California Environmental Protection Agency

Air Resources Board

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
(This facility is accessible to persons with disabilities.)

PUBLIC MEETING AGENDA

November 20 & 21, 2008

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO: http://www.arb.ca.gov/lispub/comm/bclist.php

November 20, 2008
9:00 a.m.

Item #

08-10-1: Report to the Board on Impacts of Climate Change on California: Scenarios Assessment Findings

Staff will provide an overview of the findings of the 2006 and 2008 Climate Action Team scenarios analysis report on the impacts of future climate change on various sectors of the California economy. This is the second biennial report to the Governor pursuant to Executive Order S-3-05. The analysis is based on several climate change scenarios that have different assumptions for greenhouse gas emissions, population growth and changes in demographics, and the nature of the economy. Topics to be covered include estimates of future temperature change and possible impacts on public health, air quality, water resources, sea level, agriculture, and forests.

08-10-2: Public Meeting to Consider Approval of Assembly Bill 32 (AB 32) Scoping Plan to Reduce Greenhouse Gas Emissions in California

In 2006, Governor Schwarzenegger signed the California Global Warming Solutions Act of 2006 (AB 32). AB 32 directs the Air Resources Board to adopt a Scoping Plan on or before January 1, 2009, for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions by 2020. At the Board meeting, staff will present the Proposed Scoping Plan for Board discussion. The Board intends that this public meeting will be the main forum for hearing oral testimony on the Plan. The Board will not take action on the Proposed Scoping Plan until its December 11-12 public meeting.

November 21, 2008
8:30 a.m.

Item #

08-10-3: Public Hearing to Consider Amendments to the Current Regulations for Small Off-Road Engines

Staff is proposing modifications to the small off-road engine regulations to address the existing credit program. Staff is also preparing other minor modifications to provide greater compliance flexibility to the regulated industry and to enhance alignment with proposed United States Environmental Protection Agency regulations.

08-10-4: Public Hearing to Consider Amendments to the Current Regulations for Large Spark-Ignition Engines with an Engine Displacement Less Than or Equal to One Liter

Staff is proposing more stringent exhaust and evaporative emission standards for large spark-ignition engines with an engine displacement less than or equal to one liter.

CLOSED SESSION – LITIGATION

The Board will hold a closed session, as authorized by Government Code section 11126(e), to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

Central Valley Chrysler-Jeep, Inc. et al. v. Goldstene, U.S. District Court (E.D. Cal. - Fresno), No. 1:04-CV-06663-AWI-GWA.

Fresno Dodge, Inc. et al. v. California Air Resources Board et al., Superior Court of California (Fresno County), Case No. 04CE CG03498.

General Motors Corp. et al. v. California Air Resources Board et al., Superior Court of California (Fresno County), Case No. 05CE CG02787.

State of California by and through Arnold Schwarzenegger, the California Air Resources Board, and the Attorney General v. U.S. Environmental Protection Agency, and Stephen L. Johnson, Administrator, U.S. Court of Appeals, District of Columbia Circuit, Case No. 08-1178.

Green Mountain Chrysler-Plymouth-Dodge-Jeep, et al. v. Crombie, 508 F.Supp.2d 295, U.S. District Court Vermont (2007), appeal to U.S. Court of Appeals, Second Circuit, Docket Nos. 07-4342-cv(L) and 07-4360-cv(CON).

Tesoro Refining and Marketing Company v. California Air Resources Board, Superior Court of California (Sacramento County), Case No. 34-2008-80000064.

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING. BOARD ITEMS NOTED ABOVE WHICH ARE NOT COMPLETED ON NOVEMBER 20 WILL BE HEARD ON NOVEMBER 21 BEGINNING AT 8:30 A.M.

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
http://www.arb.ca.gov/lispub/comm/bclist.php

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CLERK OF THE BOARD:
OFFICE: (916) 322-5594 or FAX: (916) 322-3928
1001 I Street, Floor 23, Sacramento, California 95814
ARB Homepage: www.arb.ca.gov

To request special accommodation or language needs, please contact the following:

- **For individuals with sensory disabilities, this document and other related material can be made available in Braille, large print, audiocassette, or computer disk. For assistance, please contact ARB's Reasonable Accommodation/Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711 to place your request for disability services, or go to** http://www.arb.ca.gov/html/ada/ada.htm.
- **If you are a person with limited English, and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.**

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
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INDEX

November 21, 2008 at 9:00 a.m.
&
November 22, 2008 at 8:30 a.m.

		Pages
08-10-1:	Report to the Board on Impacts of Climate Change on California: Scenarios Assessment Finding	---
08-10-2:	Public Meeting to Consider Approval of Assembly Bill 32 (AB 32) Scoping Plan to Reduce Greenhouse Gas Emissions in California	1 - 146
08-10-3:	Public Hearing to Consider Amendments to the Current Regulations for Small Off-Road Engines	147 - 176
08-10-4	Public Hearing to Consider Amendments to the Current Regulations for Large Spark-Ignition Engines with an Engine Displacement Less Than or Equal to One Liter	177 - 215

CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER APPROVAL OF AB 32 SCOPING PLAN TO REDUCE GREENHOUSE GAS EMISSIONS IN CALIFORNIA

The Air Resources Board (ARB or the Board) will conduct a public meeting at the time and place noted below to consider the approval of the AB 32 Scoping Plan to reduce greenhouse gas emissions in California.

DATE: December 11, 2008

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., December 11, 2008 and may continue at 8:30 a.m., December 12, 2008. This item may not be considered until December 12, 2008. Please consult the agenda for the meeting, which will be available at least 10 days before December 11, 2008, to determine the day on which this item will be considered. The AB 32 Scoping Plan will also be noticed for the Board's October 23, 2008, public meeting for ARB staff to present a brief summary and for the Board's November 20-21, 2008, public meeting. Please refer to the section below entitled "Proposed Action" for a description of how each meeting will be structured.

For individuals with sensory disabilities, this document and other related material can be made available in Braille, large print, audiocassette or computer disk. For assistance, please contact ARB's Reasonable Accommodations/Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services, or go to http://www.arb.ca.gov/html/ada/ada.htm

If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.

Background

In 2006, Governor Schwarzenegger signed Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006 (Nuñez, Chapter 488, Statutes of 2006). AB 32 directs the Air Resources Board to approve, on or before January 1, 2009, a Scoping Plan for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions by 2020. At the December 2008 Board Meeting, staff will present the Proposed Scoping Plan for Board consideration and approval.

ARB staff proposes a comprehensive set of actions designed to reduce overall greenhouse gas emissions in California. Reducing greenhouse gas emissions to 1990 levels requires cutting approximately 30 percent from business-as-usual emission levels projected for 2020. The recommended measures and strategies have the added benefits of improving our environment, reducing our dependence on fossil fuel, diversifying our energy sources, saving energy, and enhancing public health, while creating new jobs and enhancing the growth in California's economy.

Key elements of California's plan to reduce California's greenhouse gas emissions to 1990 levels by 2020 include:

- Expanding and strengthening existing energy efficiency programs and building and appliance standards;
- Obtaining 33 percent of California's electricity from renewables;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long term commitment to AB 32 implementation.

Proposed Action

The Board will not take action on the Proposed Scoping Plan until the December 11-12 Board meeting. At the Board's October 23, 2008 public meeting, ARB staff will provide a brief summary of the Plan to the Board. On November 20-21, 2008, the Board will conduct a public meeting to discuss the Plan. At the December 11-12, 2008 public meeting, staff will recommend adoption of the Plan. All written comments and oral testimony provided at the October, November and December meetings will be considered as part of the December item. However, the Board intends that the November meeting will be the main forum for hearing oral testimony on the Plan, and requests the public to consider this when planning their testimony. Please consult the agendas for each meeting, which will be available at least ten days before each meeting, to determine the day on which the Plan will be discussed. The agendas for each meeting can be found at: http://www.arb.ca.gov/board/meetings.htm.

ARB staff has reviewed the Proposed Scoping Plan and concluded that it meets the requirements of AB 32. The Scoping Plan was developed with the input from other affected State agencies, the Climate Action Team and its sub-groups, the Economic

and Technology Advancement Advisory Committee, the Environmental Justice Advisory Committee, the Market Advisory Committee, as well as other interested parties who commented on the Plan through public workshops and the ARB website.

Economic and public health analyses are included in the Plan and its appendices. Additionally, in accordance with the California Environmental Quality Act (CEQA), an environmental impact analysis has been prepared and is provided as Appendix J in the Proposed Scoping Plan. This document has been circulated through the State Clearinghouse for agency review and comment. The Board will consider approval of the Proposed Scoping Plan and adoption of the environmental document concurrently.

Availability of Documents

ARB staff will present the Proposed Scoping Plan at the meeting. Copies of the Proposed Scoping Plan may be obtained from the Board's Public Information Office,1001 "I" Street, First Floor, Environmental Services Center, Sacramento, CA 95814, (916) 322-2990, on or after October 15, 2008. The report may also be obtained from ARB's internet site at http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm

Interested members of the public may present comments orally or in writing at the meeting, and in writing or by electronic submission before the meeting. To be considered by the Board, written comments submissions not physically submitted at the meeting must be received **no later than 12:00 noon, Wednesday, December 10, 2008,** and addressed to the following:

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Please note: For "electronic submittal" the webpage has a link for commenting on the Proposed Scoping Plan and a separate link for commenting on the Appendix J - California Environmental Quality Act Functional Equivalent Document.

For commenting on the Proposed Scoping Plan:
The link is titled "scopingpln08".

For commenting on Appendix J - California Environmental Quality Act Functional Equivalent Document: The link is titled "ceqa-sp08".

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

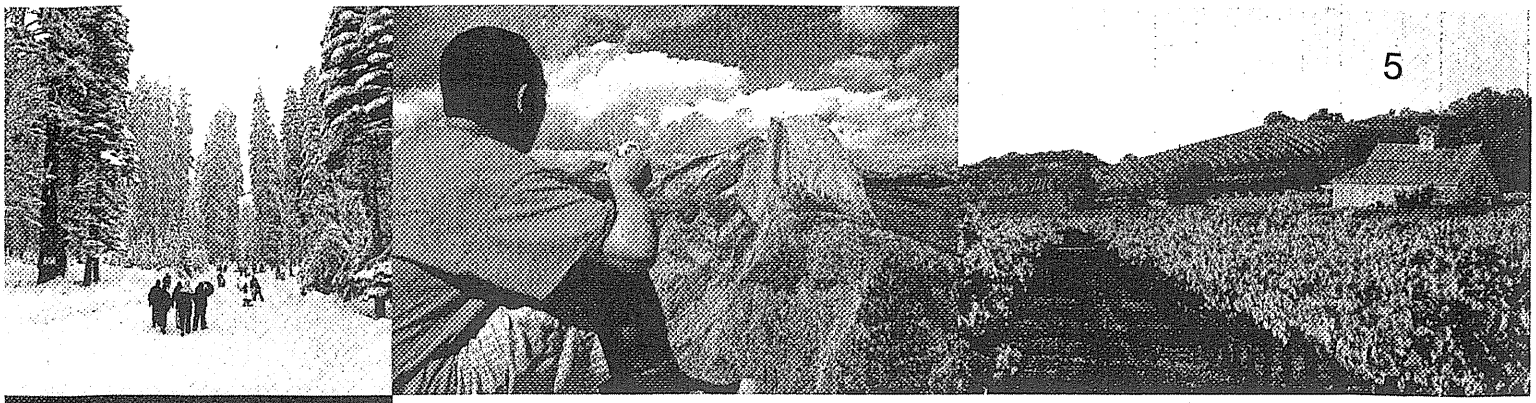
The Board requests, but does not require, 30 copies of any written submission. The ARB also requests that written and e-mail statements be filed at least 10 days prior to the meeting so that ARB staff and Board members have time to fully consider each comment.

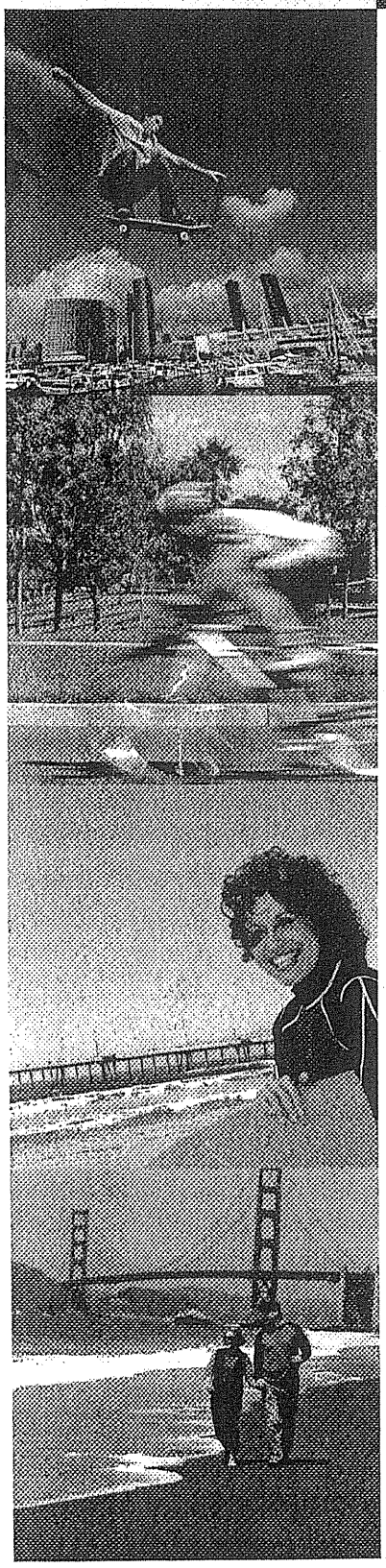
Further inquiries regarding the **Proposed Scoping Plan** should be directed to Mr. Rob DuVall at the Office of Climate Change, (916) 324-5930, 1001 I Street, Sacramento, CA 95814. Inquiries and written comments regarding **Appendix J -California Environmental Quality Act Functional Equivalent Document** should be directed to Ms. Jeannie Blakeslee at the Office of Climate Change, (916) 445-8286, 1001 I Street, Sacramento, CA 95814.

CALIFORNIA AIR RESOURCES BOARD

James N. Goldstene
Executive Officer

Date: October 15, 2008





CLIMATE CHANGE PROPOSED SCOPING PLAN

a framework for change

OCTOBER 2008

Pursuant to AB 32

The California Global Warming Solutions Act of 2006

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

Arnold Schwarzenegger
Governor

Linda S. Adams
Secretary, California Environmental Protection Agency

Mary D. Nichols
Chairman, Air Resources Board

James N. Goldstene
Executive Officer, Air Resources Board

Table of Contents

EXECUTIVE SUMMARY ES-1

I. INTRODUCTION: A FRAMEWORK FOR CHANGE 1

A. Summary of Changes from the Draft Scoping Plan 2

1. General 2

2. Proposed Measures 3

B. Background 4

1. Climate Change Policy in California 4

2. Assembly Bill 32: The Global Warming Solutions Act 5

3. Climate Action Team 6

4. Development of the Greenhouse Gas Emission Reduction Strategy 8

5. Implementation of the Scoping Plan 9

6. Climate Change in California 10

C. California's Greenhouse Gas Emissions and the 2020 Target 11

II. RECOMMENDED ACTIONS 15

A. The Role of State Government: Setting an Example 24

B. The Role of Local Government: Essential Partners 26

C. Emissions Reduction Measures 27

1. California Cap-and-Trade Program Linked to Western Climate Initiative Partner Jurisdictions 30

2. California Light-Duty Vehicle Greenhouse Gas Standards 38

3. Energy Efficiency 41

4. Renewables Portfolio Standard 44

5. Low Carbon Fuel Standard 46

6. Regional Transportation-Related Greenhouse Gas Targets 47

7. Vehicle Efficiency Measures 51

8. Goods Movement 52

9. Million Solar Roofs Program 53

10. Medium/Heavy-Duty Vehicles 53

11. Industrial Emissions 54

12. High Speed Rail 56

13. Green Building Strategy 57

14. High Global Warming Potential Gases 59

15. Recycling and Waste 62

16. Sustainable Forests 63

17. Water 65

18. Agriculture 66

D. Voluntary Early Actions and Reductions 67

1. Voluntary Early Action 68

2. Voluntary Reductions 68
E. Use of Allowances and Revenues 69
III. EVALUATIONS 73
A. Economic Modeling 73
1. Macro-economic Modeling Results 74
2. Impact on Specific Business Sectors 75
3. Household Impacts 78
4. WCI Economic Analysis 79
B. Green Technology 80
C. Cost-Effectiveness 84
D. Small Business Impact 85
E. Public Health/Environmental Benefits Analyses 86
1. Key Air Quality-Related Public Health Benefits 87
2. Approach 90
3. Existing Programs for Air Quality Improvement in California 90
4. Statewide Analysis 91
5. Regional Assessment: South Coast Air Basin Example 92
6. Community Level Assessment: Wilmington Example 92
F. Summary of Societal Benefits 94
1. Energy Diversification 94
2. Mobility and Shifts in Land Use Patterns 95
G. California Environmental Quality Act Functional Equivalent Document 95
H. Administrative Burden 96
I. De Minimis Emission Threshold 96
IV. IMPLEMENTATION: PUTTING THE PLAN INTO ACTION 99
A. Personal Action 99
B. Public Outreach and Education 100
1. Involving the Public and Stakeholders in Measure Development 101
2. Education and Workforce Development 101
3. Small Businesses 104
C. Implementation of the Plan 104
D. Tracking and Measuring Progress 107
1. Report Card 107
2. Tracking Progress by Implementing Agencies 108
3. Progress Toward the State Government Target 108
4. Mandatory Reporting Regulation 108
E. Enforcement 109
F. State and Local Permitting Considerations 110
G. Role of Local Air Districts 111
H. Program Funding 112

V. A VISION FOR THE FUTURE 113
A. Collaboration 113
1. Working Closely with Key Partners 113
2. International 114
B. Research 116
1. Unleash the Potential of California's Universities and Private Sector 116
2. Public-Private Partnerships 116
C. Reducing California's Emissions Further – A Look Forward to 2030 117
D. Conclusion 120
ACKNOWLEDGMENTS 122

APPENDICES

Appendix A: Assembly Bill 32: The Global Warming Solutions Act of 2006
Appendix B: List of Acronyms and Glossary
Appendix C: Sector Overviews and Emission Reduction Strategies
Appendix D: Western Climate Initiative Documentation
Appendix E: List of Measures
Appendix F: California's Greenhouse Gas Emissions Inventory
Appendix G: Economic Analysis
Appendix H: Public Health Benefits Analyses
Appendix I: Measure Documentation
Appendix J: California Environmental Quality Act Functional Equivalent Document

EXECUTIVE SUMMARY

On September 27, 2006, Governor Schwarzenegger signed Assembly Bill 32, the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006). The event marked a watershed moment in California's history. By requiring in law a reduction of greenhouse gas (GHG) emissions to 1990 levels by 2020, California set the stage for its transition to a sustainable, clean energy future. This historic step also helped put climate change on the national agenda, and has spurred action by many other states.

The California Air Resources Board (ARB or Board) 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 discrete early actions to begin reducing greenhouse gas emissions, assembling an inventory of historic emissions, establishing greenhouse gas emission reporting requirements, and setting the 2020 emissions limit.

ARB must develop a Scoping Plan outlining the State's strategy to achieve the 2020 greenhouse gas emissions limit. This Proposed Scoping Plan, developed by ARB in coordination with the Climate Action Team (CAT), proposes a comprehensive set of actions designed to reduce overall greenhouse gas emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health. It will be presented to the Board for approval at its meeting in December 2008. The measures in the Scoping Plan approved by the Board will be developed over the next two years and be in place by 2012.

Reduction Goals

This 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 15 percent from today's levels. On a per-capita basis, that means reducing our annual emissions of 14 tons of carbon dioxide equivalent 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 in the future 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 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 global climate change. This long range goal is reflected in California 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 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 transition will require close coordination of California's climate change and energy policies, and represents a concerted and deliberate shift away from fossil fuels toward a more secure and sustainable future. This is the firm commitment that California is making to the world, to its children and to future generations.

Making the transition to a clean energy future brings with it great opportunities. With these opportunities, however, also come challenges. As the State moves ahead with the development and implementation of policies to spur this transition, it will be necessary to ensure that they are crafted to not just cut greenhouse gas emissions and move toward cleaner energy sources, but also to ensure that the economic and employment benefits that will accompany the transition are realized in California. This means that particular attention must be paid to fostering an economic environment that promotes and rewards California-based investment and development of new technologies and that adequate resources are devoted to building and maintaining a California-based workforce equipped to help make the transition.

A Public Process

Addressing climate change presents California with a challenge of unprecedented scale and scope. Success will require the support of Californians up and down the state. At every step of the way, we have endeavored to engage the public in the development of this plan and our efforts to turn the tide in the fight against global warming.

In preparing the Draft Scoping Plan, ARB and CAT subgroups held dozens of workshops, workgroups, and meetings on specific technical issues and policy measures. Since the release of the draft plan in late June, we have continued our extensive outreach with workshops and webcasts throughout the state. Hundreds of Californians showed up to share their thoughts about the draft plan, and gave us their suggestions for improving it. We've received thousands of postcards, form letters, emails, and over 1,000 unique comments posted to our website or sent by mail. All told, more than 42,000 people commented on the draft Plan.

ARB catalogued and publicly posted all the comments we received. In many instances, we engaged experts and staff at our partner agencies for additional evaluation of comments and suggestions.

This plan reflects the input of Californians at every level. Our partners at other State agencies, in the legislature, and at the local government level have provided key input. We've met with members of community groups to address environmental justice issues, with representatives of California's labor force to ensure that good jobs accompany our transition to a clean energy future, and with representatives of California's small businesses to ensure that this vital part of our state's economic engine flourishes under this plan. We've heeded the advice of public health and environmental experts throughout the state to design the plan so that it provides valuable co-benefits in addition to cutting greenhouse gases. We've also worked with representatives from many of California's leading businesses and industries to craft a plan that works in tandem with the State's efforts to continue strong economic growth.

In short, we've heard from virtually every sector of California's society and economy, reflecting the fact that the plan will touch the life of almost every Californian in some way.

Proposed Scoping Plan Recommendations

The recommendations in this plan were shaped by input and advice from ARB's partners on the Climate Action Team, as well as the Environmental Justice Advisory Committee (EJAC), the Economic and Technology Advancement Advisory Committee (ETAAC), and the Market Advisory Committee (MAC). Like the Draft Scoping Plan, the strength of this plan lies in the comprehensive array of emission reduction approaches and tools that it recommends.

Key elements of California's recommendations for reducing its greenhouse gas emissions to 1990 levels by 2020 include:

- **Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;**
- **Achieving a statewide renewables energy mix of 33 percent;**
- **Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;**
- **Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;**
- **Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and**

- **Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long term commitment to AB 32 implementation.**

After Board approval of this plan, the measures in it will be developed and adopted through the normal rulemaking process, with public input.

Key Changes

This plan is built upon the same comprehensive approach to achieving reductions as the draft plan. However, as a result of the extensive public comment we received, this plan includes a number of general and measure-specific changes. The key changes and additions follow.

Additional Reports and Supplements

1. Economic and Public Health Evaluations: This plan incorporates an evaluation of the economic and public health benefits of the recommended measures. These analyses follow the same methodology used to evaluate the Draft Scoping Plan.[1]

2. CEQA Evaluation: This plan includes an evaluation of the potential environmental impacts of the Proposed Scoping Plan under the California Environmental Quality Act (CEQA).[2]

Programmatic Changes

1. Margin of Safety for Uncapped Sectors: The plan provides a 'margin of safety,' that is, additional reductions beyond those in the draft plan to account for measures in uncapped sectors that do not, or may not, achieve the estimated reduction of greenhouse gas emissions in this plan. Along with the certainty provided by the cap, this will ensure that the 2020 target is met.

2. Focus on Labor: The plan includes a discussion of issues directly related to California's labor interests and working families, including workforce development and career technical education. This additional element reflects ARB's existing activities and expanded efforts by State agencies, such as the Employment Development Department, to ensure that California will have a green technology workforce to address the challenges and opportunities presented by the transition to a clean energy future.

[1] Staff will provide an update to the Board to respond to comments received on these analyses.

[2] This evaluation is contained in Appendix J.

3. Long Term Trajectory: The plan includes an assessment of how well the recommended measures put California on the long-term reduction trajectory needed to do our part to stabilize the global climate.

4. Carbon Sequestration: The plan describes California's role in the West Coast Regional Carbon Sequestration Partnership (WESTCARB), a public-private collaboration to characterize regional carbon capture and sequestration opportunities. In addition, the plan expresses support for near-term development of sequestration technology. This plan also acknowledges the important role of terrestrial sequestration in our forests, rangelands, wetlands, and other land resources.

5. Cap-and-Trade Program: The plan provides additional detail on the proposed cap-and-trade program including a discussion regarding auction of allowances, a discussion of the proposed role for offsets, and additional detail on the mechanisms to be developed to encourage voluntary early action.

6. Implementation: The plan provides additional detail on implementation, tracking and enforcement of the recommended actions, including the important role of local air districts.

Changes to Specific Measures and Programs

1. Regional Targets: ARB re-evaluated the potential benefits from regional targets for transportation-related greenhouse gases in consultation with regional planning organizations and researchers at U.C. Berkeley. Based on this information, ARB increased the anticipated reduction of greenhouse gas emissions for Regional Transportation-Related Greenhouse Gas Targets from 2 to 5 million metric tons of CO_2 equivalent ($MMTCO_2E$).

2. Local Government Targets: In recognition of the critical role local governments will play in the successful implementation of AB 32, ARB added a section describing this role. In addition, ARB recommended a greenhouse gas reduction goal for local governments of 15 percent below today's levels by 2020 to ensure that their municipal and community-wide emissions match the State's reduction target.

3. Additional Industrial Source Measures: ARB added four additional measures to address emissions from industrial sources. These proposed measures would regulate fugitive emissions from oil and gas recovery and transmission activities, reduce refinery flaring, and require control of methane leaks at refineries. We anticipate that these measures will provide 1.5 $MMTCO_2E$ of greenhouse gas reductions.

4. Recycling and Waste Re-Assessment: In consultation with the California Integrated Waste Management Board, ARB re-assessed potential measures in the Recycling and Waste sector. As a result of this review, ARB increased the anticipated reduction of greenhouse gas emissions from the Recycling and Waste Sector from 1 to 10 $MMTCO_2E$, incorporating measures to move toward high recycling and zero-waste.[3]

5. Green Building Sector: This plan includes additional technical evaluations demonstrating that green building systems have the potential to reduce approximately 26 $MMTCO_2E$ of greenhouse gases. These tools will be helpful in reducing the carbon footprint for new and existing buildings. However, most of these greenhouse gas emissions reductions will already be counted in the Electricity, Commercial/Residential Energy, Water or Waste sectors and are not separately counted toward the AB 32 goal in this plan.

6. High Global Warming Potential (GWP) Mitigation Fee: Currently many of the chemicals with very high Global Warming Potential (GWP)—typically older refrigerants and constituents of some foam insulation products—are relatively inexpensive to purchase. ARB includes in this plan a Mitigation Fee measure to better reflect their impact on the climate. The fee is anticipated to promote the development of alternatives to these chemicals, and improve recycling and removal of these substances when older units containing them are dismantled.

7. Modified Vehicle Reductions: Based on current regulatory development, ARB modified the expected emissions reduction of greenhouse gases from the Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency) measure and the Tire Inflation measure. The former measure is now expected to achieve 0.9 $MMTCO_2E$ while the latter is now expected to achieve 0.4 $MMTCO_2E$.

8. Discounting Low Carbon Fuel Standard Reductions: ARB modified the expected emission reductions from the Low Carbon Fuel Standard to reflect overlap in claimed benefits with California's clean car law (the Pavley greenhouse gas vehicle standards). This has the result of discounting expected reduction of greenhouse gas emissions from the Low Carbon Fuel Standard by approximately 10 percent.

A Balanced and Comprehensive Approach

Meeting the goals of AB 32 will require a coordinated set of strategies to reduce emissions throughout the economy. These strategies will fit within the comprehensive tracking,

[3] Research to help quantify these greenhouse gas emissions reductions is continuing, so only 1 $MMTCO_2E$ of these reductions are currently counted toward the AB 32 goal in this plan. Additional tons will be considered part of the safety margin.

reporting, and enforcement framework that is already being developed and implemented. By 2020, a hard and declining cap will cover 85 percent of California's greenhouse gas emissions, helping to ensure that we meet our reduction targets on time.

AB 32 lays out a number of important factors that have helped to guide the development of this plan and will continue to be considered as regulations are developed over the next few years. Some of the key criteria that have and will be further considered are: cost-effectiveness; overall societal benefits like energy diversification and public health improvements; minimization of leakage; and impacts on specific sectors like small business and disproportionately impacted communities. The comprehensive approach in the plan reflects a balance among these and other important factors and will help to ensure that California meets its greenhouse gas reduction targets in a way that promotes and rewards innovation, is consistent with and helps to foster economic growth, and delivers improvements to the environment and public health.

Many of the measures in this plan complement and reinforce one another. For instance, the Low Carbon Fuel Standard, which reduces the carbon intensity of transportation fuels sold in California, will work in tandem with 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 also build on highly successful long-standing practices in California—such as energy efficiency and the 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, reduce greenhouse gas emissions that come from ships in California's ports, and promote changes to agricultural and forestry practices. There are also measures designed to safely reduce or recover a range of very potent greenhouse gases – refrigerants and other industrial gases – that contribute to global warming at a level many times greater per ton emitted than carbon dioxide.

Many of the measures in this plan are designed to take advantage of the economic and innovation-related benefits that market-based compliance strategies can provide. Particularly in light of current economic uncertainty, it is important to ensure that California's climate policies be designed to promote and take advantage of economic opportunities while also cutting greenhouse gas emissions. For instance, the cap-and-trade program creates an opportunity for firms to seek out cost-effective emission reduction strategies and provides an incentive for technological innovation. California's clean car standards, which require manufacturers to meet annual average levels of greenhouse gas emissions for all cars they sell in California, also offer flexibility to help ensure compliance. Under California's clean car standards, manufacturers who exceed compliance standards are permitted to bank credits for future use or sell them to other manufacturers. These types of compliance options will be key in ensuring that we are able to meet our reduction targets in a cost-effective manner.

Working with the Western Climate Initiative

California is working closely with six other states and four Canadian provinces in the Western Climate Initiative (WCI) to design a regional greenhouse gas emissions reduction program that includes a cap-and-trade approach. 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.

The WCI partners released the recommended design for a regional cap-and-trade program in September 2008.[4] ARB embraces the WCI effort, and will continue to work with WCI partners. The creation of a robust regional trading system can complement the other policies and measures included in this plan, and provide the means to achieve the reduction of greenhouse gas emissions needed from a wide range of sectors as cost-effectively as possible.

California's Economy, Environment, and Public Health

The approaches in this plan are designed to maximize the 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. This plan continues in that tradition.

AB 32: Evaluating the Economic Effects

The economic analysis of this plan indicates that implementation of the recommended strategies to address global warming will create jobs and save individual households money.[5] The analysis also indicates that measures in the plan will position California to move toward a more secure, sustainable future where we invest heavily in energy efficiency and clean technologies. The economic analysis indicates that implementation of that forward-looking approach also creates more jobs and saves individual households more money than if California stood by and pursued an unacceptable course of doing nothing at all to address our unbridled reliance on fossil fuels.

Specifically, analysis of the Proposed Scoping Plan indicates that projected economic benefits in 2020 compared to the business-as-usual scenario include:

- Increased economic production of $33 billion
- Increased overall gross state product of $7 billion
- Increased overall personal income by $16 billion
- Increased per capita income of $200

[4] Details of the WCI recommendation are provided in Appendix D.

[5] See Appendix G.

- Increased jobs by more than 100,000

Furthermore, the results of the economic analysis may underestimate the economic benefits of the plan since the models that were used do not account for savings that result from the flexibility provided under market-based programs.

AB 32: The Environmental and Public Health Costs of Inaction

A key factor that was not weighed in the overall economic analysis is the potential cost of doing nothing. When these costs are taken into account, the benefits associated with implementing a comprehensive plan to cut greenhouse gas emissions become even clearer. As a state, California is particularly vulnerable to the costs associated with unmitigated climate change.

A summary report from the California Climate Change Center notes that a warming California climate would generate more smoggy days by contributing to ozone formation while also fostering more large brush and forest fires. Continuing increases in global greenhouse gas emissions at business-as-usual rates would result, by late in the century, in California losing 90 percent of the Sierra snow pack, sea level rising by more than 20 inches, and a three to four times increase in heat wave days. These impacts will translate into real costs for California, including flood damage and flood control costs that could amount to several billion dollars in many regions such as the Central Valley, where urbanization and limited river channel capacity already exacerbate existing flood risks.[6] Water supply costs due to scarcity and increased operating costs would increase as much as $689 million per year by 2050.[7] ARB analysis shows that due to snow pack loss, California's snow sports sector would be reduced by $1.4 billion (2006 dollars) annually by 2050 and shed 14,500 jobs; many other sectors of California's economy would suffer as well.

