recalibrated to reflect new information.

California's forests will play an even greater role in reducing carbon emissions for the 2050 greenhouse gas reduction goals. Forests are unique in that planting trees today will maximize their sequestration capacity in 20 to 50 years. As a result, near-term investments in activities such as planting trees will help us reach our 2020 target, but will play a greater role in reaching our 2050 goals.

Monitoring carbon sequestered on forest lands will be necessary to implement the target. The Board of Forestry and Fire Protection, working with the Resources Agency, the Air Resources Board, and the Department of Forestry and Fire Protection would be tasked with developing a monitoring program, improving greenhouse gas inventories, and determining what actions are needed to meet the 2020 target for the Forest sector. Future climate impacts will exacerbate existing wildfire and pest problems in the Forest sector. These problems will create new uncertainties in reducing emissions and maintaining sequestration levels over the long-term requiring more creative strategies for adapting to these changes. In the short term, focusing on sustainable management practices and land-use issues is a practical approach for moving forward.

Future land use decisions will play a role in reaching our greenhouse gas emission reduction goals for all sectors. Loss of forest land to development increases greenhouse gas emissions because less carbon is sequestered. Avoiding or mitigating such conversions will support efforts to meet the 2020 goal. When significant changes occur, the California Environmental Quality Act is a mechanism providing for assessment and mitigation of greenhouse gas emissions.

Biomass fuels will also play a role in the expansion of renewable energy sources but will be accounted for in the Energy sector. Similarly, no reductions are yet attributed to future fuels management strategies, but that accounting will be done following implementation. Public investments to purchase and preserve forests and woodlands

would also provide reductions that will be accounted for as projects are funded. Urban forest projects can provide the dual benefit of carbon sequestration and shading to reduce air conditioning load. The Forest sector is already a source of voluntary reductions that would not otherwise occur. ARB has already adopted a methodology to quantify reductions from forest projects, and will be considering additional quantification methodologies later this year. Table 11 summarizes the emission reductions from the forest measure.

Table 11: Sustainable Forests Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
F-1	Sustainable Forest Target	5
	Total	**5**

8. Water

Continue efficiency programs and use cleaner energy sources to move water.

Water use requires significant amounts of energy. Approximately one-fifth of the electricity and a third of the non-power plant natural gas consumed in the state are associated with water use. Although State, federal and local water projects have allowed the state to grow and meet its water demands, greenhouse gas emissions can be reduced if we can use water more efficiently. Table 12 summarizes emission reductions from the Water sector.

In addition to the many efficiency efforts throughout the state, the Department of Water Resources is implementing a directive from the Governor to develop a plan to reduce per capita water use by 20 percent by 2020. Measures to increase water use efficiency and re-use will reduce electricity demand from the Water sector, reducing greenhouse gas emissions. The Water sector emissions inventory is included in the Electricity sector and ARB is currently evaluating methods to distinguish water emissions and reductions from the Electricity sector.

The State will also establish a public goods charge for funding investments in water efficiency that will lead to reductions in greenhouse gases. As noted by the Economic and Technology Advancement Advisory Committee, a public goods charge on water can be collected on water bills and then used to fund end-use water efficiency improvements, system-wide efficiency projects and water recycling. Depending on how the fee schedule is developed, a public goods charge could generate $100 million to $500 million annually to invest in further efficiency improvements. These actions would also have the co-benefit of improving water quality and water supply reliability.

Table 12: Water Preliminary Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
W-1	Water Use Efficiency	1.4
W-2	Water Recycling	0.3
W-3	Water System Energy Efficiency	2
W-4	Reuse Urban Runoff	0.2
W-5	Increase Renewable Energy Production	0.9
W-6	Public Goods Charge	TBD
	Total	**4.8**[27]

9. Vehicle Efficiency Measures

Implement light-duty vehicle efficiency measures.

Several additional measures could reduce light-duty greenhouse gas emissions. For example, measures to ensure that tires are properly inflated can both reduce greenhouse gas emissions and improve fuel efficiency. ARB is pursuing a regulation to ensure that tires are properly inflated when vehicles are serviced. In addition, the California Energy Commission is developing a tire tread program focusing first on data gathering and outreach, then on potential adoption of minimum fuel-efficient tire standards. ARB is also pursuing ways to reduce engine load via lower friction oil and reducing the need for air conditioner use.

Table 13: Vehicle Efficiency Preliminary Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-3	Vehicle Efficiency Measures	4.8
	Total	**4.8**

10. Goods Movement

Implement adopted regulations for port drayage trucks and the use of shore power for ships at berth. Improve efficiency in goods movement operations.

A significant portion of the transportation activities are associated with the movement of freight or goods throughout the state. Activity at ports is forecast to increase by 250 percent between now and 2020. ARB has already adopted a regulation to require ship electrification at ports. Proposition 1B funds, as well as clean air plans being implemented by California's ports, will also help reduce greenhouse gases while cutting criteria pollutant and toxic diesel emissions. ARB will continue to investigate additional opportunities to reduce greenhouse gas emissions due to goods movement at ports and other related facilities. This effort should provide opportunities for

[27] GHG reductions from the water sector may already be incorporated in the 2020 forecast. They are not currently counted toward the 2020 goal. ARB will work with the appropriate agencies to determine whether these reductions are additional.

accompanying reductions in air toxics. The estimated GHG emission reductions are shown in Table 14.

Table 14: Goods Movement Preliminary Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-4	Ship Electrification at Ports (Discrete Early Action)	0.2
T-5	Goods Movement Efficiency Measures • System-Wide Efficiency Improvements	3.5
	Total	**3.7**

11. Heavy/Medium-Duty Vehicles

Adopt heavy- and medium-duty vehicle and engine measures.

Medium- and heavy-duty vehicles account for approximately 20 percent of the transportation greenhouse gas inventory. A regulation to require retrofits to improve the fuel efficiency of heavy-duty trucks could include devices that reduce aerodynamic drag and rolling resistance. Hybridization of medium- and heavy-duty vehicles would also reduce greenhouse gas emissions again through increased fuel efficiency. This measure would likely achieve the greatest benefits on trucks used in urban, stop-and-go applications, such as parcel delivery trucks and vans, utility trucks, transit buses, and other vocational work trucks. For long-haul trucks, heavy-duty engine efficiency improvements may involve advanced combustion strategies, friction reduction, waste heat recovery, and electrification of accessories. The preliminary recommendation for this sector is summarized in Table 15.

Table 15: Heavy/Medium-Duty Vehicle Preliminary Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-6	Heavy-Duty Vehicle GHG Emission Reduction Measure - Aerodynamic Efficiency (Discrete Early Action)	1.4
T-7	Medium- and Heavy-Duty Vehicle Hybridization	0.5
T-8	Heavy-Duty Engine Efficiency	0.6
	Total	**2.5**

12. Million Solar Roofs Program

Install 3,000 MW of solar-electric capacity under California's existing solar programs.

As part of Governor Schwarzenegger's Million Solar Roofs Program, California has set a goal to install 3,000 megawatts (MW) of new, solar-electric systems by 2017 – moving the state toward a cleaner energy future and helping lower the cost of solar systems for consumers. The Million Solar Roofs Initiative is a ratepayer-financed

incentive program aimed at transforming the market for rooftop solar systems by driving down costs over time. Created under Senate Bill 1 (Murray, Chapter 132, Statutes of 2006), the Million Solar Roofs Program builds upon the CPUC's existing California Solar Initiative and the CEC's New Solar Homes Partnership, and requires publicly-owned utilities (POUs) to adopt, implement and finance a solar incentive program. This measure would offset electricity from the grid, thereby reducing greenhouse gas emissions. The estimated emission reductions are shown in Table 16.

Obtaining the incentives requires the building owners or developers to meet certain efficiency requirements: specifically, that new construction projects meet energy efficiency levels that exceed the State's Title 24 Building Energy Efficiency Standards, and that existing commercial buildings undergo an energy audit. Thus, the program is also a mechanism for achieving the efficiency targets for the Energy sector. By requiring greater energy efficiency for projects that seek solar incentives, the State would be able to reduce both electricity and natural gas needs and their associated greenhouse gas emissions.

Table 16: Million Solar Roofs Preliminary Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
E-4	Million Solar Roofs (including California Solar Initiative and New Solar Homes Partnership) • Target of 3000 MW Total Installation by 2020	2.1
	Total	**2.1**

13. Local Government Actions and Regional Targets

Encourage local governments to set quantifiable emission reduction targets for their jurisdictions; recommend regional greenhouse gas emission reduction targets.

Local governments and regional government agencies are essential partners in achieving California's greenhouse gas goals. The actions that local governments take individually, and through local and regional planning processes, can reduce greenhouse gas emissions associated with transportation, energy, waste/recycling, and water use. Local governments should build on existing strategies and adopt best practices, such as those developed by the Institute for Local Government's "California Climate Action Network," to achieve greenhouse gas reductions. ARB encourages local governments to develop climate action plans and to set 2020 targets to reduce greenhouse gas emissions. ARB also encourages local governments to incorporate greenhouse gas reduction measures and regional blueprint plans into their general plans. Table 17 summarizes the measure for this section.

Local Government Actions

Many California local governments have already adopted climate action plans, committing to ongoing efforts to tackle the causes of global warming. The areas of influence and authority for climate action by local governments typically include:

- *Community Energy.* Local governments can directly influence the energy used by their buildings, equipment, and infrastructure. In addition, many cities and counties can influence the carbon content of energy provided to their community through municipal utility operations, as well as the amount of energy used by the community businesses and residents through building codes, conservation programs and other mechanisms.

- *Community Waste and Recycling.* Local governments can directly influence the waste and recycling activities in their municipal buildings. Local agencies can also change the carbon footprint of their jurisdiction's waste and recycling operations through collection system adjustments, as well as through promotion of waste reduction and recycling to community businesses and residents.

- *Community Water and Wastewater Systems.* Local governments can work to reduce water use in municipal operations. They can reduce energy use of water, irrigation, and waste water systems operated by their municipal agencies, by upgrading or retrofitting pump systems, and also through community-wide water conservation and reclamation program efforts.

- *Community Transportation.* Local governments can increase the carbon efficiency of vehicles in their fleets. They can directly influence the local transportation planning processes to increase the use of low-carbon travel such as transit, carpooling, biking, and walking. They can also partner with regional planning agencies to create a sustainable vision for the future that accommodates population growth in a carbon-efficient way.

- *Community Design.* Local governments have the ability to directly influence both the siting and design of new residential and commercial developments in a way that reduces greenhouse gases associated with energy, water, waste, and vehicle travel. They must account for environmental impacts in these decisions.

Although not quantified at this time, actions taken by local government are expected to provide significant greenhouse gas reductions that ARB will track and account for as the Scoping Plan is implemented. ARB, along with relevant State agencies, will work with California Climate Action Registry, ICLEI-Local Governments for Sustainability, Local Government Commission, and the Institute for Local Government's "California Climate Action Network," to develop measurement and tracking protocols, planning tools and best practices to assist local governments in planning for, quantifying and reporting greenhouse gas emissions reductions. Using these tools, ARB encourages local governments to set municipal and community-wide 2020 greenhouse gas reduction goals and adopt measures and best practices to meet those goals. ARB will work with local governments to reconcile local level accounting with state and regional emissions tracking as the Scoping Plan is implemented.

Recommended Regional Targets

This measure is based on current modeling showing how changes from improved land use and transportation planning in major urban areas could provide greenhouse gas reductions of at least two percent over business as usual in 2020, double the benefits in 2030, and continued benefit increases through 2050. While improved vehicle technology and lower carbon fuels provide most of the transportation reductions in 2020, additional reductions can be achieved by making the connection between transportation and land use. This scenario reflects an increased emphasis on urban infill development: more mixed use communities, improved mobility options, and better designed suburban environments.

ARB, along with other State agencies, will work with regional and local governments to develop targets to reduce greenhouse gas emissions on a regional basis. ARB and local and regional governments will collaborate to design a comprehensive process to meet these targets.