Failing to address climate change also carries with it the risk of substantial public health costs, primarily as a result of rising temperatures. Sustained triple-digit heat waves increase the health risk for several segments of the population, especially the elderly. But higher average temperatures will also increase the interactions of smog-causing chemicals with sunlight and the atmosphere to produce higher volumes of toxic byproducts than would otherwise occur. In the 2006 report to the Governor from the California Climate Center, it was reported that global increases in temperature will lead to increased concentrations and emissions of harmful pollutants

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[6] A Summary Report from: California Climate Change Center. *Our Changing Climate: Assessing the Risks to California.* Document No. CEC-500-2006-077. July 2006. http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF (accessed October 12, 2008)

[7] A Report from: California Climate Change Center. *Climate Warming and Water Supply Management in California.* Document No. CEC-500-2005-195-SF. March 2006. pp.13-14 http://www.energy.ca.gov/2005publications/CEC-500-2005-195/CEC-500-2005-195-SF.PDF (accessed October 12, 2008).

in California.[8] Some cities in California are disproportionately susceptible to temperature increases since they already have elevated pollution levels and are subject to the heat-island effect that reduces nighttime cooling, allowing heat to build up and magnify the creation of additional harmful pollution. Low-income communities are disproportionately impacted by climate change, lacking the resources to avoid or adapt to these impacts. For example, low-income residents are less likely to have access to air conditioning to prevent heat stroke and death in heat waves. For California, then, taking action with other regions and nations to help mitigate the impacts of climate change will help slow temperature rise. This in turn will likely result in fewer premature deaths from respiratory and heat-related causes, and many thousands fewer hospital visits and days of illness.

California cannot avert the impacts of global climate change by acting alone. We can, however, take a national and international leadership role in this effort by demonstrating that taking firm and reasoned steps to address global warming can actually help spur economic growth.

AB 32: Providing Savings for Households and Businesses

This plan builds upon California's thirty-year track record of pioneering energy efficiency programs. Many of the measures in the plan will deliver significant gains in energy efficiency throughout the economy. These gains, even after increases in per unit energy costs are taken into account, will help deliver annual savings of between $400 and $500 on average by 2020 for households, including low-income households.

Businesses, both large and small, will benefit too. By 2020, the efficiency measures in the plan will decrease overall energy expenditures for businesses even after taking into account projected rises in per unit energy costs. Since small businesses spend a greater proportional share of revenue on energy-related costs, they are likely to benefit the most. Furthermore, businesses throughout the state will benefit from the overall economic growth that is projected to accompany implementation of AB 32 between now and 2020.

Similar savings are projected in the transportation sector. By reducing greenhouse gas pollution from more efficient and alternatively-fueled cars and trucks under California's Clean Car law (the Pavley greenhouse gas standards), consumers 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. Current estimates indicate that consumer savings in 2020 for California's existing clean car standards will be over $12 billion. These savings give Californians the ability to invest their dollars in other sectors of the state's economy.

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[8] A Report from: California Climate Change Center. *Scenarios of Climate Change in California: An Overview.* Document No. CEC-500-2005-186-SF. February 2006. http://www.energy.ca.gov/2005publications/CEC-500-2005-186/CEC-500-2005-186-SF.PDF (accessed October 12, 2008)

AB 32: Driving Investment and Job Growth

Addressing climate change also provides a strong incentive for investment in California. Our leadership in environmental and energy efficiency policy has already helped attract a large and growing share of the nation's venture capital investment in green technologies. Since AB 32 was signed into law, venture capital investment in California has skyrocketed. In the second quarter of 2008 alone, California dominated world investment in clean technology venture capital, receiving $800 million of the global total of $2 billion.[9]

These investments in building a new clean tech sector also translate directly into job growth. A study by U.C. 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 capital funding helps create 2,700 jobs, $500 million in annual revenues for two decades and many indirect jobs.[11]

AB 32: Improving Public Health

The public health analysis conducted for this Plan indicates that cutting greenhouse gases will also provide a wide range of additional public health and environmental benefits. By 2020, the economic value alone of the additional air-quality related benefits is projected to be on the order of $2.2 billion. Our analysis indicates that implementing the Proposed Scoping Plan will result in a reduction of 15 tons per day of combustion-generated soot (PM 2.5) and 61 tons per day of oxides of nitrogen (precursors to smog). These reductions in harmful air pollution would provide the following estimated health benefits in 2020, above and beyond those projected to be achieved as a result of California's other existing public health protection and improvement efforts:

- An estimated 400 premature deaths statewide will be avoided
- Almost 11,000 incidences of asthma and lower respiratory symptoms will be avoided
- 67,000 work loss days will be avoided

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[9] Press Release from Cleantech Network LLC, *Cleantech Venture Investment Reaches Record of $2 Billion in 2008*. July 08, 2008. http://cleantech.com/about/pressreleases/011008.cfm (accessed October 12, 2008)

[10] Report of the Renewable and Appropriate Energy Laboratory. *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. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

[11] Report prepared for the National Venture Capital Association. *Venture Impact 2004: Venture Capital Benefits to the U.S. Economy*. Prepared by: Global Insight. June 2004. http://www.globalinsight.com/publicDownload/genericContent/07-20-04_fullstudy.pdf (accessed October 12, 2008)

In addition to the quantified health benefits, our analysis also indicates that implementation of the measures in the plan will deliver a range of other public health benefits. These include health benefits associated with local and regional transportation-related greenhouse gas targets that will facilitate greater use of alternative modes of transportation such as walking and bicycling. These types of moderate physical activities reduce many serious health risks including coronary heart disease, diabetes, hypertension and obesity.[12] Furthermore, as specific measures are developed, ARB and public health experts will work together to ensure that they are designed with an eye toward capturing a broad range of public health co-benefits.

The results of both the economic and public health analyses are clear: guiding California toward a clean energy future with reduced dependence on fossil fuels will grow our economy, improve public health, protect the environment and create a more secure future built on clean and sustainable technologies.

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, 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.

Moving Beyond 2020

AB 32 requires a return to 1990 emission levels by 2020. The Proposed Scoping Plan is designed to achieve that goal. However, 2020 is by no means the end of California's journey to a clean energy future. In fact, that is when many of the strategies laid out in this plan will just be kicking into high gear.

Take, for example, the regional transportation-related greenhouse gas emissions targets. In order to achieve the deep cuts in greenhouse gas emissions we will need beyond 2020 it will be necessary to significantly change California's current land use and transportation planning policies. Although these changes will take time, getting started now will help put California on course to cut statewide greenhouse gas emissions by 80 percent in 2050 as called for by Governor Schwarzenegger.

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[12] Appendix H contains a reference list of studies documenting the public health benefits of alternative transportation.

Similarly, measures like the cap-and-trade program, energy efficiency programs, the California clean car standards, and the renewables portfolio standard will all play central roles in helping California meet its 2020 reduction requirements. Yet, these strategies will also figure prominently in California's efforts beyond 2020. Some of these measures, like energy efficiency programs and the renewables portfolio standard, have already delivered greenhouse gas emissions reduction benefits that will expand over time. Others, like the cap-and-trade program, will put in place a foundation on which to build well into the future. All of these measures, and many others in the plan, will ensure that California meets its 2020 target and is positioned to continue its international role as leader in the fight against global warming to 2050 and beyond.

A Shared Challenge

Californians are already responding to the challenge of reducing greenhouse gas emissions. Over 120 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, this 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 footprints.

Californians will not have to wait for decades to 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 retrofitted to use far less energy than at present. 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 transport will improve, and high-speed rail will give travelers a new clean transportation option.

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[13] Mayors Climate Protection Center. *List of Participating Mayors.* http://www.usmayors.org/climateprotection/list.asp (accessed October 12, 2008)

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 of Californians, California will make the transition to a clean-energy, low-carbon society and become a healthier, cleaner and more sustainable place to live. This plan charts a course toward that future.

ARB invites comment and input from the broadest array of the public and stakeholders as we move forward over the next two years to develop the individual measures, and develop the policies that will move us toward sustainable clean energy and away from fossil fuels. Your participation will help craft the mechanisms and measures to make this plan a reality. This is California's plan and together, we need to make the necessary changes to address the greatest environmental challenge we face. As Governor Schwarzenegger stated when he signed AB 32 into law two years ago, "We owe our children and we owe our grandchildren. We simply must do everything in our power to fight global warming before it is too late."

I. INTRODUCTION: A Framework for Change

California strengthened its commitment to address climate change when Governor Schwarzenegger signed Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006). This groundbreaking legislation represents a turning point for California and makes it clear that a business-as-usual approach toward greenhouse gas emissions is no longer acceptable. In light of the need for strong and immediate action to counter the growing threat of global warming, AB 32 sets forth an aggressive timetable for achieving results.

AB 32 embodies the idea that California can continue to grow and flourish while reducing its greenhouse gas emissions and continuing its long-standing efforts to achieve healthy air, and protect and enhance public health. Achieving these goals will involve every sector of the state's $1.7 trillion economy and touch the life of every Californian.

As the lead agency for implementing AB 32, the California Air Resources Board (ARB or the Board) released a Draft Scoping Plan in June 2008, which laid out a comprehensive statewide plan to reduce California's greenhouse gas emissions to 1990 levels by 2020. This Proposed Scoping Plan builds upon that draft. This plan sets forth a comprehensive reduction strategy that combines market-based regulatory approaches, other regulations, voluntary measures, fees, policies, and programs that will significantly reduce emissions of greenhouse gases and help make our state cleaner, more efficient and more secure.

The Board will consider this Proposed Scoping Plan for approval at its December 2008 meeting. Once approved by the Board, the Scoping Plan will provide specific direction for the State's greenhouse gas emissions reduction program. The recommended measures will be developed into regulations over the next two years, to go into effect by January 1, 2012. As specific measures in the plan are developed, we will update and adjust our regulatory proposals as necessary to ensure that they reflect any new information, additional analyses, new technologies or other factors that emerge during the process.

ARB has conducted a transparent, wide-ranging public process to develop the Proposed Scoping Plan, including numerous meetings, workshops, and seminars with stakeholders. Substantial input on the development of the Proposed Scoping Plan came from formal advisory committees, meetings with industrial and business groups, non-profit organizations and members of the public, as well as written comments on the Draft Scoping Plan. ARB will continue its outreach activities to seek ongoing public input and will encourage early and continued involvement in the implementation of the plan from all Californians.

A. Summary of Changes from the Draft Scoping Plan

On June 26, 2008, ARB released the Draft Scoping Plan and requested public comment and input, while continuing to analyze the measures and their impact on California. Since the Draft Scoping Plan release, ARB has received almost 1,000 unique written comments as well as hundreds of verbal comments at workshops and in meetings. Taking into account that some written comments were submitted by multiple individuals, all told more than 42,000 people have commented on the draft plan. ARB has also completed detailed economic and public health evaluations of its recommendations. This Proposed Scoping Plan reflects changes made to the draft plan as a result of the comments and input received and the additional analysis performed. The Proposed Plan does not incorporate modifications as a result of comments on the economic and public health supplements. ARB is evaluating those comments and will propose any necessary modifications to the Board.

The key changes between the Draft Scoping Plan and the Proposed Scoping Plan are summarized below. The Proposed Scoping Plan includes the following modifications:

1. General

- Incorporates economic and public health analyses of the Proposed Scoping Plan. These analyses show that the recommendations in the Proposed Scoping Plan will have a net positive impact on both the economy and public health. These analyses follow the same methodology used to evaluate the Draft Scoping Plan. ARB is continuing to consider comments on the methodology and assumptions used in these analyses. Staff will provide an update to the Board as needed to respond to comments received on these analyses.
- Provides a "margin of safety" by recommending additional greenhouse gas emissions reduction strategies to account for measures in uncapped sectors that do not achieve the greenhouse gas emissions reductions estimated in the Proposed Scoping Plan. Along with the certainty provided by the cap, this will ensure that the 2020 target is met.
- Expands the discussion of workforce development, education, and labor to more fully reflect existing activities and the role of other state agencies in ensuring an adequate green technology workforce.
- Assesses how well the recommended measures put California on the long-term reduction trajectory needed to do our part to stabilize the global climate.
- Describes California's role in the West Coast Regional Carbon Sequestration Partnership (WESTCARB), a public-private collaboration to characterize regional carbon capture and sequestration opportunities, and expresses support for near-term advancement of the technology and monitoring of its development. Acknowledges the important role of terrestrial sequestration.
- Provides greater detail on the mechanisms to be developed to encourage voluntary early action.
- Provides additional detail on implementation, tracking and enforcement of the recommended actions, including the important role of local air districts.

- Evaluates the potential environmental impacts of the Proposed Scoping Plan under the California Environmental Quality Act (CEQA). This evaluation is contained in Appendix J.

2. Proposed Measures

- Provides greater detail on the proposed cap-and-trade program including more detail on the allocation and auction of allowances, and clarification of the proposed role of offsets.
- Re-evaluates the potential benefits from regional targets for transportation-related greenhouse gases in consultation with regional planning organizations and researchers at U.C. Berkeley. Based on this information, ARB increased the anticipated greenhouse gas emissions reductions for Regional Transportation-Related Greenhouse Gas Targets from 2 to 5 million metric tons of CO_2 equivalent ($MMTCO_2E$).
- In recognition of the importance of local governments in the successful implementation of AB 32, adds a section describing this role and recommends a greenhouse gas emissions reduction target for local government municipal and community-wide emissions of a 15 percent reduction from current levels by 2020 to parallel the State's target.
- Adds four measures to address emissions from industrial sources. These proposed measures would regulate fugitive emissions from oil and gas recovery and gas transmission activities, reduce refinery flaring, and remove the methane exemption for refineries. These proposed measures are anticipated to provide 1.5 $MMTCO_2E$ of greenhouse gas reductions in 2020.
- In consultation with the California Integrated Waste Management Board, re-assesses potential measures in the Recycling and Waste sector. As a result of this assessment, ARB increased the reduction of greenhouse gas emissions that can ultimately be anticipated from the Recycling and Waste Sector from 1 to 10 $MMTCO_2E$, recommending measures to move toward high recycling and zero-waste. Research to help quantify these greenhouse gas emissions is continuing, so only 1 $MMTCO_2E$ of these reductions is currently counted towards the AB 32 goal in this plan.
- Estimates the potential reduction of greenhouse gas emissions from the Green Building sector. Green building systems have the potential to reduce approximately 26 $MMTCO_2E$ of greenhouse gas emissions. Since most of these emissions reductions are counted in the Electricity, Commercial/Residential Energy, Water or Waste sectors, emission reductions in the Green Building sector are not separately counted toward the AB 32 goal.
- Adds a High Global Warming Potential (GWP) Mitigation Fee measure to ensure that the climate impact of these gases is reflected in their price to encourage reduced use and end-of-life losses, as well as the development of alternatives.
- Reduces the expected greenhouse gas emissions reduction from the Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction (Aerodynamic Efficiency) measure and the Tire Inflation measure based on ongoing regulatory

development. The Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction (Aerodynamic Efficiency) measure is now expected to achieve 0.9 $MMTCO_2E$ and the Tire Inflation measure is now expected to achieve 0.4 $MMTCO_2E$.

- Modifies the expected reduction of greenhouse gas emissions from the Low Carbon Fuel Standard to account for potential overlap of benefits with the Pavley greenhouse gas vehicle standards. ARB discounted the expected emission reductions from the Low Carbon Fuel Standard by 10 percent.
- After further evaluation, moves the Heavy-Duty Truck Efficiency measure to the Goods Movement measure. ARB expects that market dynamics will provide an inducement to improve heavy-duty truck efficiency, and reductions in greenhouse gases in the future. ARB would consider pursuing direct requirements to reduce greenhouse gases if truck efficiency does not improve in the future.

B. 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). This bill directed the California Energy Commission (CEC) to study global warming impacts to the state and develop an inventory of greenhouse gas emissions 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.

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 into law, requiring ARB to develop regulations to reduce greenhouse gas emissions from passenger vehicles, light-duty trucks and non-commercial vehicles sold in California.

Recognizing the value of regional partners in addressing climate change, the governors of California, Washington, and Oregon created the West Coast 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 greenhouse gas performance standards for new long-term financial investments in base-load electricity generation serving California customers. This law is designed to help spur the transition toward cleaner energy in California by placing restrictions on the ability of utilities to build new carbon-intensive plants or enter into new contracts with high carbon sources of electricity. Expiration of existing utility long-term contracts with coal plants will reduce greenhouse gas emissions when such generation is replaced by lower greenhouse gas-emitting resources. These reductions will reduce the need for utilities to submit allowances to comply with the cap-and-trade program.

2. Assembly Bill 32: The Global Warming Solutions Act

In 2006, the Legislature passed and Governor Schwarzenegger signed AB 32, the Global Warming Solutions Act of 2006, which set the 2020 greenhouse gas emissions reduction goal into law. It directed ARB to begin developing discrete early actions to reduce greenhouse gases while also preparing a Scoping Plan to identify how best to reach the 2020 limit. The reduction measures to meet the 2020 target are to become operative by 2012.

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 2007, the Board approved the 2020 emission limit of 427 million metric tons of carbon dioxide equivalent ($MMTCO_2E$) 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 January 1, 2010 (HSC §38560.5).* The Board identified nine Discrete Early Action measures including potential regulations affecting landfills, motor vehicle fuels, refrigerants in cars, port operations and other sources in 2007. The Board has already approved two Discrete Early Action measures (ship electrification at ports and reduction of high GWP gases in consumer products). Regulatory development for the remaining measures is ongoing.
- *Ensure early voluntary reductions receive appropriate credit in the implementation of AB 32 (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. ARB, along with California's local air districts and the California Climate Action Registry, is working to implement this program. Voluntary programs are discussed further in Chapter II and in Chapter IV.

- *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).* The EJAC has met 12 times since early 2007, providing comments on the proposed Early Action measures and the development of the Scoping Plan, and submitted its comments and recommendations on the draft Scoping Plan in October 2008. ARB will continue to work with The EJAC as AB 32 is implemented.
- *Appoint an Economic and Technology Advancement Advisory Committee (ETAAC) to provide recommendations for technologies, research and greenhouse gas emission reduction measures (HSC §38591).* After a year-long public process, The ETAAC submitted a report of their recommendations to the Board in February 2008. The ETAAC also reviewed and provided comments on the Draft Scoping Plan.

3. Climate Action Team

In addition to establishing greenhouse gas emissions reduction targets for California, Executive Order S-3-05 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 the reduction of greenhouse gas emissions and engage key State agencies including ARB. The Health and Human Services Agency, represented by the Department of Public Health, is the newest member of the CAT. Based on 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.

Climate Action Team

California Environmental Protection Agency
Business, Transportation, and Housing Agency
Health and Human Services 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

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.

AB 32 recognizes the essential role of the CAT in coordinating overall climate policy. AB 32 does not affect the existing authority of other state agencies, and in addition to

ARB, many state agencies will be responsible for implementing the measures and strategies in this plan. The CAT is central to the success of AB 32, which requires an unprecedented level of cooperation and coordination across State government. The CAT provides the leadership for these efforts and helps ARB work closely with our state partners on the development and implementation of the strategies in the Proposed Scoping Plan.

There are currently 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 emissions reduction efforts. The CAT sector-based 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. ARB participated in each of the subgroups. All of the subgroups held public meetings and solicited public input, and many had multiple public workshops.

In March 2008, the subgroups collectively submitted more than 100 greenhouse gas emissions reduction measures to ARB for consideration in the Draft Scoping Plan. Many of those recommendations are reflected in this plan, and a number of them focus on reducing greenhouse gas emissions from energy production and use.

Through the Energy Subgroup the California Energy Commission (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 the 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 2008 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. The two Commissions have developed a second proposed decision that was released in September 2008. This proposed decision provides more detailed recommendations that relate to the electricity and natural gas sectors. Because implementation of the Scoping Plan will require careful coordination with the State's energy policy, ARB will continue working closely with the two Commissions on this important area during the implementation of the recommendations in the Scoping Plan.

There are also 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 with updates reflected in the report, "Updated Macroeconomic Analysis of Climate Strategies," in October 2007. This report provided an update of the macroeconomic analysis presented in the March 2006 CAT report to Governor Schwarzenegger and the Legislature. The Research Subgroup coordinates climate change research and identifies opportunities for collaboration, and is presently working on a report to the Governor. The State Operations Subgroup

has been created to work with State agencies to create a statewide plan to reduce State government's greenhouse gas emissions by a minimum of 30 percent by 2020.

In the first quarter of 2009, the Climate Action Team will release a report on its activities outside of its involvement in the development of the Proposed Scoping Plan. The CAT report will focus on several cross-cutting topics with which members of the CAT have been involved since the publication of the 2006 CAT report. The topics to be covered include research on the physical and consequent economic impacts of climate change as well as climate change research coordination efforts among the CAT members. There will also be an update on the important climate change adaptation efforts led by the Resources Agency and a discussion of cross-cutting issues related to environmental justice concerns. The CAT report will be released in draft form and will be available for public review in December 2008.

4. Development of the Greenhouse Gas Emission Reduction Strategy

In developing the Proposed Scoping Plan, ARB considered the State's existing climate change policy initiatives and the Early Action measures identified by the Board. Several advisory groups were formed to assist ARB in developing the Proposed Scoping Plan, including the Environmental Justice Advisory Committee (EJAC), the Economic and Technology Advancement Committee (ETAAC), and the Market Advisory Committee (MAC).

The Environmental Justice Advisory Committee (HSC §38591(a) et seq) advises ARB on development of the Scoping Plan and any other pertinent matter in implementing AB 32. The Board appoints its members, based on nominations received from environmental justice organizations and community groups.

The Economic and Technology Advancement Advisory Committee (HSC §38591(d)) includes members who are appointed by the Board based on expertise in fields of business, technology research and development, climate change, and economics. The ETAAC advises ARB on activities that will facilitate investment in, and implementation of, technological research and development opportunities, funding opportunities, partnership development, technology transfer opportunities, and related areas that lead to reductions of greenhouse gas emissions.

Members of the Market Advisory Committee (created under Executive Order S-20-06) were appointed by the Secretary of CalEPA based on their expertise in economics and climate change. The MAC advised ARB on the design of a cap-and-trade program for reducing greenhouse gas emissions.

Along with input from the advisory groups, ARB received submittals to a public solicitation for ideas, and numerous comments during public workshops, workgroup meetings, community meetings, and meetings with stakeholder groups. ARB held numerous workshops on the Draft Scoping Plan and convened workgroup meetings focused on program design and economic analysis. ARB and other involved State

agencies also held sector-specific technical workshops to look in greater detail at potential emissions reduction measures.

ARB also looked outward to examine programs at the regional, national and international levels. ARB met with and learned from experts from the European Union, the United Kingdom, Japan, Australia, the United Nations, the Regional Greenhouse Gas Initiative, the RECLAIM program, and the U.S. Environmental Protection Agency (U.S. EPA).

After the release of the Draft Scoping Plan, ARB conducted workshops and community meetings around the state to solicit public input. The Environmental Justice Advisory Committee and the Economic and Technology Advancement Advisory Committee held meetings to review and provide additional comments on the Draft Scoping Plan. In addition, ARB held meetings with numerous stakeholder groups to discuss specific greenhouse gas emissions reduction measures.

As described before, ARB has reviewed and considered both the written comments and the verbal comments received at the public workshops and meetings with stakeholders. This input, along with additional analysis, has ultimately shaped this Proposed Scoping Plan.

5. Implementation of the Scoping Plan

The foundation of the Proposed Scoping Plan's strategy is a set of measures that will cut greenhouse gas emissions by nearly 30 percent by the year 2020 as compared to business as usual and put California on a course for much deeper reductions in the long term. In addition to pursuing the reduction of greenhouse gas emissions, other strategies to mitigate climate change, such as carbon capture and storage (underground geologic storage of carbon dioxide), should also be further explored. And, as greenhouse gas reduction measures are implemented, we will continually evaluate how these measures can be optimized to also help deliver a broad range of public health benefits.

Most of the measures in this Proposed Scoping Plan will be implemented through the full rulemaking processes at ARB or other agencies. These processes will provide opportunity for public input as the measures are developed and analyzed in more detail. This additional analysis and public input will likely provide greater certainty about the estimates of costs and expected greenhouse gas emission reductions, as well as the design details that are described in this Proposed Scoping Plan. With the exception of Discrete Early Actions, which will be in place by January 1, 2010, other regulations are expected to be adopted by January 1, 2011 and take effect at the beginning of 2012.

Some of the measures in the plan may deliver more emission reductions than we expect; others less. It is also very likely that we will figure out new and better ways to cut greenhouse gas emissions as we move forward. New technologies will no doubt be developed, and new ideas and strategies will emerge. The Scoping Plan puts

California squarely on the path to a clean energy future but it also recognizes that adjustments will probably need to occur along the way and that as additional tools become available they will augment, and in some cases perhaps even replace, existing approaches.

California will not be implementing the measures in this Plan in a vacuum. Significant new action on climate policy is likely at the federal level and California and its partners in the Western Climate Initiative are working together to create a regional effort for achieving significant reductions of greenhouse gas emissions throughout the western United States and Canada. California is also developing a state Climate Adaptation Strategy to reduce California's vulnerability to known and projected climate change impacts.

ARB and other State agencies will continue to monitor, lead and participate in these broader activities. ARB will adjust the measures described here as necessary to ensure that California's program is designed to facilitate the development of integrated and cost-effective regional, national, and international greenhouse gas emissions reduction programs. (HSC §38564)

6. Climate Change in California

The impacts of climate change on California and its residents are occurring now. Of greater concern are the expected future impacts to the state's environment, public health and economy, justifying the need to sharply cut greenhouse gas emissions.

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.

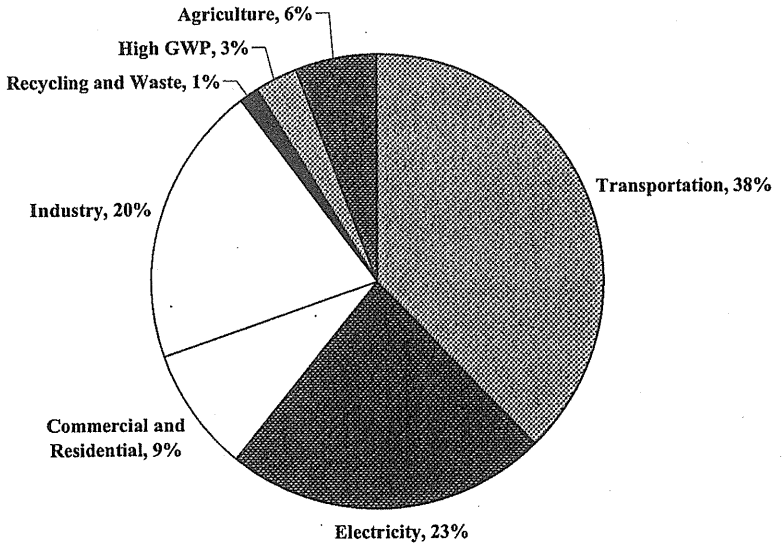
The impacts of global warming are already being felt in California. The Sierra snowpack, an important source of water supply for the state, has shrunk 10 percent in the last 100 years. It is expected to continue to decrease by as much as 25 percent by 2050. World-wide changes are causing sea levels to 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.

C. 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 also references five other greenhouse gases: methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). Many other gases contribute to climate change and would also be addressed by measures in this Proposed 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 business-as-usual forecast does not take any credit for reductions from measures included in this Proposed Plan, including the Pavley greenhouse gas emissions standards for vehicles, full implementation of the Renewables Portfolio Standard beyond current levels of renewable energy, or the solar 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)[14]



As seen in Figure 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 shows that if we take no action, greenhouse gas emissions in the

[14] Air Resources Board. Greenhouse Gas Inventory. http://www.arb.ca.gov/cc/inventory/inventory.htm (accessed October 12, 2008)

Transportation sector are expected to grow by approximately 25 percent by 2020 (an increase of 46 $MMTCO_2E$).

The Electricity and Commercial/Residential Energy sector is the next largest contributor with over 30 percent of the statewide greenhouse gas emissions. Although electricity imported into California accounts for only about a quarter of our electricity, imports contribute more than 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, cement plants, 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. The sector termed recycling and waste management is a unique system, encompassing not just emissions from waste facilities but also the emissions associated with the production, distribution and disposal of products throughout the economy.

Although high global warming potential (GWP) gases are a small contributor to 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 carbon dioxide (CO_2). While the current inventory shows forests as a sink of 4.7 $MMTCO_2E$, carbon sequestration has declined since 1990. For this 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.

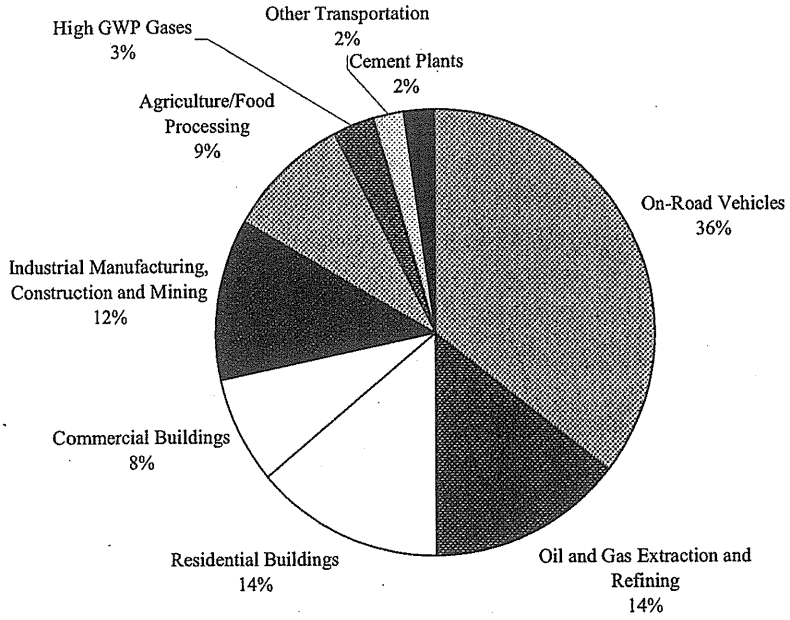
In December 2007, ARB approved a greenhouse gas emissions target for 2020 equivalent to the state's calculated greenhouse gas emissions level in 1990. ARB developed the 2020 target after extensive technical work and a series of stakeholder meetings. The 2020 target of 427 $MMTCO_2E$ requires the reduction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

Table 1: 2002-2004 Average Emissions and 2020 Projected Emissions (Business-as-Usual)[15]
(MMTCO$_2$E)

Sector	2002-2004 Average Emissions	Projected 2020 Emissions [BAU]
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	0.0
Emissions Total	**469**	**596**

Figure 2 presents California's historic greenhouse gas emissions in a different way – based not on the source of the emissions, but on the end use. This chart highlights the importance of addressing on-road transportation sources of greenhouse gas emissions, as well as the significant contribution from the heating, cooling, and lighting of buildings.

Figure 2: California's Greenhouse Gas Emissions – A Demand-Side View –



[15] Ibid.

The data shown in this section provide two ways to look at California's greenhouse gas profile – emissions-based and end use (demand side)-based. While it is possible to illustrate the inventory many different ways, no chart or graph can fully display how diverse economic sectors fit together. California's economy is a web of activity where seemingly independent sectors and subsectors operate interdependently and often synergistically. For example, reductions in water use reduce the need to pump water, directly lowering electricity use and associated greenhouse gas emissions. Similarly, reducing the generation of waste reduces the need to transport the waste to landfills – lowering transportation emissions and, possibly, landfill methane emissions. Increased recycling or re-use reduces the carbon emissions embedded in products – it takes less energy to make a soda can made from recycled aluminum than from virgin feedstock.

The measures included in this Proposed Scoping Plan are identified discretely, but many impact each other, and changes in one measure can directly overlap and have a ripple effect on the efficacy and success of other measures. The measures and policies outlined in this Plan reflect these interconnections, and highlight the need for all agencies to work collaboratively to implement the Scoping Plan.

II. RECOMMENDED ACTIONS

Achieving the goals of AB 32 in a cost-effective manner will require a wide range of approaches. Every part of California's economy needs to play a role in reducing greenhouse gas emissions. ARB's comprehensive greenhouse gas emissions inventory lists emission sources ranging from the largest refineries and power plants to small industrial processes and farm livestock. The recommended measures were developed to reduce greenhouse gas emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities. These measures also put the state on a path to meet the long-term 2050 goal of reducing California's greenhouse gas emissions to 80 percent below 1990 levels. This trajectory is consistent with the reductions that are needed globally to help stabilize the climate. While the scale of this effort is considerable, our experience with cultural and technological changes makes California well-equipped to handle this challenge.