This resulting system at a minimum should:

- Use integrated scenario modeling to align regional transportation plans and local general plans
- Take into consideration other State policy goals
- Incorporate performance indicators to monitor progress
- Coordinate local and regional planning efforts to achieve maximum reductions
- Establish priorities for and direct State resources to help local and regional governments meet the regional greenhouse gas targets

Transportation planning is done on a regional level in major urban areas, reflecting local land use patterns and decisions. Through efforts such as the "Blueprint" planning model, regions can select future growth scenarios that lead to more sustainable communities. Blueprint plans are developed through an extensive public process to provide for local accountability. Implementation relies on local general plans and project level decisions being consistent with the Blueprint.

Through the Blueprint planning process, regions can map out preferred land use and transportation scenarios that meet the recommended targets while addressing housing needs and other goals. ARB, along with relevant State agencies, will work with local and regional governments to secure the funding necessary for robust scenario planning, mapping and general plan updates. ARB will also work with the Governor's Office of Planning and Research to ensure that the California Environmental Quality Act (CEQA) will provide recognition of projects that are consistent with general plans that align with blueprints that meet regional greenhouse gas targets.

Table 17: Local Government Actions and Regional Targets Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-9	Local Government Actions and Regional Targets	2
	Total	**2**

14. High Speed Rail

Support implementation of a high speed rail system

A high speed rail (HSR) system is part of the statewide strategy to provide more mobility choice and reduce greenhouse gas emissions. This measure supports implementation of plans to construct and operate a HSR system between Northern and Southern California. As planned, the HSR is a 700-mile-long rail system capable of speeds in excess of 200 miles per hour on dedicated, fully-grade separated tracks with state-of-the-art safety, signaling and automated rail control systems. The system would serve the major metropolitan centers of California in 2030 and is projected to displace between 86 and 117 million riders from other travel modes in 2030. For Phase 1 of the HSR, between San Francisco and Anaheim, 2020 is projected to be the first year of service, with 40 percent of the projected 2030 ridership levels.

HSR implementation is dependent on voter approval, and may be placed on the ballot as early as November 2008. If approved, construction of HSR is anticipated to begin in 2010, with full implementation anticipated in 2030.

Table 18: High Speed Rail Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-10	High Speed Rail	1
	Total	**1**

15. Recycling and Waste

Increase waste diversion, composting, and commercial recycling, and move toward zero-waste.

When organic matter, construction materials and garbage are discarded, they end up in the state's landfills and disposal sites. Methane emissions produced from landfills can be captured and controlled, rather than emitted uncontrolled or flared. In many cases this captured methane can be used as a fuel. In addition, capturing this methane can result in air quality benefits as other landfill gases, such as volatile organic compounds, are also captured and removed. ARB is working closely with the California Integrated Waste Management Board (CIWMB) to develop a measure to reduce methane emissions from landfills.

California also has a long track record of turning waste into resources, and in the process, realizing significant greenhouse gas emission reductions. Increasing waste diversion from landfills beyond the current rate of 54 percent (which exceeds the 50 percent mandate) provides additional recovery of recyclable materials. This will directly reduce greenhouse gas emissions by re-introducing recyclables with intrinsic energy value back into the manufacturing process, and indirectly by reducing the need for virgin materials extraction, though these reductions may not occur in California. Many programs and initiatives currently under way at the CIWMB, such as composting and commercial recycling, could have substantial greenhouse gas benefits but their in-state reductions have not been quantified at this time. In the long term, zero-waste policies that would require manufacturers to design products to be fully recyclable may be necessary. ARB is continuing to work with the CIWMB to determine whether any of these programs and initiatives should be pursued for regulatory development in the near-term. Table 19 summarizes the emission reductions from the preliminary recommendation.

Table 19: Recycling and Waste Sector Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
RW-1	Landfill Methane Control (Discrete Early Action)	1
	Total	**1**

16. Agriculture

In the near-term, encourage investment in manure digesters and at the five-year Scoping Plan update determine if the program should be made mandatory by 2020. Increase efficiency and encourage use of agricultural biomass for sustainable energy production.

Encouraging the capture of methane through use of manure digester systems at large dairies will provide early voluntary emission reductions. This measure is also a renewable energy strategy to promote the use of captured gas for fuels or power production. Initially, economic incentives such as marketable emission reduction credits, favorable utility contracts, or renewable energy incentives will be needed. The preliminary recommendation does not include quantified reductions since the initial approach is voluntary. ARB is working with the California Climate Action Registry on a manure digester protocol to establish methods for quantifying greenhouse gas reductions from voluntary actions. The voluntary approach will be re-assessed at the five-year update of the Scoping Plan to determine if the program should become mandatory in 2020.

The use of nitrogen fertilizers which produce N_2O emissions is the other significant source of greenhouse gases in the Agricultural sector. ARB has begun a research program to better understand the variables affecting emissions (Phase 1) and based on the findings will explore opportunities for emission reductions (Phase 2).

As recommended by ETAAC, other opportunities for further reductions include efficiency measures, such as water efficiency, and biomass utilization for fuels and power production. Like the energy produced from manure digestion, development of other bioenergy sources, such as crop residue, will be tracked and accounted for in the Energy sector. Increasing carbon sequestration in soils and permanent crops is desirable but sound quantification protocols are not yet developed. Further research is also needed to understand and quantify the benefits of practices to reduce direct methane emissions from livestock digestive processes.

Table 20: Agriculture Preliminary Recommendation

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
A-1	Methane Capture at Large Dairies	1
	Total	**1**[28]

17. Energy Efficiency and Co-Benefits Audits for Large Industrial Sources

Require assessment of large industrial sources to determine whether individual sources within a facility can cost-effectively reduce GHG emissions and provide other pollution reduction co-benefits.

This measure would apply to major industrial facilities with more than 0.5 MMTCO$_2$E per year of greenhouse gas emissions. In general, these facilities also have the significant emissions of criteria air pollutants, toxic air pollutants, or both. Major industrial facilities include power plants, refineries, cement plants, and miscellaneous other sources. ARB would implement this measure through a regulation, requiring each facility to conduct an audit of the energy efficiency of individual sources within the facility to determine the potential to reduce greenhouse gases, criteria air pollutants, and toxic air contaminants. The audit would include an assessment of the impacts of replacing or upgrading, older, less efficient units such as boiler and heaters, or replacing the units with combined heat and power units.

The analysis would indentify the potential emissions reductions, the costs, the cost-effectiveness, the technical feasibility, and the potential to reduce air pollution impacts on local populations. ARB will use the results of the audit to determine if certain emissions sources within a facility can make cost-effective GHG reductions that also provide needed reductions in other criteria or toxic pollutants. Where this is the case, rule provisions or permit conditions would be considered to ensure the best combination of pollution reduction.

[28] Because the emission reductions from this measure are not required, they are not counted in the total.

Table 21: Energy Efficiency and Co-Benefits Audits for Large Industrial Sources Preliminary Recommendation

($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
I-1	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	TBD
	Total	**TBD**

C. Other Measures Under Evaluation

In addition to the recommended measures, ARB is also evaluating other measures for possible inclusion in the Proposed Scoping Plan – either in addition to or instead of the recommended measures. In some cases, ARB did not have enough information to make a decision about whether to recommend these measures. In others, ARB has identified other ways to achieve the same emission reductions. ARB will continue to evaluate both the recommended measures and the measures under evaluation (including the potential environmental and economic impacts), to receive and to consider public input on the suite of measures that should be included in the Proposed Scoping Plan.

1. Other Sector-Based Measures

In the development of the Draft Scoping Plan, ARB considered hundreds of reduction concepts from the CAT, EJAC, ETAAC, stakeholders, and the public. The measures below are the most promising additional measures that ARB is considering for possible inclusion in the Proposed Scoping Plan. Please note that Appendix C also includes additional measures that ARB, in concert with the CAT, is continuing to evaluate for possible inclusion in the Proposed Scoping Plan. Estimated emissions reductions for these measures are presented in Table 22.

Transportation

Feebates: A feebate regulation would combine a rebate program for low-emitting vehicles with a fee program for high-emitting vehicles. This program would obtain additional greenhouse gas emission reductions from California's new light-duty vehicles, and could be expanded to include medium-duty vehicles as well. As discussed in the preliminary recommendation, if California is unable to implement the Pavley regulations, this program could be adjusted to obtain the foregone emission reductions.

Congestion Pricing: Research has shown that sending market signals that reflect the cost of driving can improve transportation system efficiency and reduce emissions. In a congestion pricing program, vehicles are charged a price, or toll, for traveling during peak hours on congested routes. Drivers who continue to travel on these routes during peak periods would pay more, but experience a faster, easier trip. Others would defer trips to off-peak hours, shift travel to less congested roadways, or switch to transit, carpools, or vanpools. Greenhouse gas emission reductions would

come directly from the relief of severely congested traffic, some reduction in vehicle travel, and from the investment of funds in transit infrastructure that would provide additional transportation options during congested hours. Regional planning agencies would need legal authority from the State to implement congestion pricing measures.

Pay-As-You-Drive (PAYD): In Pay-As-You-Drive (PAYD) programs insurance premiums are set based on driving record and other traditional risk factors, but are broken down into per-mile charges. Motorists would have the opportunity to lower their insurance costs by driving less. PAYD insurance offered to a large percentage of California drivers would have the potential to significantly reduce vehicle miles traveled and greenhouse gas emissions. California's Department of Insurance is considering potential regulatory requirements for such programs.

Indirect Source Rules for New Development: "Indirect source" rules are designed to address air pollutant emissions associated with residential and commercial developments. These developments attract traffic and result in other indirect emissions. For example, research shows that low-density development located distant from employment centers and other destinations has a high transportation carbon footprint. Adoption of regional indirect source rules could provide reductions in greenhouse gases through better project design and mitigation of emission impacts.

Public Education and Programs to Reduce Vehicle Travel: Engaging the public to reduce their transportation carbon footprint through voluntary actions can provide immediate greenhouse gas benefits. Large scale public education programs in California have been successful in reducing energy use and waste. Similar outreach programs to encourage increased transit use, consolidation of vehicle trips, walking, biking, and other actions could help reduce growth in vehicle travel. Employer programs can reduce or mitigate impacts of commute trips, such as telecommute and flex-time work schedules.

Electricity and Commercial/Residential Sector

ARB will continue to work with the California Energy Commission and the Public Utilities Commission to pursue more aggressive building and appliance efficiency standards. The State is also investigating zero net energy targets for new buildings.

ARB is considering measures that would expand existing solar programs such as the Million Solar Roofs Program and the Residential Solar Hot Water Heater Installation Program. ARB is also considering additional energy efficiency targets that are 8,000 GWh and 200 million therms higher than those included in the preliminary recommendations. Meeting these targets would require aggressive utility programs and major changes to the building and appliance efficiency standards. Existing residential and commercial buildings offer tremendous potential for meeting these efficiency targets because the majority of California's stock was built to lesser or non-existent building standards. ARB will work with other State agencies to evaluate mechanisms for aggressively promoting environmental performance testing and

ratings for all existing homes and commercial buildings. Building owners that have not taken advantage of these programs could be required to do so at time of sale.

ARB and other State agencies are exploring innovative financing options to help buildings owners spread the costs over the lifetime of the building and allow the measures to more than pay for themselves. This would require action by many State agencies including the ARB, the Business, Transportation and Housing Agency, the State and Consumer Services Agency, the Public Utilities Commission, the California Energy Commission, and the Department of General Services.

Coal Emission Reduction Standard: Approximately 32,000 GWh of the electricity consumed each year in California comes from coal-based generation, with approximately 87 percent of this imported from out-of-state facilities. ARB is working with the CEC and the CPUC to evaluate approaches to reduce the carbon dioxide associated with their current coal-based electricity sales, including requiring electric service providers to divest or otherwise mitigate portions of existing investments in coal-based generation.

Industry

California's industries account for 20 percent of the state's greenhouse gas emissions – and about one-and-a-half million jobs in the state. While manufacturing in California has declined in the past few years, it is still a major driver of the state's economy and provides significant opportunities for greenhouse gas reductions. The Industry sector is broad and includes many diverse operations around the state, from pumping oil to manufacturing semiconductors to producing cement to building automobiles to construction activities. In the recommended measures, this sector's emissions would be significantly reduced via the cap-and-trade measure. However, opportunities to use other mechanisms to obtain reductions are also under consideration.