ARB evaluated a comprehensive array of approaches and tools to achieve these emission reductions. Reducing greenhouse gas emissions from the wide variety of sources can best be accomplished though a cap-and-trade program along with a mix of complementary strategies that combine market-based regulatory approaches, other regulations, voluntary measures, fees, policies, and programs. ARB will monitor implementation of these measures to ensure that the State meets the 2020 limit on greenhouse gas emissions.

An overall limit on greenhouse gas emissions from most of the California economy – the "capped sectors" – will be established by the cap-and-trade program. (The basic elements of the cap-and-trade program are described later in this chapter.) Within the capped sectors, some of the reductions will be accomplished through direct regulations such as improved building efficiency standards and vehicle efficiency measures. Whatever additional reductions are needed to bring emissions within the cap are accomplished through price incentives posed by emissions allowance prices. Together, direct regulation and price incentives assure that emissions are brought down cost-effectively to the level of the overall cap. ARB also recommends specific measures for the remainder of the economy – the "uncapped sectors."

Key elements of California's recommendations for reducing its greenhouse gas emissions to 1990 levels by 2020 include:

- **Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;**
- **Achieving a statewide renewables energy mix of 33 percent;**
- **Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;**
- **Establishing targets for transportation-related greenhouse gas emissions for regions throughout California and pursuing policies and incentives to achieve those targets;**
- **Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and**
- **Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long-term commitment to AB 32 implementation.**

The recommended greenhouse gas emissions reduction measures are listed in Table 2 and are summarized in Section C below. The total reduction for the recommended measures slightly exceeds the 169 $MMTCO_2E$ of reductions estimated in the Draft Scoping Plan. This is the net effect of adding several measures and adjusting the emission reduction estimates for some other measures. The 2020 emissions cap in the cap-and-trade program is preserved at the same level as in the Draft Scoping Plan (365 $MMTCO_2E$).

The measures listed in Table 2 lead to emissions reductions from sources within the capped sectors (146.7 $MMTOCO_2E$) and from sources or sectors not covered by cap-and-trade (27.3 $MMTCO_2E$). As mentioned, within the capped sectors the reductions derive both from direct regulation and from the incentives posed by allowance prices. Further discussion of how the cap-and-trade program and the complementary measures work together to achieve the overall target is provided below.

Table 2 also lists several other recommended measures which will contribute toward achieving the 2020 statewide goal, but whose reductions are not (for various reasons including the potential for double counting) additive with the other measures. Those measures and the basis for not including their reductions are further discussed in Section C.

Table 2: Recommended Greenhouse Gas Reduction Measures

Recommended Reduction Measures	Reductions Counted Towards 2020 Target ($MMTCO_2E$)	
ESTIMATED REDUCTIONS RESULTING FROM THE COMBINATION OF CAP-AND-TRADE PROGRAM AND COMPLEMENTARY MEASURES		**146.7**
California Light-Duty Vehicle Greenhouse Gas Standards • Implement Pavley standards • Develop Pavley II light-duty vehicle standards	31.7	
Energy Efficiency • Building/appliance efficiency, new programs, etc. • Increase CHP generation by 30,000 GWh • Solar Water Heating (AB 1470 goal)	26.3	
Renewables Portfolio Standard (33% by 2020)	21.3	
Low Carbon Fuel Standard	15	
Regional Transportation-Related GHG Targets[16]	5	
Vehicle Efficiency Measures	4.5	
Goods Movement • Ship Electrification at Ports • System-Wide Efficiency Improvements	3.7	
Million Solar Roofs	2.1	
Medium/Heavy Duty Vehicles • Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency) • Medium- and Heavy-Duty Vehicle Hybridization	1.4	
High Speed Rail	1.0	
Industrial Measures (for sources covered under cap-and-trade program) • Refinery Measures • Energy Efficiency & Co-Benefits Audits	0.3	
Additional Reductions Necessary to Achieve the Cap	34.4	
ESTIMATED REDUCTIONS FROM UNCAPPED SOURCES/SECTORS		**27.3**
High Global Warming Potential Gas Measures	20.2	
Sustainable Forests	5.0	
Industrial Measures (for sources not covered under cap and trade program) • Oil and Gas Extraction and Transmission	1.1	
Recycling and Waste (landfill methane capture)	1.0	
TOTAL REDUCTIONS COUNTED TOWARDS 2020 TARGET		**174**

Other Recommended Measures	Estimated 2020 Reductions ($MMTCO_2E$)
State Government Operations	1-2
Local Government Operations	TBD
Green Buildings	26
Recycling and Waste (other measures)	9
Water Sector Measures	4.8
Methane Capture at Large Dairies	1.0

[16] This number represents an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target. ARB will establish regional targets for each Metropolitan Planning Organization (MPO) region following the input of the Regional Targets Advisory Committee and a public consultation process with MPOs and other stakeholders per SB 375.

The development of a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system is a central feature of the overall recommendation. This program will lead to prices on greenhouse gas emissions, prices that will spur reductions in greenhouse gas emissions throughout the California economy, through application of existing technologies and through the creation of new technological and organizational options. The rationale for combining a cap-and-trade program with complementary measures was outlined by the Market Advisory Committee, which noted the following in its recommendations to the ARB:

> Before setting out the key design elements of a cap-and-trade program it is important to explain how the proposed emissions trading approach relates to other policy measures. The following considerations seem especially relevant:
>
> - The emissions trading program puts a cap on the total emissions generated by facilities covered under the system. Because a certain number of emissions allowances are put in circulation in each compliance period, this approach provides a measure of certainty about the total quantity of emissions that will be released from entities covered under the program.
> - The market price of emissions allowances yields an enduring price signal for GHG emissions across the economy. This price signal provides incentives for the market to find new ways to reduce emissions.
> - By itself, a cap-and-trade program alone will not deliver the most efficient mitigation outcome for the state. There is a strong economic and public policy basis for other policies that can accompany an emissions trading system. [17]

The Economic and Technology Advancement Advisory Committee (ETAAC) also addressed the benefits associated with a combined policy of cap and trade and complementary measures.

> A declining cap can send the right price signals to shape the behavior of consumers when purchasing products and services. It would also shape business decisions on what products to manufacture and how to manufacture them. Establishing a price for carbon and other GHG emissions can efficiently tilt decision-making toward cleaner alternatives. This cap and trade approach (complemented by technology-forcing performance standards) avoids the danger of having government or other centralized decision-makers choose specific technologies, thereby limiting the flexibility to allow other options to emerge on a level playing field.

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[17] Recommendations of the Market Advisory Committee to the California Air Resources Board. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California.* June 30, 2007. p. 19. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (accessed October 12, 2008)

> If markets were perfect, such a cap and trade system would bring enough new technologies into the market and stimulate the necessary industrial RD&D to solve the climate change challenge in a cost effective manner. As the Market Advisory Committee notes, however, placing a price on GHG emissions addresses only one of many market failures that impede solutions to climate change. Additional market barriers and co-benefits would not be addressed if a cap and trade system were the only state policy employed to implement AB 32. Complementary policies will be needed to spur innovation, overcome traditional market barriers (e.g., lack of information available to energy consumers, different incentives for landlords and tenants to conserve energy, different costs of investment financing between individuals, corporations and the state government, etc.) and address distributional impacts from possible higher prices for goods and services in a carbon-constrained world.[18]

The Environmental Justice Advisory Committee (EJAC) also supports an approach that includes a price on carbon along with complementary measures. Although the EJAC recommends that the carbon price be established through a carbon fee rather than through a cap-and-trade program, they recognize the importance of mutually supportive policies: .

> California should establish a three-pronged approach for addressing greenhouse gases: (1) adopting standards and regulations; (2) providing incentives; and (3) putting a price on carbon via a carbon fee. The three pieces support one another and no single prong can work without equally robust support from the others.[19]

In keeping with the rationale outlined above, ARB finds that it is critically important to include complementary measures directed at emission sources that are included in the cap-and-trade program. These measures are designed to achieve cost-effective emissions reductions while accelerating the necessary transition to the low-carbon economy required to meet the 2050 target:

- The already adopted Light-Duty Vehicle Greenhouse Gas Standards are designed to accelerate the introduction of low-greenhouse gas emitting vehicles, reduce emissions and save consumers money at the pump.
- The Low Carbon Fuel Standard (LCFS) is a flexible performance standard designed to accelerate the availability and diversity of low-carbon fuels by taking into consideration the full life-cycle of greenhouse gas emissions. The LCFS will reduce emissions and make our economy more resilient to future petroleum price volatility.
- The Regional Transportation-Related Greenhouse Gas Targets provide incentives for channeling investment into integrated development patterns and transportation

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[18] Recommendations of the Economic and Technical Advancement Advisory Committee (ETAAC), Final Report. *Technologies and Policies to Consider for Reducing Greenhouse Gas Emissions in California.* February 14, 2008. pp. 1-4 http://www.arb.ca.gov/cc/etaac/ETAACFinalReport2-11-08.pdf (accessed October 12, 2008)

[19] Recommendations and Comments of the Environmental Justice Advisory Committee on the Implementation of the Global Warming Solutions Act of 2006 (AB32) on the Draft Scoping Plan. October 2008. p. 10. http://www.arb.ca.gov/cc/ejac/ejac_comments_final.pdf (accessed October 12, 2008)

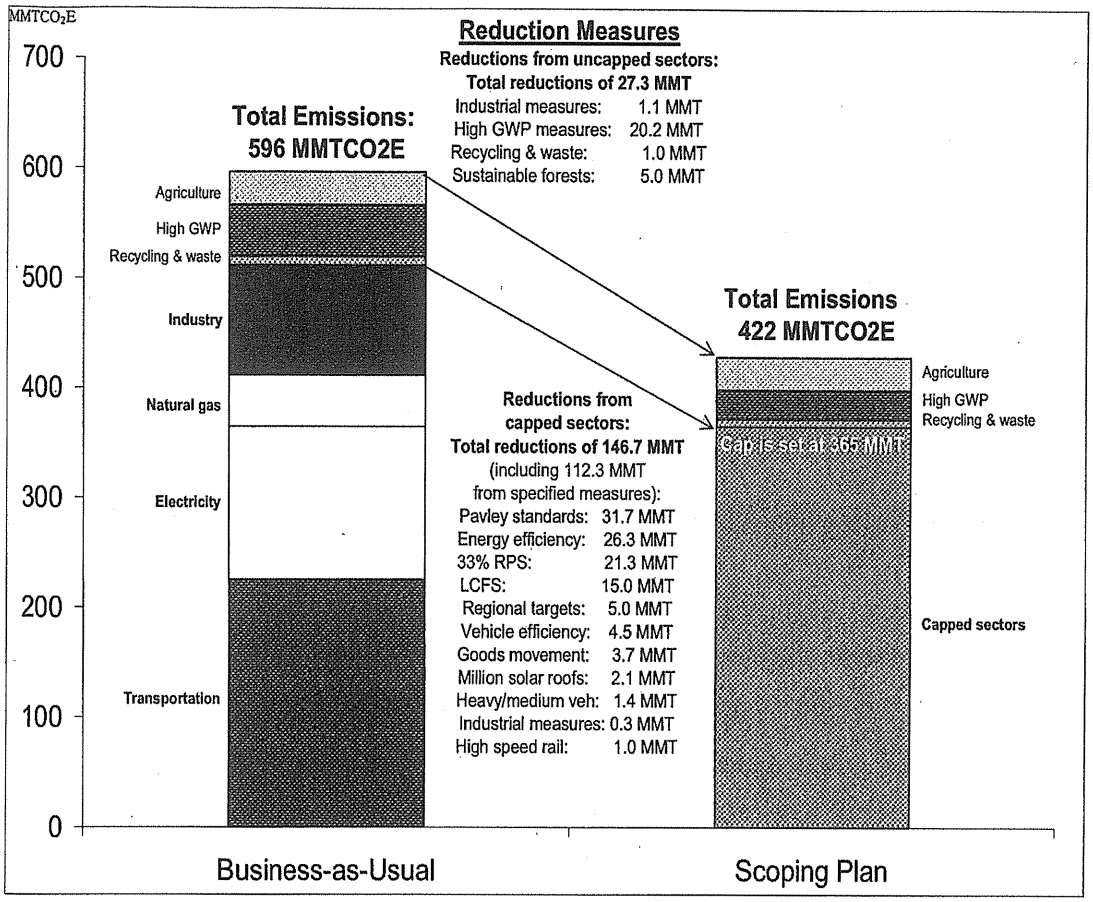
infrastructure, through improved planning. Improved planning and the resulting development are essential for meeting the 2050 emissions target.

- In the Energy sector, measures will provide better information and overcome institutional barriers that slow the adoption of cost-effective energy efficiency technologies. Enhanced energy efficiency programs will provide incentives for customers to purchase and install more efficient products and processes, and building and appliance standards will ensure that manufacturers and builders bring improved products to market.
- The Renewables Portfolio Standard (RPS) promotes multiple objectives, including diversifying the electricity supply. Increasing the RPS to 33 percent is designed to accelerate the transformation of the Electricity sector, including investment in the transmission infrastructure and system changes to allow integration of large quantities of intermittent wind and solar generation.
- The Million Solar Roofs Initiative uses incentives to transform the rooftop solar market by driving down costs over time.
- The Goods Movement program is primarily intended to achieve criteria and toxic air pollutant reductions but will provide important greenhouse gas benefits as well.
- Similar to the light duty vehicle greenhouse gas standards, the heavy duty and medium duty vehicle measures and the additional light duty vehicle efficiency measures aim to achieve cost-effective reductions of GHG emissions and save fuel.

Each of these complementary measures helps to position the California economy for the future by reducing the greenhouse gas intensity of products, processes, and activities. When combined with the absolute and declining emissions limit of the cap-and-trade program, these policies ensure that we cost-effectively achieve our greenhouse gas emissions goals and set ourselves on a path towards a clean low carbon future.

Figure 3 illustrates how the recommended emission reduction measures together put California on a path toward achieving the 2020 goal. The left hand column in Figure 3 shows total projected business as usual emissions in 2020, by sector (596 $MMTCO_2E$). The right hand column shows 2020 emissions after applying the Scoping Plan recommended reduction measures (422 $MMTCO_2E$). The measures that accomplish the needed reductions are listed in between the columns. As Figure 3 shows, there are a total of 27.3 $MMTCO_2E$ in reductions from uncapped sectors, and 146.7 $MMTCO_2E$ in reductions from capped sectors.

Figure 3: California Greenhouse Gas Emissions in 2020 and Recommended Reduction Measures



The recommended cap-and-trade program provides covered sources with the flexibility to pursue low cost reductions. It is important to recognize, however, that other recommended measures also provide compliance flexibility. As is often the case with ARB regulations, many of the measures establish performance standards and allow regulated entities to determine how best to achieve the required emission level. This approach rewards innovation and allows facilities to take advantage of the best way to meet the overarching environmental objective.

Table 3 lists the proposed measures that include compliance flexibility or market mechanisms. This flexibility ranges from the potential for tradable renewable energy credits in the Renewables Portfolio Standard to the incentives to encourage emission reductions in electricity and natural gas efficiency programs to the averaging, banking and trading mechanisms in the Pavley and Low Carbon Fuel Standard programs to a multi-sector cap-and-trade program.

Table 3: Measures With Flexible Market Compliance Features

Measure	Estimated Reductions
Additional Reductions from Capped Sectors	34.4
California Light-Duty Vehicle Greenhouse Gas Standards (Pavley I & II)	31.7
Renewables Portfolio Standard	21.3
Electricity Efficiency	15.2
Low Carbon Fuel Standard	15.0
Mitigation Fee on High GWP Gases	5.0
Natural Gas Efficiency	4.3
Goods Movement Systemwide Efficiency	3.5
Medium/Heavy Duty Vehicle Hybridization	0.5
Total	**130.9**

The recommended mix of measures builds on a strong foundation of previous action in California to address climate change and broader environmental issues. The program recommended here relies on implementing existing laws and regulations that were adopted to reduce greenhouse gas emissions and other policy goals; strengthening and expanding existing programs; implementing the discrete early actions adopted by the Board in 2007; and new measures developed during the Scoping Plan process itself.

The mix of measures recommended in this Proposed Plan provides a comprehensive approach to reduce emissions to achieve the 2020 target, and to initiate the transformations required to achieve the 2050 target. The cap-and-trade program and complementary measures will cover about 85 percent of greenhouse gas emissions throughout California's economy. ARB recognizes that due to several factors, including information discovered during regulatory development, technology maturity, and implementation challenges, actual reductions from individual measures aimed at achieving the 2020 target may be higher or lower than current estimates. The inclusion of many of these emissions within the cap-and-trade program, along with a margin of safety in the uncapped sectors, will help ensure that the 2020 target is met. The combination of approaches provides certainty that the overall program will meet the target despite some degree of uncertainty in the estimates for any individual measure. Additionally, by internalizing the cost of CO_2E emissions throughout the economy, the cap-and-trade program supports the complementary measures and provides further incentives for innovation and continuing emissions reductions from energy producers and consumers setting us on a path toward our 2050 goals.

Some emissions sources are not currently suitable for inclusion in the cap-and-trade program due to challenges associated with precise measurement, tracking or sector structure. For these emissions sources, ARB is including measures designed to focus on waste management, agriculture, forestry, and certain emissions of high GWP gases, a rapidly growing component of California's greenhouse gas emissions inventory.

California's economy is expected to continue to experience robust growth through 2020. Economic modeling, including evaluation of the effects on low-income Californians, shows that the measures included within this Proposed Scoping Plan can be implemented with a net positive effect on California's long-term economic growth. The evaluation of related public health and environmental benefits of the various measures also shows that implementation will result in not only reduced greenhouse gas emissions and improved public health, but also in a beneficial effect on California's environment. The results of these evaluations are presented in Chapter III.

AB 32 includes specific criteria that ARB must consider before adopting regulations for market-based compliance mechanisms to implement a greenhouse gas reduction program, and directs the Board, to the extent feasible, to design market-based compliance mechanisms to prevent any increase in the emissions of toxic air contaminants or criteria air pollutants. In the development of regulations that contain market mechanisms, ARB will consider the economic, environmental and public health effects, and the evaluation of potential localized impacts. These results will be used to institute appropriate economic, environmental and public health safeguards.

ARB has also designed the recommendation to ensure that reductions will come from throughout the California economy. Transportation accounts for the largest share of California's greenhouse gas emissions. Accordingly, a large share of the reduction of greenhouse gas emissions from the recommended measures comes from this sector. Measures include the inclusion of transportation fuels in the cap-and-trade program, the Low Carbon Fuel Standard to reduce the carbon intensity of transportation fuels, enforcement of regulations that reduce greenhouse gas emissions from vehicles, and policies to reduce transportation emissions by changes in future land use patterns and community design as well as improvements in public transportation.

In the Energy sector, the recommended measures increase the amount of electricity from renewable energy sources, and improve the energy efficiency of industries, homes and buildings. The inclusion of these sectors and the Industrial sector in the cap-and-trade program provides further assurance that significant cost-effective reductions will be achieved from the sectors that contribute the greatest emissions. Additional energy production from renewable resources may also rely on measures suggested in the Agriculture, Water, and the Recycling and Waste Management Sectors.

Other sectors are also called upon to cut emissions. The cap-and-trade program covers industrial sources and natural gas use. The recommended measures would require industrial processes to examine how to lower their greenhouse gas emissions and be more energy efficient, and would require goods movement operations through California's ports to be more energy efficient. 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 or eliminate the emissions of high global warming potential gases that, on a per-ton basis, contribute to global warming at a level many times greater than carbon dioxide.

As the Scoping Plan is implemented, ARB and other agencies will coordinate with the Green Chemistry Initiative, particularly in the Green Building and Recycling/Waste sectors. Green Chemistry is a fundamentally new approach to environmental protection that emphasizes environmental protection at the design stage of product and manufacturing processes, rather than focusing on end-of-pipe or end-of-life activities, or a single environmental medium, such as air, water or soil. This new approach will reduce the use of harmful chemicals, generate less waste, use less energy, and, accordingly, will contribute toward California's greenhouse gas reduction goals.

A. The Role of State Government: Setting an Example

For many years California State government has successfully incorporated environmental principles in managing its resources and running its business. The Governor has directed State agencies to sharply reduce their building-related energy use and encouraged our State-run pensions to invest in energy efficient and clean technologies.[20] The State also has been active in procuring low-emission, alternative fuel vehicles in its large fleet.

While State government has already accomplished much to reduce its greenhouse gas emissions, it can and must do more. State agencies must lead by example by continuing to reduce their greenhouse gas emissions. Therefore, California State government has established a target of reducing its greenhouse gas emissions by a *minimum* of 30 percent below its estimated business-as-usual emissions by 2020 – approximately a 15 percent reduction from current levels.

As an owner-operator of key infrastructure, State government 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 targets to reduce greenhouse gas emissions, such as through the efforts of Environmentally Preferable Purchasing. As an investor of more than $400 billion,[21] State government has the ability to prioritize low-carbon investments. With more than 350,000 employees, State government is uniquely situated to adopt and implement policies that give State workers the ability to decrease their individual carbon impact, including encouraging siting facilities within communities to enhance balance in jobs and housing, encouraging carpooling, biking, walking, telecommuting, the use of public transit, and the use of alternative work schedules.

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[20]Governor Schwarzenegger signed Executive Order Executive Order S-20-04 on December 14, 2004. This Order contains a number of directives, including a set of 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 August 2008.

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 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-fired power plants are currently underway. Together with energy conservation and efficiency strategies on water projects, roadways, parks, and bridges, these efforts all play major roles in reducing the State's greenhouse gas emissions. State agencies should review their travel practices and make greater use of teleconferencing and videoconferencing to reduce the need for business travel, particularly air travel.

State agencies are now examining their policies and operations to determine how they can reduce their greenhouse gas emissions. These findings will be instrumental as each cabinet-level agency registers with the California Climate Action Registry (CCAR) to record and report their individual carbon footprints. The Climate Action Team has created a new State Government Operations sub-group that will work closely with the agencies to review the results of their evaluations and the CCAR reports to determine how best to achieve the maximum reductions possible.

State agencies must take the lead in driving this low-carbon economy by reducing their own emissions, and also by serving as a catalyst for local government and private sector activity. New "Best Practices" implemented by State agencies can be transferred to other entities within California, the nation, and internationally. By increasing cooperation and coordination across organizational boundaries, State government will maximize the experience and contributions of each agency involved to achieve the 30 percent reduction of greenhouse gas emissions while growing the economy and protecting the environment.

State government's impact on emissions goes far beyond its own buildings, vehicles, projects, and employees. State government casts a sizable "carbon shadow"– that is, the climate change impact of legislative, executive, and financial actions of State agencies that affect Californians now and in the future. For example, the California Energy Commission (CEC) recently initiated a proceeding to consider how to align its permitting process with the State's greenhouse gas and renewable energy policy goals. ARB intends to work closely with the CEC during this proceeding. New power plants, both fossil-fuel fired and renewable generation, will be a critical part of the state's electricity mix in coming decades. The investments that are made in this new infrastructure in the next several years will become part of the backbone of the state's electricity supply for decades to come. This timely investigation will be a critical element of California's ability to meet the AB 32 emissions reduction target for 2020, the ambitious target set by the Governor for 2050, and also the specific goal of achieving 33 percent renewables in the state's electricity mix. The Governor's Office of Planning and Research and the Resources Agency are developing proposed amendments to the California Environmental Quality Act (CEQA) Guidelines to

provide guidance on how to address greenhouse gases in CEQA documents. As required by SB 97 (Chapter 185, Statutes of 2007), the amended CEQA guidelines will be adopted by January 1, 2010.

In addition, agencies such as the California Labor and Workforce Development Agency, the Business, Transportation and Housing Agency and the newly created Green Collar Jobs Council (AB 3018, Chapter 312, Statutes of 2008) are dedicated to economic development, training, safety, labor relations, and employment development throughout the State. ARB will coordinate with the Council and also with other State agencies to address workforce needs and facilitate a smooth transition to California's emerging low-carbon economy that maximizes economic development and employment opportunities in California.

The State expends funds to provide services to California residents – from preserving our natural resources to building and maintaining infrastructure like roads, bridges and dams. California residents should reap all of the benefits of these projects, including any associated quantifiable and marketable reductions in greenhouse gas emissions. Because of this, California should retain ownership of these greenhouse gas emissions reductions and use them to promote the goals of AB 32 and other goals of the state.

California State government can also lead through example by aligning its efforts to reduce greenhouse gas emissions with efforts to protect and improve public health. As a new member of the Climate Action Team, the Department of Public Health will help ensure that measures to combat global warming also incorporate public health protection and improvement strategies. As discussed below, these and many other State leadership efforts can be built upon at the local level as well.

B. The Role of Local Government: Essential Partners

Local governments are essential partners in achieving California's goals to reduce greenhouse gas emissions. They have broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect greenhouse gas emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations. Many of the proposed measures to reduce greenhouse gas emissions rely on local government actions.

Over 120 California cities have already signed on to the U.S. Conference of Mayors Climate Protection Agreement. In addition, over 30 California cities and counties have committed to developing and implementing Climate Action Plans. Many local governments and related organizations have already begun educating Californians on the benefits of energy efficiency measures, public transportation, solar homes, and recycling. These communities have not only demonstrated courageous leadership in taking initiative to reduce greenhouse gas emissions, they are also reaping important co-benefits, including local economic benefits, more sustainable communities, and improved quality of life.

Land use planning and urban growth decisions are also areas where successful implementation of the Scoping Plan relies on local government. Local governments have primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth and the changing needs of their jurisdictions. Decisions on how land is used will have large impacts on the greenhouse gas emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas sectors.

To provide local governments guidance on how to inventory and report greenhouse gas emissions from government buildings, facilities, vehicles, wastewater and potable water treatment facilities, landfill and composting facilities, and other government operations, ARB recently adopted the Local Government Operations Protocol. ARB encourages local governments to use this protocol to track their progress in achieving reductions from municipal operations. ARB is also developing an additional protocol for community emissions. This protocol will go beyond just municipal operations and include emissions from the community as a whole, including residential and commercial activity. These local protocols will play a key role in ensuring that strategies that are developed and implemented at the local level, like urban forestry and greening projects, water and energy efficiency projects, and others, can be appropriately quantified and credited toward California's efforts to reduce greenhouse gas emissions.

In addition to tracking emissions using these protocols, ARB encourages local governments to adopt a reduction goal for municipal operations emissions and move toward establishing similar goals for community emissions that parallel the State commitment to reduce greenhouse gas emissions by approximately 15 percent from current levels by 2020. To consolidate climate action resources and aid local governments in their emission reduction efforts, the ARB is developing various tools and guidance for use by local governments, including the next generation of best practices, case studies, a calculator to help calculate local greenhouse gas emissions, and other decision support tools.

The recent passage of SB 375 (Steinberg, Chapter 728, Statutes of 2008) creates a process whereby local governments and other stakeholders work together within their region to achieve reduction of greenhouse gas emissions through integrated development patterns, improved transportation planning, and other transportation measures and policies. The implementation of regional transportation-related greenhouse gas emissions targets and SB 375 are discussed in more detail in Section C.

C. Emissions Reduction Measures

The Scoping Plan will build on California's successful history of balancing effective regulations with economic progress. Several types of measures have been recommended. The plan includes a California cap-and-trade program that will be integrated with a broader regional market to maximize cost-effective opportunities to achieve GHG emissions reductions. The plan also includes transformational measures that are designed to help pave the path toward California's clean energy future. For example, the Low Carbon Fuel

Standard (LCFS) is a performance standard with flexible compliance mechanisms that will incent the development of a diverse set of clean, low-carbon transportation fuel options. Similarly, the plan recognizes the importance of local and regional government leadership in ensuring that California's land use and transportation planning processes are designed to be consistent with efforts to achieve a clean energy future and to protect and enhance public health and safety.

The Proposed Scoping Plan also contains a number of targeted measures that are designed to overcome existing barriers to action such as lack of information, lack of coordination, or other regulatory and institutional factors. Energy efficiency is a classic example where cost-effective action often is not taken due to lack of complete information, relatively high initial costs, and mismatches between who pays for and who benefits from efficiency investments. These problems often mean that efficiency measures are not taken that would save money in the long term for small businesses, home owners and renters. While California has a long history of success in implementing regulations and programs to encourage energy efficiency, innovative methods to overcome these economic and information barriers are needed to provide the benefits of increased efficiency to more Californians and to meet our greenhouse gas emissions reduction goals.

Several of the recommended measures complement each other. For example, the LCFS will provide clean transportation fuel options. The Pavley performance standards help deploy vehicles that can use many of the low-carbon fuels, including advanced biofuels, electricity and hydrogen. The combined operation 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 will benefit from ARB's zero-emission vehicle program, which focuses on deployment of plug-in battery-electric and fuel cell vehicles. All of these strategies are expandable beyond 2020, and are needed as vital components to reach the State's 2050 goal.

The cap-and-trade program creates an emissions limit or "cap" on the sectors responsible for the vast majority of California's greenhouse gas emissions and provides capped sources significant flexibility in how they collectively achieve the reductions necessary to meet the cap. The other measures in these capped sectors provide a clear path toward achieving reductions required by the cap, while simultaneously addressing market barriers and creating the low-carbon energy options needed to achieve our long term climate goals. In the design of the cap-and-trade program, ARB will also evaluate possible ways to include features that complement the other measures, such as consideration of allowance set-asides that could be used to help achieve or exceed the aggressive energy efficiency goals included in this Plan.

Both required measures and other cost-effective actions by capped sectors will contribute toward achievement of the cap. For example, increasing energy efficiency will reduce electricity demand, thereby reducing the need for utilities to submit allowances to comply with the cap-and-trade program. In this way, energy efficiency contributes to real reductions toward the cap. Expiration of existing utility long-term contracts with coal plants will reduce GHG emissions when such generation is replaced by renewable generation, coal with carbon sequestration, or natural gas generation, which emits less CO_2 per megawatt-hour.

Additionally, measures and other actions that result in reductions in energy demand 'downstream' of capped sectors will help achieve the cap. For example, the Pavley vehicle standards, building efficiency standards, and land use planning that contributes to reduced transportation fuel demand will all reduce emissions by reducing the demand for upstream energy production. These downstream entities will further benefit from these reductions by avoiding any costs that would be passed through from a cap-and-trade system.

Discrete Early Actions

In September 2007, ARB approved a list of nine Discrete Early Actions 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 and are shown below in Table 4.

Table 4: 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 – Adopted
SmartWay – Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency)	December 2008
Reduction of Perfluorocarbons from Semiconductor Manufacturing	February 2009
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
Low Carbon Fuel Standard	March 2009

The following sections describe the recommended measures in this Proposed Scoping Plan. Additional information about these measures is provided in Appendix C.

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

Implement a broad-based California cap-and-trade program to provide a firm limit on emissions. Link the California cap–and-trade program with other Western Climate Initiative Partner programs to create a regional market system to achieve greater environmental and economic benefits for California. 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 reductions of greenhouse gas emissions throughout the region. ARB will develop a cap-and-trade program for California that will link with the programs in the other WCI Partner jurisdictions to create a regional cap-and-trade program. The WCI Partner jurisdictions released the program design document on September 23, 2008 (see Appendix D). ARB will continue to work with the WCI Partner jurisdictions to develop and implement the cap-and-trade program. ARB will also design the California program to meet the requirements of AB 32, including the need to consider any potential localized impacts and ensure that reductions are enforceable by the Board.

Based on the requirements of AB 32, regulations to implement the cap-and-trade program need to be developed by January 1, 2011, 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. Preliminary plans for this rulemaking are described later in this section.

A cap-and-trade program sets the total amount of greenhouse gas emissions allowable for facilities under the cap and allows covered sources, including producers and consumers of energy, to determine the least expensive strategies to comply. The emissions allowed under the cap will be denominated in metric tons of CO_2E. The currency will be in the form of allowances which the State will issue based upon the total emissions allowed under the cap during any specific compliance period. Emission allowances can be banked for future use, encouraging early reductions and reducing market volatility. The ability to trade allows facilities to adjust to changing conditions and take advantage of reduction opportunities when those opportunities are less expensive than buying additional emissions allowances.

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

Appendix C describes the fundamentals of a cap-and-trade program and program design elements. Appendix D contains the WCI Design Recommendations and related background documents.

California Cap-and-Trade Program

By providing a firm cap on 85 percent of the state's greenhouse gas emissions, the cap-and-trade regulatory program is an essential component of the overall plan to meet the 2020 target and provides a robust mechanism to achieve the additional reductions needed by 2050. To meet the emissions reduction target under AB 32, the limit on emissions allowed under the cap, plus emissions from uncapped sources, must be no greater than the 2020 emissions goal.