Cement: Concrete and cement are the foundation of our infrastructure: freeways, canals, dams, transmission towers, house foundations and high-rise buildings. However, the manufacturing of cement is very CO_2-intensive. Much of California's cement is produced in just 11 plants in the state. However, the industry faces stiff competition from cement importers – about 40 percent of the state's cement is imported. ARB is considering approaches that would reduce emissions during the production process, reducing the carbon-intensity of cement when used in concrete, and reducing the amount of concrete that is delivered to job sites but not used. Since cement imports are a major part of California's cement use, all of these approaches include consideration of both in-state production and imported cement.

Refineries/Oil and Gas Production: California is also a major oil and gas producer as well as a regional refining center. Crude oil, both from in-state and imported sources, is turned into useful products at 21 oil refineries in the state. ARB is evaluating a suite of measures that include capturing methane emissions during

extraction, reducing methane leaks during transmission, improving the efficiency of refineries, and capturing methane at refineries.

Boiler and Engine Efficiency: ARB is also considering measures that would increase efficiency in other industries that use industrial boilers or on-site internal combustion power sources, and for off-road equipment like forklifts and bulldozers.

Glass Plants: There are several possible approaches to reducing greenhouse gas emissions from glass manufacturing. In general, this involves the use of recycled materials or improving the energy efficiency of the process.

Table 22: Estimated Potential Emission Reductions from Measures Under Evaluation

(MMTCO$_2$E in 2020)

Measure Description	Reductions
Feebates for New Vehicles	2-6
Congestion Pricing	up to 1
Pay-As-You-Drive	up to 1
Indirect Source Rules for New Development	up to 1
Programs to Reduce Vehicle Trips	up to 1
Electricity Energy Efficiency (Up to Additional 8,000 GWh of Reduced Demand) • Utility Energy Efficiency Programs • Building and Appliance Standards • Additional Efficiency and Conservation	up to 4
Million Solar Roofs (including New Solar Homes Partnership) • Up to 5,000MW Total Installation by 2020	up to 1
Reduce Coal Generation by up to 13,000 GWh	up to 8*
Natural Gas Energy Efficiency (Up to Additional 200 Million Therms of Reduced Demand) • Utility Energy Efficiency Programs • Building and Appliance Standards • Additional Efficiency and Conservation	up to 1
Solar Water Heating (beyond SB 1470 goal)	up to 1
Carbon Intensity Standard for Cement Manufacturers	1.1-2.5
Carbon Intensity Standard for Concrete Batch Plants	2.5-3.5
Waste Reduction in Concrete Use	0.5-1
Refinery Energy Efficiency Process Improvement	2-5
Removal of Methane Exemption from Existing Refinery Regulations	0.01-0.05
Oil and Gas Extraction GHG Emission Reduction	1-3
GHG Leak Reduction from Oil and Gas Transmission	0.5-1.5
Industrial Boiler Efficiency	0.5-1.5
Stationary Internal Combustion Engine Electrification	0.1-1
Glass Manufacturing Efficiency • Equipment Efficiency • Use of Recycled Material	0.1-0.2
Off-Road Equipment	up to 0.5

*Assumes coal generation is replaced by combined cycle gas turbine generation.

2. Carbon Fees

Carbon fees can play two distinct roles in implementing AB 32. Fees can be used as a powerful tool to incent emission reductions by affecting the relative prices within the economy. By making carbon-intensive fuels and GHG-intensive products relatively expensive compared to low-carbon fuels and low-GHG products, carbon fees can affect consumption and investment within the economy and reduce GHG emissions. Fees would also provide a source of revenue to pay for reductions or achieve other goals related to the program. Both roles for carbon fees are discussed in this section.

Even if they are not used to manage emissions, fees will be part of the overall AB 32 program in more targeted ways. For example, relatively modest fees similar to the public goods charge on electricity could be applied to water and to pay for targeted efficiency programs or other measures aimed at reducing GHG emissions. Targeted fees are also likely to be included to help pay for implementation of some of the measures included in the Plan. At a minimum, ARB will develop a fee structure to pay for administration of the AB 32 program.

ARB is also including evaluation of carbon fees to incent significant emission reductions in the ongoing evaluations. Such fees would need to be sufficiently high to change behavior over time and be widely spread across those sectors of the economy responsible for a large majority of GHG emissions. While some fees could be levied at emission sources, broader coverage could be achieved using an upstream approach to cover virtually all GHG emissions from the combustion of natural gas, petroleum, and coal in California. Other mechanisms could cover sources of industrial process emissions, high-GWP gases, and electricity imports. In practice, for GHG emissions from in-state combustion sources, the fees would be levied at key delivery points for natural gas, gasoline and diesel. For other emissions, the fees would be levied on industrial process sources, on suppliers of high-GWP gases, and on imported electricity through a mechanism similar to the first jurisdictional deliverer approach being considered for the cap-and-trade program.

The level of the fees would need to be set based on economic evaluations identifying the amount of emission reductions likely to be achieved from different fee levels. To incent significant reductions, fees would likely need to be set between $10 and $50 per metric ton CO_2E. For every $10/metric ton, the fees would increase the wholesale price of coal-fired electricity by $0.01 per kilowatt-hour, of gasoline by $0.10 per gallon, and natural gas by $0.05 per therm. While this type of price signal would have some effect on consumer buying patterns, the larger effect would be on the investment decisions and fuel choices made by suppliers of goods and services.

Fees could be widely applied to most emissions sources, likely generating billions of dollars per year in revenue that could be directed toward various purposes, including programs that achieve GHG emission reductions more directly. Every $10 per ton, if placed on all emissions of GHGs in California, would result in more than $4 billion per year through the life of the program.

The revenue generated through broad or targeted carbon fees could be used to decrease the costs borne by consumers and to increase the economic, environmental and public health benefits of the program. Possible uses include providing incentives for additional reductions, investment in efficiency and renewables, research and development and deployment of green tech, mitigation of consumer price increases, or adaptation. Revenue use is discussed in more detail in Section C.

Carbon fees, while supported by a number of interests, have received less attention during the development of the Draft Plan, in large part because they provide less certainty in California's ability to meet specific emission targets, as required under AB 32. Such a program could also provide a useful transition to a larger regional or federal system by creating a financial incentive for California companies and consumers to incorporate GHG emissions into their economic decision making. This approach could be similar to that recently adopted by British Columbia, which has imposed a carbon fee that includes provisions for a transition to a future regional cap-and-trade system.

Carbon Fees Implementation

Implementing an upstream carbon fee would require the development of a monitoring and reporting system to track all fossil fuels produced in or imported into California, as well as fuel exports. The Market Advisory Committee describes what this type of program would look like for an upstream cap-and-trade program.[29] The administrative details relating to who is regulated would be the same for an upstream carbon fee or for an upstream cap-and-trade program.

For transportation fuels, ARB would establish a system to monitor the amount of carbon sold by refiners and importers in the form of gasoline and transport diesel fuel. Approximately 30 such sources are located in the state (including refiners, importers, and blenders).

The fees would be levied on all natural gas processing plants, the state's seven interstate natural gas pipelines, and pipelines from Mexico. Data on fossil fuel flows are currently collected by a diverse group of municipal, state, and federal regulatory agencies, though this information is of varying quality and collected for different reporting periods. A system would be needed to track imports of coal. Some industrial sources that have significant process emissions (mainly cement and nitric acid production) and suppliers of high-GWP gases would also need to be included.

Emission fees for California-bound electricity that is generated by power plants outside the state would need to be assessed on firms that deliver electricity to the California power grid. These entities would include independent power marketers that purchase electricity imports for sale to California utilities, California utilities that import their electricity from other states, and independent out-of-state electricity

[29] Market Advisory Committee. Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California. June 2007. http://climatechange.ca.gov/market_advisory_committee/index.html

generators that sell or contract electricity directly to the California utilities or the California grid operator.

To provide the needed GHG emission reductions, carbon fees would need to increase over time. The fees would be set high enough to drive investment and fuel use choices toward more efficient and lower carbon options. The fee level and rate of increase would be guided by economic analysis that considers the availability, phase-in, and cost of achievable technologies, and guided by a price structure that would stimulate changes to lower carbon activities. Carbon fees would be administered by the ARB, and would be assessed at the same rate per $MMTCO_2E$. A specific fee schedule would need to be established to define the rate of increase between 2012 and 2020.

ARB would closely monitor emissions reduction progress throughout the program. The level of the fees might need to be adjusted from the schedule initially adopted by the Board if emissions reductions are insufficient to support meeting the 2020 target. Any adjustments to the fee schedule would be undertaken through the regulatory process and involve public review and input. Because the economic modeling for the Scoping Plan is still in a preliminary state, no estimates are currently available for the level of fees that would be needed to meet the AB 32 emissions target for 2020.

The carbon fee and regulatory measures would complement each other. Emissions and energy use from sectors covered by a carbon fee would also be addressed through the recommended measures. As sources comply with these measures, affected entities would reduce their emissions and therefore the amount of the fee they would need to pay.

3. Offsets

Many individual activities that are not easily addressed under regulatory approaches can nevertheless result in cost-effective, real, additional, and verifiable GHG reductions. Individual emission reduction projects can be developed to achieve emission reductions from activities not otherwise regulated, covered under an emissions cap, or resulting from government incentives. These projects can generate "offsets," i.e. verifiable emission reductions whose ownership can be transferred to others. Offsets are generally separated into two types – compliance offsets and voluntary offsets.

Compliance Offsets

If offsets are used for compliance purposes, the reductions must be real, additional, verifiable, enforceable and permanent. Reductions from compliance offset projects must be quantified using rigorous measurement and enforcement protocols. The methodology provides a basis to determine whether the reductions are also additional, i.e. beyond what would have happened in the absence of the offset project. Establishing that reductions are additional is one of the major challenges in establishing the validity of particular offset projects. Once a project can quantify

emissions using an approved methodology, the emission reductions must be verified to ensure that real reductions actually occurred.

Compliance offsets can provide regulated entities a source of low-cost emission reductions to use for specified regulatory obligations to the extent allowed under traditional regulations, a cap-and-trade program, and programs that establish carbon fees.

Offsets also provide opportunities for the most cost-effective reductions to be pursued early in the program, which can help meet the AB 32 emission reduction target sooner and at a lower-cost. By lowering overall costs, an offset program can serve to encourage GHG emission reductions from sources not covered by a regulation or cap-and-trade system which can further spur innovation in unregulated sectors.

Offsets can also reduce compliance costs and encourage the spread of clean, efficient technology outside California. The locations of offset projects are an important consideration. High quality offset projects located outside California can help lower compliance costs in California while reducing GHG emissions in areas that would otherwise lack the resources needed to do so. Projects in the Mexican border region may be of particular interest, considering the opportunity to realize considerable co-benefits on both sides of the border. Additionally, defining project types related to imported commodities (such as cement) would enable California to provide incentives to reduce emissions associated with products that are imported into the state for our consumption.

Allowing offset projects from outside California to count for compliance under AB 32 could reduce the amount of reductions occurring within the state, and which would reduce the local economic, environmental and public health co-benefits from GHG emission reduction. Therefore, ARB is considering limiting the use of offsets for regulatory compliance obligations to help ensure a significant portion of required reductions come from within the state and within the regulated sectors. This issue is being considered in the ongoing evaluations, and will be further addressed in the evaluation supplement that will be published this summer and in the Proposed Scoping Plan.

Offsets could also be used by a source subject to direct regulation if the regulation would need specifically provides for its use. In this case, the State would need to demonstrate that the emission reduction benefits can be calculated and that the program has a means of taking enforcement actions for non-compliance.

Offsets used to meet regulatory requirement must be quantified according to Board-adopted methodologies, and ARB must adopt a regulation to verify and enforce the reductions (HSC §38571). While offsets could play a role under other measures, ARB is currently considering the use of compliance offsets primarily under the cap-and-trade system. The potential role of offsets in that context is discussed in Section B, above.

Voluntary Offsets

Voluntary offset markets have recently flourished as a way for companies and individuals to offset their emissions by purchasing reductions outside of their own operations. These transactions are largely completed by offset retail providers who either transfer the money to a fund that generates emission reduction credits by financing projects and then retiring them, or sends the credits for retirement to organizations that find solutions for climate change. A number of major companies have also established 'carbon neutral' policies, under which they seek to minimize their GHG emissions to the extent possible, and buy voluntary offsets. Businesses often use brokers who match businesses directly with offset providers. ARB believes voluntary effort to reduce GHG emissions will play an important role in meeting the State's overall GHG goal. ARB encourages all Californians to take voluntary action to reduce their carbon emissions, and recognizes the importance that this type of voluntary action can have in creating support for and momentum toward GHG emission reductions.