By setting a limit on the quantity of greenhouse gases emitted, a well-designed cap-and-trade program will complement other measures for entities within covered sectors. Additionally, starting a cap-and-trade program now will set us on a course to achieve further emissions cuts well beyond 2020 and ensure that California is primed to take advantage of opportunities for linking with other programs, including future federal and international efforts.

The proposed cap-and-trade measure phases in the following sectors:

Starting in the first compliance period (2012):

- Electricity generation, including imports not covered by a WCI Partner jurisdiction
- Large industrial facilities that emit over 25,000 metric tons CO_2E per year.

Starting in the second compliance period (2015):

- Upstream treatment of industrial fuel combustion at facilities with emissions at or below 25,000 metric tons CO_2E, and all commercial and residential fuel combustion regulated where the fuel enters into commerce
- Transportation fuel combustion regulated where the fuel enters into commerce.

For some energy-intensive industrial sources such as cement, stringent requirements in California, either through inclusion in a cap-and-trade program or through source-specific regulation, have the potential to create a disadvantage for California facilities relative to out-of-state competitors unless those locations have similar requirements (e.g., through the WCI). If production shifts outside of California in order to operate without being subject to these requirements, emissions could remain unchanged or even increase. This is referred to as "leakage." AB 32 requires ARB to design measures to minimize leakage. Minimizing leakage will be a key consideration when developing the cap-and-trade regulation and the other AB 32 program measures.[22]

[22] The cement industry is an example of a sector that may be susceptible to this type of leakage, and the Draft Scoping Plan included consideration of a measure to institute an intensity standard at concrete batch plants that would consider this type of life-cycle emissions. ARB will evaluate whether this type of intensity standard could be incorporated into the cap-and-trade program or instituted as a complementary measure during the cap-and-trade rulemaking.

As shown in Table 5, the preliminary estimate of the cap on greenhouse gas emissions for sectors covered by the cap-and-trade program is 365 $MMTCO_2E$ in 2020, which covers about 85 percent of California's total greenhouse gas emissions.[23] Greenhouse gas emissions from most of the sectors covered by a cap-and-trade program will also be governed by other measures, including performance standards, efficiency programs, and direct regulations. These other measures will provide real reductions which will contribute reductions toward the cap.

In addition, ARB will work closely with the CPUC, CEC, and The California Independent System Operator to ensure that the cap-and-trade program works within the context of the State's energy policy and enables the reliable provision of electricity.

Table 5: Sector Responsibilities Under Cap-and-Trade Program
($MMTCO_2E$ in 2020)

Sector	Projected 2020 Business-as-Usual Emissions		Preliminary 2020 Emissions Limit under Cap-and-Trade Program
	By Sector	Total	
Transportation	225	512	365
Electricity	139		
Commercial and Residential	47		
Industry	101		

Linkage with the Western Climate Initiative Partner Jurisdictions

The WCI was formed in 2007. Members are California, Arizona, New Mexico, Oregon, Washington, Utah, and Montana, and the Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec. The WCI Partner jurisdictions, including California, have adopted goals to reduce greenhouse gas emissions that, in total, reduce regional emissions to 15 percent below 2005 levels by 2020. This regional goal is approximately equal to California's goal of returning to 1990 levels by 2020. A cap-and-trade program is one element of the effort by the WCI Partner jurisdictions to identify, evaluate, and implement ways to reduce greenhouse gas emissions and achieve related co-benefits.

The WCI Partner jurisdictions released their recommendation for the design of a regional cap-and-trade program in September 2008. This design document and the

[23] The actual cap for the program will be established as part of the rulemaking process. The preliminary cap of 365 $MMTCO_2E$ in 2020 assumes that all of California's electricity imports would be covered under a California cap. Because a significant portion of California's imported electricity is from power plants located in other WCI Partner Jurisdictions, emissions from those sources could be included in the cap of the states within which the power plants are located. In establishing the California cap, ARB will need to consider the degree to which emissions from these sources are addressed as part of the WCI regional market.

background paper that accompanied it are presented in Appendix D. These recommendations were developed collaboratively by the WCI Partner jurisdictions, including California, with a goal of achieving regional targets to reduce greenhouse gas emissions equitably and effectively. The WCI Partner jurisdictions' recommendations are generally consistent with the recommendations provided in June 2007 by the California Market Advisory Committee,[24] the recommendations provided to ARB by the California Public Utilities Commission and the California Energy Commission in March 2008,[25] and the proposed opinion released by the two Commissions in September 2008.[26]

Participating in a regional system has several advantages for California. The reduction of greenhouse gas emissions that can be achieved collectively by the WCI Partner jurisdictions are approximately double what can be achieved through a California-only program. The broad scope of a WCI-wide market will provide additional opportunities for reduction of emissions, therefore providing greater market liquidity and more stable carbon prices within the program. The regional system also significantly reduces the potential for leakage, which is a shift in economic and emissions activity out of California that could hurt the state's economy without reducing global greenhouse gas emissions. Harmonizing the approach and timing of California's requirements for reducing greenhouse gas emissions with other states and provinces in the region can encourage retention of local businesses in the state. Further, by creating a cost-effective regional market system, California and the other WCI Partner jurisdictions will continue to demonstrate leadership in preparation for future federal and international climate action.

To achieve the individual WCI Partner jurisdiction goals and the regional goal, each WCI Partner jurisdiction will have an allowance budget based on its goal that declines to 2020. For example, California's allowance budget will be based on the level of emissions needed to achieve the AB 32 target for 2020, as described above. Once California links with the other WCI Partner jurisdictions, allowances could be traded across state and provincial boundaries. As a result of trading, emissions in a

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[24] Recommendations of the Market Advisory Committee to the California Air Resources Board. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California.* June 30, 2007. p. 19. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (accessed October 12, 2008) CalEPAThe Market Advisory Committee (MAC) consisted of a consortium of economists, policy makers, academics, government representatives, and environmental advocates who came together through the auspices of CalEPA, pursuant to Executive Order S-20-06 from Governor Schwarzenegger.

[25] Joint Agency Decision of the CEC and the CPUC. *Final Adopted Interim Decision on Basic Greenhouse Gas Regulatory Framework for Electricity and Natural Gas Sectors*, March 13, 2008. Document number CEC-100-2008-002-F. http://www.energy.ca.gov/2008publications/CEC-100-2008-002/CEC-100-2008-002-F.PDF (accessed October 12, 2008)

[26] Joint Agency proposed final opinion of the CEC and the CPUC. *Proposed Final Opinion on Greenhouse Gas Regulatory Strategies*. Published September 12, 2008 and to be considered for adoption on October 16, 2008 by the CEC and the CPUC. Document Number CEC-100-2008-007-D http://www.energy.ca.gov/ghg_emissions/index.html (accessed October 12, 2008)

state may vary from its allowance budget, although total regional emissions will not exceed the regional cap.

The overall number of allowances issued in a given year by the WCI Partner jurisdictions will set a limit on emissions from sectors covered by the program for the region. Details of distribution of allowances will be established by each partner within the general guidelines set forth in the WCI program design framework. The WCI Partner jurisdictions have agreed to consider standardizing allowance distribution across specific sectors if necessary to address competitiveness issues. In addition, the WCI Partner jurisdictions have agreed to phase in regionally coordinated auctions of allowances, with a minimum percentage of allowances auctioned in each period starting with 10 percent in the first compliance period and increasing to 25 percent in 2020. WCI partners aspire to reach higher auction percentages over time, possibly to 100 percent. Under the program design, each WCI Partner jurisdiction, including California, can auction a greater portion of its allowance budget in any compliance period. The distribution of California's allowances will be determined during the cap-and-trade rulemaking process, as discussed below.

The WCI Partner jurisdictions are also proposing the use of an allowance reserve price for the first 5 percent of the auctioned allowances in the regional cap. A reserve price will help to ensure that the cap is set at a level that will motivate real emissions reductions and may provide an opportunity for the regional cap-and-trade program to provide reductions that exceed the regional target.

A regional coordinated cap-and-trade program with strong reporting and enforcement rules will provide a high degree of certainty that emissions will not exceed targeted levels and that leakage will not occur.

Federal Action

A cap-and-trade program is expected to be a significant element in any future federal action taken to reduce greenhouse gas emissions. ARB's efforts to design a broad cap-and-trade system that works in concert with sector- or source-related measures and meets the requirements of AB 32 can serve as a model for a federal program. An effective, enforceable regional cap-and-trade program can promote the type of federal legislation needed to meet the pressing challenge of climate change. In the event that California businesses, organizations, or individuals hold regional allowances when a federal system is implemented, California will work to ensure that those allowances continue to have value, either in a continuing regional program or within the federal program.

Cap-and-Trade Rulemaking

To implement the cap-and-trade program, ARB will embark on regulatory development that includes extensive and broad-based public participation. Major program design elements will include setting an emissions cap in conjunction with the WCI Partner jurisdictions, determining the method of distributing both allowances

and revenues raised through auctions, and establishing the rules for the use of offsets. ARB will continue to work with all affected stakeholders, State and local agencies, and our WCI partners to create a robust regional market system.

After adoption of the Scoping Plan, ARB will establish a formal structure to elicit ongoing participation in the rulemaking process from a wide range of affected stakeholders. While the process will be open to involvement by all interested parties, ARB anticipates creation of a series of focused working groups that include participation by representatives of the regulated community, environmental and community advocates and other public interest groups, prominent academics with expertise in cap-and-trade issues and new technology development, local air pollution control districts, stakeholders in the WCI, and other State agencies with existing authority for regulating capped sectors.

This process will integrate economic and administrative design considerations and include consideration of environmental and public health issues. ARB will convene a series of technical workshops to examine mechanisms to address the concerns related to the cap-and-trade program raised by the Environmental Justice Advisory Committee and other stakeholders. The first workshop will explore cap-and-trade program design options that could provide incentives to maximize additional environmental and economic benefits, and to analyze the proposed program to prevent increases in emissions of toxic air contaminants or criteria pollutants through the design and architecture of the program itself. Similar technical workshops will focus on issues related to offsets and the WCI proposal.

Allowances and Revenues

Emission allowances represent a significant economic value whether they are freely allocated or sold through auction. Section E includes a preliminary discussion of some of the options that have been suggested for use of allowance value or revenues. ARB will evaluate the possible uses of allowances or revenues as part of the rulemaking process. One approach would be to dedicate a portion of the allowances for such purposes as rewarding early actions to reduce emissions, providing incentives for local governments and others to promote energy efficiency, better land use planning, and other reduction strategies, and targeting projects to reduce emissions in low-income or disadvantaged communities. This type of dedicated use of allowances is typically referred to as an allowance 'set-aside.'

The California Public Utilities Commission and the California Energy Commission addressed the question of allocation and auction of allowances in their joint proceeding on implementation of AB 32 for the Electricity and Natural Gas sectors. They have recently released a proposed opinion that recommends to ARB a transition to 100 percent auction for the Electricity sector by 2016.[27] The CPUC and CEC

[27] Op. Cit. The proposed opinion has not yet been voted on by either the CPUC or the CEC. The Commissions are expected to vote on this proposed opinion before the December Board meeting when the Proposed Scoping Plan will be considered for approval.

included in their draft opinion the recommendation that all auction revenues be used for purposes related to AB 32, and all revenue from allowances allocated to the Electricity sector and received by retail providers would be used for the benefit of the Electricity sector to support investments in renewable energy, efficiency, new energy technology, infrastructure, customer bill relief, and other similar programs.

The Market Advisory Committee also recommended the eventual transition to full auction within the cap-and-trade program, noting that a system in which California ultimately auctions all of its emission allowances is consistent with fundamental objectives of cost-effectiveness, fairness and simplicity.[28] ARB agrees that a transition to a 100 percent auction is a worthwhile goal for distributing allowances. However a broad set of factors must be considered in evaluating the potential timing of a transition to a full auction including competiveness, potential for emissions leakage, the effect on regulated vs. unregulated industrial sectors, the overall impact on consumers, and the strategic use of auction revenues.

Allowance allocation and revenue use decisions can greatly affect the equity of a cap-and-trade system. Addressing both these issues will be a major part of the rulemaking process. ARB will seek input from a broad range of experts in an open public process regarding the options for allocation and revenue use under consideration by ARB and the WCI Partner jurisdictions. This process will evaluate various mechanisms ARB is considering for allowance distribution and potential uses of allowance value, including the recommendations offered by CPUC and CEC. Issues to be considered will include the appropriate timing and structure of a transition to full auction of allowances, the potential need to harmonize the allocation process regionally for certain sectors subject to inter-state competition, and equity across the various sectors here in California.

Offsets

Individual projects can be developed to achieve the reduction of emissions from activities not otherwise regulated, covered under an emissions cap, or resulting from government incentives. These projects can generate "offsets," i.e., verifiable reductions of emissions whose ownership can be transferred to others. The cap-and-trade rulemaking will establish appropriate rules for use of offsets. As required by AB 32, any reduction of greenhouse gas emissions used for compliance purposes must be real, permanent, quantifiable, verifiable, enforceable, and additional (HSC §38562(d)(1) and (2)). Offsets used to meet regulatory requirements must be quantified according to Board-adopted methodologies, and ARB must adopt a regulation to verify and enforce the reductions (HSC §38571). The criteria developed will ensure that the reductions are quantified accurately and are not double-counted within the system.

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[28]Recommendations of the Market Advisory Committee to the California Air Resources Board. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California.* June 30, 2007. p. 55. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (accessed October 12, 2008)

Offsets can provide regulated entities a source of low-cost emissions reductions. Reductions from compliance offset projects must be quantified using rigorous measurement and enforcement protocols that provide 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 reductions of emissions must be verified to ensure that reductions actually occurred.

While some offsets provide benefits, allowing unlimited offsets would reduce the amount of reductions of greenhouse gas emissions occurring within the sectors covered by the cap-and-trade program. This could reduce the local economic, environmental and public health co-benefits and delay the transition to low-carbon energy systems within the capped sectors that will be necessary to meet our long term climate goals. The limit on the use of offsets and allowances from other systems within the WCI Partner jurisdiction program design assures that a majority of the emissions reductions required from 2012 to 2020 occur at entities and facilities covered by the cap and trade program. Consequently, the use of offsets and allowances from other systems are limited to no more than 49 percent of the required reduction of emissions. This quantitative limit will help provide balance between the need to achieve meaningful emissions reductions from capped sources with the need to provide sources within capped sectors the opportunity for low-cost reduction opportunities that offsets can provide. The WCI offset program may incorporate flexibility to use offsets and non-WCI allowances across the three compliance periods, which each WCI Partner jurisdiction could use at its discretion. ARB will apply the limit on offsets that is within its jurisdiction, such that the allowable offsets in each compliance period is less than half of the emissions reductions expected from capped sectors in that compliance period. Each WCI Partner jurisdiction may choose to adopt a more stringent limit on the use of offsets and non-WCI allowances.

Offsets can also encourage the spread of clean, low carbon technologies outside California. High quality offset projects located outside the state can help lower the compliance costs for regulated entities in California, while reducing greenhouse gas emissions in areas that would otherwise lack the resources needed to do so. International projects may also have significant environmental, economic and social benefits. 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. The Governor has recently signed a Memorandum of Understanding with the six Mexican border states that calls for cooperation on the development of project protocols for Mexican greenhouse gas emissions reduction projects.[29] Additionally,

[29] Memorandum of Understanding on Environmental Cooperation between the California Environmental Protection Agency, the California Department of Food and Agriculture and the California Resources Agency of the State of California, United States of America and the Ministry of Environment and Natural Resources of the United Mexican States. February 13, 2008. http://gov.ca.gov/pdf/press/021308_MOU_English.pdf (accessed October 12, 2008)

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.

California is committed to working at the international level to reduce greenhouse gas emissions globally and finding ways to support the adoption of low-carbon technologies and sustainable development in the developing world. ARB will work with WCI Partner jurisdictions and within the rulemaking process to establish an offsets program without geographic restrictions that includes sufficiently stringent criteria for creating offset credits to ensure the overall environmental integrity of the program.

One concept being evaluated for accepting offsets from the developing world is to limit offsets to those jurisdictions that demonstrate performance in reducing emissions and/or achieving greenhouse gas intensity targets in certain carbon intensive sectors (e.g., cement), or in reducing emissions or enhancing sequestration through eligible forest carbon activities in accordance with appropriate national or sub-national accounting frameworks. This could be achieved through an agreement to work jointly to develop minimum performance standards or sectoral benchmarks, backed by appropriate monitoring and accounting frameworks. Such agreements would encourage early action in developing countries toward binding commitments, and could also reduce concerns about competitiveness and risks associated with carbon leakage.

2. California Light-Duty Vehicle Greenhouse Gas Standards

Implement adopted Pavley standards and planned second phase of the program. Align zero-emission vehicle, alternative and renewable fuel and vehicle technology programs with long-term climate change goals.

Passenger vehicles are responsible for almost 30 percent of California's greenhouse gas emissions. To address these emissions, ARB is proposing a comprehensive three-prong strategy – reducing greenhouse gas emissions from vehicles, reducing the carbon content of the fuel these vehicles burn, and reducing the miles these vehicles travel. Transportation fuels and regional transportation-related greenhouse gas targets are discussed later in the recommendations.

There are a number of efforts intended to reduce greenhouse gas emissions from California's passenger vehicles, including the Pavley greenhouse gas vehicle standards to achieve near-term emission reductions, the zero-emission vehicle (ZEV) program to transform the future vehicle fleet, and the Alternative and Renewable Fuel and Vehicle Technology Program created by AB 118 (Núñez, Chapter 750, Statutes of 2007).

Pavley Greenhouse Gas Vehicle Standards

AB 1493 (Pavley, Chapter 200, Statutes of 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. To obtain additional reductions from the light duty fleet, ARB plans to adopt a second, more stringent, phase of the Pavley regulations. Table 6 summarizes the estimated reduction of emissions for the Pavley regulations. In addition to delivering greenhouse gas emissions reductions, the standards will save money for Californians who purchase vehicles that comply with the Pavley standards – an estimated average of $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 until 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.

ARB is evaluating the use of feebates as a measure to achieve additional reductions from the mobile source sector, either as a backstop to the Pavley regulation if the regulation cannot be implemented, or as a supplement to Pavley if the waiver is approved and the regulation takes effect. 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 reductions of greenhouse gas emissions (HSC §38590). ARB is currently evaluating the use of a feebate program as the mechanism to secure these reductions. A feebate regulation would combine a rebate program for low-emitting vehicles with a fee program for high-emitting vehicles. This program would be designed in a way to generate equivalent or greater cumulative reductions of greenhouse gas emissions compared to what would have been achieved under the Pavley regulations. ARB would also evaluate the potential to expand the program to include additional vehicle classes not currently included in the Pavley program for further greenhouse gas benefits.

If the U.S. EPA grants California's request for a waiver to proceed with implementation of the Pavley regulations, we will analyze the potential for pursuing a feebate program that could complement the Pavley regulations and achieve additional reductions of greenhouse gas emissions.

Zero-Emission Vehicle Program

The Zero Emission Vehicle (ZEV) program will play an important role in helping California meet its 2020 and 2050 greenhouse gas emissions reduction requirements. Through 2012, the program requires placement of hundreds of ZEVs (including hydrogen fuel cell and battery electric vehicles) and thousands of near-zero emission vehicles (plug-in hybrids, conventional hybrids, compressed natural gas vehicles). In the mid-term (2012-2015), the program will require placement of increasing numbers of ZEVs and near-zero emission vehicles in California. In 2009, the Board will consider a proposal that is currently being developed to ensure that the ZEV program is optimally designed to help the State meet its 2020 target and put us on the path to meeting our 2050 target of an 80 percent reduction in greenhouse gas emissions.

It is important to note that while the use of both battery-powered electric vehicles and plug-in hybrids (which can be plugged in to recharge batteries) is not expected to increase electricity demand in the near term, over the longer term these technologies could result in meaningful new electricity demand. However, the expected increased electricity demand is likely to be met by off peak vehicle battery charging (i.e., overnight) to provide a means of load leveling and other possible benefits.[30]

Air Quality Improvement Program/Alternative and Renewable Fuel and Vehicle Technology Program

Under AB 118 (Núñez, Chapter 750, Statutes of 2007), ARB is administering the Air Quality Improvement Program, which provides approximately $50 million per year for grants to fund clean vehicle/equipment projects and research on the air quality impacts of alternative fuels and advanced technology vehicles.

AB 118 also created the Alternative and Renewable Fuel and Vehicle Technology Program and authorized CEC to spend up to $120 million per year for over seven years (from 2008-2015) to develop, demonstrate, and deploy innovative technologies to transform California's fuel and vehicle types. This program creates the opportunities for investment in technologies and fuels that will help meet the Low Carbon Fuel Standard, the AB 1007 (Pavley, Chapter 371, Statutes of 2005) goal of increasing alternative fuels, the AB 32 goal of reducing greenhouse gas emissions to 1990 levels by 2020, and the State's overall goal of reducing greenhouse gas emissions 80 percent below 1990 levels by 2050. CEC and ARB are coordinating closely in the implementation of AB 118. In the long-term, programs to reduce greenhouse gas emissions from cars would reduce highway funds because less fuel would be sold, reducing tax revenue. In coordination with other State agencies, ARB will continue to evaluate the potential impacts of these shifts and identify potential solutions.

[30] There is also a potential for battery-electric and hybrid vehicles (both plug-in and traditional hybrid-electric) to be used in the future to provide electricity back into the electricity grid during times of especially high demand (peak periods).

Table 6: California Light-Duty Vehicle Greenhouse Gas Standards Recommendation
($MMTCO_2E$ in 2020)

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

3. Energy Efficiency

Maximize energy efficiency building and appliance standards, and pursue additional efficiency efforts including new technologies, and new policy and implementation mechanisms. Pursue comparable investment in energy efficiency from all retail providers of electricity in California (including both investor-owned and publicly-owned utilities).

Energy-efficiency measures for both electricity and natural gas can reduce greenhouse gas emissions significantly. 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 through legislation that requires electric utilities to meet their resource needs first with energy efficiency.[31]

This measure would set new targets for statewide annual energy demand reductions of 32,000 gigawatt hours and 800 million therms from business as usual[32] – enough to power more than 5 million homes, or replace the need to build about ten new large power plants (500 megawatts each). These targets represent a higher goal than existing efficiency targets established by CPUC for the investor-owned utilities due to the inclusion of innovative strategies above traditional utility programs. Achieving the State's energy efficiency targets will require coordinated efforts from the State, the federal government, energy companies and customers. ARB will work with CEC and CPUC to facilitate these partnerships. A number of these measures also have the potential to deliver significant economic benefits to California consumers, including low-income households and small businesses. California's energy efficiency programs for buildings and appliances have generated more than $50 billion in savings over the past three decades. Tables 7 and 8 summarize the reduction of greenhouse gas emissions.

[31] SB 1037 (Kehoe, Chapter 366, Statutes of 2005) and AB 2021 (Levine, Chapter 734, Statutes of 2006) directed electricity corporations subject to 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.

[32] The savings targeted here are additional to savings currently assumed to be incorporated in CEC's 2007 demand forecasts. However, CEC has initiated a public process to better determine the quantity of energy savings from standards, utility programs, and market effects that are embedded in the baseline demand forecast.

Efficiency

Achieving the energy efficiency target will require redoubled efforts to target industrial, agricultural, commercial, and residential end-use sectors, comprised of both innovative new initiatives that have been embraced by CEC's energy policy reports and CPUC's long-term strategic plan, and improvements to California's traditional approaches of improved building standards and utility programs.

High-efficiency distributed generation applications like fuel cell technologies can also play an important role in helping the State meet its requirements for reduction of greenhouse gas emissions. Key energy efficiency strategies, grouped by type, include:

Cross-cutting Strategy for Buildings
- "Zero Net Energy" buildings[33]

Codes and Standards Strategies
- More stringent building codes and appliance efficiency standards
- Broader standards for new types of appliances and for water efficiency
- Improved compliance and enforcement of existing standards
- Voluntary efficiency and green building targets beyond mandatory codes

Strategies for Existing Buildings
- Voluntary and mandatory whole-building retrofits for existing buildings
- Innovative financing to overcome first-cost and split incentives for energy efficiency, on-site, renewables, and high efficiency distributed generation

Existing and Improved Utility Programs
- More aggressive utility programs to achieve long-term savings

Other Needed Strategies
- Water system and water use efficiency and conservation measures
- Local government programs that lead by example and tap into local authority over planning, development, and code compliance
- Additional industrial and agricultural efficiency initiatives
- Providing real time energy information technologies to help consumers conserve and optimize energy performance

With the support of key State agencies, utilities, local governments and others, the CPUC has recently adopted the *California Long Term Energy Efficiency Strategic Plan.*[34] Released September 2008, this Plan sets forth a set of strategies toward maximizing the achievement of cost-effective energy efficiency in California's Electricity and Natural Gas sectors between 2009 and 2020, and beyond. Its

[33] Zero net energy refers to building energy use over the course of a typical year. When the building is producing more electricity than it needs, it exports its surplus to the grid. When the building requires more electricity than is being produced on-site, it draws from the grid. Generally, when constructing a ZNE building, energy efficiency measures can result in up to 70% savings relative to existing building practices, which then allows for renewables to meet the remaining load.

[34] California Public Utilities Commission. *California Long Term Energy Efficiency Strategic Plan.* September 2008. http://www.californiaenergyefficiency.com/docs/EEStrategicPlan.pdf (accessed October 12, 2008).

recommendations are the result of a year-long collaboration by energy experts, utilities, businesses, consumer groups, and governmental organizations in California, throughout the west, nationally and internationally.

For many of the above goals and others, the Strategic Plan discusses practical implementation strategies, detailing necessary partnerships among the state, its utilities, the private sector, and other market players and timelines for near-term, mid-term and long-term success. While the Strategic Plan is the most current and innovative summary of energy efficiency strategies needed to meet State goals, additional planning and new strategies will likely be needed, both to achieve the 2020 emissions reduction goals and to set the State on a trajectory toward 2050.

Other innovative approaches could also be used to motivate private investment in efficiency improvements. One example that will be evaluated during the development of the cap-and-trade program is the creation of a mechanism to make allowances available within the program to provide incentives for local governments, third party providers, or others to pursue projects to reduce greenhouse gas emissions, including the bundling of energy efficiency improvements for small businesses or in targeted communities.

Solar Water Heating

Solar water heating systems offer a potential for natural gas savings in California. A solar water heating system offsets the use of natural gas by using the sun to heat water, typically reducing the need for conventional water heating by about two-thirds. Successful implementation of the zero net energy target for new buildings will require significant growth in California's solar water heating system manufacturing and installation industry. The State has initiated a program to move toward a self sustaining solar water heater industry. The Solar Hot Water and Efficiency Act of 2007 (SHWEA) authorized a ten year, $250-million incentive program for solar water heaters with a goal of promoting the installation of 200,000 systems in California by 2017.[35]

Combined Heat and Power

Combined heat and power (CHP), also referred to as cogeneration, produces electricity and useful thermal energy in an integrated system. The widespread development of efficient CHP systems would help displace the need to develop new, or expand existing, power plants. This measure sets a target of an additional 4,000 MW of installed CHP capacity by 2020, enough to displace approximately 30,000 GWh of demand from other power generation sources.[36]

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[35] Established under Assembly Bill 1470 (Huffman, Chapter 536, Statues of 2007).

[36] Accounting for avoided transmission line losses of seven percent, this amount of CHP would actually displace 32,000 GWh from the grid.

California has supported CHP for many years, but market and other barriers continue to keep CHP from reaching its full market potential. Increasing the deployment of efficient CHP will require a multi-pronged approach that includes addressing significant barriers and instituting incentives or mandates where appropriate. These approaches could include such options as utility-provided incentive payments, the creation of a CHP portfolio standard, transmission and distribution support payments, or the use of feed-in tariffs.

Table 7: Energy Efficiency 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 • Additional Efficiency and Conservation Programs	15.2
E-2	Increase Combined Heat and Power Use by 30,000 GWh	6.7
	Total	**21.9**

Table 8: Energy Efficiency 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 Programs	4.3
CR-2	Solar Water Heating (AB 1470 goal)	0.1
	Total	**4.4**

4. Renewables Portfolio Standard

Achieve 33 percent renewable energy mix statewide.

CEC estimates that about 12 percent of California's retail electric load is currently met with renewable resources. Renewable energy includes (but is not limited to) wind, solar, geothermal, small hydroelectric, biomass, anaerobic digestion, and landfill gas. 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 greenhouse gases from the Electricity sector. Based on Governor Schwarzenegger's call for a statewide 33 percent RPS, the Plan anticipates that California will have 33 percent of its electricity provided by renewable resources by 2020, and includes the reduction of greenhouse gas emissions based on this level.

Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006) obligates the investor-owned utilities (IOUs) 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.

In 2005, CEC and 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." The proposed opinion in the CPUC/CEC joint proceeding lends strong support for obtaining 33 percent of California's electricity from renewables, and states the two Commissions' belief that this target is achievable if the State commits to significant investments in transmission infrastructure and key program augmentation. As with the energy efficiency target, achieving the 33 percent goal will require broad-based participation from many parties and the removal of barriers. CEC, CPUC, California Independent System Operator (CAISO), and ARB are working with California utilities and other stakeholders to formally establish and meet this goal.

A key prerequisite to reaching a target of 33 percent renewables will be to provide sufficient electric transmission lines to renewable resource zones and system changes to allow integration of large quantities of intermittent wind and solar generation. The Renewable Energy Transmission Initiative (RETI) is a broad collaborative of State agencies, utilities, the environmental community, and renewable generation developers that are working cooperatively to identify and prioritize renewable generation zones and associated transmission projects. Although biomass, geothermal, and small-scale hydroelectric generation can provide steady baseload power, other renewable generation is intermittent (wind) or varies over time (solar). Therefore, integration of intermittent generation into the electricity system will require grid improvements so that fluctuations in power availability can be accommodated. Improved communications technology, automated demand response, electric sub-station improvements and other modern technologies must be implemented both to facilitate intermittent renewables, and to improve grid reliability.

Another key action that may help to achieve the renewable energy goals is to reduce the complexity and cost faced by small renewable developers in contracting with utilities to supply renewable generation. This is particularly important for projects offering below 20 megawatts of generation capacity. One such option may be a feed-in tariff for all RPS-eligible renewable energy facilities up to 20 megawatts in size. This mechanism was recommended in CEC's 2007 Integrated Energy Policy Report. Such a tariff, set at an appropriate level, could benefit small-scale facilities by allowing them to be brought into the electricity grid more rapidly.

For the purposes of calculating the reduction of greenhouse gas emissions in this Proposed Scoping 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 9.

Table 9: Renewables Portfolio Standard Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
E-3	Achieve a 33% renewables mix by 2020	21.3
	Total	**21.3**

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 emissions from this sector. Beyond including vehicle efficiency improvements and lowering vehicle miles traveled, the State is proposing to reduce the carbon intensity of transportation fuels consumed in California.

To reduce the carbon intensity of transportation fuels, ARB is developing a Low Carbon Fuel Standard (LCFS), which would reduce the carbon intensity of California's transportation fuels by at least ten percent by 2020 as called for by Governor Schwarzenegger in Executive Order S-01-07.

LCFS will incorporate compliance mechanisms that provide flexibility to fuel providers in how they meet the requirements to reduce greenhouse gas emissions. The LCFS will examine the full fuel cycle impacts of transportation fuels and ARB will work to design the regulation in a way that most effectively addresses the issues raised by the Environmental Justice Advisory Committee and other stakeholders. ARB identified the LCFS as a Discrete Early Action item, and is developing a regulation for Board consideration in March 2009. A 10 percent reduction in the intensity of transportation fuels is expected to equate to a reduction of 16.5 $MMTCO_2E$ in 2020. However, in order to account for possible overlap of benefits between LCFS and the Pavley greenhouse gas standards, ARB has discounted the contribution of LCFS to 15 $MMTCO_2E$.

Table 10: Low Carbon Fuel Standard Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-2	Low Carbon Fuel Standard (Discrete Early Action)	15
	Total	**15**

6. Regional Transportation-Related Greenhouse Gas Targets

Develop regional greenhouse gas emissions reduction targets for passenger vehicles.

Establishment of Regional Targets

On September 30, 2008, Governor Arnold Schwarzenegger signed Senate Bill 375 (Steinberg) which establishes mechanisms for the development of regional targets for reducing passenger vehicle greenhouse gas emissions. Through the SB 375 process, regions will work to integrate development patterns and the transportation network in a way that achieves the reduction of greenhouse gas emissions while meeting housing needs and other regional planning objectives. This new law reflects the importance of achieving significant additional reductions of greenhouse gas emissions from changed land use patterns and improved transportation to help achieve the goals of AB 32.