As specified in AB 32, ARB will adopt methodologies for quantifying voluntary reductions. (HSC §38571) The Board has adopted a methodology for forest projects in October 2007, and is scheduled to consider methodologies for dairy digester projects and additional forest projects later this year. While these methodologies can be used for voluntary offsets projects, the Board would need to adopt regulations to verify and enforce voluntary reductions achieved under these or other approved methodologies before they could be used for compliance purposes. (HSC §38571)

Voluntary Early Action

In February 2008, ARB adopted a policy statement encouraging the early reductions of GHG emissions. The policy statement described a process for interested parties to submit proposed emission quantification methodologies for voluntary GHG reductions to ARB for review. The intent is to provide a rapid assessment of methodologies for evaluating potential GHG reduction projects to encourage early actions. Where appropriate, ARB will issue Executive Orders to confirm the technical soundness of the methodologies, and the methodology would be available for use by other parties. ARB is currently in the process of evaluating a number of submitted project methodologies.

4. Use of Possible Revenues

Revenues may be generated from the implementation of various components of the Scoping Plan, including by the use of auctions within a cap-and-trade system, adoption of carbon fees, or through the imposition of more targeted measures like public goods charges on water. These revenues could be used to support AB 32 requirements for GHG emission reductions and associated socio-economic considerations.

The Economic and Technology Advancement Advisory Committee (ETAAC) recommended the creation of a California Carbon Trust as a possible mechanism for

using revenues generated by the program, leveraged with private funds, to further the overall program goals. ETAAC's recommendation is roughly based on the United Kingdom Carbon Trust. The United Kingdom program was established with public funds, but now functions as a stand-alone corporation, providing management and consulting services to corporations and small and medium businesses on reducing GHG emissions, but it also funds innovations in carbon reduction technologies. ETAAC recommended the creation of a similar organization that would use revenue from the sale of carbon allowances or from carbon fees to:

- Fund research and development and demonstration projects,
- Help bring promising and high potential technologies through the "Valley of Death," and get them to market to begin providing cost-effective reductions,
- Manage the early carbon market and mitigate price volatility, purchasing credits and selling them or retiring them as needed,
- Dedicate resources to fund projects to achieve AB 32 Environmental Justice Goals, or
- Support a green technology workforce training program.

ARB is considering the possible creation and use of a Carbon Trust as a vehicle directing use of revenues from the AB 32 program.

The considerations discussed here for spending revenues apply equally to the use of revenues from an auction for allowances within a cap-and-trade system or to revenues generated from a carbon fee. In either case, some industries (or their customers) might believe that the revenue generated from their sector should be returned to them or their customers. For example, the CEC and CPUC specifically recommended that significant portions of the revenue generated from the Electricity sector under a cap-and-trade program be used within the sector. In the case of more targeted revenues from a public good charge, the intent would be to use the funds for program purposes within the sector in which it was raised.

Possible uses of the revenue generated under the program include:

- **Reducing costs of emission reductions or achieving additional emission reductions –** Funding energy efficiency and renewable resource development could lower overall costs to consumers and companies, and provide the opportunity to achieve greater emission reductions than would otherwise be possible. Program revenues could be used to fund programs directly, or create financial incentives for others.
- **Achieving environmental co-benefits –** Criteria and toxic air pollutants create health risks, and some communities bear a disproportionate burden from air pollution. Revenues could be used to enhance GHG emission reductions that also provide reductions in air and other pollutants that affect public health.
- **Incentives to local governments –** Funding or other incentives to local governments for well-designed land-use planning and infrastructure projects can

do much to discourage long commutes and encourage walking, bicycling and use of transit.

- **Consumer rebates –** Utilities and other businesses could use revenues to support and increase rebate programs to customers to offset some of the cost associated with increased investments in renewable resources and to encourage increased energy efficiency.
- **Direct refund to consumers –** Revenue from the program could be recycled directly back to consumers in a variety of forms including per capita dividends, earned income tax credits, or other mechanisms.
- **Climate change adaptation programs –** Climate change will impact natural and human environments. Program revenues could be used to help the state adapt to the effects of climate change.
- **Subsidies –** Revenues could be used to reduce immediate cost impacts to covered industries required to make substantial upfront capital investments to reduce GHG emissions.
- **RD&D funding –** Revenues could be used to support research, development, and deployment of green technologies.
- **Worker transition assistance –** Regulating GHG emissions will probably shift economic growth to some sectors and green technologies and away from higher carbon intensity industries. Worker training programs can help the California labor force be competitive in these new industries.
- **Administration of a GHG program –** Revenues could be used to underwrite the State's AB 32 programs and operating costs.
- **Direct emission reductions –** Revenues could be used to purchase CO_2 reductions for the sole purpose of retirement, providing direct additional GHG emission reductions. Potential projects such as afforestation and reforestation would both sequester CO_2 and provide other ecological benefits.

Many of the potential uses of revenue would help ARB implement the community benefit section of the AB 32 (HSC §38565) which directs the Board, where applicable and to the extent feasible, to ensure that the GHG reduction program directs public and private investment toward the most disadvantaged communities in California.

ARB is seeking comment on how such revenues could best be used.

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III. ANALYSIS: Costs and Benefits

The primary purpose of the Scoping Plan is to develop a set of measures that will provide the maximum cost-effective and technologically feasible GHG emission reductions. In developing this Plan, ARB is evaluating the effect of these measures on California's economy, environment, and public health. This Chapter outlines these preliminary and planned analyses. ARB is conducting broad evaluations of the potential impacts of the Scoping Plan, and will conduct more specific evaluations during regulatory development (HSC §38561(d), and HSC §38562(b)). Prior to inclusion of market-based compliance mechanisms in a regulation the Board will consider direct, indirect and cumulative emission impacts, and, to the extent possible, localized impacts in communities that are already adversely impacted by air pollution (HSC §38570(b)). For this Draft Scoping Plan and the supplemental evaluation that will be available in summer 2008, ARB is focusing on an evaluation of the preliminary recommendation and other measures under evaluation. The specific statutory language is included in Appendix A.

A. Criteria for Developing the Preliminary Recommendation

To develop the preliminary recommendation, ARB used a set of criteria designed to assess the ability to reach the 2020 target, the economic and societal impacts, and the potential to influence regional and national climate change programs. These evaluations are preliminary, and they will be supplemented with additional information in summer 2008.

Achieve the 2020 cap: The recommended program includes a regional cap-and-trade program along with major regulations and programs that provide emission reductions from specific sectors. As part of the cap-and-trade program, major sources of emissions would be subject to an emission cap which must be met, regardless of growth. Inclusions of strong reporting and enforcement requirements in this program would provide certainty in achieving the 2020 cap. In addition, the largest sectors would also be subject to other recommended measures, which provide significant cost-effective reductions and complement the cap-and-trade system.

Maximize economic benefits and minimize economic harm: ARB must consider the economic impacts of the Scoping Plan (HSC §38561(d)). These economic impacts vary from impact on statewide indicators such as gross state product and the number of jobs to more specific effects like the potential impacts on households, particularly low-income households. As discussed below, preliminary information indicates that the projected effect of the recommendation on the state economy is likely to be overall positive, but very small relative to expected growth. More detailed analyses of the economic impacts will be provided in summer 2008. ARB is

also evaluating the potentially beneficial impacts of new job creation in the emerging "greentech" industry, and the significant advantage that California industry could reap from the State's "first mover" status. Investment in California in this arena is increasing, which may result in expansive economic benefits similar to past technological revolutions in California like information technology and telecommunications.

Maximize societal benefits, including environmental and public health co-benefits: The evaluation of the potential environmental, public health and societal impacts of the Scoping Plan (HSC §38561(d); HSC §38562(b)(6)) is ongoing. These analyses include an evaluation under the California Environmental Quality Act, an assessment of the criteria pollutant and air toxic emissions, an evaluation of the potential public health impacts, and an evaluation of societal benefits including fuel diversity. These evaluations are currently in progress and will be available in summer 2008.

Provide leadership and influence other governments: California contributes only a small portion of global greenhouse gas reductions, and by itself, California cannot solve the climate change challenge. However, as one of the first states to develop a comprehensive climate change plan addressing all emission sources, California can influence the regional and national debate about how best to address climate change. Under the preliminary recommendation, California can play a significant role in the regional and national dialogues about future climate change programs. By working with the Western Climate Initiative (WCI) to design a regional cap-and-trade program, California can ensure that the state's interests are represented in the design of the programs. By taking the lead in implementing an enforceable GHG emission reduction program, California will influence the debate around the design of the future federal system. In addition, the Draft Plan calls for significant regulatory development, which will provide technical leadership for other states and countries to follow. For example, 13 states have already adopted California's Pavley clean car standards. Pursuing further regulations will provide additional opportunities for other governments to adopt similar regulations.

Assure that emissions reductions required of each sector are equitable: A central tenet of the Draft Scoping Plan, and all of ARB's programs, is that emission reduction obligations should be distributed equitably across all sectors. However, to determine an equitable distribution, ARB will consider the magnitude of emission reduction measures, the percentage reduction, the cost of the reductions, the cost-effectiveness of the reductions, the timing of the control measures (particularly as it relates to other control requirements), and whether every sector has contributed reductions. The preliminary recommendation seeks to balance a cap-and-trade program with regulations, where needed. The cap-and-trade program is expected to encourage the lowest-cost emission reductions to be implemented – some sectors may not contribute any emission reductions, but the reductions that are achieved would likely be the cheapest ones. The regulatory components of the preliminary recommendation

primarily address the Transportation and Energy sectors, which account for over two-thirds of California's greenhouse gas emissions.

B. Summary of Potential Costs and Benefits

The evaluation of the potential costs and benefits of the Scoping Plan is still underway, and additional results will be provided over the summer. Even at this point, however, certain conclusions have emerged, which are discussed in more detail below:

- Implementation of the measures in the preliminary recommendation will reduce statewide NOx, VOC and PM emissions due to reduced fuel consumption, with resulting public health benefits.
- The impact of the Scoping Plan measures on the state economy is likely to be overall positive, but very small relative to expected growth.

C. Evaluations

1. Economic Modeling

ARB is evaluating the economic impacts of implementing AB 32. The modeling scenarios that will be assessed include the preliminary recommendation, with different options for the design of the cap-and-trade program included as separate scenarios, greater use of regulations, and implementation of a carbon fee. The modeling results alone will not dictate the appropriate policy direction, but will provide important information on how different approaches to addressing climate change would affect the way business is conducted in California. As part of this effort, ARB developed methods for evaluating the cost-effectiveness of individual emission reduction measures, is assessing potential impacts on small businesses, households, and communities, and is analyzing how the preliminary recommendation might increase or decrease greenhouse gas emissions occurring inside and outside of California. A more detailed description of the economic models is contained in Appendix G.

Three computer models are being used to conduct this evaluation. The first two models, known as the Environmental Dynamic Revenue Assessment Model (E-DRAM) and the Berkeley Energy and Resources (BEAR) model, are macro-economic models that predict how the broad California economy will grow and change as ARB begins to control greenhouse gas emissions. These models, developed by economists at the University of California, Berkeley, simulate the way that changes in energy investment, price and use affect how Californians live their lives. Specifically, this analysis will provide estimates of how personal income may change and will estimate shifts in how people choose to spend money. Changes in personal income are an excellent indicator of California's economic well-being in the long-term, and these models will provide estimates of the economic costs and benefits of implementing the measures under evaluation. E-DRAM and BEAR also model

how different sectors of the economy interact, including how much companies buy from and sell to each other. In aggregate, the amount that companies and individuals buy from and sell to each other determines how, and in which sectors, the state economy grows.

The third model, Energy 2020, will complement the macroeconomic models. Energy 2020 describes the way in which energy use is expected to change as GHG emission reduction measures are implemented. Energy 2020 is an economy-wide energy use model that predicts the investment behavior of both energy suppliers and consumers. The model provides information about which sectors make reductions in emissions and the rate by which vehicles, buildings, and industrial processes become more efficient over time. This model also evaluates how much money is spent on fuels and electricity and invested in energy related elements of the economy.