SB 375 requires ARB to develop, in consultation with metropolitan planning organizations (MPOs), passenger vehicle greenhouse gas emissions reduction targets for 2020 and 2035 by September 30, 2010. It sets forth a collaborative process to establish these targets, including the appointment by ARB of a Regional Targets Advisory Committee to recommend factors to be considered and methodologies for setting greenhouse gas emissions reduction targets. SB 375 also provides incentives – relief from certain California Environmental Quality Act (CEQA) requirements for development projects that are consistent with regional plans that achieve the targets.

Reaching the Targets

Transportation planning is done on a regional level in major urban areas, through the Metropolitan Planning Organizations. These MPOs are required by the federal government to prepare regional transportation plans (RTPs) in order to receive federal transportation dollars. These plans must reflect the land uses called out in city and county general plans. Regional planning efforts provide an opportunity for community residents to help select future growth scenarios that lead to more sustainable and energy efficient communities. Such plans should be developed through an extensive public process to provide for local accountability.

SB 375 requires MPOs to prepare a sustainable communities strategy to reach the regional target provided by ARB. MPOs would use the sustainable communities strategy for the land use pattern underlying the region's transportation plan. If the strategy does not meet the target, the MPO must document the impediments and show how the target could be met with an alternative planning strategy. The CEQA relief

would be provided to those projects that are consistent with either the sustainable communities strategy or alternative planning strategy, whichever meets the target.

Many regions in California have conducted comprehensive scenario planning, called Blueprint planning, that engages a broad set of stakeholders at the local level on the impacts of land use and transportation choices. The State has allocated resources to initiate or augment existing Blueprint efforts of MPOs. These efforts focus on fostering efficient land use patterns that not only reduce vehicle travel but also accommodate an adequate supply of housing, reduce impacts on valuable habitat and productive farmland, increase resource use efficiency, and promote a prosperous regional economy. Blueprint planning can play an important role in the SB 375 process by helping inform target-setting efforts and building strong sustainable communities strategies.

Local governments will play a significant role in the regional planning process to reach passenger vehicle greenhouse gas emissions reduction targets. 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 vehicle travel, as well as energy, water, and waste. A partnership of local and regional agencies is needed to create a sustainable vision for the future that accommodates population growth in a carbon efficient way while meeting housing needs and other planning goals. Integration of the sustainable communities strategies or alternative planning strategies with local general plans will be key to the achievement of these goals. State, regional, and local agencies must work together to prioritize and create the supporting policies, programs, incentives, guidance, and funding to assist local actions to help ensure regional targets are met.

Enhanced public transit service combined with incentives for land use development that provides a better market for public transit will play an important role in helping to reach regional targets.

SB 375 maintains regions' flexibility in the development of sustainable communities strategies. There are many different ways regions can plan and work toward reducing the growth in vehicle travel. Increasing low-carbon travel choices (public transit, carpooling, walking and biking) combined with land use patterns and infrastructure that support these low-carbon modes of travel, can decrease average vehicle trip lengths by bringing more people closer to more destinations. The need for integrated strategies is supported by the current transportation and land use modeling literature.

Supporting measures that should be considered in both the regional target-setting and sustainable communities strategy processes include the following:

- Congestion pricing strategies can provide a method of efficiently managing traffic demand while raising funds for needed transit, biking and pedestrian infrastructure investment. Regional and local agencies, however, do not have the authority to pursue these strategies on their own, as federal approval and State

authorization must be provided for regional implementation of most pricing measures.

- Indirect source rules for new development have already been implemented by some local air districts and proposed by others for purposes of criteria pollution reduction. Regions should evaluate the need for measures that would ensure the mitigation of high carbon footprint development outside of the sustainable communities strategies or alternative planning strategies that meet the targets established under SB 375.

- Programs to reduce vehicle trips while preserving personal mobility, such as employee transit incentives, telework programs, car sharing, parking policies, public education programs and other strategies that enhance and complement land use and transit strategies can be implemented and coordinated by regional and local agencies and stakeholder groups.

Another way to encourage greenhouse gas reductions from vehicle travel is through pay as you drive insurance (PAYD), a structure in which drivers realize a direct financial benefit from driving less. The California Insurance Commissioner recently announced support for PAYD and has proposed regulations to permit PAYD on a voluntary basis.

Separate emissions reduction estimates for these strategies are not quantified here. As regional targets are developed in the SB 375 process, ARB will work with regions to quantify the benefits in the context of the targets.

Estimating the Benefits of Regional Targets

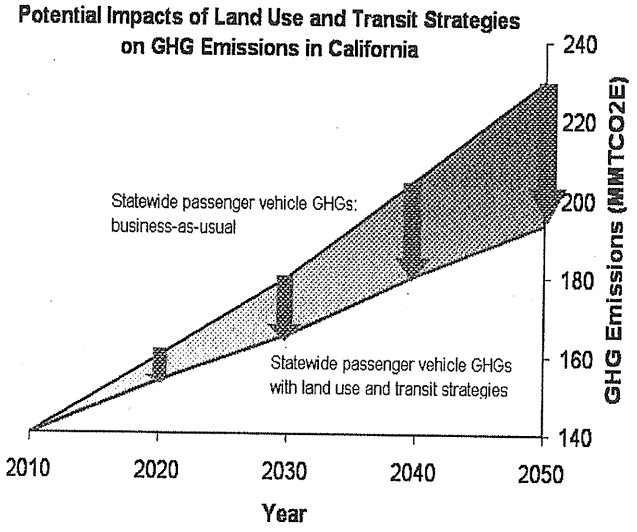
The ARB estimate of the statewide benefit of regional transportation-related greenhouse gas emissions reduction targets is based on analysis of research results quantifying the effects of land use and transportation strategies. The emissions reduction number in Table 11 is not the statewide metric for regional targets that must be developed as SB 375 is implemented. The emissions target will ultimately be determined during the SB 375 process.

The possible impacts of land use and transportation policies have been well documented. Most recently, a 2008 U.C. Berkeley study[37] reviewed over 20 modeling studies from California (including the State's four largest MPOs), other states and Europe. The study found a range of 0.4 to 7.7 percent reduction in vehicle miles traveled (VMT) resulting from a combination of land use and enhanced transit policies compared to a business-as-usual case over a 10-year horizon, with benefits doubling by 2030, as shown in Figure 4. With the inclusion of additional measures

[37]Rodier, Caroline. U.C. Berkeley, Transportation Sustainability Research Center, "A Review of the International Modeling Literature: Transit, Land Use, and Auto Pricing Strategies to Reduce Vehicle Miles Traveled and Greenhouse Gas Emissions," August 2008. http://www.arb.ca.gov/planning/tsaq/docs/rodier_8-1-08_trb_paper.pdf (accessed October 12, 2008)

such as pricing policies, the reduction of greenhouse gas emissions can be greater. These strategies will be considered during the target-setting process. Sophisticated land use and transportation models can best assess these effects. As part of the development of regional targets, technical tools will need to be refined to ensure sound quantification techniques are available.

Figure 4



The potential benefits of this measure that can be realized by 2020 (as shown in Table 11) were estimated after first accounting for the benefits of the vehicle technology and efficiency measures in the plan. It was calculated based on the U.C. Berkeley study's median value of 4 percent per capita VMT reduction over a 10-year time horizon. This value should not be interpreted as the final estimate of the benefits of this measure. The current academic literature supports this realistic statewide estimate of potential benefits, but the ultimate benefit will be determined as an outcome of SB 375 implementation on a regional level. The incentives for sustainable planning in SB 375 can set California on a new path. ARB's establishment of regional targets in 2010, combined with the Regional Targets Advisory Committee process, required by the legislation, provides a clear mechanism for maximizing the benefits of this measure.

Additional Benefits of Regional Targets and Land Use Strategies

Land use and transportation measures that help reduce vehicle travel will also provide multiple benefits beyond greenhouse gas reductions. Quality of life will be improved by increasing access to a variety of mobility options such as transit, biking, and walking, and will provide a diversity of housing options focused on proximity to jobs, recreation, and services. Other important state and community goals that could be met through better integrated land use and transportation planning include

agricultural, open space and habitat preservation, improved water quality, positive health effects, and the reduction of smog forming pollutants.

Growing more sustainably has the potential to provide additional greenhouse gas and energy savings by encouraging more compact, mixed-use developments resulting in reduced demand for electricity and heating and cooling energy. These land use-related energy savings will contribute toward the Plan's energy efficiency measures to achieve the goal of reducing electricity and natural gas usage. ARB is continuing to evaluate the greenhouse gas emissions reductions that may be additional to the proposed measures in this plan.

Table 11: Regional Transportation-Related Greenhouse Gas Targets Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-3	Regional Transportation-Related Greenhouse Gas Targets[38]	5
	Total	**5**

7. Vehicle Efficiency Measures

Implement light-duty vehicle efficiency measures.

Several additional measures could reduce light-duty vehicle greenhouse gas emissions. The California Integrated Waste Management Board (CIWMB) with various partners continues to conduct a public awareness campaign to promote sustainable tire practices. ARB is pursuing a regulation to ensure that tires are properly inflated when vehicles are serviced. In addition, CEC in consultation with CIWMB is developing an efficient tire program focusing first on data gathering and outreach, then on potential adoption of minimum fuel-efficient tire standards, and lastly on the development of consumer information requirements for replacing tires. ARB is also pursuing ways to reduce engine load via lower friction oil and reducing the need for air conditioner use. ARB is actively engaged in the regulatory development process for the tire inflation component of this measure. Current information indicates the reduction of greenhouse gas emissions is likely to be less than estimated in the Draft Scoping Plan. ARB has adjusted the estimated reductions shown in Table 12 to reflect this.

[38] This number represents an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target. ARB will establish regional targets for each MPO region following the input of the Regional Targets Advisory Committee and a public consultation process with MPOs and other stakeholders per SB 375.

Table 12: Vehicle Efficiency Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-4	Vehicle Efficiency Measures	4.5
	Total	**4.5**

8. Goods Movement

Implement adopted regulations for the use of shore power for ships at berth. Improve efficiency in goods movement activities.

A significant portion of greenhouse gas emissions from transportation activities comes from the movement of freight or goods throughout the state. Activity at California ports is forecast to increase by 250 percent between now and 2020. Both the Goods Movement Emission Reduction Plan (GMERP) and the 2007 State Implementation Plan (SIP) contain numerous measures designed to reduce the public health impact of goods movement activities in California. 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 gas emissions while cutting criteria pollutant and toxic diesel emissions. ARB is proposing to develop and implement additional measures to reduce greenhouse gas emissions due to goods movement from trucks, ports and other related facilities. The anticipated reductions would be above and beyond what is already expected in the GMERP and the SIP. This effort should provide accompanying reductions in air toxics and smog forming emissions. The estimated reduction of greenhouse gas emissions is shown in Table 13.

After further evaluation, ARB incorporated the Draft Scoping Plan's Heavy-Duty Vehicle-Efficiency measure into the Goods Movement measure. A Heavy-Duty Engine Efficiency measure could reduce emissions associated with goods movement through improvements which could involve advanced combustion strategies, friction reduction, waste heat recovery, and electrification of accessories. ARB will consider setting requirements and standards for heavy-duty engine efficiency in the future if higher levels of efficiency are not being produced either in response to market forces (fuel costs) or federal standards.

Table 13: Goods Movement Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-5	Ship Electrification at Ports (Discrete Early Action)	0.2
T-6	Goods Movement Efficiency Measures • System-Wide Efficiency Improvements	3.5
	Total	**3.7**

9. 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 capacity 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 includes CPUC's California Solar Initiative and 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 emissions reductions are shown in Table 14.

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 14: Million Solar Roofs Recommendation
(MMTCO$_2$E in 2020)

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

10. Medium/Heavy-Duty Vehicles

Adopt medium and heavy-duty vehicle efficiency measures.

Medium- and heavy-duty vehicles account for approximately 20 percent of the transportation greenhouse gas inventory. Requiring retrofits to improve the fuel efficiency of heavy-duty trucks could include a requirement for devices that reduce aerodynamic drag and rolling resistance. In addition, hybridization of medium- and heavy-duty vehicles would also reduce greenhouse gas emissions through increased fuel efficiency. Hybrid trucks would likely achieve the greatest benefits in urban, stop-and-go applications, such as parcel delivery, utility services, transit, and other

vocational work trucks. The recommendation for this sector is summarized in Table 15.

Table 15: Medium/Heavy-Duty Vehicle Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-7	Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction Measure - Aerodynamic Efficiency (Discrete Early Action)	0.9
T-8	Medium/Heavy-Duty Vehicle Hybridization	0.5
	Total	**1.4**

11. Industrial Emissions

Require assessment of large industrial sources to determine whether individual sources within a facility can cost-effectively reduce greenhouse gas emissions and provide other pollution reduction co-benefits. Reduce greenhouse gas emissions from fugitive emissions from oil and gas extraction and gas transmission. Adopt and implement regulations to control fugitive methane emissions and reduce flaring at refineries.

Energy Efficiency and Co-Benefits Audits for Large Industrial Sources

This measure would apply to the direct greenhouse gas emissions at major industrial facilities emitting more than 0.5 $MMTCO_2E$ per year. In general, these facilities also have 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 energy efficiency audit of individual combustion and other direct sources of greenhouse gases within the facility to determine the potential reduction opportunities, including 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 boilers and heaters, or replacing the units with combined heat and power (CHP) units. The measure is summarized in Table 16.

The audit would help ARB to identify potential reductions of greenhouse gas emissions reductions, the associated costs and cost-effectiveness, their technical feasibility, and the potential to reduce air pollution impacts at the local or regional level. ARB will use the results to determine if certain emissions sources within a facility can make cost-effective reductions of greenhouse gas emissions that also provide 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 reductions. Nothing in this measure would delay known cost-effective strategies that otherwise would be required.

The California Long Term Energy Efficiency Strategic Plan (CPUC) discusses a number of strategies associated with improving industrial sector efficiency and greenhouse gas emissions reductions, including the development of certification protocols for industrial efficiency improvements to develop market recognition for efficiency gains.

Oil and Gas Recovery Operations and Transmission/Refineries

California is a major oil and gas producer. Crude oil, both from in-state and imported sources, is processed at 21 oil refineries in the state. In addition to conforming to the requirements of the cap-and-trade program and the audit measure, ARB has identified four specific measures for development and implementation, two for oil and gas recovery operations and gas transmission, and two for refineries. Other industrial measures that were under consideration affect greenhouse gas emissions sources that are fully regulated under cap and trade, which ARB concluded would provide cost-effective reductions of greenhouse gas emissions. All measures would be designed to secure a combination of cost-effective reductions in greenhouse gas emissions, criteria air pollutants and air toxics. Two measures would be developed to reduce methane emissions in the oil and gas production and gas transmission processes from leaks and incomplete combustion of methane (used as fuel). These measures would include improved leak detection, process modifications, equipment retrofits, installation of new equipment, and best management practices. The first measure would affect oil and gas producers. The second would impact operators of natural gas pipeline systems. These fugitive emissions are not proposed to be covered by a cap and trade program, although combustion-related emissions from these operations are proposed to be covered. The WCI partner jurisdictions are currently evaluating the inclusion of fugitive methane emissions to the extent that adequate quantification methods exist. During implementation of this measure, ARB will determine whether these emissions will also be covered in California's cap-and-trade program. If the emissions are covered under the cap, ARB will evaluate the need for the measures described here.

Two measures would be developed for oil refineries. The first would limit the greenhouse gas emissions from refinery flares while preserving flaring as needed for safety reasons. The second would remove the current fugitive methane exemption in most refinery Volatile Organic Compounds (VOC) regulations. This exemption was established because methane does not appreciably contribute to urban smog, but is inappropriate given the role that methane plays in global warming. ARB believes these measures would provide cost-effective greenhouse gas, criteria pollutants and air toxics emissions reductions. Most combustion and other process emissions at refineries would be governed by the cap-and-trade program. As with the oil and gas production measures above, the need for these measures would be evaluated if fugitive methane is included in the WCI cap-and-trade program.

Table 16: Industrial Emissions Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
I-1	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	TBD
I-2	Oil and Gas Extraction GHG Emissions Reduction	0.2
I-3	GHG Leak Reduction from Oil and Gas Transmission	0.9
I-4	Refinery Flare Recovery Process Improvements	0.33
I-5	Removal of Methane Exemption from Existing Refinery Regulations	0.01
	Total	**1.4**

12. 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 26 percent of the projected 2030 full system ridership levels. The anticipated reduction of greenhouse gas emissions are shown in Table 17. HSR system ridership and the benefits associated with it are anticipated to increase over time as additional portions of the planned system are completed. Over the long term, the system also has the potential to support the reduction of greenhouse gas emissions in the transportation sector from land use strategies, by providing opportunities for and encouraging low-impact transit-oriented development.

HSR implementation is dependent on voter approval, and the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century" will appear on the November 2008 ballot as Proposition 1A. If Proposition 1A is approved, construction of HSR is anticipated to begin in 2010, with full implementation anticipated in 2030.

Table 17: High Speed Rail Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-9	High Speed Rail	1.0
	Total	**1.0**

13. Green Building Strategy

Expand the use of green building practices to reduce the carbon footprint of California's new and existing inventory of buildings.

Collectively, energy use and related activities by buildings are the second largest contributor to California's greenhouse gas emissions. Almost one-quarter of California's greenhouse gas emissions can be attributed to buildings.[39] As the Governor recognized in his Green Building Initiative (Executive Order S-20-04), significant reductions in greenhouse gas emissions can be achieved through the design and construction of new green buildings as well as the sustainable operation, retrofitting, and renovation of existing buildings.

A Green Building strategy offers a comprehensive approach to reducing direct and upstream greenhouse gas emissions that cross-cuts multiple sectors including Electricity/Natural Gas, Water, Recycling/Waste, and Transportation. Green buildings are designed, constructed, renovated, operated, and maintained using an integrated approach that reduces greenhouse gas emissions by maximizing energy and resource efficiency. Employing a whole-building design approach can create tremendous synergies that result in multiple benefits at little or no net cost, allowing for efficiencies that would never be possible on an incremental basis.

A Green Building strategy will produce greenhouse gas saving through buildings that exceed minimum energy efficiency standards, decrease consumption of potable water, reduce solid waste during construction and operation, and incorporate sustainable materials. Combined these measures can also contribute to healthy indoor air quality, protect human health and minimize impacts to the environment. A Green Building strategy also includes siting considerations. Buildings that are sited close to public transportation or near mixed-use areas can work in tandem with transportation-related strategies to decrease greenhouse gas emissions that result from that sector.

In July 2008, the California Building Standards Commission (CBSC) adopted the Green Building Standards Code (GBSC) for all new construction in the state. While the current version of the commercial green building code is voluntary, CBSC anticipates adopting a mandatory code in 2011 which will institute minimum environmental performance standards for all occupancies. The Green Building Strategy includes Zero Net Energy (ZNE) goals for new and existing homes and commercial buildings consistent with the recently-adopted California Long Term Energy Efficiency Strategic Plan. ARB encourages local governments to raise the bar by adopting "beyond-code" green building requirements. To assist this effort, State government would develop and regularly tighten voluntary standards, written in GBSC language for easy adoption by local jurisdictions.

[39] Greenhouse gas emission estimates from electricity, natural gas, and water use in homes and commercial buildings.

As we approach the 2020 and 2030 targets for zero energy buildings, these "percent above code" targets must shift to "percent of ZNE" targets. Zero energy new and existing buildings can be an overarching and unifying concept for energy efficiency in buildings, as discussed above (building energy efficiency measures E-1 and CR-1). In order to achieve statewide GHG emission reductions, these targets should be expanded to address other aspects of environmental performance. For example, these targets could be re-framed as a carbon footprint reduction goal for a 35 percent reduction in both energy and water consumption. For commercial buildings, a 2011 target should be established such that a quarter of all new buildings reduce energy and water consumption by at least 25 percent beyond code.

Furthermore, retrofitting existing residential and commercial buildings would achieve substantial greenhouse gas emissions reduction benefits. This Proposed Scoping Plan recommends the establishment of an environmental performance rating system for homes and commercial buildings and further recommends that California adopt mechanisms to encourage and require retrofits for buildings that do not meet minimum standards of performance.

An effective green building framework can operate to deliver reductions of greenhouse gas emissions in multiple sectors. The green building strategies provide a vehicle to achieve the statewide electricity and natural gas efficiency targets and lower greenhouse gas emissions from the waste and water transport sectors. Achieving these green building emissions reductions will require coordinated efforts from a broad range of stakeholders, and new financing mechanisms to motivate investment in green building strategies.

Achieving significant greenhouse gas emissions reductions from new and existing buildings will require a combination of green building measures for new construction and retrofits to existing buildings. The State of California will set an example by requiring all new State buildings to exceed existing Green Building Initiative energy goals and achieve nationally-recognized building sustainability standards such as Leadership in Energy and Environmental Design - New Construction (LEED-NC) "Gold" certification. Existing State buildings would also be retrofitted to achieve higher standards equivalent to LEED-EB for existing buildings (EB) "Silver." All new schools should be required to meet the Collaborative for High Performance Schools (CHPS) 2009 criteria. Existing schools applying for modernization funds should also be required to meet CHPS 2009 criteria.

ARB estimates that the greenhouse gas savings from green building measures as approximately 26 $MMTCO_2E$, as shown in Table 18 below. Most of these reductions are accounted for in the Electricity, Waste, Water, and Transportation sectors. Because of this, ARB has assigned all emissions reductions that occur as a result of green building strategies to other sectors for purposes of meeting AB 32 requirements, but will continue to evaluate and refine the emissions from this sector. As such, this strategy will require implementation from various entities within

California, including CEC, PUC, State Architect, and others, each taking the lead in their area of authority and expertise.

Table 18: Green Buildings Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
GB-1	Green Buildings[40]	26
	Total	**26**

14. High Global Warming Potential Gases

Adopt measures to reduce high global warming potential gases.

High global warming potential (GWP) gases pose a unique challenge. Just a few pounds of high GWP materials can have the equivalent effect on global warming as several *tons* 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 would have a global warming impact equivalent to five metric tons of CO_2.

High GWP chemicals are very common and are used in many different applications such as refrigeration, air conditioning systems, fire suppression systems, and 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 primarily in two ways. The first is through leaking systems, and 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. Recommended measures to address this growing problem take the form of direct regulations and use of mitigation fees.

ARB identified four Discrete Early Action measures to reduce greenhouse gas emissions from the refrigerants used in car air conditioners, semiconductor manufacturing, air quality tracer studies, and consumer products. ARB has identified additional potential reduction opportunities 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 as well as stationary refrigeration equipment do not leak. Recovery and destruction of high GWP materials in the banks described above could also provide significant reductions.

[40] Although some of these emissions reductions may be additional, most of them are accounted for in the Energy, Waste, Water, and Transportation sectors. In addition, some of these reductions may occur out of state, making quantification more difficult. Because of this, these emissions reductions are not currently counted toward the AB 32 2020 goal.

ARB is also proposing to establish an upstream mitigation fee on the use of high GWP gases. Even with the reductions from the specific high GWP measures described above, this sector's emissions are still projected to more than double from current levels by 2020. This is because of the high growth in the sector due, in part, to the replacement of ozone-depleting substances being phased out of production. These emissions would be difficult to address via traditional approaches since the gases are used in small quantities in very diverse applications. Additionally, there are no proven substitutes or alternatives for some uses, and the relative low price of most high GWP compounds provides little incentive to develop alternatives, reduce leakage, or recover the gases at end-of-life.

An upstream fee would ensure that the climate impact of these substances is reflected in the total cost of the product, encouraging reduced use and end-of-life losses, as well as the development of alternatives. The fee would be variable and associated with the impact the product makes on public health and the environment. This could encourage product innovation because fees would correspondingly decrease as the manufacturer or producer redesigned their product or found lower-cost alternatives. This mitigation fee would complement many of the downstream high GWP regulations currently being developed.[41] Fees on high GWP gases would be set to be consistent with the cost of reducing greenhouse gas emissions and could be set to reduce multiple environmental impacts. Revenues could be used to mitigate greenhouse gas emissions either from other high GWP compounds or other greenhouse gases.

Table 19 summarizes the recommendations 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. The emissions reductions shown are only for the six greenhouse gases explicitly identified in AB 32.

[41] Industrial process emissions of high GWP gases are also expected to be part of the cap-and-trade program. As ARB moves through the rulemaking for both the high GWP fee and the cap-and-trade program, staff will evaluate whether these are complementary approaches or if one or the other needs to be adjusted to prevent duplicative regulation of the industrial process emissions of these gases.

Table 19: High GWP Gases Sector Recommendation
($MMTCO_2E$ 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)	0.26
H-2	SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)	0.3
H-3	Reduction of Perfluorocarbons in Semiconductor Manufacturing (Discrete Early Action)	0.15
H-4	Limit High GWP Use in Consumer Products (Discrete Early Action) (Adopted June 2008)	0.25
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 Stationary Equipment Refrigerant Management Program: o Refrigerant Tracking/Reporting/Repair Deposit Program o Specifications for Commercial and Industrial Refrigeration Systems • 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	10.9
H-7	Mitigation Fee on High GWP Gases[42]	5
	Total	**20.2**

[42] The 5 $MMTCO_2E$ reduction is an estimate of what might occur with a fee in place. Additional emissions reductions from a fee would be expected as resulting revenues are used in mitigation programs. Using the funds to mitigate greenhouse gas emissions could substantially increase the emissions reductions from this measure.

15. Recycling and Waste

Reduce methane emissions at landfills. Increase waste diversion, composting, and commercial recycling. Move toward zero-waste.

California has a long track record of reducing greenhouse gas emissions by turning waste into resources, exemplified by the waste diversion rate from landfills of 54 percent (which exceeds the current 50 percent mandate) resulting from recovery of recyclable materials. Re-introducing recyclables with intrinsic energy value back into the manufacturing process reduces greenhouse gas emissions from multiple phases of product production including extraction of raw materials, preprocessing and manufacturing. Additionally, by recovering organic materials from the waste stream, and having a vibrant compost industry, there is an opportunity to further reduce greenhouse gas emissions through the indirect benefits associated with the reduced need for water and fertilizer for California's Agricultural sector. Incentives may also be an effective way to secure greenhouse gas emissions reductions in this sector. Table 20 summarizes the emissions reductions from Recycling and Waste sector.

Reduction in Landfill Methane

Methane emissions from landfills, generated when wastes decompose, account for one percent of California's greenhouse gas emissions. Greenhouse gas emissions can be substantially reduced by properly managing all materials to minimize the generation of waste, maximize the diversion from landfills, and manage them to their highest and best use. Capturing landfill methane results in greenhouse gas benefits, as well as reductions in other air pollutants such as volatile organic compounds. ARB is working closely with the California Integrated Waste Management Board (CIWMB) to develop a Discrete Early Action measure for landfill methane control that will be presented to ARB in January.

CIWMB is also pursuing efforts to reduce methane emissions by diverting organics from landfills, and to promote best management practices at smaller uncontrolled landfills. Landfill gas may also provide a viable source of liquefied natural gas (LNG) vehicle fuel. Reductions from these types of projects would be accounted for in the Transportation sector.

High Recycling / Zero Waste

This measure reduces greenhouse gas emissions primarily by reducing the substantial energy use associated with the acquisition of raw materials in the manufacturing stage of a product's life-cycle. As virgin raw materials are replaced with recyclables, a large reduction in energy consumption should be realized. Implementing programs with a systems approach that focus on consumer demand, manufacturing, and movement of products will result in the reduction of greenhouse gas emissions and other co-benefits. Reducing waste and materials at the source of generation, increased use of compost to benefit soils, coupled with increased recycling – especially in the commercial sector – and Extended Producer Responsibility (EPR)

plus Environmentally Preferable Purchasing (EPP) also have the potential to reduce emissions, both in-state and within the connected global economy. This measure could also assist in meeting the 33 percent renewables energy goal through deployment of anaerobic digestion for production of fuels/energy.

As noted by ETAAC, recycling in the commercial sector could be substantially increased. This could be implemented, for example, through voluntary or mandatory programs, including protocols, enhanced partnerships with local governments, and provision of appropriate financial incentives. ARB will work with CIWMB to develop and implement these types of programs. ARB will also work with CIWMB, the California Department of Food and Agriculture, the Department of Transportation, and others to provide direct incentives for the use of compost in agriculture and landscaping. Further, CIWMB will explore the use of incentives for all Recycling and Waste Management measures, including for commercial recycling and for local jurisdictions to encourage the collection of residentially and commercially-generated food scraps for composting and in-vessel anaerobic digestion.

Table 20: Recycling and Waste Sector Recommendation - Landfill Methane Capture and High Recycling/Zero Waste
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
RW-1	Landfill Methane Control (Discrete Early Action)	1
RW-2	Additional Reductions in Landfill Methane • Increase the Efficiency of Landfill Methane Capture	TBD
RW-3	High Recycling/Zero Waste • Commercial Recycling • Increase Production and Markets for Compost • Anaerobic Digestion • Extended Producer Responsibility • Environmentally Preferable Purchasing	9
	Total	**10**[43]

16. Sustainable Forests

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

The 2020 Proposed Scoping Plan target for California's forest sector is to maintain the current 5 $MMTCO_2E$ of sequestration 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

[43] Reductions from RW-2 and RW-3 are not counted toward the AB 32 goal. ARB is continuing to work with CIWMB to quantify these emissions and determine what portion of the reductions can be credited to meeting the AB 32 2020 goal. These measures may provide greater emissions reductions than estimated.

Fire Protection has the existing authority to provide for sustainable management practices, and will, at a minimum, work to maintain current carbon sequestration levels. The Resources Agency and its departments will also have an important role to play in implementing this measure.

In addition, the Resources Agency is supporting voluntary actions, including expenditure of public funds for projects focused largely on conserving biodiversity, providing recreation, promoting sustainable forest management and other projects that also provide carbon sequestration benefits. The federal government must also use its regulatory authority to, at a minimum, maintain current carbon sequestration levels for land under its jurisdiction in California.

Forests in California are now a carbon sink. This means that atmospheric removal of carbon through sequestration is greater than atmospheric emissions from processes like fire and decomposition of wood. However, several factors, such as wildfires and forest land conversion, may cause a decline in the carbon sink. The 2020 target would provide a mechanism to help ensure that current carbon stocks are, at a minimum, maintained and do not diminish over time. The 5 $MMTCO_2E$ emission reduction target is set equal to the magnitude of the current estimate of net emissions from California's forest sector. 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 emissions 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 also 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 Department of Forestry and Fire Protection and ARB 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 insect disturbances in the Forest sector. These disturbances 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 emissions reduction goals for all sectors. Loss of forest land to development increases greenhouse gas emissions levels 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.

Going forward there are a number of forestry-related strategies that can play an important role in California's greenhouse gas emissions reduction efforts. Biomass resources from forest residue will factor into the expansion of renewable energy sources (this is currently accounted for in the Energy sector). Similarly, no reductions are yet attributed to future actions to reduce wildfire risk, but that accounting will be done following implementation. Additionally, public investments to purchase and preserve forests and woodlands would also provide greenhouse gas emission reductions that will be accounted for as projects are funded and urban forest projects can also provide the dual benefit of carbon sequestration and shading to reduce air conditioning load.

Furthermore, the Forest sector currently functions as a source of voluntary reductions that would not otherwise occur and this role could expand even further in the future. ARB has already adopted a methodology to quantify reductions from forest projects, and recently adopted additional quantification methodologies. Table 21 summarizes the emission reductions from the forest measure.

Table 21: Sustainable Forests Recommendation
(MMTCO$_2$E in 2020)

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

17. Water

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

Water use requires significant amounts of energy. Approximately one-fifth of the electricity and one-third of the non-power plant natural gas consumed in the state are associated with water delivery, treatment and 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 move, treat, and use water more efficiently. As is the case with energy efficiency, California has a long history of advancing water efficiency and conservation programs. Without this ongoing, critical work, baseline or business-as-usual greenhouse gas emissions associated with water use would be much higher than is currently the case.

Six greenhouse gas emission reduction measures are proposed for the Water sector, and are shown in Table 21. Three of the measures target reducing energy requirements associated with providing reliable water supplies and two measures are aimed at reducing the amount of non-renewable electricity associated with conveying and treating water. The final measure focuses on providing sustainable funding for

implementing these actions. The greenhouse gas emission reductions from these measures are indirectly realized through reduced energy requirements and are accounted for in the Electricity and Natural Gas sector.

In addition, a mechanism to make allowances available in a cap-and-trade program could be used to provide additional incentives for local governments, water suppliers, and third party providers to bundle water and energy efficiency improvements. This type of allowance set-aside will be evaluated during the rulemaking for the cap-and-trade program.

ARB recommends a public goods charge for funding investments in water management actions that improve water and energy efficiency and reduce GHG emissions. As noted by the Economic and Technology Advancements 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, water recycling, and other actions that improve water and energy efficiency and reduce GHG emissions. Depending on how the fee schedule is developed in a subsequent rulemaking process, a public goods charge could generate $100 million to $500 million annually. These actions would also have the co-benefit of improving water quality and water supply reliability for customers.

Table 22: Water 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	2.0
W-4	Reuse Urban Runoff	0.2
W-5	Increase Renewable Energy Production	0.9
W-6	Public Goods Charge	TBD
	Total	**4.8**[44]

18. 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.

Encouraging the capture of methane through use of manure digester systems at dairies can provide emission reductions on a voluntary basis. This measure is also a

[44] Greenhouse gas emission reductions from the water sector are not currently counted toward the 2020 goal. ARB anticipates that a portion of these reductions will be additional to identified reductions in the Electricity sector and is working with the appropriate agencies to refine the electricity/water emissions inventory.

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. Quantified reductions for this measure (shown in Table 23) are not included in the sum of statewide reductions shown in Table 2 since the initial approach is voluntary. ARB and the California Climate Action Registry worked together on a manure digester protocol to establish methods for quantifying greenhouse gas emissions reductions from individual projects; the Board adopted this protocol in September 2008. The voluntary approach will be re-assessed at the five-year update of the Scoping Plan to determine if the program should become mandatory for large dairies by 2020.

Nitrogen fertilizer, which produces 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 fertilizer N_2O emissions (Phase 1), and based on the findings, will explore opportunities for emission reductions (Phase 2).

There may be significant potential for additional voluntary reductions in the agricultural sector through strategies, such as those recommended by ETAAC. These opportunities include increases in fuel efficiency of on-farm equipment, water use efficiency, and biomass utilization for fuels and power production.

Increasing carbon sequestration, including on working rangelands, hardwood and riparian woodland reforestation, also hold potential as a greenhouse gas strategies. As we evaluate the role that this sector can play in California's emissions reduction efforts, we will explore the feasibility of developing sound quantification protocols so that these and other related strategies may be employed in the future.

Table 23: Agriculture Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
A-1	Methane Capture at Large Dairies[45]	1.0
	Total	**1.0**

D. Voluntary Early Actions and Reductions

Many individual activities that are not currently addressed under regulatory approaches can nevertheless result in cost-effective, real, additional, and verifiable greenhouse gas emissions reductions that will help California meet its 2020 target. Ensuring that appropriate credit is available to these types of emissions reduction projects will also help jump-start a new wave of technologies that will feature prominently in California and the world's long-term efforts

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

to combat climate change. ARB will pursue several approaches that will recognize and reward these types of projects.

1. Voluntary Early Action

ARB is required to design regulations to encourage early action to reduce greenhouse gas emissions, and to provide appropriate recognition or credit for that action. (HSC §38562(b)(1) and (3)) Recognizing and rewarding greenhouse gas emissions reductions that occur prior to the full implementation of the AB 32 program can set the stage for innovation by incentivizing the development and employment of new clean technologies and by generating economic and environmental benefits for California.

In February 2008, ARB adopted a policy statement encouraging the early reductions of greenhouse gas emissions.[46] The policy statement describes a process for interested parties to submit proposed emission quantification methodologies for voluntary greenhouse gas emissions reductions to ARB for review. The intent is to provide a rapid assessment of methodologies for evaluating potential greenhouse gas emissions 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 to demonstrate the creation of voluntary early reductions. ARB is currently in the process of evaluating a number of submitted project methodologies.

ARB will provide appropriate credit for voluntary early reductions that can be adequately quantified and verified through three primary means. First, within the cap-and-trade program, ARB would set aside a certain number of allowances from the first compliance period to use to reward voluntary reductions that occur before 2012. In addition, ARB will assure that the allocation process in the first compliance period does not disadvantage facilities that have made reductions after AB 32 went into effect at the start of 2007 and before 2012.[47] The third approach will be to design other regulations, to the extent feasible, to recognize and reward early action. These approaches are discussed in more detail in Appendix C.

2. Voluntary Reductions

Emissions reduction projects that are not otherwise regulated, covered under an emissions cap, or undertaken as a result of government incentive programs can generate "offsets." These are verifiable reductions whose ownership can be

[46]Board Meeting Agenda. California Air Resources Board. February 28, 2008. http://www.arb.ca.gov/board/ma/2008/ma022808.htm (accessed October 12, 2008)

[47] ARB will evaluate whether some reductions that occurred prior to AB 32 going into effect on January 1, 2007, should also receive credit under these rules. For example, many facilities in California registered with the California Climate Action Registry after its creation in 2002 to document early actions to reduce emissions by having a record of entities profiles and baselines. ARB will evaluate what reductions made prior to 2007 should be eligible for credit from the allowance set-aside as part of the cap-and-trade program rulemaking.

transferred to others. Voluntary offset markets have recently flourished as a way for companies and individuals to offset their own emissions by purchasing reductions outside of their own operations. These sorts of voluntary efforts to reduce greenhouse gas emissions can play an important role in helping the State meet its overall greenhouse gas reduction goals.

ARB will adopt methodologies for quantifying voluntary reductions. (HSC §38571) The Board adopted a methodology for forest projects in October 2007, and for local government operations, urban forestry, and manure digesters in September 2008. The recognition of voluntary reduction or offset methodologies does not in any way guarantee that these offsets can be used for other compliance purposes. The Board would need to adopt regulations to verify and enforce reductions achieved under these or other approved methodologies before they could be used for compliance purposes. (HSC §38571)

Allowance set-asides, in addition to being used to potentially reward voluntary early actions by facilities that will be included in the cap-and-trade program, could also be used to reward voluntary early action at other facilities not covered by the cap. An early action allowance set-aside could be utilized both by entities that are covered by the cap, and by those who develop emissions reducing projects outside of the cap, or purchase the reductions associated with those projects, and have not sold or used them. Additional discussion of voluntary offsets is included in Appendix C.

E. Use of Allowances and Revenues

Revenues may be generated from the implementation of various proposed components of the Scoping Plan, including by the use of auctions within a cap-and-trade system or through the imposition of more targeted measures, such as a public goods charge on water. These revenues could be used to support AB 32 requirements for greenhouse gas emissions reductions and associated socio-economic considerations. This section summarizes some of the recommendations and ideas that ARB has received to date. As discussed in the description of the cap-and-trade measure above, ARB will seek input from a broad range of experts in an open public process regarding the options for allocation and revenue use under consideration.

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 greenhouse gas emissions. 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, development and demonstration projects,
- Help bring promising and high potential technologies through the often challenging early stages of development and get them to market,
- 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.

The most appropriate use for some of the allowances and revenue generated under AB 32 may be to retain it within or return it to the sector from which it was generated. For example, CEC and CPUC specifically recommended that significant portions of the revenue generated from the electricity sector under a cap-and-trade program be used for the benefit of that sector to support investments in renewable energy, efficiency, new energy technology, infrastructure, customer utility bill relief, and other similar programs. In the case of more targeted revenues from a public goods charge, the intent would be to use the funds for program purposes within the sector in which it was raised, for example in the water sector. ARB will seek input from a broad range of experts in an open public process, and will work with other agencies, the WCI partner jurisdictions, and stakeholders to consider the options for use of revenues from the AB 32 program.

Possible uses of allowances and of the revenue generated under the program include:

- **Reducing costs of emissions reductions or achieving additional reductions** – Funding energy efficiency and renewable resource development could lower overall costs to consumers and companies, and provide the opportunity to achieve greater emissions 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 greenhouse gas 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 could lead to shorter commutes and encourage walking, bicycling and the use of public transit. Funding of other incentives for local governments could also be used to increase recycling, composting, and to generating renewable energy from anaerobic digestion.
- **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 which will be detailed in the State's Climate Adaptation Strategy being prepared by the Resources Agency to be completed in early 2009.
- **Subsidies** – Revenues could be used to reduce immediate cost impacts to covered industries required to make substantial upfront capital investments to reduce greenhouse gas emissions.
- **RD&D funding** – Revenues could be used to support research, development, and deployment of green technologies.
- **Worker transition assistance** – Regulating greenhouse gas emissions will probably shift economic growth to some sectors and green technologies and away from higher carbon intensity industries. Worker training programs could help the California labor force be competitive in these new industries.
- **Administration of a greenhouse gas program** – A portion of revenues could be used to underwrite the State's AB 32 programs and operating costs.
- **Direct emission reductions** – Revenues could be used to purchase greenhouse gas reductions for the sole purpose of retirement, providing direct additional greenhouse gas emission reductions. Potential projects, such as afforestation and reforestation, would both sequester CO_2 and provide other environmental 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 greenhouse gas emissions reduction program directs public and private investment toward the most disadvantaged communities in California.

III. EVALUATIONS

The primary purpose of the Scoping Plan is to develop a set of measures that will provide the maximum technologically feasible and cost-effective greenhouse gas emission reductions. In developing this Plan, ARB evaluated the effect of these measures on California's economy, environment, and public health. This Chapter outlines these analyses.

ARB conducted 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, to the extent feasible, the Board will consider direct, indirect and cumulative emission impacts, and localized impacts in communities that are already adversely impacted by air pollution (HSC §38570(b)).

Based on the evaluation of the recommendations included in this Proposed Plan, implementing AB 32 is expected to have an overall positive effect on the economy. In addition, implementation of the measures in the Recommended Actions section (Chapter II) will reduce statewide oxides of nitrogen (NOx), volatile organic compounds (VOC) and atmospheric particulate matter (PM) emissions primarily due to reduced fuel consumption, with resulting public health benefits. ARB will also work at the measure-specific level to further maximize the public health benefits that can accompany implementation of greenhouse gas emissions reduction strategies. The following sections provide a summary of the ARB evaluations of the recommended measures included in this Proposed Scoping Plan. More detailed information on the evaluations and their results are provided in Appendices G and H.

A. Economic Modeling

To evaluate the economic impacts of the Scoping Plan, ARB compared estimated economic activity under a business-as usual (BAU) case to the results obtained when actions recommended in this Plan are implemented. The BAU case is briefly described below. The estimated costs and savings used as model inputs for individual measures are outlined in Appendix G, and additional documentation on the calculation of those costs and savings is provided in Appendix I. All dollar estimates are in 2007 dollars.

Under the BAU case, Gross State Product (GSP) in California is projected to increase from $1.8 trillion in 2007 to almost $2.6 trillion in 2020. The results of our economic analysis indicate that implementation of the Scoping Plan will have an overall positive net economic benefit for the state. Positive impacts are anticipated primarily because the investments motivated by several measures result in substantial energy savings that more than pay back the cost of the investments at expected future energy prices.

The business-as-usual case is a representation of what the State of the California economy will be in the year 2020 assuming that none of the measures recommended in the Scoping Plan are implemented. While a number of the measures in the plan will be implemented as the result of existing federal or State policies and do not require additional regulatory action resulting from the implementation of AB 32, they are not included in the BAU case to ensure that the economic impacts of all of the measures in the Scoping Plan are fully assessed.

The BAU case is constructed using forecasts from the California Department of Finance, the California Energy Commission, and other sources, and is described in more detail in Appendix G. ARB used a conservative estimate of future petroleum price in this analysis, $89 per barrel of oil in 2020. Aspects of the BAU case are subject to uncertainty, for example, the possibility that future energy prices could deviate from those that are included in the BAU case.

1. Macro-economic Modeling Results

Table 24 summarizes the key findings from the economic modeling. Gross State Product, personal income and employment are shown for 2007 and for two cases for 2020, the BAU case and for implementation of the Proposed Scoping Plan. For both the BAU case and the Scoping Plan case, Gross State Product increases by almost $800 billion between 2007 and 2020, personal income grows by 2.8 percent per year from $1.5 trillion in 2007 to $2.1 trillion in 2020, and employment grows by 0.9 percent per year from 16.4 million jobs in 2007 to 18.4 million (BAU) or 18.5 million (Scoping Plan) in 2020. The results consistently show that implementing the Scoping Plan will not only significantly reduce California's greenhouse gas emissions, but will also have a net positive effect on California's economic growth through 2020.

Table 24: Summary of Key Economic Findings from Modeling the Scoping Plan Using E-DRAM

Economic Indicator	2007	Business-as-Usual*		Scoping Plan		
		2020	Average Annual Growth	2020	Change from BAU	Average Annual Growth
Gross State Product ($Billion)	1,811	2,586	2.8%	2,593	0.3%	2.8%
Personal Income ($Billion)	1,464	2,093	2.8%	2,109	0.8%	2.8%
Employment (Million Jobs)	16.41	18.41	0.9%	18.53	0.7%	0.9%
Emissions ($MMTCO_2E$)	500**	596	1.4%**	422	-28%	-1.2%**
Carbon Prices (Dollars)	-	-	-	10.00	NA	-

* Business-as-usual is a forecast of the California economy in 2020 without implementation of any of the measures identified in the Proposed Scoping Plan.

** Approximate value. ARB is in currently estimating greenhouse gas emissions for 2007.

The macroeconomic modeling results presented here understate the benefits of market-based policies, including the cap-and-trade program. Consequently, our estimate of the economic impact of implementing the Scoping Plan understates the positive impact on the California economy. Nonetheless, using the current best estimates of the costs and savings of the measures, which are documented in Appendix I, the models demonstrate that implementing the Plan will have a positive effect on California's economy.

The modeling results reflect a carbon price for the cap-and-trade program of $10 per-ton. It is important to note that the $10 per-ton figure does not reflect the average cost of reductions; rather it is the *maximum* price at which reductions to achieve the cap are pursued based on the marketing program.

The positive impacts are largely attributable to savings that result from reductions in expenditures on energy. These savings translate into increased consumer spending on goods and services other than energy. Many of the measures entail more efficient use of energy in the economy, with savings that exceed their costs. In this way, investment in energy efficiency results in money pumped back into local economies. Table 25 summarizes the energy savings that are projected from implementation of the Scoping Plan. These savings are estimated to exceed $20 billion annually by 2020.

Table 25: Fuels and Electricity Saved in 2020 from Implementation of the Scoping Plan

	Gasoline	Diesel	Electricity	Natural Gas*
Use Avoided**	4,600 million gallons	670 million gallons	74,000 GWh	3,400 million therms
Value of Avoided Fuel Use (Million $2007)	$17,000	$2,500	$6,400***	$2,700
Percent Reduction from BAU	25%	17%	22%****	24%

* Not including natural gas for electric generation.

** These estimates are based on reduced use of these fuels due to increased efficiencies, reduced vehicle miles travelled, etc. Changes to the fuel mix, such as those called for under the RPS or the LCFS, are not included here. These estimates are not the same as the estimates of reduced fuel consumption used in the public health analysis.

*** Based on estimated avoided cost based on average base-load electricity, including generation, transmission and distribution.

**** This is as a percentage of BAU total California electricity consumption in 2020.

2. Impact on Specific Business Sectors

As indicated in Table 26 and Table 27, the effects of the Plan are not uniform across sectors. Implementation of the Scoping Plan would have the strongest positive impact on output and employment for the agriculture, forestry and fishing sector, the

finance, insurance and real estate sector, and the mining sector. Similar to the statewide economic impacts projected by the model, however, these results also indicate that relative to the business-as-usual case, the impacts due to implementation of the Plan change current growth projections for most sectors by only very small amounts.

Table 26 and Table 27 also show that a decrease in output is projected for the utility and retail trade sectors as compared to the business-as-usual case, and a decrease in employment is projected for the utility sector. In the utility sector, the modeling indicates that implementation of the Scoping Plan would significantly reduce the need for additional power generation and natural gas consumption, which subsequently reduces the growth in output for this sector. This results in a reduction from business-as-usual for economic output and employment of approximately 17 and 15 percent respectively in 2020. The primary reason for these projections is the implementation of efficiency measures and programs for both consumers and producers. While increasing spending on efficiency and renewable energy is expected to increase employment, many of the resulting jobs will not appear in the utility sector.

The retail trade sector, which is projected to grow by nearly 50 percent in both the business-as-usual and the Scoping Plan case, is also projected to experience a slight net decline in output relative to business-as-usual. Since gasoline is considered a consumer retail purchase under this model, the reduced growth is mostly due to the decrease of approximately $19 billion in retail transportation fuel purchases, which is largely offset by the positive $14 billion increase in spending at other retail enterprises.

Table 26: Summary of Economic Output by Sector from Modeling the Scoping Plan Using E-DRAM

Sector	Output ($Billions)			
	2007	Business-as-Usual	Scoping Plan	Percent Change from BAU
Agriculture, Forestry and Fishing	76	109	113	3.9%
Mining	27	29	31	7.2%
Utilities	51	72	60	-16.7%
Construction	114	164	166	1.7%
Manufacturing	673	943	948	0.5%
Wholesale Trade	120	171	173	1.0%
Retail Trade	207	296	291	-1.6%
Transportation and Warehousing	76	109	111	1.9%
Information	164	235	238	1.1%
Finance, Insurance and Real Estate	391	559	572	2.3%
Services	636	910	927	1.9%
Government	-	-	-	-
Total	**2,535**	**3,597**	**3,630**	**0.8%**

Table 27: Summary of Employment Changes by Sector from Modeling the Scoping Plan Using E-DRAM

Sector	Employment (thousands)			
	2007	Business-as-Usual	Scoping Plan	Percent Change from BAU
Agriculture, Forestry and Fishing	398	449	464	3.5%
Mining	26	26	26	1.3%
Utilities	60	67	57	-14.7%
Construction	825	929	934	0.5%
Manufacturing	1,821	2,046	2,057	0.5%
Wholesale Trade	703	791	793	0.1%
Retail Trade	1,688	1,901	1,916	0.8%
Transportation and Warehousing	447	503	510	1.2%
Information	398	448	450	0.4%
Finance, Insurance and Real Estate	911	1,026	1,046	2.0%
Services	5,975	6,729	6,773	0.7%
Government	3,100	3,491	3,502	0.3%
Total	**16,352**	**18,405**	**18,528**	**0.6%**

3. Household Impacts

Implementation of the Scoping Plan will provide low- and middle-income households savings on the order of a few hundred dollars per year in 2020 compared to the business-as-usual case, primarily as a result of increased energy efficiencies.

Low-Income Households: Based on current U.S. Department of Health and Human Services poverty guidelines, we evaluated the projected impacts of the plan on households with earnings at or below both 100 and 200 percent of the poverty guidelines. For all households, including those with incomes at 100 percent and 200 percent of the poverty level, implementation of the Scoping Plan produces a slight increase in per-capita income relative to the business-as-usual case.

At the same time, the analysis projects an increase of approximately 50,000 jobs available for lower-income workers[48] relative to business-as-usual as a result of implementing the Plan. The largest employment gains come in the retail, food service, agriculture, and health care fields. A decline in such jobs is projected in the retail gasoline sector due to the overall projected decrease in output from this sector. This decline, however, is more than offset by the increases experienced in other areas.

Another important factor to consider when analyzing the impact of the Scoping Plan on households is how it will affect household expenditures. As indicated in Table 28, analysis based on the modeling projections estimates a savings (i.e., reduced expenditures) of around $400 per household in 2020 for low-income households under both federal poverty guideline definitions. These savings are driven primarily by the implementation of the clean car standards and energy efficiency measures in the Scoping Plan that over time are projected to outweigh potential increases in electricity and natural gas prices that may occur. As the measures in the Scoping Plan are implemented, ARB will work to ensure that the program is structured so that low income households can fully participate in and benefit from the full range of energy efficiency measures. Many of California's energy efficiency efforts are targeted specifically at low income populations, and the CPUC's Long Term Strategic Plan for energy efficiency has redoubled its objective for the delivery of energy efficiency measures to low income populations. Additional information regarding the data in Table 28 can be found in Appendix G.

[48] Low-income jobs are defined as those with a median hourly wage below $15 per hour (2007 dollars) based on wage data and staffing pattern projections from the California Employment Development Department. The shares of low-wage occupations for each industry are then applied to the corresponding E-DRAM sector employment projections.

Table 28: Impact of Implementation of the Scoping Plan on Total Estimated Household Savings in 2020 (2007 $)

Income at 100% of Poverty Guideline	Income at 200% of Poverty Guideline	Middle Income*	High Income**	All Households***
$400	$400	$500	$500	$500

* All households between 200% and 400% of the poverty guidelines.

** All households above 400% of the poverty guidelines.

*** Average of households of all income levels.

The analysis indicates that implementation of the Scoping Plan is likely to result in small savings for most Californians, with little difference across income levels. Largely due to increased efficiencies, low-income households are projected to be slightly better off from an economic perspective in 2020 as a result of implementing AB 32.

Middle-Income Households: Implementation of the plan produces a small increase in household income across all income levels, including middle-income households, relative to the business-as-usual case.[49] In terms of how jobs for middle-income households[50] would be impacted, the modeling indicates a slight overall increase of almost 40,000 in 2020.

As shown in Table 28, the analysis projects a net-savings in annual household expenditures of about $500 in 2020 for middle-income households. These savings are driven by the emergence of greater energy efficiencies that will be implemented as a result of the plan.

4. WCI Economic Analysis

The Proposed Scoping Plan recommends that California develop a cap-and-trade program that links to the broader regional market being developed by the Western Climate Initiative (WCI). In order to examine the economic impacts of WCI program design options, WCI Partner jurisdictions contracted with ICF International and Systematic Solutions, Inc. (SSI) to perform economic analyses using ENERGY 2020, a multi-region, multi-sector energy model. The WCI economic modeling results are reported in full in Appendix D and are discussed in the Background Report on the Design Recommendations for the WCI Regional Cap-and-Trade Program, also included in Appendix D.

To help inform the program design process, the WCI analysis examined the implications of key design decisions, including: program scope, allowance banking,

[49] For purposes of our analysis we define "middle-income" households as those earning between 200% and 400% of the federal poverty guidelines.

[50] Hourly wage between $15 and $30 per hour.

and the use of offsets. Due to time and resource constraints, the modeling was limited to the eight WCI Partner jurisdictions in the Western Electric Coordinating Council (WECC) area, thereby excluding from the analysis three Canadian provinces, Manitoba, Quebec, and Ontario. Future analyses are planned that will integrate these provinces so that a full assessment of the WCI Partner jurisdictions can be performed.

The WCI modeling work is not directly comparable to the ARB results reported here. The WCI analysis relies on a more aggregated set of greenhouse gas emissions reduction measures rather than the specific individual policies recommended in the Proposed Scoping Plan; it uses somewhat different assumptions regarding what measures are included in the "business-as-usual" case, and it models the entire WECC rather than California. Nevertheless, the results of the WCI modeling provide useful insight into the economic impact of greenhouse gas emissions reduction policies.

Consistent with the conclusions of the ARB evaluation, overall the WCI analysis found that the WCI Partner jurisdictions can meet the regional goal of reducing emissions to 15 percent below 2005 levels by 2020 (equivalent to the AB 32 2020 target) with small overall savings due to reduced energy expenditures exceeding the direct costs of greenhouse gas emissions reductions. The savings are focused primarily in the residential and commercial sectors, where energy efficiency programs and vehicle standards are expected to have their most significant impacts. Energy-intensive industrial sectors are estimated to have small net costs overall (less than 0.5 percent of output).

The WCI analysis does not examine the potential macroeconomic impacts of the costs and savings estimated with ENERGY 2020. The WCI Partner jurisdictions are planning to continue the analysis so that macroeconomic impacts, such as income, employment, and output, can be assessed. Once completed, the macroeconomic impacts can be compared to previous studies of cap-and-trade programs considered in the United States and Canada.

B. Green Technology

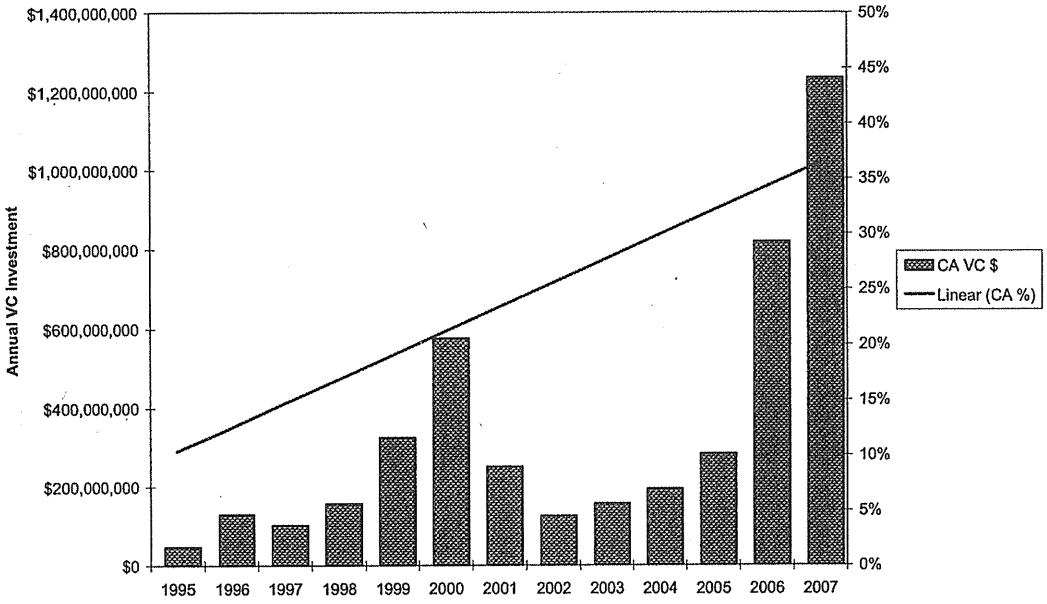
The development of green technologies and a trained workforce equipped to design, develop and deploy them will be key to the success of California's long-term efforts to combat global warming. Bold, long-range environmental policies help drive innovation and investment in emission-reducing products and services in part by attracting private capital. Typically, the private sector under invests in research and development for products that yield public benefits. However, when environmental policy is properly designed and sufficiently robust to support a market for such products, private capital is attracted to green technology development as it is to any strategic growth opportunity.

California's leadership in environmental and energy efficiency policy has helped attract an increasing share of venture capital investment in green technologies. According to statistics from PricewaterhouseCoopers and the National Venture Capital Association, California's

share of U.S. venture capital investment in innovative energy technologies increased dramatically from 1995 to 2007 (see Figure 5 below).[51] The same period saw a stream of pioneering environmental policy initiatives, including energy efficiency codes for buildings and appliances, a renewables portfolio standard for electricity generation, climate change emissions standards for light-duty automobiles and, most recently, AB 32. Flows of venture capital into California are escalating as a direct result of the focus on reductions of greenhouse gas emissions. As mentioned above, California captured the largest single portion of global venture capital investment ($800 million out a total of two billion dollars) during the second quarter of 2008.

Figure 5

California's Growing Share of Venture Capital Investment in Energy Innovation, 1995-2007 (current $, % share)



Source: PricewaterhouseCoopers MoneyTree Report, available at: [https://www.pwcmoneytree.com].

A survey of clean technology investors by Global Insight and the National Venture Capital Association found that public policy influences where venture capitalists invest.[52] Furthermore, investments in green technology solutions produce jobs at a higher rate than

[51] Based on historical trend data for the 'Industrial/Energy' industry for California and the United States from the PricewaterhouseCoopers MoneyTree Report. https://www.pwcmoneytree.com/MTPublic/ns/nav.jsp?page=historical (accessed October 12, 2008)

[52] Clean Tech Entrepreneurs & Cleantech Venture Network LLC. *Creating Cleantech Clusters: 2006 Update.* May 2006. p.43 http://www.e2.org/ext/doc/2006%20National%20Cleantech%20FORMATTED%20FINAL.pdf (accessed October 12, 2008)

investments in comparable conventional technologies.[53] Venture capitalists estimate that each $100 million in venture capital funding, over a period of two decades, helps create 2,700 jobs, $500 million in annual revenues, and many indirect jobs.[54]

Access to capital controlled by institutional investors is also enhanced by policies that encourage early adoption of green technologies. When California-based corporations use green technologies to reduce their exposure to climate change risk, institutional investors reward them by facilitating their access to capital. The Investor Network on Climate Risk – including institutional investors with more than $8 trillion of assets under management – endorsed an action plan in 2008 that calls for requiring asset managers to consider climate risks and opportunities when investing; investing in companies developing and deploying clean technologies; and expanding climate risk scrutiny by investors and analysts.[55]

Additional capital for green technologies helps drive increased employment, both indirectly, as energy savings are plowed back into other sectors of the economy, and directly, as new green products are successfully commercialized.

McKinsey & Company projects average annual returns of 17 percent on global investments in energy productivity, and estimates the global investment opportunity at $170 billion annually through 2020.[56] Meanwhile, global investment in energy efficiency and renewable energy has grown from $33 billion to more than $148 billion in the last four years. Beyond 2020, green technologies are expected to attract investment of more than $600 billion annually.[57] In short, green technology is now a *bona fide* global growth industry.

Today, green technology businesses directly employ at least 43,000 Californians, primarily in energy efficiency and energy generation, according to a 2008 study from the California Economic Strategy Panel. Green jobs are concentrated in manufacturing (41 percent), and

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[53] Report of the Renewable and Appropriate Energy Laboratory. *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. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

[54] Report prepared for the National Venture Capital Association. *Venture Impact 2004: Venture Capital Benefits to the U.S. Economy.* Prepared by: Global Insight. June 2004. http://www.globalinsight.com/publicDownload/genericContent/07-20-04_fullstudy.pdf (accessed October 12, 2008)

[55] The Investor Network on Climate Risk. *Final Report, 2008 Investor Summit on Climate Risk.* February 14, 2008. http://www.ceres.org//Document.Doc?id=331 (accessed October 12, 2008)

[56] McKinsey Global Institute. *The Case for Investing in Energy Productivity.* McKinsey & Company. February, 2008. p.8 http://www.mckinsey.com/mgi/reports/pdfs/Investing_Energy_Productivity/Investing_Energy_Productivity.pdf (accessed October 12, 2008)

[57] United Nations Environment Programme-New Energy Finance Ltd. *Global Trends in Sustainable Energy Investment 2008: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency* 2008. p.12 ISBN: 978-92-807-2939-9 http://www.unep.fr/energy/act/fin/sefi/Global_Trends____2008.pdf (accessed October 12, 2008)

professional, scientific and technical services (28 percent), with median annual earnings of $35,725 and $56,754, respectively.[58] By 2030, under a moderate growth scenario, green businesses nationwide are expected to generate revenues of $2.4 trillion, (2006 dollars), and employ 21 million Americans.[59]

As a leader in green technology development and use, California has already realized substantial economic benefits from the adoption of energy efficiency policies. State energy efficiency measures have saved enough energy over the past 30 years to avoid construction of two dozen 500-megawatt power plants. Today, California's per capita electricity consumption is 40 percent below the national average, and the carbon intensity of California's economy is among the lowest in the nation.[60]

Renewable energy, such as solar, wind, biomass, geothermal, will also bring new employment opportunities to Californians while spurring economic growth. California enjoys significant comparative advantages for renewable energy: concentrated innovation resources, a large potential customer base, key natural resources such as reliable solar and wind, and supportive regulatory programs, including the California Renewables Portfolio Standard, the Million Solar Roofs Initiative, the California Global Warming Solutions Act of 2006, and the Solar Water Heating and Efficiency Act of 2007.

Other researchers have estimated that under a national scenario with 15 percent renewables penetration by 2020, California will experience a net gain in direct employment of 140,000 jobs.[61] Because investments in green technologies produce jobs at a higher rate than investments in conventional technologies, jobs losses that occur in traditional fossil fuel industries will be more than compensated for by gains in the clean energy sector.

Furthermore, if California's renewable energy suppliers field products that are sufficiently competitive to penetrate the export market, employment and earnings dividends for the state will also increase. California renewable energy industries servicing the export market can generate up to 16 times more employment than those that only manufacture for domestic

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[58] California Economic Strategy Panel with Collaborative Economics. *Clean Technology and the Green Economy*. March 2008. P.14-15 http://www.labor.ca.gov/panel/pdf/DRAFT_Green_Economy_031708.pdf (accessed October 12, 2008)

[59] The American Solar Energy Society. *Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century*. 2007. p.39 ISBN 978-0-89553-307-3 http://www.ases.org/images/stories/ASES-JobsReport-Final.pdf (accessed October 12, 2008)

[60] California Energy Commission. *2007 Integrated Energy Policy Report*. Document No. CEC-100-2007-008-CMF. 2007. p. 3 http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF (accessed October 12, 2008)

[61] Tellus Institute and MRG Associates. *Clean Energy: Jobs for America's Future*. As cited in: 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. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

consumption, according to a study by the Research and Policy Center of Environment California.[62]

C. Cost-Effectiveness

As noted in several provisions of AB 32, cost-effectiveness is an important requirement to be considered in the design and implementation of emission reduction strategies. (See HSC §§38505, 38560, 38561, 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 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 estimated cost per ton of greenhouse gas emissions reduced by the measures recommended in this Plan ranges from $-408 (net savings) to $133, with all but one (the Renewables Portfolio Standard) costing less than $55 per ton. The RPS is being implemented for energy diversity purposes, not just greenhouse gas reductions, and the $133 per ton figure does not take these other benefits into account. Therefore, it should not be used as a reference to define the range of cost-effective greenhouse gas measures. These estimates are based on the best information available as ARB prepared this Proposed Plan. Updated estimates and greater certainty will be provided as the measures are further developed during the rulemaking process.