The direct and indirect economic effects of implementing AB 32 on the California economy can be better understood when the macroeconomic models and Energy 2020 are used together. Energy 2020 uses inputs of fuel prices, statewide economic activity, and personal income to predict energy use, electricity prices, investment, and greenhouse gas reductions. These outputs are then used as inputs to E-DRAM and BEAR to model the effects of these changes on the overall California economy, including employment, income and spending. The full effect of the policies can be evaluated based on the interaction of these two models: an initial forecast of economic activity and income is used by Energy 2020 to forecast changes in fuel prices and investment; those changes can be used by E-DRAM or BEAR to forecast changes in economic activity and income. This cycle is repeated until only minor changes result from each cycle. Additional modeling work is being conducted by E3 for the California Public Utilities Commission. The E3 model is being using to analyze the impact of AB 32 programs on the Electricity sector. ARB and CPUC have worked together to ensure the assumptions for the Electricity sector used by Energy 2020 and the E3 model are reasonably consistent.

ARB has developed preliminary estimates of the costs and savings of the various measures considered in this Draft Plan that will be used as inputs for the economic models. These estimates indicated that the overall savings from improved efficiency and developing alternatives to petroleum will on the whole outweigh the costs. This balance is largely driven by current high energy costs and the degree to which measures increase energy efficiency throughout the economy and move California toward alternatives to fossil fuels. Summary information on costs is included in the measure descriptions in Appendix C. These estimates will be further refined in the coming months. ARB will provide a supplement to this Draft Plan with the results of the economic and other evaluations later this summer.

ARB has reviewed a number of the recent modeling studies that have been conducted at the federal level on the potential impact that greenhouse gas reduction policies would have on economic growth. While the conclusions of the studies vary significantly in many respects, nearly all are consistent in regard to one key finding –

any costs associated with the introduction of greenhouse gas reduction policies will have relatively little impact on continued economic growth. Further, these studies have focused almost exclusively on the costs associated with greenhouse gas policies, not the potential for economic and environmental benefits that are likely to flow from a well-designed carbon reduction investment strategy.

For example, a number of recent economic modeling studies have been completed attempting to assess the economic impact of the legislation proposed by Senators Lieberman and Warner (S. 2191) or related national climate policy proposals. Although the models differ in terms of methodology and the assumptions upon which they rely, the results of most are similar in terms of projected economic costs. For instance, the Office of Integrated Analysis and Forecasting at the Energy Information Administration concludes that S. 2191 would only slightly reduce overall gross domestic product (GDP) between the range of 0.3 percent and 0.4 percent between 2010 and 2020.[30] Economic modeling of S. 2191 conducted at the Massachusetts Institute of Technology projects a similar impact on federal GDP, ranging between a dip of 0.26 percent and 0.38 percent by the year 2030 depending upon various policy design scenarios.[31] A recent study by the Environmental Defense Fund calculates the median and average impacts of a federal climate policy on GDP as forecasted by eight recent models. The median projected impact between 2010 and 2030 is 0.47 percent decrease in overall GDP; the average is 0.67 percent.[32] Based on these figures, instead of reaching $26 trillion GDP by January 2030 under a business-as-usual scenario, the U.S. economy would reach $26 trillion GDP in April of the same year if a federal climate policy were in place.

As part of the economic evaluation, ARB is also assessing the potential impact of AB 32 implementation on households by income. Some of the likely impacts of AB 32, such as increased energy prices, are expected to have a larger effect on lower-income households because they spend a higher percentage of their income on energy such as gasoline, electricity, and home heating than do higher-income households. For example, in an April 2007 report the Congressional Budget Office found that price increases for electricity and gasoline would disproportionately affect people at the bottom of the income scale. Such impacts can be partially or fully mitigated through both through more efficient cars and homes, as well as program design options that lower costs (and thereby lower energy costs), protect low-income ratepayers, and/or generate revenue which can be used to directly address increased costs for low income households.

Some climate change regulations may help consumers save money. For example, because the Pavley vehicle greenhouse gas standards increase the efficiency of cars

[30] Energy Information Administration Office of Integrated Analysis and Forecasting, U.S. Department of Energy, Washington DC. Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007. April 2008

[31] Paltsev, S., J. Reilly, H. Jacoby, A. Gurgel, G. Metcalf, A. Sokolov, and J. Holak. Report 146. Assessment of U.S. Cap and Trade Proposals. April 2007 (Appendix D, February 2008)

[32] Keohane, Nathaniel, and Peter Goldmark. What will It Cost to Protect Ourselves from Global Warming: The Impacts on the U.S. Economy of a Cap and Trade Policy for Greenhouse Gas Emissions.

and trucks, the fuel savings put money directly into consumers' hands to spend on additional goods and services – causing increased economic activity in California. Even when the increased cost of purchasing a Pavley-compliant car is included, at today's high gasoline prices, the consumer will have an extra $30 a month for other expenditures. Additional analysis of the impact of the Draft Scoping Plan on low-income households will be presented in the supplement available in the summer of 2008.

ARB has initiated a peer review process through a contract with the University of California to ensure that ARB is making use of the best available economic models, emission estimation techniques, and other scientific methods (HSC §38561(d)). Under this process, a panel of modeling experts will evaluate the economic modeling presented in this draft and the supplemental evaluation. Recommendations and comments from the peer review panel will be addressed in the Proposed Scoping Plan, which will be released in early October, 2008.

Staff also plans to characterize the impacts of the Draft Scoping Plan on business, particularly small business. Specifically, staff is developing a supplemental document to be made available this summer that will present the spectrum of economic results from the modeling efforts including potential impacts on business. The analysis will focus on the impact of any changes to the cost of energy (e.g., electricity, natural gas) will have on businesses that have small margins and for which fuel costs represent a significant operational obligation. The results should inform potential impacts of the policies including impacts on profitability and jobs.

Any cost projections associated with the adoption of greenhouse gas reduction strategies must also be viewed in light of a shortcoming of all of the economic modeling studies; the inability to accurately account for both the economic and environmental benefits associated with the adoption of a comprehensive climate policy. As discussed below, a number of important environmental and public health co-benefits are likely to accompany the implementation of AB 32. There will be substantial cost savings from taking action sooner rather than later to avoid the more severe impacts of climate change. There will also likely be substantial economic benefits associated with the increasing number of firms in the business of developing, supplying, and delivering clean energy technologies. These are all key factors to keep in mind when evaluating the potential costs of reducing greenhouse gases.

ARB is continuing to work on the economic modeling, and plans to publish a supplement with the full set of economic evaluation results this summer. Workshops will be held this summer to solicit comments on the evaluation results.

2. Green Technology

California's climate change program will generate investments in climate change emission reductions, yielding potentially vast economic benefits to California. Much of the economic benefit of greenhouse gas emission reductions is from reduced spending on energy. In addition, the process of developing and deploying green

technologies creates new businesses and new jobs. The savings from both reduced energy spending and the income from new jobs is channeled back into the state's economy.

California's leadership in green technology development also yields economic benefits by attracting increased investment and generating income from export sales. Many developing regions, like China and Eastern Europe, are experiencing large increases in energy demand – providing large energy efficiency investment opportunities. Successful California-based providers of energy efficiency technologies can capture a share of that rapidly growing export market, estimated at $170 billion a year.

By addressing greenhouse gas emissions, California can help drive innovation by attracting private capital. Environmental policy is just one of the factors that guide technology innovation investors. Investors also seek an "innovation infrastructure" of established research centers, a physical and cultural environment that attracts innovative thinkers, and a large-scale local market for innovative products. In California, where an "innovation infrastructure" exists, environmental policy can make a difference.

California's leadership in environmental and energy efficiency programs is already attracting an increasing share of venture capital investment in green technologies. According to PriceWaterhouseCoopers and the National Venture Capital Association, California's share of national venture capital investment in innovative energy technologies more than tripled from 1995 to 2007.

A survey of clean technology investors by Global Insight and the National Venture Capital Association found that public policy does influence where venture capitalists invest. The resulting investments in green technology solutions produce jobs at a higher rate than investment in comparable conventional technologies. Between 1990 and 2006, California green technology businesses grew by 84 percent, adding more than 10,000 jobs to the state's economy. Much of this growth came in the solar energy, energy conservation, and green transportation sectors.

Both the Economic and Technology Advancement Advisory Committee and the Environmental Justice Advisory Committee have recognized that the Scoping Plan provides an opportunity to place California business in a leadership position and to increase economic opportunities for all Californians. Where applicable and to the extent feasible, ARB will direct public and private investment toward the most disadvantaged communities in our implementation of the climate change program (HSC §38565).

California's aggressive climate change program will lead to significant investment, job creation and export opportunities within the state. Specific program design choices may impact the level and type of investment and jobs created. For example, revenue used to fund long-term research, design and development will induce

different types of investment and jobs than revenue used to fund energy efficiency improvements for small businesses. Offsets may provide an opportunity for innovators to create new emission reduction opportunities in California.

3. Cost-Effectiveness

An important requirement of AB 32 is that cost-effectiveness must be considered. This requirement is found in several provisions of the Act. The Act requires the Board to approve a Scoping Plan for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions (HSC §38561). The Act also requires the Board to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions, and to "consider the cost-effectiveness of these regulations" (HSC §38560 and §38562).

AB 32 defines "cost-effective" or "cost-effectiveness" as "the cost per unit of reduced emissions of greenhouse gases adjusted for its global warming potential." (HSC §38505(d)). This definition specifies the metric (i.e., dollars per ton) by which the Board must express cost-effectiveness, but it does not provide criteria to assess if a regulation is or is not cost-effective. It also does not specify whether there should be a specific upper-bound dollar per ton ($/ton) cost that can be considered cost-effective, or how such a bound would be determined or adjusted over time. ARB has investigated different approaches that could be used to evaluate the cost-effectiveness of regulations and is recommending the following approach.

The set of measures needed to achieve the necessary reductions of about 169 $MMTCO_2E$ required by AB 32 would be defined. These measures would be selected to provide the needed reductions in the most cost-effective manner possible. The cost of individual measures could vary widely, but would establish a range from most to least cost-effective.

This range will assist the Board in evaluating the cost-effectiveness of individual measures when considering adoption of regulations. The range of acceptable cost-effectiveness may change if effective lower-cost measures and options are identified. Because the both the projections of "business-as-usual" 2020 emissions and the degree of reductions from any given measures may be greater or less than current estimates, the determination should remain flexible to accommodate a higher or lower estimate of cost-effectiveness.

In addition, the criteria for judging cost-effectiveness can be updated as additional technological data and strategies become available. As ARB moves from developing the Scoping Plan to developing specific regulations, and as regulations continue to be adopted, updated cost-effectiveness estimates will be established. As ARB progresses from proposed strategies and estimated costs to actual regulations, the comparison of cost-effectiveness would move toward the well established practice of comparing the cost-effectiveness of new regulations to the cost-effectiveness of previously enacted and/or similar regulations. This approach is consistent with how cost-effectiveness is evaluated for strategies to reduce criteria and toxic pollutants.

The scheduling of the regulations to be considered by the Board for adoption would be based on practical reasons such as the complexity of the regulation, the size of the potential reductions, or the lead time required for compliance.

4. Potential Impact on Small Business

Because of the important role that small businesses play in California's economy, AB 32 requires ARB to take into account the potential for adverse effects on them in developing the Scoping Plan (HSC §38561(e)). Based on the preliminary recommendation identified in this Draft Scoping Plan, the impacts of greenhouse gas emission reduction efforts would vary greatly among different types of small businesses. While the unit cost of electricity and petroleum-based fuels is expected to rise in future years due to a variety of factors, including the need to transition away from carbon, small businesses are more likely than larger ones to have opportunities to offset the impact of these cost increases by taking cost-effective steps to conserve energy or increase energy efficiency. Some of these efforts will have little or no capital cost associated with them, while the cost of more extensive efforts such as purchase of more efficient equipment or may qualify for incentives offered by utility companies, as well as an array of State and local government programs.

As measures are evaluated through the final scoping plan, and as programs and regulations are designed by ARB and other agencies, the potential impacts as well as opportunities for small businesses will be an important consideration.

5. Environmental Analyses

Background

The AB 32 climate change program is only one in a portfolio of ARB air quality programs. ARB's traditional public health programs focus on the key "criteria pollutants" ozone and fine particulate matter (PM2.5) , and air toxics. Evaluating the potential for reductions in these pollutants as a result of AB 32 implementation is a significant aspect of the environmental analysis.