In the meantime, the current estimates provide a range illustrating the cost per ton of the mix of measures that collectively meet the 2020 target. 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 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 approach must provide flexibility to pursue measures that simultaneously achieve policy objectives other than greenhouse gas emissions reduction (such as energy diversity).

The criteria for judging cost-effectiveness will be updated as additional technological data and strategies become available. As ARB moves from adoption of the Scoping Plan to

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[62] Environment California Research and Policy Center. *Renewable Energy and Jobs. Employment Impacts of Developing Markets for Renewables in California.* July 2003. As cited in: 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. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

developing specific regulations, and as regulations continue to be adopted, updated cost-effectiveness estimates will be established in a rigorous and transparent process with full stakeholder participation. As ARB progresses from proposed measures 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.

D. Small Business Impact

Small businesses play an important role in California's economy. As required under AB 32, ARB analyzed the impact that implementation of the Scoping Plan would have on small businesses in the state. The analysis indicates that the primary impacts on small businesses as a result of AB 32 will come in the form of changes in the costs of goods and services that they procure, and in particular, changes in energy expenditures. Due to the number of measures in the plan that will deliver significantly greater energy efficiencies, our analysis projects that implementation of the plan will have a positive impact on small business in California even after taking into account the higher per-unit energy prices that are likely to occur between now and 2020. Small businesses also will benefit as a result of the robust economic growth and the increases in jobs, production, and personal income that are projected between now and 2020 as AB 32 is implemented. Additional information is provided in Appendix G.

Recent analysis from Energy and Environmental Economics, Inc. (E3) forecasts that a package of greenhouse gas emissions reduction measures similar to those recommended in this Plan would deliver a five percent decrease in electricity expenditures for the average California electricity customer relative to business-as-usual in 2020.[63] This projection is based on the assumption that increases in electricity prices will be more than offset by the continued expansion of energy efficiency measures and that more efficient technologies will be developed and implemented.[64] For purpose of this analysis, expenditures on natural gas are assumed to remain the same, balancing the projected 29 percent decrease in natural gas consumption in California with the model's projected natural gas price increase of almost 9 percent.

Based on this assessment, implementation of the Scoping Plan will likely have minor but positive impacts on small businesses in the state. These benefits are attributable primarily to the measures in the plan that will deliver significantly greater energy and fuel efficiencies. Even when higher per unit energy prices are taken into account, these efficiencies will decrease overall energy expenditures for small businesses. Additionally, as previously described, the California economy is projected to experience robust economic growth

[63] Based on their GHG Calculator, CPUC/CEC GHG Docket (CPUC Rulemaking.06.04.009, CEC Docket 07-OIIP-01), available at http://www.ethree.com/cpuc_ghg_model.html.

[64] The E3 analysis focuses on direct programmatic measures and does not include the incremental price impact of the cap-and-trade program, which will depend upon allowance price, allocation strategy, the capped sector industry response, and other program design decisions.

between now and 2020 as AB 32 is implemented. Small businesses will experience many of the benefits associated with this growth in the form of more jobs, greater production activity, and rising personal income.

The projected decrease in electricity expenditures is especially important for small businesses since they typically spend more on energy as a percentage of revenue compared to larger enterprises. For example, firms with a single employee spend approximately 3.3 percent of each sales dollar on electricity, while businesses with between ten and forty-nine employees spend around 1.2 percent. As a result, smaller businesses are likely to experience a greater relative benefit from decreased energy expenditures relative to their larger counterparts.

From the broader economic perspective, these changes will make California more competitive as a location for small business, moving it from 7th highest to 19th among all states in terms of the percentage of revenue that businesses expend on electricity.[65] As was noted above for low income households, care must be taken to ensure that the program is structured to allow small businesses to participate in and benefit from the energy efficiency measures.

While ARB's analysis indicates a positive impact on small businesses from AB 32 implementation, to ensure that these benefits are realized to the fullest potential it will take additional outreach and communication efforts on the part of ARB and many other state and local entities. There are a number of existing programs that are designed to help small businesses achieve greater efficiencies in energy use. These programs can be enhanced and expanded upon, and new programs and efforts can be developed to ensure that all small businesses in California are aware of and able to take cost-effective steps to reduce energy use and enjoy the associated economic savings. For example, as discussed more completely in Chapter IV, ARB and our partners in State government are working together to develop an on-line small business "toolkit" designed for small and medium-sized businesses to provide a one-stop shop of technical and financial information resources. As further development and implementation of the measures in the plan proceeds, we will work with other state and local partners to ensure that small businesses can both benefit from and play a role in helping to achieve our greenhouse gas emission reduction requirements.

E. Public Health/Environmental Benefits Analyses

AB 32 requires ARB to evaluate the environmental and public health impacts of the Scoping Plan. The analysis of this plan is focused primarily on the quantification of public health benefits from air quality improvements that would result from implementation. Unlike traditional pollutants and toxic emissions, global warming pollutants do not typically have localized impacts. At ambient levels, carbon dioxide, which makes up over 80 percent of global warming pollutants in California, has no direct environmental or public health consequences. Climate change caused by greenhouse gas pollutants emitted in another state

[65] Although the natural gas data is less specific, a similar scenario is expected where increased prices are typically offset by greater efficiencies for most small businesses.

or country has the same potential to damage our public health and the environment as does climate change due to pollutants emitted within California. Although this analysis does not consider the public health impacts of climate change, the potential public health impacts are great, and have been well documented elsewhere. However, many of the measures aimed at reducing global warming pollutants also provide co-benefits to public health and California's natural resources.

The environmental and cumulative impacts of the Plan are discussed in the California Environmental Quality Act (CEQA) document that is included in Appendix J. As the Scoping Plan is implemented, and specific measures are developed, ARB will conduct further CEQA analyses, including cumulative and multi-media impacts. As ARB further develops its approach for consideration of these issues in future rulemakings, and updates needed analytical tools and data sets, we will consult with outside experts and the EJAC. ARB recognizes that the adoption of the Scoping Plan will launch a variety of regulatory proceedings in many different venues. ARB will work closely with other California State agencies including: the Office of Planning and Research, Environmental Protection Agency, Resources Agency, Integrated Waste Management Board, Department of Public Health, Office of Environmental Health Hazard Assessment, State Water Resources Control Board, Department of Toxic Substances Control, Department of Water Resources, Board of Forestry, Department of Fish and Game, Public Utilities Commission, California Energy Commission, and others to identify and address potential multi-media environmental impacts early in the regulatory development process.

California's actions to reduce greenhouse gas emissions will help transition the State to new technologies, improved efficiencies, and land use patterns also necessary to meet air quality standards and other public health goals. California's challenging public health issues associated with air pollution are already the focus of comprehensive regulatory and incentive programs. These programs are reducing smog forming pollutants and toxic diesel particulate matter at a rapid pace. However, to meet increasingly stringent air quality standards and air toxics reduction goals, transformative changes are needed in the 2020 timeframe and beyond. Implementation of AB 32 will provide additional support to existing State efforts devoted to protecting and improving public health.

1. Key Air Quality-Related Public Health Benefits

The primary direct public health benefits of the Proposed Scoping Plan are reductions in smog forming emissions and toxic diesel particulate matter. The most significant reductions are of oxides of nitrogen (NOx), which forms both ozone and particulate pollution (PM2.5), and directly emitted PM2.5, which includes diesel particulate matter. The analysis focuses on PM2.5 impacts and quantifies 2020 public health benefits of this plan in terms of avoided premature deaths, hospitalizations, respiratory effects, and lost work days. Additional benefits associated with the reductions in ozone forming emissions were not quantified since statewide 2020 photochemical modeling is not available.

The estimated air quality-related public health benefits of the Proposed Scoping Plan are above and beyond the much greater benefits of California's existing programs, which are reducing air pollutant emissions every year. This continuing progress is the result of California's plans for meeting air quality standards ("State Implementation Plans" or SIPs), reducing emissions from goods movement activities, and addressing health risk from diesel particulate matter. These programs address both existing and new sources of air pollution, taking into account population and economic growth. The additional benefits of the Proposed Scoping Plan in 2020 are significant, and in the longer term, can be expected to increase with further reductions in fossil fuel combustion, the primary basis for the estimated public health benefits.

The recommended measures in the Proposed Scoping Plan that reduce smog forming ("criteria") pollutants are shown in Table 29 along with the estimated reductions. Statewide, these measures would reduce approximately 61 tons per day of NOx and 15 tons per day of PM2.5 in 2020. As shown in Table 30, this equates to an estimated air quality-related public health benefit of 400 avoided premature deaths statewide. In comparison, reductions in PM2.5 from California's existing programs and 2007 SIP measures are estimated to result in 3,700 avoided premature deaths statewide in the same timeframe.

Table 29: Statewide Criteria Pollutant Emission Reductions in 2020 from Proposed Scoping Plan Recommendation[66]

(tons per day)

Measure	NOx	PM2.5
Light-Duty Vehicle • Pavley I and Pavley II GHG Standards • Vehicle Efficiency Measures	1.6	1.4
Goods Movement Efficiency Measures	16.9	0.6
Medium and Heavy-Duty Vehicle GHG Emission Reduction • Aerodynamic Efficiency • Hybridization • Engine Efficiency	5.6	0.2
Local Government Actions and Regional Targets	8.7	1.4
Energy Efficiency and Conservation (Electricity)	7.0	4.0
Energy Efficiency and Conservation (Natural Gas)	10.4	0.8
Solar Water Heating	0.3	0.03
Million Solar Roofs	1.0	0.6
Renewables Portfolio Standard	9.8	5.6
Total	**61**	**15**

[66] Table 29 does not include the criteria pollutant co-benefits of additional greenhouse gas reductions that would be achieved from the proposed cap-and-trade regulation because we cannot predict in which sectors they would be achieved.

Table 30: Estimates of Statewide Air Quality-Related Health Benefits in 2020

Health Endpoint	Health Benefits of Existing Measures and 2007 SIP *mean*	Health Benefits of Recommendations in the Proposed Scoping Plan *mean*
Avoided Premature Death	3,700	400
Avoided Hospital Admissions for Respiratory Causes	770	84
Avoided Hospital Admissions for Cardiovascular Causes	1,400	150
Avoided Asthma and Lower Respiratory Symptoms	110,000	11,000
Avoided Acute Bronchitis	8,700	910
Avoided Work Loss Days	620,000	67,000
Avoided Minor Restricted Activity Days	3,600,000	380,000

In addition to the quantified air-quality-related health benefits, our analysis indicates that implementation of the Proposed Scoping Plan can deliver other public health benefits as well. These include potential health benefits associated with local and regional transportation-related greenhouse gas targets that can facilitate greater use of alternative modes of transportation, such as walking and bicycling. These types of moderate physical activities reduce many serious health risks including coronary heart disease, diabetes, hypertension and obesity.[67] Finally, it is important to note that the steps California is taking to address global warming, along with actions by other regions, states, and nations, will help mitigate the public health effects of heat waves, more widespread incidence of illness and disease, and other potentially severe impacts.

The measures in the Proposed Scoping Plan are designed primarily to help spur the transition to a lower carbon economy. However, in addition to improving air quality, these measures can also improve California's environmental resources, including land, water, and native species. Land resources will be affected by regional transportation-related targets leading to improved land use planning, and forest carbon sequestration targets which can result in better stewardship of California lands and reduced wildfire risk. A number of conservation measures will aid in effective management of the State's precious water resources. Demand for waste disposal and hazardous materials should decrease as measures to encourage recycling and reuse transform our wastes into fuel, energy, and other useful products are implemented. Additional analysis of the way that implementation of the Scoping Plan will impact these environmental resources will be conducted as we proceed. Many of these measures serve the dual purpose of mitigating greenhouse gas emissions and helping California adapt to the impacts of climate change.

[67] Appendix H contains a reference list of studies documenting the public health benefits of alternative transportation.

2. Approach

ARB quantified the potential reductions of NOx and PM2.5 from implementation of the Proposed Plan's recommendations, and the public health benefits associated with the resulting potential air quality improvement. These analyses compare NOx and PM2.5 emissions in 2020 with the implementation of the Scoping Plan with NOx and PM2.5 emissions in 2020 in the absence of the Scoping Plan – a "business-as-usual" scenario. The methodology used to evaluate the public health benefits of the emission reductions is similar to the methodology used in ARB's 2006 Goods Movement Emission Reduction Plan (GMERP).[68] This methodology is based on a peer-reviewed methodology developed by the U.S. Environmental Protection Agency (U.S. EPA). ARB augmented U.S. EPA's methodology by incorporating the result of new epidemiological studies relevant to California's population, including regionally specific studies, as they became available.

AB 32 directs ARB to conduct several levels of analysis as we proceed through the development and implementation of a comprehensive greenhouse gas emissions reduction strategy. As part of the Scoping Plan development, ARB is required to assess both the economic and non-economic impacts of the plan as noted above. Additionally, AB 32 requires ARB to undertake additional analysis at the time of adoption of regulations, including market-based compliance mechanisms.

Although not yet at the stage of regulatory development and adoption, in this analysis ARB conducted an evaluation of the air quality-related public health benefits associated with the Proposed Scoping Plan based on a community level emissions analysis example. As regulations that rely on market-based compliance mechanisms are further developed for consideration by the Board, more detail about the specific regulatory proposals will be developed, enabling ARB to more closely evaluate the potential for direct, indirect and cumulative impacts.

3. Existing Programs for Air Quality Improvement in California

The public health analysis of the Proposed Scoping Plan presents air-quality benefits that will occur in addition to the benefits of California's comprehensive air quality programs designed to meet health-based standards and reduce health risk from air toxics. It is also important to note that under both a "business-as-usual" scenario and under the implementation of the Proposed Scoping Plan, the population and economy of California are projected to continue to grow. New businesses and industries will continue to be sited in California, bringing both economic opportunity and potential environmental impacts. Federal, State, and local laws and regulations have established requirements to ensure that new and modified sources of pollution are carefully evaluated and that significant impacts are mitigated. Emissions from existing businesses are also tightly controlled by local air pollution control districts.

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[68] Air Resources Board. Technical Supplement on Health Analysis. *Technical Supplement on Quantification of the Health Impacts and Economic Valuation of Air Pollution from Ports and Goods Movement in California.* March 2006 http://www.arb.ca.gov/planning/gmerp/gmerp.htm (accessed October 12, 2008)

Statewide programs are in place to reduce emissions from cars, trucks, and off-road equipment, along with smog check, cleaner gasoline and diesel fuels, and regulations to reduce evaporative emissions from consumer products, paints, and refueling. Additional information about the existing regulatory framework for sources of air pollution is provided in Appendix H.

It is important to evaluate the air quality and public health benefits of the Proposed Scoping Plan in the context of the State's on-going air quality improvement efforts. California's long-standing air pollution control programs have substantially improved air quality in the state and will continue to do so in the future. By 2020, these programs will deliver reductions in statewide NOx emissions of 441 tons per day and direct fine particle emission reductions of 34 tons per day. Through 2020, three key ARB efforts will deliver deep reductions in air pollutant emissions despite continuing growth:

- Diesel Risk Reduction Plan
- Goods Movement Emission Reduction Plan
- 2007 State Implementation Plan

Measures in these plans will result in the accelerated phase-in of cleaner technology for virtually all of California's diesel engine fleets including trucks, buses, construction equipment, and cargo handling equipment at ports. Adoption and implementation of these and other measures are critical to achieving clean air and public health goals statewide.

The U.S. Environmental Protection Agency has set a new, more stringent, national ambient air quality standard for ozone that will have compliance deadlines well past 2020 for the most severely impacted areas like southern California.[69] The unmitigated impacts of climate change will make it harder to meet this standard and to provide healthful air to Californians.

4. Statewide Analysis

For this evaluation, ARB examined the recommended measures to determine the potential for impacts on air, land, water, native species and biological resources, and waste and hazardous materials. Local government, State government, and green building sectors were not included in this evaluation as they represent means of implementation of the greenhouse gas emission reduction measures. As noted, the main focus of this analysis is on air quality. To the extent feasible, ARB quantified estimated emissions reductions in criteria pollutants associated with each recommended measure except cap-and-trade. Reductions in NOx and PM2.5 were used to estimate public health benefits. The estimated statewide reductions are

[69] U.S. Environmental Protection Agency. *National Ambient Air Quality Standards for Ozone. Final Rule.* 73 Federal Register 16436. March 27, 2008. http://www.epa.gov/fedrgstr/EPA-AIR/2008/March/Day-27/a5645.pdf (accessed October 12, 2008)

61 tons per day of NOx and 15 tons per day of PM2.5. Further analysis of the potential criteria pollutant benefits of a cap-and-trade program will be done as part of regulatory development.

5. Regional Assessment: South Coast Air Basin Example

In order to assess potential air quality benefits of the Proposed Scoping Plan on a regional level, ARB evaluated associated criteria pollutant reductions in the South Coast Air Basin as an example case. Existing programs will reduce current NOx emissions by almost 50 percent in 2020. With the new 2007 SIP measures, NOx emissions will be reduced almost 60 percent. Because of the large population and high pollutant concentrations in this region, greater benefits occur from each ton of pollution reduced. The estimated air quality-related public health benefits of the Proposed Scoping Plan for the South Coast region are shown in Table 31. The significant air quality-related public health benefits in this region are largely attributed to the additional reductions in PM2.5.

Table 31: Estimated Air Quality-Related Health Benefits of Existing Program, 2007 SIP, and Proposed Scoping Plan in the South Coast Air Basin, 2020

Health Impacts / Scenario	Benefits from Existing Program	Additional Benefits from 2007 SIP	Additional Co-Benefits from Proposed Scoping Plan
Premature Deaths Avoided	1,600	920	200
Hospitalizations Avoided – Respiratory	330	200	42
Hospitalizations Avoided – Cardiovascular	610	360	78
Asthma & Lower Respiratory Symptoms Avoided	46,000	28,000	5,900
Acute Bronchitis Avoided	3,800	2,300	490
Work Loss Days Avoided	270,000	160,000	35,000
Minor Restricted Activity Days Avoided	1,600,000	940,000	200,000

6. Community Level Assessment: Wilmington Example

ARB also conducted an evaluation of the potential air quality impacts of the Proposed Scoping Plan in the community of Wilmington as an illustration of the potential for localized impacts. Wilmington is in southern Los Angeles County and includes a diverse range of stationary and mobile emissions sources, including the ports of Los Angeles and Long Beach, railyards, major transportation corridors, refineries, power plants, and other industrial and commercial operations. Like the regional analysis, additional emission reductions from the 2007 SIP were estimated and show significant reductions in Wilmington by 2020 – approximately a 45 percent reduction in NOx and a 40 percent reduction in directly-emitted PM2.5. Mobile source emissions are projected to continue to be proportionately greater than stationary source emissions in 2020 even as mobile source emissions decline.

For this assessment, ARB evaluated criteria pollutant emission reductions in the Wilmington study area assuming that the source-specific quantified measures are implemented, including measures to reduce emissions from oil and gas extraction and refineries. It was further assumed that the non-source specific program elements, such as the proposed cap-and-trade program, result in a 10 percent reduction in fuel combustion by affected sources within the study area. For example, it is estimated that industrial sources would achieve greenhouse gas emission reductions through efficiency measures that reduce on site fuel use by 10 percent either in response to a cap-and-trade program, or due to the results of the facility energy efficiency audits. While it is likely that the actual onsite reductions will differ across individual facilities from the assumed uniform ten percent reduction,[70] the analysis identifies how reductions at these facilities affect the overall level of co-benefits.

The estimated NOx co-benefit of about 1.7 tons per day is small relative to the projected reductions of 24 tons per day that will occur as a result of the SIP and other measures. For example, an 8 ton per day NOx reduction is expected from cleaner port trucks. In comparison, the potential NOx benefit from a 10 percent efficiency improvement in major goods movement categories is estimated at about 1.5 tons per day. The estimated PM2.5 co-benefits, on the order of 0.12 tons per day, are also small relative to the projected reductions of 2.3 tons per day that will occur as a result of the SIP and other measures. Approximately 30 percent (0.04 ton per day) of the PM 2.5 co-benefit reduction is associated with assumed energy efficiency measures at the four large refineries in the study area, while another 30 percent would occur due to a 10 percent efficiency improvement by goods movement sources.

The co-benefit emissions reductions in the study area would produce regional air quality-related health benefits. A relatively small portion of these benefits would occur in the study area (approximately 300,000 area residents). Health benefits due to reductions in NOx are mostly at the regional levels, since NOx emissions have usually travelled some distance before they are transformed into PM via atmospheric reactions. Point source combustion PM emissions persist in the atmosphere and increase exposures both in the area where they are emitted and broadly throughout the region. Based on previous modeling studies of the impact of port and rail yard PM emissions in the South Coast Air Basin conducted by ARB, PM exposures will be reduced far beyond the study area, and a majority of the health benefits are expected to occur in areas outside of the Wilmington community.[71]

Using the previously described methodology that correlates emission reductions in the air basin with expected regional health benefits there would be an estimated

[70] The reductions at any one facility could be much greater or lesser than 10 percent For example, very small or no reductions might occur because available cost-effective industrial emission reductions have already been implemented at a particular site.

[71] ARB analysis indicates that about 20 percent of the health benefits would occur in the Wilmington area.

11 avoided premature deaths attributed to emission reductions that occur in Wilmington as a result of the Scoping Plan.[72]

F. Summary of Societal Benefits

AB 32 requires ARB to "consider the overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health" (HSC § 38562(b)(6)) when developing regulations to implement the Scoping Plan. ARB conducted an initial assessment of societal benefits associated with AB 32 implementation. This section summarizes those that have been identified during development of the Scoping Plan, including diversification of energy sources, mobility, regressivity, and job creation. More detailed economic and environment/public health analyses can be found in Appendix G and H, respectively. The impact of low income households (regressivity), impacts on small businesses, and impact on jobs are described in the Economic Analysis section and Appendix G.

1. Energy Diversification

Generally, energy-related measures in this Proposed Scoping Plan are expected to result in a transformation of the State's energy portfolio, driven primarily by the Low Carbon Fuel Standard (LCFS), which addresses transportation fuel, and the 33 percent RPS, which increases renewably-produced electricity production and distribution to households and businesses.

The LCFS aims to achieve at least a 10 percent reduction in the carbon intensity of California's transportation fuels by 2020. As the State moves toward less dependence upon one source of fuel for transportation, our economy will be less at risk from significant fluctuations in fuel prices. Measures within the Scoping Plan will force energy diversification in California toward low-carbon intensive energy sources and encourage significant growth in infrastructure, capital, and investment in biofuels.

The move toward 33 percent renewables will, by definition, increase the diversification of California's electrical supply. Increased use of wind, solar, geothermal and biomass (including from the organic fraction of municipal solid waste) generation will all add to ensuring the state has a broader portfolio of energy inputs.

Based on ARB's economic analysis, the combined energy diversification and increased energy efficiency expected from implementation of the Scoping Plan is predicted to result in: a 25 percent decrease in gasoline usage (4.6 billion gallons), a 17 percent decrease in diesel fuel use (670 million gallons), a 22 percent decrease in electricity (74,000 GWh reduction) and a 24 percent reduction in natural gas (3,400 therms).

[72] See Appendix H

The cap-and-trade program, offsets, and other measures that contain market-based features may also help diversify California's energy portfolio by incentivizing the development and deployment of clean and efficient energy generating technologies.

2. Mobility and Shifts in Land Use Patterns

Mobility is analyzed through multiple approaches in the Proposed Scoping Plan. Appendix C includes an analysis of a proposed measure for regional transportation-related greenhouse targets. Reductions in vehicle miles traveled (VMT) are expected to result from regional and local planning which target land use, building and zoning improvements.

As the Scoping Plan is implemented, measures that support shifts in land use patterns are expected to emphasize compact, low impact growth in urban areas over development in greenfields. Communities could realize benefits, such as improved access to transit, improved jobs-housing balance, preservation of open spaces and agricultural fields, and improved water quality due to decreased runoff. Local and regional strategies promoting appropriate land use patterns could encourage fewer miles traveled, lowering emissions of greenhouse gases, criteria pollutants and PM. More compact communities with improved transit service could increase mobility, allowing residents to easily access work, shopping, childcare, health care and recreational opportunities.

Furthermore, if open spaces and desirable locations become more accessible and communities are designed to encourage walkability between neighborhoods and shopping, entertainment, schools and other destinations, residents are likely to increase their levels of physical activity. Research shows that regular physical activity can reduce health risks, including coronary heart disease, diabetes, hypertension, anxiety and depression, and obesity. Measures in the Proposed Scoping Plan encourage Californians to use alternatives to personal vehicle travel that could result in increased personal exercise. To complement these changes, future community developments may evolve to include trails and pedestrian access to major centers. However, where compact development may increase proximity to large sources of pollution, such as high traffic arterials, distribution centers, and industrial facilities, it will be critical to analyze the anticipated and unanticipated impacts and benefits, to ensure that increases in exposure to vehicular air pollution and other toxics and particulates do not occur .

G. California Environmental Quality Act Functional Equivalent Document

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed projects. ARB's analysis of the potential adverse environmental impacts of the Proposed Scoping Plan is presented in Appendix J. The analysis summarizes and discusses the specific strategies in the Scoping Plan that, if adopted and implemented, will reduce greenhouse gas emissions throughout the

state. The evaluation is programmatic by necessity; it allows consideration of broad policy alternatives and program-wide mitigation measures at a time when an agency has greater flexibility to deal with basic problems of cumulative impacts. A programmatic document also plays an important role in establishing a structure within which future reviews of related actions can be effectively conducted. The Secretary of California's Resources Agency determined that ARB meets the criteria for a Certified Regulatory Program and requires ARB to prepare a substitute document. This functionally equivalent document (FED) is intended to disclose potential adverse impacts and identify mitigation measures specific to the actions identified in the Proposed Scoping Plan. The analysis generally found that the proposed Low Carbon Fuel Standard, Renewables Portfolio Standard and Water measures have the most potential to cause adverse environmental impacts due to the potential for land conversion when projects are undertaken. Additional environmental analysis will be needed when regulations are adopted and at the individual project level to identify mitigation for project specific impacts.

H. Administrative Burden

ARB conducted a assessment of the administrative burden of implementing the Proposed Scoping Plan recommendation. (HSC §38562 (b)(7)) The recommendation calls for ARB to develop a cap-and-trade program – a market-based regulatory 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 ARB. Sources under the cap would 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 previously developed this type of market regulation, there is extensive experience to draw upon from within California, nationally, and internationally. In addition, the other regulatory components of the recommendation would require ARB and other State agencies to adopt a series of measures requiring regulatory development, outreach to stakeholders and the public, implementation by industry, and enforcement for numerous measures and programs.

I. De Minimis Emission Threshold

A minimum level at which regulations are determined not to apply is termed the 'de minimis threshold.' In recommending a de minimis level, ARB must take into account the relative contribution of each source or source category to statewide greenhouse gas emissions and the adverse effect on small business. (HSC §38561(e)) This threshold acts as a buffer below which the burden of regulation is determined to outweigh the potential harmful effect of the minimal level of emissions. However, it should not be assumed that an individual source of greenhouse gas emissions that is minimal if taken by itself will fall below the threshold. ARB often looks at the aggregate emissions from a source category or related source category when determining regulatory applicability.

A source category may be evaluated as the aggregate of businesses doing the same type of work (e.g., semiconductor manufacturers), a type of equipment (cargo handling equipment,

cars), a process or product (cans of pressurized duster), or other aggregated sources of emissions. Emissions of greenhouse gases from any individual entity within these source categories by themselves could be small. However, when emissions from the source category are evaluated, the relative contribution to climate change can be significant.

As ARB developed the Proposed Scoping Plan, potential measures were evaluated against criteria that included the relative contribution of the source to climate change. After this review and considering the level of emissions needed to meet the 1990 target established by AB 32, ARB recommends a de minimis level 0.1 $MMTCO_2E$ annual emissions per source category.[73] Source categories whose total aggregated emissions are below this level are not proposed for emission reduction requirements in the Proposed Scoping Plan but may contribute toward the target via other means.

ARB and other agencies implementing measures included in the Scoping Plan should carefully consider this de minimis level in developing regulations, and only regulate smaller source categories if there is a compelling necessity.

As each regulation to implement the Scoping Plan is developed, ARB and other agencies will consider more specific de minimis levels below which the regulatory requirements would not apply. These levels will consider the cost to comply, especially for small businesses, and other factors.

[73] The Forest sector was not included in determining the de minimis level because this sector serves both as a source and a sink for carbon, making the concept of a de minimis level less applicable.

IV. IMPLEMENTATION: Putting the Plan into Action

Adoption of this Scoping Plan will be a groundbreaking step forward for California. However it is only the beginning of a journey that will last for decades, gradually moving the State into a low-carbon, clean energy future. Putting the Scoping Plan into action will be challenging but with adequate commitment and leadership from Californians up and down the state, it will be a success.

A. Personal Action

The greenhouse gas emission 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.

Shifts in individual choices and attitudes drive changes in the economy and in institutions. This dynamic of changing individual behavior will influence California's effort to reduce greenhouse gas emissions. For example, as market forces and environmental awareness encourage more people to drive low-greenhouse gas emitting vehicles, the auto manufacturers will respond with more innovative 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 and our carbon footprint will naturally become part of how individuals make decisions about travel, work, and recreation. Some families may choose to purchase a more efficient vehicle when it comes time to replace their current model. Households may 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 to install solar water heaters, or arrays of solar electric 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.

This Proposed 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.

Californians have embraced statewide programs that support positive change in home and business behavior. 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 toward a cleaner more efficient economy will produce a wide range of benefits to individuals, through lower energy bills and a healthier environment for all.

Conservation can also play a key role. By employing practices to use our resources more sparingly, consumers can both save money and reduce greenhouse gas emissions. On August 18, 2008, Governor Arnold Schwarzenegger launched the EcoDriving program – a comprehensive effort to save consumers money at the gas pump, reduce fuel use and cut CO_2 emissions. By following a set of easy-to-use best practices for driving and vehicle maintenance, a typical EcoDriver can improve mileage by approximately 15 percent. Furthermore, safety is improved when driving speeds are reduced, a key EcoDriving strategy.

Similarly, consumers and businesses can save money and reduce greenhouse gas emissions by conserving resources at homes, offices and commercial buildings. For example, wireless monitor devices to provide instantaneous energy-usage information inside the home are being developed to show users how many kilowatt hours they're consuming at any given moment – as well as how much it's costing them.[74] Providing real-time information on appliance energy use can greatly assist consumers in conserving electricity use.

Many Californians concerned about climate change have also begun to buy carbon offsets to mitigate the impact of their daily activities. These can take various forms, including options that allow consumers to add 'carbon credits' when buying airline tickets, or paying a small monthly charge on utility bills to buy green power. ARB will be working to establish clear rules for voluntary reductions and offsets that might be used for compliance with AB 32. These rules will also help establish clear guidelines for these types of voluntary carbon credit programs and provide California's businesses and consumers greater assurance that money spent on these programs result in real reductions in greenhouse gas emissions.

For more information about how to reduce one's personal carbon footprint, visit www.coolcalifornia.org. This web site provides a carbon footprint calculator and a "top ten" list of ways to save energy at home.

B. Public Outreach and Education

To be successful, a climate action program needs an effective public outreach and education program. The Proposed Plan calls for a robust statewide program designed to generate awareness and involvement in California's climate change efforts.

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[74] The Sacramento Municipal Utility District (SMUD) is subsidizing PowerCost Monitors to 5,000 customers as a part of a demonstration program. [www.smud.org/residential/saving-energy/monitor.html]

The Climate Action Team will convene a steering team that includes State agencies and other public agencies such as the state's air districts, and public and private utilities, 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. With the release of the California Energy Efficiency Strategic Plan, the CPUC has committed to the launch of a new brand for California Energy Efficiency in 2009, focused on energy efficiency opportunities and coordinated with climate change messaging under AB 32. 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.

To ensure that all Californians are included in efforts to address climate change, California will also support highly localized efforts at public education and outreach at the community and neighborhood level. This includes service club organizations and existing faith-based communities – churches, mosques and synagogues. Other private-sector entities including businesses and local chambers of commerce will be invited to partner in spreading the word.