Many areas in California do not attain air quality standards for ozone and particulate matter. To address unhealthful air in these areas, ARB and local air districts adopt and implement air quality plans or "State Implementation Plans (SIPs)" that describe how standards will be met by the required deadlines. In 2007, ARB and local air districts updated the California SIP for ozone and PM2.5. By 2020 these SIPs will reduce NOx emissions that form ozone and PM2.5 by 60 percent in the South Coast Air Basin and the San Joaquin Valley. However, these two regions face California's most challenging air pollution problems so the potential for achieving additional criteria pollutant reductions as a co-benefit of this Plan is important.

ARB and local air districts are also implementing programs to reduce emissions of toxic air contaminants. Both criteria pollutants and air toxics are collectively referred to in the Draft Scoping Plan as "co-pollutants." Because diesel particulate matter

(diesel PM) accounts for 75 percent of the public health risk from known airborne toxics in California, ARB has placed its highest priority on controlling emission sources of diesel PM. Through a combination of rulemaking, incentives, and enhanced enforcement, health risk from diesel PM will continue to decrease steadily even with projected economic growth. ARB's Diesel Risk Reduction Plan and Goods Movement Emission Reduction Plan both focus on diesel emissions. Over the past several years, ARB has adopted regulations to reduce diesel PM emissions from stationary engines, cargo handling equipment, port trucks, transportation refrigeration units, idling diesel trucks, urban and transit buses, public fleets, and off-road equipment. An ARB port electrification rule was adopted in 2007. ARB is currently developing regulations to reduce emissions from trucks operating in California. Communities especially impacted by diesel emissions from goods movement activities will see public health benefits from all of these measures. Regional air quality will also be significantly improved.

Evaluation of Potential Co-Benefits

Based on the preliminary recommendations in the plan, ARB is evaluating the potential of reductions in co-pollutants. Later this summer ARB will provide further analysis of the potential for co-benefits from the plan's greenhouse gas reduction measures. This analysis will focus on the reductions in fossil fuel use and improvements in combustion efficiencies that will result in public health co-benefits. Evaluation of the recommended measures will also include assessment of the potential for any emission increases in co-pollutants.

The statewide analysis of potential co-benefits is based on estimates of reduced fuel and electricity use to quantify potential emission reductions and associated public health benefits. An estimate of the reduced transportation fuel and electricity use from all the measures other than cap and trade is shown in Table 23. The additional reductions from a cap-and-trade program would be expected to further reduce fuel use.

Table 23: Preliminary Estimate of Reduced Gasoline, Diesel and Fossil-Fuel Fired Electricity Use in 2020 from Recommended Measures Other than Cap and Trade

	Estimated 2020 Demand without Scoping Plan	Estimated Reduction from Recommended Measures Other than Cap and Trade
Gasoline (gallons)	19 billion	3.7 billion
Diesel Fuel (gallons)	5 billion	400 million
Fossil Fuel Fired Electricity[1] (Gigawatt-hrs)	188,000[2]	90,000

1 For electricity, these numbers represent a reduction in demand due to conservation and efficiency programs (32,000 GWh), an increase in zero-emission electricity sources due to the implementation of the 33 percent Renewables Portfolio Standard (greater than 48,000 GWh) and distributed solar generation (4,500 GWh). These estimates include the benefits from reduced line loss (5,500 GWh).

2 Business-as-usual estimate for in-state fossil fuel fired electricity in 2020.

Table 24 provides estimates of potential reductions of NOx and particulate matter in 2020 based on all the recommended measures other than cap and trade. Implementation of a cap-and-trade program would further reduce emissions, although the magnitude and location of the reductions would depend, in part, on program design.

Table 24: Preliminary Estimate of Statewide Emission Impact of Reduced Fuel Use in 2020

(tons per day)

	Emissions from Fuel Combustion without Scoping Plan[33]	Reductions from Regulatory Measures in Preliminary Recommendation
NOx	1900	50
PM2.5	240	10

In addition to evaluating the impacts of the Plan as a whole, ARB will evaluate each measure as it is developed. For example, ARB is evaluating the potential impacts of the low-carbon fuel standard on both the co-pollutant emissions at existing refineries and the potential co-pollutant impacts from indirect sources such as the trucks and trains that travel to and from the refinery, and the cumulative impacts of new facilities that may be built to support the new fuel standard. This includes the siting of new ethanol or other biorefineries needed to meet the low-carbon fuel standard.

ARB will also evaluate the role of new power plants and how new power plants may affect the AB 32 program. If new power plants displace imported electricity, co-pollutant emissions in California would increase. However if new power plants displace outdated and inefficient power plants in California, co-pollutant emissions could decrease. The electricity generation and distribution system is very complex, which makes evaluation of potential local effects challenging. Power plants are dispatched based on variable costs (mostly fuel costs), the need to ensure sufficient generation to meet peak loads over the next day, maximizing the value of dispatchable hydroelectric power generation and other limited energy resources, and the availability of sufficient generation in transmission-constrained areas to meet power needs and to protect against the failure of lower cost local generation resources and transmission lines. Because of this, ARB has requested assistance from the California Energy Commission for this evaluation. ARB will provide a more detailed discussion of this analysis in the evaluation supplement in summer 2008.

In designing a cap-and-trade program it will be necessary to evaluate statewide, regional, and community level impacts. For example, under a cap-and-trade program, a facility could potentially purchase extra greenhouse gas allowances instead of reducing emissions onsite. ARB's evaluation will identify scenarios under which potential reductions in co-pollutants do not occur due to the compliance flexibility

[33] Includes reductions from 2007 SIP measures.

mechanisms. Under such scenarios, the expected co-benefits of the greenhouse gas measure would occur in a location other than the surrounding community.

In response to a request from the Environmental Justice Advisory Committee (EJAC), ARB will evaluate methods for assessing the potential co-benefits under various scenarios at a community level. This will be included in the summer 2008 supplemental analysis for the scoping plan.

Under the California Environmental Quality Act (CEQA), ARB is required to conduct an assessment of the potential environmental impacts of ARB actions. The final Proposed Scoping Plan, to be published in early October 2008, will include an assessment of the potential environmental impacts of the Plan. The State will also perform an environmental analysis of each regulatory action developed from the Scoping Plan.

As with other ARB plans and programs, the Scoping Plan and the subsequent regulations will be evaluated consistent with ARB's environmental justice policies. We expect that the Scoping Plan strategies will complement ARB's traditional air quality programs, resulting in better air quality and reduced health risk to the people of California. ARB is conducting a series of community meetings throughout the state to solicit input on the Draft Scoping Plan, including how ARB can design and implement the Plan in ways that meet ARB's public health and environmental justice goals.

6. Public Health Analyses

ARB is conducting an evaluation of the potential public health benefits and impacts of the Scoping Plan (HSC §38561(d)). Expected reductions in fossil fuel use and improvements in combustion efficiencies will likely result in benefits to public health overall. Evaluations of these benefits and impacts are currently underway. Air pollution-related public health is based on exposure of sensitive populations to ambient air. Public health evaluations are difficult to conduct without specific information about the location and duration of emissions. These public health evaluations will focus primarily on estimated statewide public health effects of changes to air quality, and explore potential effects in smaller geographic regions. The evaluations will build on the environmental analyses described above, and will be released this summer.

Preliminary estimates of the public health benefits results from the implementation of the regulatory components of the preliminary recommendation are shown in Table 25 below. The PM2.5 and NOx emission estimates used in calculating health effects are based on predicted statewide values shown in Table 24. These estimates do not consider the geographic distribution of emissions or sensitive populations so the estimated health benefits numbers should be treated as preliminary.

Table 25: Preliminary Estimates of Public Health Benefits of Reduced Fuel Use in 2020 from Recommended Measures other than Cap and Trade

Health Endpoint	Estimated Benefit*
Avoided premature deaths	340
Avoided hospitalizations due to respiratory causes	71
Avoided hospitalizations due to cardiovascular causes	130
Avoided asthma-related & other lower respiratory symptoms	9,400
Avoided acute bronchitis	780
Avoided work loss days	57,000
Avoided minor restricted activity days	330,000
Total economic valuation: $1.5 billion to $2.4 billion	

* Uncertainty intervals for each estimated benefit range within 20-70 percent of the mean benefit (presented in this table). For example, the number of premature deaths avoided could be between 93 and 580.

7. Societal Impacts Analyses

ARB must consider overall societal benefits in adopting regulations (HSC §38562(b)(6)). ARB is evaluating the potential societal impacts and benefits of the preliminary recommendation. Societal impacts, as described here, include issues such as diversification of energy sources, mobility, regressivity, and job creation. Regressivity, the potential impact on low income households, is discussed in the Economic Analysis section and will be further discussed in the supplemental evaluation. ARB will evaluate energy diversity using the Energy 2020 model to evaluate how the recommendation will make progress toward the goal of reducing petroleum dependence.

In addition, AB 32 directs ARB to identify ways to encourage public and private investment toward disadvantaged communities and smaller institutions, so that they can participate in and benefit from emission reduction co-benefits and new technology. ARB is consulting stakeholders to assist in developing this program.

8. Future Regulatory Analyses

ARB must design equitable regulations that encourage early action, do not disproportionately impact low-income communities, ensure that AB 32 programs complement and do not interfere with the attainment and maintenance of ambient air quality standards, consider overall societal benefits (such as diversification of energy sources), minimize the administrative burden, and minimize emission leakage. To the extent feasible and in furtherance of achieving the statewide greenhouse gas emission limit, ARB must consider the potential for direct, indirect and cumulative emission impacts from the market mechanisms, including localized impacts in communities that are already adversely impacted by air pollution, design the program to prevent any increase in emissions, and maximize additional environmental and economic benefits prior to the inclusion of market-based compliance mechanisms in the regulations.

ARB already conducts robust environmental and environmental justice assessments of our regulatory actions. Many of the requirements in AB 32 overlap with ARB's typical evaluations. A good example of how ARB plans to address the regulatory evaluations required by AB 32 is the current Low Carbon Fuel Standard rulemaking. The Low Carbon Fuel Standard (LCFS) is a Discrete Early Action that ARB is pursuing as a regulatory measure. The Board is scheduled to consider this regulation in late 2008 or early 2009. The goal of the LCFS is to reduce lifecycle greenhouse gas emissions from transportation fuel by at least 10 percent. Fuel producers can meet the LCFS requirements by blending lower-carbon fuels, such as biofuels from renewable sources, with gasoline or diesel fuel, or by deploying lower-carbon fuels such as electricity or hydrogen. To ensure that the LCFS regulation actually reduces greenhouse gas emissions and to ensure sustainability, it is critical to understand the full lifecycle greenhouse gas emissions of potential replacement fuel. Sustainable development can be used to describe a pattern of resource use that meets human needs while preserving the natural environment so that needs can be met in the present as well as the indefinite future.

The LCFS is a complex climate change regulation that is likely to incorporate market-based compliance mechanisms, requiring the full range of AB 32 evaluations. ARB is contracting with academic institutions to assist in the development of sustainability provisions for the LCFS. These efforts are aimed at a number of sustainability issues such as direct and indirect land use effects, air quality, water quality, and biodiversity, and social impacts such as environmental justice. In addition, the scope of the sustainability issues cross many jurisdictional boundaries. Therefore it is critical to work on a national and international basis to seek harmonization of sustainability provisions. A summary of the ongoing evaluations is provided below.

Greenhouse Gas Emissions: The main purpose of the LCFS is to reduce greenhouse gas emissions through a full lifecycle analysis. Therefore, it is important to consider the direct and indirect land-use effects on greenhouse gas emissions during the regulatory process. To that extent, ARB is conducting a quantitative analysis using publicly available models to assess the global impacts of biofuel production and the direct and indirect impacts of other fuels as well. Based on the results of this evaluation, ARB will then evaluate the need to include land use protections, similar to those in the federal Renewable Fuels Standards (RFS). The RFS land use protections limit renewable biomass to that which is produced on land that was cleared or cultivated prior to the enactment of the RFS requirement.

Economic Impacts: ARB will evaluate the potential economic impacts of the LCFS strategy, including impacts on agriculture.

Other Environmental Impacts: ARB will evaluate the potential impacts of LCFS on criteria pollutants and air toxics and consider water use and water quality, as well as soil erosion. To the extent feasible, these evaluations will be quantitative for California, and qualitative for impacts outside of California. ARB will ensure that to

the extent feasible, the LCFS complements and does not interfere with achievement and maintenance of federal and state ambient air quality standards.

Environmental Justice: To the extent feasible, ARB will quantitatively assess potential impacts on low-income and disproportionately impacted communities in California. This evaluation will include an evaluation of the direct, indirect, and cumulative emission impacts of the proposed regulation on communities that are adversely impacted by air pollution, and to the extent feasible will ensure that LCFS requirements do not disproportionately impact low-income communities. For example, this analysis will include an assessment of the potential impacts of the construction of low-carbon fuel production facilities in California using the Governor's goals for California production of biofuels as a benchmark as described in Executive Order S-06-06.

Food Prices: ARB will analyze and present information on the impact of biofuels on food prices as part of the regulatory development process.

Other Sustainability Issues: In consideration of the overall societal benefits of the LCFS, ARB will evaluate other environmental and social components including genetically-modified organisms, biodiversity, labor rights, income distribution, working conditions, worker rights, child labor and land rights. Although these issues may be outside of ARB's ability to address, ARB will consider them in the regulatory development and evaluate the need to incorporate recommendations for future study. As part of this effort, ARB will seek to develop guidelines for the sustainable production of fuel in coordination with the University of California, the California Energy Commission, the U.S. Environmental Protection Agency and others.

The LCFS is unusually broad in scope so the analysis that is underway to meet the AB 32 regulation may be atypically complex. However the planned evaluations provide insight into the scope of future regulatory analyses. For simpler regulations, the required analysis may not be as broad and far-reaching.

9. Administrative Burden

ARB conducted a preliminary assessment of the administrative burden of implementing the preliminary recommendation (HSC §38562 (b)(7)). The preliminary recommendation calls for ARB to develop a cap-and-trade program – a market-based program to cap and reduce emissions from the Industrial, Electricity, Natural Gas, and Transportation sectors. This program would require stringent monitoring and reporting on the part of the regulated community, and comprehensive enforcement on the part of the ARB. Sources under the cap would also need to analyze the best approach for their company to comply with a cap – assessing the cost of reducing emissions and comparing that to the cost of purchasing emission reductions in a market. Although ARB has not developed this type of market regulation before, there is extensive experience to draw upon both within California, nationally, and internationally. In addition, the regulatory component of the preliminary recommendation would requires ARB and other State agencies to adopt a

series of regulations requiring regulatory development, outreach to stakeholders and the public, implementation by industry, and enforcement for numerous measures and programs. ARB is continuing to evaluate the potential administrative burden of the preliminary recommendation.

10. De Minimis Threshold

ARB is evaluating appropriate de minimis thresholds for the Scoping Plan below which emission reduction requirements will not apply (HSC §38561(e)). ARB is considering separate de minimis for combustion carbon dioxide and non-carbon dioxide gases. This is because many high-GWP gases are used in very small quantities. For example, a ten ounce can of pressurized duster (commonly used to clean computer keyboards) can contain 800 pounds of CO_2E. ARB believes that a de minimis threshold for combustion carbon dioxide should be higher than that for non-carbon dioxide gases, and is soliciting comment on this proposal.

IV. IMPLEMENTATION: Putting the Plan into Action

Adoption of the Scoping Plan, in whatever final form, will be a groundbreaking step forward for California. But it is only the beginning of a journey that will last for decades, and project the state into a low-carbon, clean energy future. We must be clear: putting the Plan into action is a challenge that will test the mettle of the State, and the political will of all levels of government. ARB is confident that we can – and must – address this most serious threat to the state's economy and wellbeing. This Plan sets the stage for each of us to personally take on the challenge of climate change, to move beyond good intentions to concerted actions and usher in a bold new chapter for California, and the world.

A. Personal Action

The pollutant reductions required under AB 32 cannot be realized without the active participation of the people of California.. While many of the measures in this Plan must be taken by large sources of emissions such as power plants and industrial facilities, it is the voluntary commitment and involvement of millions of individuals and households throughout the state that will truly make this 'California's Plan'.

We are all, ultimately, the real agents of change. Shifts in individual choices and attitudes drive changes in the economy and at the institutional level. Examples abound: dolphin-safe tuna, for example, was the product of using the forces of demand to drive changes in the fishing and canning industry. Boycotting lumber from old-growth trees led to a certification process that helps consumers choose their wood and wood products.

When these changes in behavior are linked with supporting incentives, policies or regulations, they can be even more effective. An attitudinal shift against smoking was reinforced by banning smoking in restaurants.

The same dynamic of changing individual behavior will drive California's pioneering effort to reduce greenhouse gas emissions. As more people choose to drive low-greenhouse gas emitting vehicles, the auto manufacturers will respond with more models and more intensive research. Regulations requiring auto manufacturers to provide these cars will complement the market demand.

This means that thinking about climate change in ways that will reduce our individual and household carbon footprint will become an integral part of our everyday decisions about travel, work, and recreation. Some families may choose to purchase a more efficient vehicle when it comes time to replace the current model. Some may decide to make locally grown food a larger part of their diet as a way to reduce

related emissions from transportation. Many households will choose to lower their thermostat to 68 degrees Fahrenheit during the colder months, and raise it to 78 degrees when air conditioning is required. Some households may choose to swap out incandescent light bulbs for more efficient compact fluorescent lights. Others may choose now to install solar water heaters, or arrays of solar panels on their roofs to take advantage of renewable energy, and lower their household energy bills. Many households may choose to plant trees to shade and cool their homes, and use landscaping and plants that require less water (and so produce less emissions ultimately to transport and treat it). What is crucial is that we all begin making these kinds of changes now.

This Draft Plan recommends measures that will help support many of these individual decisions to improve energy efficiency. Statewide measures and regional efforts will result in programs to promote public transportation or riding in carpools, subsidize the purchase of energy efficient appliances, or provide incentives to better insulate and weatherize older homes. ARB is fully committed to assuring California consumers have the widest possible choice of vehicles that emit fewer greenhouse gases than today's models, including the most advanced technology vehicles produced anywhere in the world. But it will still require individual decisions, and changing individual habits, to make those programs and policies rapidly effective.

Californians have embraced statewide programs to that support positive change in home and business behavior in the past. In less than two decades, separating household waste and recycling at home and work have become commonplace, as has the widespread purchase of appliances with the Energy Star label to save energy. Reducing our carbon footprint by moving towards a cleaner more efficient economy will produce a wide range of benefits to individuals, through lower energy bills, a more sustainable lifestyle, and a cleaner environment for all.

B. Public Outreach and Education

The backbone of an effective climate action plan is public outreach and education. The Draft Plan calls for a robust statewide program designed to generate awareness and involvement in California's climate change efforts.

The Climate Action Team will convene a steering team that includes State agencies along with other public agencies such as the state's air districts and utilities – both public, and investor owned -- which have a strong track record of successful efforts at public education to reduce driving (Spare the Air) or promote energy efficiency and reduce energy demand (Flex Your Power).

The steering committee will develop a coordinated array of messages and draw upon a wide range of messengers to deliver them. These will include regional and local governments whose individual outreach campaigns can reinforce the broader State outreach themes while also delivering more targeted messages directly tied to specific local and regional programs.

In keeping with the critical element of involving all Californians in addressing climate change, California will also support highly localized efforts at public education and outreach at the community and neighborhood level, including service club organizations and existing faith-based communities – churches, mosques and synagogues. Other private sector entities including businesses will be invited to partner in spreading the word.

1. Reaching Children through Schools

Setting California on track to a low-carbon future beyond 2020 is the definition of a multi-generational challenge. This means that climate-related education in schools will be a central element of California's Plan. By 2010, California will develop climate change education components to the State's new K-12 model school curriculum as part of the Education and the Environment Initiative (AB 1548, Pavley, Chapter 665, Statutes of 2003). In the meantime, State outreach will continue through the Cool California web pages (www.coolcalifornia.org) and the continued support of student educators through the California Climate Champions program. Expanding the knowledge and opportunities of young people to participate in promoting their own and their communities' environmental health will be an important theme for all these efforts..

2. Involving the Public and Stakeholders in Measure Development

In keeping with the requirements of AB 32, and the legacy of four decades of regulatory development at ARB, the process of developing regulations outlined in this Plan will be transparent, and fully involve the public including disadvantaged communities and those with localized concerns, as well as affected industries, at every stage of the process including informal and formal rulemaking activities. Local and community meetings and outreach will be central element of all rulemaking, with State agencies working closely with advocates of disadvantaged communities and the EJAC to understand impacts and sensitive co-pollutant issues surrounding the possible programs. State agencies involved in measure development will continue meeting periodically with communities to assess any implementation challenges or to discover new measures down the road. Stakeholders will be invited to participate in the many workshops, workgroups and seminars that will be held as individual measures are developed.

3. Small and Medium-Sized Businesses

Small and medium-sized businesses may feel particularly uncertain about how they will transition to California's new green economy. One of the Early Action measures ARB is implementing is aimed at helping business during the implementation of AB 32. ARB is developing a small business outreach package including a business-specific calculator to assess energy use and guidance on best practices, case studies about how other businesses have implemented energy efficiency programs, and financing options. ARB will work with other State agencies to develop an outreach plan to provide technical assistance to businesses through a variety of means

including attendance at business events, workshops, working with local economic development agencies. ARB will also work with the Governor's AB 32 Small Business Task Force in the implementation of AB 32.

4. Workforce Readiness

ARB will work with other agencies, including academia, business, local governments, unions, and community colleges, to identify key steps for building a sustainable economy and expanding career technical training. Many organizations have already benefitted by developing early training for workers and have been able to place them into new, long-term, green technology jobs. In addition, if the Scoping Plan includes programs that generate revenue, these revenues could be used to encourage growth in green technology jobs.

C. Tracking Progress

State agencies, working with the diverse set of greenhouse gas emissions sources, have collaborated in the process of developing the strategies presented in this Plan. To ensure that the emission reduction goal is reached, ARB must monitor the regulations and other actions adopted by both ARB and other State agencies for actual levels of emissions reduced. Should there be shortfalls in emission reductions, the State would implement additional measures to ensure that AB 32 goals were met.

As the proposed measures are developed over the coming years, it is possible some of these strategies will not materialize as originally thought or be deemed to not be technologically feasible or cost-effective at the level given in the Plan. If this happens, new strategies would need to be developed to provide additional reductions if there is a projected shortfall in emissions reductions.

It is equally likely that new technologies and strategies will emerge after the initial adoption schedule required in AB 32 – that is, regulation adoption by January 1, 2011. If promising new tools or strategies emerge, ARB and other affected State agencies will evaluate how to incorporate the new measure into the AB 32 program as soon as possible. In this way, new strategies ensuring that the commitments in the Plan remain whole and that the 2020 goal can be met, will be incorporated into the State strategy.

ARB will update the Plan at least every five years (HSC §38561(h)). These updates allow ARB to evaluate the progress made towards the State's greenhouse gas emission reduction goals and correct the Plan's course where necessary. The Report Cards and audits, along with an evaluation of new technologies – both emerging and those recently incorporated into the Plan – will also provide valuable input into ARB's evaluation for the required updates.

1. Mandatory Reporting Regulation

ARB's mandatory reporting rule, adopted in December 2007, will help the State obtain facility level data from the largest sources of greenhouse gas emissions in California. This data will help ARB better understand these sources to develop the proposed emission reduction measures outlined in the Draft Plan.

The regulation requires annual reporting from the largest facilities in the state, accounting for 94 percent of greenhouse gas emissions from industrial and commercial stationary sources in California. There are approximately 800 separate sources that fall under the new reporting rules and include electricity generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and industrial sources that emit over 25,000 tons of carbon dioxide each year from on-site stationary source combustions such as large furnaces. This last category includes a diverse range of facilities such as food processing, glass container manufacturers, oil and gas production and mineral processing.

Affected facilities will begin tracking their emissions in 2008, to be reported beginning in 2009 with a phase-in process to allow facilities to develop reporting systems and train personnel in data collection. Emissions for 2008 may be based on best available emission data. Beginning in 2010, emissions reports will be more rigorous and will be subject to third-party verification. Reported emissions data will allow ARB to improve its facility-based emissions inventory data. Originally, the statewide greenhouse gas inventory was based on aggregated sector data and could not be disaggregated down to the facility level. The facility-level reporting will improve data on greenhouse gas emissions for individual facilities and their emitting processes. This information will also help improve emissions inventories for criteria pollutants, and methods for assessing cumulative emission impacts on a community level.

ARB emissions reporting requirements are expected to be modified over time as AB 32 is implemented.

2. Report Card

SB 85 (Chapter 178, Statutes of 2007) required every State agency to prepare an annual "report card," detailing measures the agency has adopted and taken to reduce its greenhouse gas output, and including the actual greenhouse gas emissions reduced as a result of those actions. The information must be submitted to CalEPA, which is then required to compile all the State agency data into a report format, which would be made available on the internet and submitted to the Legislature. The information would then allow comparisons of each agency's projected greenhouse gas reductions with their targets established by the CAT or the Scoping Plan, and what was actually achieved. This would be the State's 'report card' on its greenhouse gas reduction efforts.

Agencies are also required, as funds are available, to have an outside audit of greenhouse gas actions completed every three years to verify actual and projected reductions.

D. Enforcement

Enforcement is a critical component of all of ARB's regulatory programs, both to ensure that emissions are actually reduced and to provide a level playing field for companies that comply with the law. ARB has an extensive and effective enforcement program addressing the myriad sources ARB regulates from heavy-duty vehicle idling to consumer products to fuel standards to off-road equipment. To increase the scope of its enforcement efforts and provide greater assurance of compliance, ARB also partners with local, State and federal agencies to carry out inspections and where necessary prosecute violators. ARB will continue its close working relationship with local air districts in the development and enforcement of regulations to implement the Scoping Plan.

The Draft Plan recommends a mix of market-based programs and regulatory measures. ARB, EPA, and many local agencies have experience with the data collections and analysis necessary to enforce market-based regulations, in addition to the actual testing of emissions at the source. ARB will work closely with the local air districts to take advantage of the expertise of these agencies which have primary responsibility for implementing and enforcing criteria pollutant regulations at stationary sources within their jurisdictions. Local air districts not only are familiar with the individual facilities and their compliance history, their permitting files contain valuable information that can be used to make sure that greenhouse emissions reductions are accurately reported and regulators can track the relationship between greenhouse gases and toxic or criteria air pollutants.

E. State and Local Permitting Considerations

Proposed emission reduction strategies in the Draft Plan may require affected entities to modify or obtain federal, State and/or local environmental or other permits. For example, the installation of new equipment which reduces greenhouse gas emissions may require a modification of an existing air operating permit, under the jurisdiction of a local air district.

There may also be instances where proposed greenhouse gas emission reduction strategies will need to be harmonized with existing environmental, safety or other requirements, or require additional permitting. Local building codes can affect construction or remodeling permitting such as that necessary to install photovoltaic panels or building new alternative fuel infrastructure.

Some projects proposed as emission reduction strategies may require an environmental review under the California Environmental Quality Act (CEQA) or the National Environmental Protection Act (NEPA). If the project proposed to reduce

emissions of greenhouse gases has an adverse effect on another environmental factor, then mitigation may be required for the project to continue.

Many proposed emission reduction strategies require changes to the use or production of energy. In addition to other permitting issues noted here, these changes may require approval by the California Energy Commission or the California Public Utilities Commission.

Permit requirements may affect the viability of certain strategies, or timing of implementation due to the length of time required to complete an extended and comprehensive permitting process. These effects will need to be further evaluated in the subsequent regulatory development processes associated with each proposed emission reduction measure. ARB is committed to working through these potential permitting barriers with our state and local partners to ensure successful implementation of AB 32.

F. Program Funding

Administration, implementation, and enforcement of the proposed emission reduction strategies contained in the Draft Scoping Plan will require a stable continuing source of funding. AB 32 authorizes ARB to collect fees to fund implementation of the statute. Details of how this fee program will be structured will be subject to a public rulemaking that ARB will initiate this summer.

At a minimum, ARB will develop a fee structure to pay for administration of the AB 32 program. Preliminary estimates are that approximately $55 million per year will be needed on an ongoing basis to fund implementation by ARB and other State agencies. Additional revenues will be needed to repay the loans from State funds that have been used to pay for the startup of the program. If applied to all GHG emissions in California, a fee of $0.20 per metric ton would provide the needed funding. This would translate to less than $0.0002 per kilowatt-hour, $0.002 per gallon of gasoline, and $0.001 per therm of natural gas.

It would take approximately 18 months from the beginning of the regulatory process until a fee schedule is in place. This includes time for regulatory development and to set up the required billing, collection, accounting, enforcement and other administrative components of the program. Therefore, revenue from fees would be available for expenditure in the 2010-2011 fiscal year.

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V. A VISION FOR THE FUTURE

A 30 percent reduction in greenhouse gas emissions is well within the capabilities of California. This Draft Scoping Plan proposes solutions to fulfill the requirements of AB 32 while also reducing air pollution, protecting our natural resources and addressing the possible impacts on low-income communities. The task before us now is to determine how best to achieve these essential goals.

We have the know-how, the ingenuity, the research capabilities, and a culture of imaginative and profitable innovation to do it, but achieving the required reductions will not be easy. Many of the proposed programs and measures described in this Draft Plan will require changes in public policy, an investment in political will and a shared understanding of the need to reach viable solutions quickly. Other solutions – more efficient vehicles, low-carbon fuels, increased renewable energy sources – are technology-dependent and will require both the increased use of known solutions and their development into second and third generation iterations. There is little doubt that with a much larger market, and targeted incentives for both production and purchase, we will see improved photovoltaic cells, LED lighting, and highly efficient solar water heaters as essential elements of a typical house.

As the greenhouse gas emissions cap lowers toward the 2020 limit, companies and corporations will support the development of new generations of industrial processes that are more efficient, save money and energy, and produce less waste.

Looking beyond 2020, the subject of new and alternative energy sources becomes more complicated, more important, and less clear. There are many promising technologies that are at present only in the initial stages of research and development: generating electricity from the power of waves, for example. We will need to move forward with feasible solutions to carbon to do capture and sequestration, production of cellulosic-based ethanol, and other promising advances in biological solutions to produce fuels.

As the current generation of children now in school move into their productive adult years – 2020 and beyond – the need for alternate energy sources and ever-increasing requirements of energy efficiency will follow them. In many cases, developing new technology in compressed timeframes will resemble the concept of ‘inventing to schedule’ that allowed the Apollo Program to make such rapid advances in America’s successful effort to put a man on the moon. It is one of the goals of this Draft Scoping Plan to help establish and support long range approaches and institutions that will provide the continual search for new energy solutions, and their rapid development and deployment into the marketplace.

And what will California look like in 2050? It is safe to say that no one can really predict how much technology and the state will have changed forty-two years from now. Looking back forty-two years to 1966, gasoline cost about a quarter a gallon, the state had fewer than 10 million residents, and few could conceive of personal computers, let alone the Internet. It was partly through the innovation and creativity of Californians that computers are common as telephones, and we have the World Wide Web where most people will read this Draft Scoping Plan.

In addition to the implementation of measures discussed in this Draft Plan, other important areas need to be pursued to ensure the broadest goals of addressing climate change are successful. The discussion below highlights several of these ideas that need attention in both the near- and long-term.

Collaboration

Working Closely with Key Partners

Global warming requires all the major emitting nations to work together for a global rescue plan. California and other states are filling a vacuum created by a lack of national leadership by the federal government. California must press for national legislation that will allow the United States to take its place among the developed counties that have agreed to reduce their carbon emissions, and lead a new international effort to promote an agreement to replace the Kyoto agreement that expires in 2012.

Any national climate program must be built on a partnership with state and local governments to ensure that states can continue their role as incubators of climate change policy, and continue to implement effective programs such as vehicle standards, energy efficiency programs, green building codes, and alternative fuel development.

California should work with key federal agencies, including the U.S. Department of Energy and their national labs, the U.S. Environmental Protection Agency and numerous other key agencies, such as the U.S. Bureau of Land Management, U.S. Department of Agriculture, U.S. Department of Transportation, to find shared solutions to climate change.

Through the Western Climate Initiative and in collaboration with other regional voluntary alliances of states, California can promote our own best practices and learn from those of others, in addition to continuing to work on the structure of a regional and ultimately national cap-and-trade program.

California is a charter member of the International Carbon Action Partnership (ICAP), an organization made up of countries and regions that have adopted carbon caps and are actively pursuing the implementation of carbon markets through

mandatory cap-and-trade systems. We should continue our involvement in ICAP to share experiences and knowledge.

We should continue to develop current relations and existing partnership arrangements with China – now the largest contributor of greenhouse gases in the world – and to establish similar relations with India and other countries to share research on both greenhouse gas mitigation and climate change adaptation activities.

With developing nations expected to suffer the most from the effects of climate change, California and others have an obligation to share information and resources on cost-effective technologies and approaches designed to mitigate future impacts, as well as information on effective adaptation as changes in climate and the environment occur.

Research

Unleash the Potential of California's Universities and Private Sector

Bringing greenhouse gas emissions down to a level that will allow the climate to stabilize will take a generation or longer. Many of the ultimate solutions to achieve stabilization will be developed and implemented well into the future. It is likely that the most innovative solutions are going to come from people who are now in school. The challenges these children will face have never been experienced before and they will need both imagination and creativity to craft solutions. California's respected public and private academic institutions must continue to develop and fund programs based on climate change science that cut across disciplines to address the multi-dimensional aspects of climate change.

Public-Private Partnerships

To most effectively address the climate change dilemma, we must encourage collaborations between academia and the private sector. Industry is well positioned to quickly attack problems. Combining the understanding and knowledge of universities with the innovation, acumen and speed of businesses can unleash a powerful collaborative force to tackle the problems associated with climate change.

Several important programs have already been initiated at California Universities, including Stanford's Global Climate and Energy Project, and the University of California at Berkeley's Energy Biosciences Institute (EBI), [34] a $500 million, ten year program. The California Public Utilities Commission (CPUC) recently created the California Institute for Climate Solutions (CICS). The CICS is a $600 million, ten-year public-private collaboration for applied and directed research on reducing GHG emissions in the Electricity and Natural Gas sectors. All these and

[34] The EBI is being developed in cooperation with Lawrence Berkeley National Laboratory and the University of Illinois at Urbana-Champaign.

other efforts need to be recognized and encouraged, along with others that can link the results of research directly to policy decisions that the State must make.

Conclusion

Climate science and solutions are evolving rapidly, but meanwhile the evidence of harm from levels of greenhouse gases already present in Earth's atmosphere keeps mounting. While we are learning to adjust to live under conditions of global warming we must act without delay to prevent even worse consequences. AB 32 wisely requires the ARB to update its Scoping Plan every 5 years to reflect what we have learned and what we have accomplished. This draft indicates that for the first phase of implementation we have a menu of available and attractive measures from which to choose. We can attack global warming in ways that make our cities healthier, our natural areas safer and our working landscapes more productive; that make our economy more resilient as we reduce our reliance on imported petroleum; and that pave the way for technologies that can make our state both more prosperous and more sustainable. But we must choose, and then act. As this Draft Plan becomes final, it will be made sharper and given more detailed analysis; recommendations may change as a result of better information. The basic outline is here. It's up to you who read it to help fill in the blanks.

Acknowledgments

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Team Support

Climate Action Team
Climate Action Team Sector Subgroups

- Agriculture
- Cement
- Energy
- Forest
- Green Buildings
- Land Use
- Recycling and Waste Management
- State Fleet
- Water-Energy
- Economics
- Scenarios
- Research

Advisory Committees

Market Advisory Committee
Environmental Justice Advisory Committee
Economic and Technology Advancement Advisory Committee

State Agencies

Governor's Office of Planning and Research
California Environmental Protection Agency
Business, Transportation and Housing Agency
Resources Agency
State and Consumer Services Agency
California Energy Commission
California Public Utilities Commission
California Transportation Commission
Department of Conservation
Department of Food and Agriculture
Department of Forestry and Fire Protection
Department of General Services
Department of Parks and Recreation
Department of Public Health
Department of Transportation
Department of Water Resources
Housing and Community Development
Integrated Waste Management Board
State Water Resources Control Board