1. 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, we have worked to make this process fully transparent and will continue to do so as regulations to implement the plan are developed. We will continue our efforts to involve the public to the greatest extent feasible at every stage of the process, including informal and formal rulemaking activities. This will include disadvantaged communities and those with localized concerns, as well as affected industries and small businesses.

Local and community meetings and outreach have been and will continue to be a central element of all rulemaking, with State agencies working closely with disadvantaged communities, EJAC, public health experts, and other stakeholders to fully evaluate the impacts associated with California's greenhouse gas emissions reduction strategies. State agencies involved in measure development will continue to meet periodically with communities to assess any challenges to implementation, or to discover possible new measures or approaches. Stakeholders will be invited to participate in the many additional workshops, workgroups and seminars that will be held as individual measures are developed.

2. Education and Workforce Development

The transition to a clean energy future presents California with a tremendous opportunity to continue growing its green economy and to expand the growth of green job opportunities throughout the state. Making this transition will require a technically educated workforce that is equipped with the skills to develop and deploy 21st century technologies. Investments in training, career technical education, worker

transition assistance, and collaboration between public and private partners will be key to ensuring that California fully reaps the economic and job opportunities that will accompany implementation of AB 32.

Setting California on track to a low-carbon future beyond 2020 will be a multi-generational challenge. To meet this challenge, climate-related education in schools must 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). 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. In the meantime, ARB's educational outreach will continue through the Cool California web pages (www.coolcalifornia.org) and the continued support of student educators through the California Climate Champions programs. ARB will also rely on partners throughout the state to develop and display options for curricula that will enhance the K-12, community college, trade technical training programs, and programs at four-year colleges.

The demand for workers to fill green jobs is rising. There are currently more than 3,000 green businesses in the state, accounting for about 44,000 jobs: 36 percent of these jobs are in professional, scientific, and technical services; 19 percent are in construction; and 15 percent are in manufacturing.[75] Some of these jobs are in new fields, yet many others are simply augmentations of existing skills and vocations such as electrical, construction, machining, auto tech, and heating ventilation and air conditioning. As we move toward 2020, tens of thousands of new green job opportunities will be created.[76] Whether these opportunities come in entirely new fields of employment or in existing areas, it will be critical for California to have a trained workforce available.

Ensuring that California can continue to meet the demand for green jobs will require close coordination between workforce development agencies, businesses, State and local governments, labor unions, and community colleges and universities. Many organizations are already developing strategies and identifying steps to simultaneously meet industry workforce needs and help build a more sustainable economy. For instance, the California Labor and Workforce Development Agency (LWDA) provides a comprehensive range of employment and training services in partnership with State and local agencies and organizations. Similar additional efforts will be crucial in ensuring that the transition to a green economy benefits working families in California by providing a steady supply of livable-wage jobs. In the area

[75] U.C. Berkeley Labor Center. *California's Global Warming Solutions Act of 2006, A Background Paper for Labor Unions*. August 2008. p.7 http://laborcenter.berkeley.edu/greenjobs/AB32_background_paper08.pdf (accessed October 12, 2008)

[76] California Economic Strategy Panel. *Clean Technology and the Green Economy; Growing Products, Services, Businesses and Jobs in California's Value Network*, Draft, March 2008. http://www.labor.ca.gov/panel/pdf/DRAFT_Green_Economy_031708.pdf

of energy efficiency, the California Long Term Energy Efficiency Strategic Plan, adopted by the CPUC, details a vision and supporting strategies for the development of a workforce trained and engaged to achieve California's energy-efficiency objectives.

The following strategies will be key to ensure that California's workforce is equipped to help lead the transition to a clean energy future:

- **Strengthen and expand access to Career and Technical Education (CTE) in California public schools for the next generation of workers who will build a green economy.** Over the past several decades, there has been a steady decline in career and technical education. In 2007, less than one-third of all high school students in the state were enrolled in some form of CTE.[77] To take full advantage of the emerging green economy and meet the goals of AB 32, California needs to expand opportunities for CTE in schools. This could include pursuing strategies such as requiring CTE coursework for all middle- and high-school students; increasing the number of CTE credentialed teachers; expanding investment in facilities and equipment for career and technical education; and aligning educational curricula more closely with the skill and workforce needs of the emerging green economy.

- **Ensure an adequate pipeline of skilled workers who are trained in the new technologies of a greener economy.** While some green jobs will be in new businesses and new occupations, most green jobs are variations of traditional occupations in sectors like construction, utilities, manufacturing and transportation.[78] In light of the fact that forty percent of the nation's skilled workers are slated to retire in the next 5 to 10 years,[79] there is an urgent need for educational and training programs to fill these jobs. Strategies to create a steady pipeline of skilled workers include expanding curriculum choices in schools, colleges, and universities to fully reflect career opportunities available in an economy increasingly centered on clean technologies. Other strategies include offering a greater array of industry- and technology-specific courses that would link directly with postsecondary training such as apprenticeship programs, vocational training, or college.

- **Ensure that California's higher education institutions continue to produce the next generation of clean tech engineers, scientists and business leaders.** In addition to providing valuable research on potential climate-change mitigation and adaptation strategies, California's world-class research institutions are the incubators for many of the clean tech companies that will contribute to

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[77] Get REAL. *Aligning California's Public Education System with the 21st Century Economy Policy Paper for Discussion at Governor Arnold Schwarzenegger's Summit on Career and Technical Education*, March 6, 2007

[78] Ibid.

[79] The New Apollo Program, Clean Energy, Good Jobs: A National Economic Strategy for the New American Century, July 2008. p. 20 http://apolloalliance.org/downloads/fullreportfinal.pdf (accessed October 12, 2008)

California's environmental and economic future. It will be critical for California to continue to cultivate university research and training programs in a way that takes full advantage of this valuable state resource.

A successful transition to a clean energy future depends heavily on California's ability to provide a well-trained workforce to meet the demands of the growing green economy. ARB and our key partners will continue working throughout the state to ensure that an adequate supply of skilled workers is positioned to take advantage of the growing opportunities for high quality jobs and careers that implementation of AB 32 will bring.

3. Small Businesses

Small businesses play a crucial role in California's economy. As noted in Chapter III, our analysis indicates that this plan will have a net positive impact on small businesses. These impacts are attributable primarily to the measures in the plan that will deliver significantly greater energy and fuel efficiencies. However, as also noted in the analysis, ensuring that these benefits are realized to the fullest potential will require additional outreach and communication efforts by ARB and many other state and local entities.

One of ARB's Early Action measures is designed to help businesses during AB 32 implementation. With our State partners, we are developing an on-line small business "toolkit" designed for small and medium-sized businesses that will provide a one-stop shop for technical and financial resources. Toolkit components will include a business-specific calculator to assess a company's carbon footprint; a voluntary greenhouse gas inventory protocol for measuring greenhouse gas emissions; recommended best practices for energy, transportation, building, purchasing, and recycling; case studies demonstrating how small and medium California businesses have reduced greenhouse gas emissions; program financing resources; peer-networking opportunities; and an awards program to recognize reductions of greenhouse gas emissions among California businesses.

ARB will also continue working with the many business associations, organizations, and other State partners, such as the Small Business Advocate's AB 32 Small Business Task Force, the Labor and Workforce Development Agency, and Business, Transportation, and Housing Agency that have the resources, input and expertise to provide. These partners will help to further develop and implement an effective outreach plan to provide technical assistance to businesses through a variety of means, including attendance at business events, workshops, and working with local economic development agencies.

C. Implementation of the Plan

This Proposed Scoping Plan outlines the regulations and other mechanisms needed to reduce greenhouse gas emissions in California. ARB and other State agencies will work closely with stakeholders and the public to develop regulatory measures and other programs to

implement the Plan. ARB and other State agencies will develop any regulations in accordance with established rulemaking guidelines. Table 32 shows the status of the proposed measures in the plan.

Table 32: Status of Proposed Scoping Plan Measures

Existing Laws, Regulations, Policies And Programs
Light-Duty Vehicle Greenhouse Gas Standards (Pavley I)
Renewables Portfolio Standard (to 20%)
Solar Hot Water Heaters
Million Solar Roofs
High Speed Rail
Measures Strengthening & Expanding Existing Policies & Programs
Electricity Efficiency
Natural Gas Efficiency
Renewables Portfolio Standard (from 20% to 33%)
Sustainable Forests
Light-Duty Vehicle Greenhouse Gas Standards (Pavley II)
Discrete Early Actions
Low Carbon Fuel Standard
High GWP in Consumer Products (Adopted)
Smartways
Landfill Methane Capture
High GWP in Semiconductor Manufacturing
Ship Electrification (Adopted)
SF6 in non-electrical applications
Mobile Air Conditioner Repair Cans
Tire Pressure Program
New Measures
California Cap-and-Trade Program Linked to WCI Partner Jurisdictions
Increase Combined Heat and Power
Regional Transportation-Related GHG Targets
Goods Movement Systemwide Efficiency
Vehicle Efficiency Measures
Medium/Heavy Duty Vehicle Hybridization
High GWP Reductions from Mobile Sources
High GWP Reductions from Stationary Sources
Mitigation Fee on High GWP Gases
Oil and Gas Extraction
Oil and Gas Transmission
Refinery Flares
Removal of Methane Exemption from Existing Refinery Regulations

Rulemakings will take place over the next two years. As with all rulemaking processes, there will be ample opportunity for both informal interaction with technical staff in meetings and workshops, and formal interaction. ARB will consider all information and stakeholder input during the rulemaking process. Based on this information, ARB may modify proposed measures to reflect the status of technological development, the cost of the measure, the cost-effectiveness of the measures and other factors before presenting them to the Board for consideration and adoption.

In addition to these existing approaches, AB 32 imposes other requirements for the rulemaking process. Section 38562(b) explicitly added requirements for any regulations adopted for greenhouse gas emissions reductions. ARB also recognizes the need to expand the scope of analysis required when adopting future greenhouse gas emission reduction regulations. These expanded evaluations include the unique enforcement nature of climate change-related regulations and the possible extended permitting considerations and timelines that must be taken into account when establishing compliance dates. An important consideration in developing regulations will be the potential impact on California businesses. The potential for leakage, the movement of greenhouse gas emissions (and economic activity) out of state, will be carefully evaluated during the regulatory development.

As noted above, as the Scoping Plan is implemented and specific measures are developed, ARB and other implementing agencies will also conduct further CEQA analyses, including cumulative and multi-media impacts. ARB must design equitable regulations that encourage early action, do not disproportionately impact low-income and minority 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 resources), minimize the administrative burden, and minimize the potential for leakage. AB 32 requires that, 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 market-based compliance 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. As ARB further develops its approach for consideration of these issues in future rulemakings, and updates needed analytical tools and data sets, we will consult with outside experts and the EJAC.

ARB already conducts robust environmental and environmental justice assessments of our regulatory actions. Many of the requirements in AB 32 overlap with ARB's traditional evaluations. In adopting regulations to implement the measures recommended in the Scoping Plan, or including in the regulations the use of market-based compliance mechanisms to comply with the regulations, ARB will ensure that the measures have undergone the aforementioned screenings and meet the requirements established in HSC §38562 (b) (1-9) and §38570 (b) (1-3).

D. Tracking and Measuring Progress

Many 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. As the agency responsible for ensuring that AB 32 requirements are met, ARB must track the regulations adopted and other actions taken by both ARB and other State agencies as the plan is implemented.

The emissions reductions enumerated in this plan are estimates that may be modified based on additional information. As the proposed measures are developed over the coming years, it is possible that some of these strategies will not develop as originally thought or not be technologically feasible or cost-effective at the level given in the plan. 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 measures into the AB 32 program. 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 once every five years (HSC §38561(h)). These updates will allow ARB to evaluate the progress made toward the State's greenhouse gas emission reduction goals and correct the Plan's course where necessary. This section discusses the tracking and measurement of progress that ARB envisions. 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 update process. Continuous atmospheric monitoring of greenhouse gases may also be useful for determining the effectiveness of emission reduction strategies and for future inventory development.

1. Report Card

SB 85 (Budget Committee, Chapter 178, Statutes of 2007) requires every State agency to prepare an annual "Report Card," detailing measures the agency has adopted and taken to reduce greenhouse gas emissions, including the actual 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 is made available on the Internet and submitted to the Legislature. The information allows comparisons of each agency's projected and actual greenhouse gas emissions reductions with the targets established by the CAT or the Scoping Plan. This would be the State's 'Report Card' on its efforts to reduce greenhouse gas emissions.

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

2. Tracking Progress by Implementing Agencies

As the lead agency responsible for implementing AB 32, ARB must track the progress of both our efforts and the efforts of our partners in implementing their respective provisions of this plan. Communication between ARB and the other implementing agencies will be especially important as regulations and programs are developed. In support of the Report Card requirement noted above, ARB will work with CalEPA to develop a process to track and report on progress toward the plan's goals and commitments.

3. Progress Toward the State Government Target

The CAT recently established a State Government Subgroup to work with State agencies to create a statewide approach to meet the Scoping Plan's commitment to reduce greenhouse gas emissions by a minimum of 30 percent by 2020 below the State's estimated business-as-usual emissions – approximately a 15 percent reduction from current levels. State agencies must lead by example by doing their part to reduce emissions and employ practices that can also be transferred to the private sector. The statewide plan will serve as a guide for State agencies to achieve realistic, measurable objectives within specific timelines. This newly created State Government Subgroup will assist State agencies through these steps in a timely manner.

4. 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 emissions reduction measures outlined in this 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, which 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 greenhouse gas 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 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 broken down to the facility level. The facility-level reporting required under the Mandatory Reporting regulation will improve data on greenhouse gas emissions for individual facilities and their emitting processes. This information could also help improve emissions inventories for criteria pollutants, and provide additional data 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.

E. Enforcement

Enforcement is a critical component of all of the State's regulatory programs, both to ensure that emissions are actually reduced and to provide a level playing field for entities complying with the law. To meet the 2020 target this plan calls for aggressive action by a number of State agencies. Each of those agencies will employ its full range of compliance and enforcement options to ensure that planned reductions are achieved. The remainder of this section discusses ARB's portion of the enforcement program in more detail.

ARB has an extensive and effective enforcement program covering a wide variety of regulated sources, from heavy-duty vehicle idling, to consumer products, to fuel standards and off-road equipment. To increase the effectiveness of its enforcement efforts and provide greater assurance of compliance, ARB also partners with local, State and federal agencies to carry out inspections and, when necessary, prosecute violators.

ARB will continue its strong enforcement presence as the State's primary air pollution control agency. A critical function of this responsibility is to ensure that all enforcement actions are timely, effective, and appropriate with the severity of the situation. ARB will also continue its close working relationship with local air districts in the development and enforcement of applicable regulations contained within the Scoping Plan and collaborate with the appropriate State agencies on greenhouse gas emission reductions measures.

For the stationary source regulations called for in the plan, ARB will work closely with the local air districts that have primary responsibility for implementing and enforcing criteria pollutant regulations. Not only are local air districts familiar with the individual facilities and their compliance history, but information contained in district permits can be used to verify the accuracy of greenhouse gas emissions reported by sources subject to ARB mandatory reporting requirements. Using this data, regulators can also examine any correlation between greenhouse gases and toxic or criteria air pollutants as a result of emissions trading or direct regulations.

ARB will also continue to partner with the California Highway Patrol and other State and local enforcement agencies on mobile source and other laws and regulations where joint enforcement authorities apply.

Although many of the measures in the Proposed Scoping Plan are modeled on existing ARB regulations, a multi-sector, regional cap-and-trade program would bring unique enforcement challenges. ARB and CalEPA have begun the process of engaging and consulting with other State agencies, such as California's Department of Justice, Public Utilities Commission, Energy Commission, as well as the Independent System Operator, on market tracking and enforcement. These working group meetings are ongoing and will culminate in a comprehensive enforcement plan to accompany the proposed cap-and-trade program when the Board considers regulatory requirements. This enforcement plan would describe the administrative structures needed for market monitoring, prosecution, and penalty setting. Public input regarding these issues would also be a key part of the public stakeholder process conducted during development of the cap-and-trade programs regulations.

Accurate measurement and reporting of all emissions would be necessary to assure accountability, establish the integrity of allowances, and provide sufficient transparency to sustain confidence in the market. To ensure compliance, ARB would administer penalties for entities that hold an insufficient quantity of allowances to cover their emissions or fail to report their greenhouse gas emissions. Missed compliance deadlines would also result in the application of stringent administrative, civil, or criminal penalties.

This plan recommends that California implement a cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system. This system would require California to formalize enforcement agreements with its WCI partner jurisdictions for all phases of cap-and-trade program operations, including verification of emissions, certification of offsets based on common protocols, and detection of and punishment for non-compliance. As needed, California would also work with federal regulatory and enforcement agencies that oversee trading markets, such as the Commodity Futures Trading Commission and the Federal Energy Regulatory Commission. While California would work with other jurisdictions on joint enforcement activities, ARB will exercise all of its authority under HSC §38580 and other provisions of law to enforce its regulations against any violator wherever they may be.

F. State and Local Permitting Considerations

Some of the proposed emissions reduction strategies in this Proposed Scoping Plan may require affected entities to modify or obtain state or local permits. California's existing permit process ensures that health and safety concerns are evaluated, met, and when appropriate, mitigated. The State recognizes the potential for conflicts between various federal, state and local permitting requirements, which may cross various media – air, water, etc. CalEPA is actively involved in identifying and addressing these regulatory overlap issues with the ultimate goal of consolidating permits where feasible while maintaining all permit requirements. Two such examples are CalEPA's digester permit working group and the CalEPA-Air District Compost Emissions Work Group.

ARB recognizes that the permitting process may affect the viability of certain strategies and that the length of the permitting process could affect the timing of emissions reductions.

ARB, along with CalEPA and other State agencies, will continue to evaluate steps to ensure that permit requirements harmonize across the affected media.

This Plan has been developed with an understanding of the important cross-media impacts. These efforts will continue during the implementation of the Plan. Particular focus on the potential permitting impacts and cross-media consequences of a proposed rule will take place during the rulemaking process.

G. Role of Local Air Districts

Local air districts are ARB's partners in addressing air pollution. ARB takes primary responsibility for transportation, off-road equipment and consumer products. Local districts lead in controlling industrial, commercial and other stationary sources of air emissions. AB 32 recognizes the need to develop a program that meshes with local and regional activities. Although AB 32 does not provide an explicit role for air districts, their local presence as advocates for clean air and their resources, experience and expertise in regulating and enforcing rules for stationary sources make them a logical choice to have an important role in several aspects of implementing California's greenhouse gas program. ARB would partner with local air districts to develop and effectively enforce both source-specific requirements on industrial sources, and to enforce related programs, such as the high GWP rules, that affect a large number of local businesses.

ARB and local air districts are also actively working to coordinate emission reporting requirements. Some districts, like the South Coast Air Quality Management District, have developed software to allow their industrial sources to simultaneously report their criteria pollutant emissions to the District and their greenhouse gas emissions to ARB. Many air district staff are being trained as third-party verifiers to confirm the greenhouse gas emissions information provided by industrial sources under the mandatory reporting regulation, and, similarly, could provide verification of voluntary greenhouse gas reductions in the future.

Local air districts will be key in both encouraging greenhouse gas emissions reductions from other regional and local government entities, and providing technical assistance to quantify and verify those reductions. Local agencies are an important component of ARB's outreach strategy.

Many local air districts have already taken a leadership role in addressing greenhouse gas emissions in their communities. These efforts are intended to encourage early voluntary reductions. For example, local districts are "lead agencies" under the California Environmental Quality Act (CEQA) for some projects. In order to ensure high-quality mitigation projects, some districts have established programs to encourage local greenhouse gas reductions that could be used as CEQA mitigation. As the State begins to institutionalize mechanisms to generate and verify greenhouse gas emissions reductions, ARB and the districts must work together to smoothly transition to a cohesive statewide program with consistent technical standards.

H. Program Funding

Administration, implementation, and enforcement of the emissions reduction measures contained in the Proposed Scoping Plan will require a stable and continuing source of funding. AB 32 authorizes ARB to collect fees to fund implementation of the statute. This fall ARB will initiate a rulemaking for a fee program to fund administration of the program.

Approximately $55 million per year will be needed on an ongoing basis to fund implementation by ARB and other State agencies, based on the positions and funding included in the 2008-2009 fiscal year budget. Additional revenues are needed to repay the loans from State funds that were used to pay ARB and CalEPA expenses in the startup of the program. ARB is moving on an expedited schedule to develop a fee regulation and expects to take a regulation to the Board in early 2009, with the aim of beginning to collect fees in the 2009-2010 fiscal year.

V. A VISION FOR THE FUTURE

California has the know-how, ingenuity, research capabilities, and culture of innovation to meet the challenge of addressing climate change. However, reaching the goals we have set for ourselves will not be easy. Successful implementation of many of the proposed programs and measures described in this plan will require strong leadership and a shared understanding of the need to reach viable and lasting solutions quickly.

This challenge will also require establishing a wide range of partnerships, both within California and beyond our borders. We will need to support additional research, and further develop our culture of innovation and technological invention. In order to continue the momentum and the commitment to a clean energy future, we will need to both build on existing solutions and develop new ones.

The following sections lay out some of the elements that will be necessary to forge a broad-based institutional strategy to address climate change both within California and beyond. Also discussed is the need to build partnerships on the regional, national and international levels to ensure that our actions complement and support those being taken on a global scale. This section also looks forward to 2030, showing that California is on the trajectory needed to do our part to stabilize global climate.

A. Collaboration

1. Working Closely with Key Partners

True climate change mitigation will require many parties to work together for a global mitigation plan. California and other states are filling a vacuum created by the current lack of leadership at the federal level. By its bold actions, California is moving the United States closer to a seat at the table among the developed countries that have agreed to reduce their carbon emissions, and lead a new international effort for an agreement to replace the Kyoto Protocol 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 can implement effective programs such as vehicle standards, energy efficiency programs, green building codes, and alternative fuel development.

California will work for climate solutions with key federal agencies, including the U.S. Department of Energy and their national labs, the U.S. Environmental Protection Agency, the U.S. Bureau of Land Management, the U.S. Department of Agriculture, the U.S. Department of Transportation, and others.

Through the Western Climate Initiative and in collaboration with other regional alliances of states, California can promote its own best practices and learn from others while helping to formulate the structure of a regional and ultimately national cap-and-trade program.

2. International

As one of the largest economies in the world, California is committed to working at the international level to reduce global greenhouse gas emissions. As part of this effort, Governor Schwarzenegger and other U.S. governors taking the lead in climate change are co-hosting a Global Climate Summit on Finding Solutions Through Regional and Global Action. This summit, to be held on November 18th and 19th, 2008, will begin a state-province partnership with leaders from the U.S., Australia, Brazil, Canada, China, India, Indonesia, Mexico, the European Union, and other nations, to take urgent steps to contain global climate change and jointly set forth a blueprint for the next global agreement on climate change solutions.

California is also a charter member of the International Carbon Action Partnership (ICAP), an organization composed of countries and regions that have adopted carbon caps and that are actively pursuing the implementation of carbon markets through mandatory cap-and-trade systems. California's continued involvement in ICAP will be very beneficial for sharing experiences and knowledge as we design our own market program.

In addition to participating in ICAP, California hopes to engage developing countries to pursue a low-carbon development path. 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 for mitigating both emissions and future impacts as changes in climate and the environment occur.

California recognizes the "common but differentiated responsibilities" among developed and developing countries (as articulated in the Kyoto Protocol), but the reality is that rapidly escalating greenhouse gas emissions in developing countries could possibly negate any efforts undertaken in California. To the extent that we are part of the global economy, California's demand for goods manufactured in developing countries further exacerbates growth of greenhouse gas emissions globally. Therefore, it is critical for California to help support the adoption of low-carbon technologies and sustainable development in the developing world.

California can advance the international policy debate through state-provincial partnerships for achieving early climate action in developing countries. This approach envisions commitments by developed countries to provide capacity building through technological assistance and investment support in return for developing countries adopting enhanced mitigation actions. California will consider working with developing countries or provinces that have, at a minimum, pledged to achieve greenhouse gas intensity targets in certain carbon-intensive sectors through

mechanisms, such as minimum performance standards or sector benchmarks. California also recognizes that developing countries have the challenge and responsibility to reduce domestic emissions in a way that will promote sustainable development, but not undermine their economic growth.

One possible manifestation of these collaborations could be the establishment of sectoral agreements that help to grow developing countries' economies in a low-carbon manner. In a sectoral approach, energy-intensive sectors adopt programs for reducing greenhouse gas emissions and/or energy use. Such sector-based approaches seem likely to win the support of developing countries and could also reduce concerns in developed countries about international competitiveness and carbon leakage.

A state-provincial partnership related to imported commodities (such as cement) would enable California to provide incentives to reduce greenhouse gas emissions associated with products that are imported by our state. California should continue to develop current relations and existing partnership arrangements with China – now the largest emitter of greenhouse gases in the world – because in addition to other compelling reasons much of the state's imported cement originates in China. California should also work to establish similar relations with India and other countries to share research on both greenhouse gas mitigation and climate change adaptation activities. Projects in the Mexican border region may also be of particular interest, considering the opportunity to realize considerable co-benefits on both sides of the border.

Deforestation accounts for approximately 20 percent of global greenhouse gas emissions. California has set a strong precedent in the effort to incorporate forest management and conservation into climate policy by adopting the CCAR forest methodology in October 2007. California also hopes to engage developing countries, including Brazil and Indonesia, to reduce emissions and sequester carbon through eligible forest carbon activities. Activities aimed at Reducing Emissions from Deforestation and Forest Degradation (REDD) were excluded from the rules governing the first Kyoto commitment period, but there is considerable momentum behind the effort to include provisions that would recognize such activities in a post-2012 international agreement. Providing incentives to developing countries to help cut emissions by preserving standing forests, and to sequester additional carbon through the restoration and reforestation of degraded lands and forests and improved forest management practices, will be crucial in bringing those countries into the global climate protection effort. California recognizes the importance of establishing mechanisms that will facilitate global partnerships and sustainable financing mechanisms to support eligible forest carbon activities in the developing world.

B. Research

1. 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. Innovation in energy and climate will come from people who are now in school. These young people will face unprecedented challenges, and they will need both wisdom and imagination 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.

2. 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 vast knowledge housed in universities with businesses' acumen and agility 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).[80] These and 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.

Carbon Sequestration

In addition to terrestrial carbon sequestration or natural carbon sinks such as forests and soil, CO_2 can be prevented from entering the atmosphere through carbon capture and storage (CCS). This consists of separating CO_2 from industrial and energy-related sources and transporting the CO_2 to a storage location for long-term isolation from the atmosphere. Potential technical storage methods include geological storage, industrial fixation of CO_2 into inorganic carbonates, and other strategies. Large point sources of CO_2 that may pursue CCS include large power plants, fossil fuel-based hydrogen production plants, and oil refineries.[81]

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

[81] Intergovernmental Panel on Climate Change. *Carbon Dioxide Capture and Storage: A Special Report of Working Group III of the IPCC.* Cambridge University Press, UK; 2005. http://www.ipcc.ch/ipccreports/srccs.htm (accessed October 12, 2008)

According to a 2005 report by the Intergovernmental Panel for Climate Change (IPCC), a power plant with CCS could reduce CO_2 emissions to the atmosphere by approximately 80 to 90 percent compared to a plant without CCS (including the energy used to capture, compress and transport CO_2).[82] While more research and development needs to occur, California should both support near-term advancement of the technology and ensure that an adequate framework is in place to provide credit for CCS projects when appropriate.

The State is currently an active member of the West Coast Regional Carbon Sequestration Partnership (WESTCARB), a public-private collaboration to characterize regional carbon sequestration opportunities in seven western states and one Canadian province. Established in 2003, this research project is comprised of more than 80 public and private organizations. WESTCARB is conducting technology validation field tests, identifying major sources of CO_2 in its territory, assessing the status and cost of technologies for separating CO_2 from process and exhaust gases, and determining the potential for storing captured CO_2 in secure geologic formations.[83]

C. Reducing California's Emissions Further – A Look Forward to 2030

In order to assess whether implementing this plan achieves the State's long-term climate goals, we must look beyond 2020 to see whether the emissions reduction measures set California on the trajectory needed to do our part to stabilize global climate.

Governor Schwarzenegger's Executive Order S-3-05 calls for an 80 percent reduction below 1990 greenhouse gas emission levels by 2050. This results in a 2050 target of about 85 $MMTCO_2E$ (total emissions), as compared to the 1990 level (also the 2020 target) of 427 $MMTCO_2E$. Climate scientists tell us that the 2050 target represents the level of greenhouse gas emissions that advanced economies must reach if the climate is to be stabilized in the latter half of the 21st century. Full implementation of the Proposed Scoping Plan will put California on a path toward these required long-term reductions. Just as importantly, it will put into place many of the measures needed to keep us on that path.

Figure 6 depicts what an emissions trajectory might look like, assuming California follows a linear path from the 2020 AB 32 emissions target to the 2050 goal needed to help stabilize climate. While the measures needed to meet the 2050 goal are too far in the future to define in detail, we can examine the policies needed to keep us on track through at least 2030.

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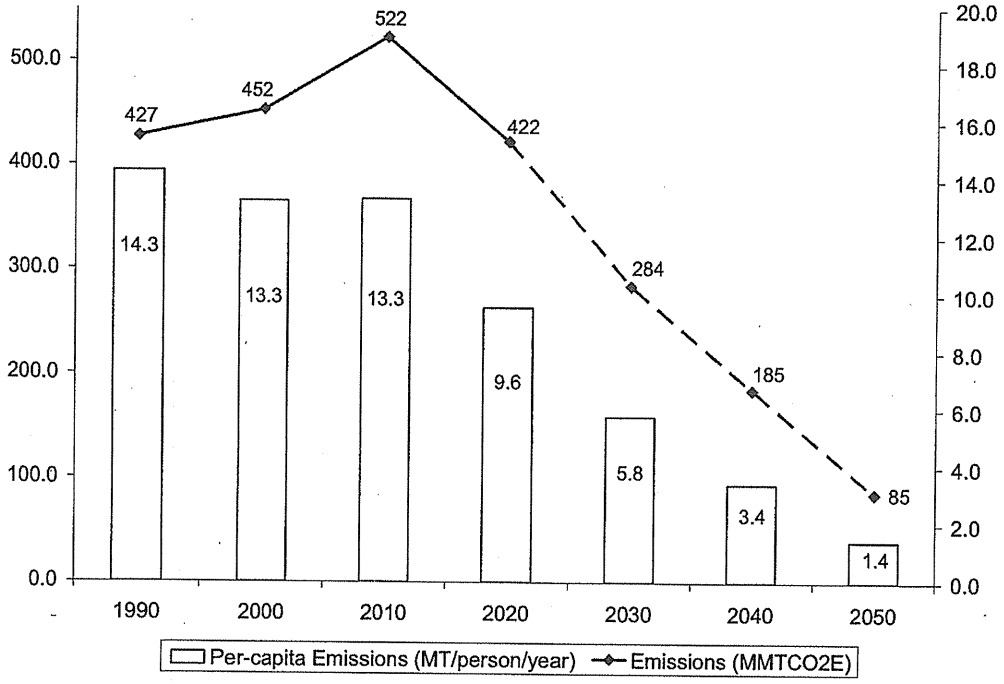
[82] Ibid

[83] WESTCARB. *WESTCARB Overview.* http://www.westcarb.org/about_overview.htm (accessed October 12, 2008)

Figure 6: Emissions Trajectory Toward 2050



To stay on course toward the 2050 target our State's greenhouse gas emissions need to be reduced to below 300 $MMTCO_2E$ by 2030. This translates to an average reduction of four percent per year between 2020 and 2030. An additional challenge comes from the fact that California's population is expected to grow by about 12 percent between 2020 and 2030. To counteract this trend, per-capita emissions must decrease at an average rate of slightly less than five percent per year during the 2020 to 2030 period.

Are such reductions possible by 2030? What measures might be able to provide the needed reductions? How do the needed measures relate to the efforts put into place to reach the 2020 goal? All of these are critical questions, and are addressed below.

The answer to the first question is yes, the reductions are possible. Furthermore, the measures needed are logical expansions of the programs recommended in the Proposed Scoping Plan that get us to the 2020 goal. We could keep on track through 2030 by extending those programs in the following ways:

- Using a regional or national cap-and-trade system to further limit emissions from the 85 percent of greenhouse gas emissions in capped sectors (Transportation Fuels and other fuel use, Electricity, Residential/Commercial Natural Gas, and Industry). By 2030 a comprehensive cap-and-trade program could lower emissions in the capped sectors from 365 $MMTCO_2E$ in 2020 to around 250 $MMTCO_2E$ in 2030;

- Achieving a 40 percent fleet-wide passenger vehicle reduction by 2030, approximately double the almost 20 percent expected in 2020;
- Increasing California's use of renewable energy;
- Reducing the carbon intensity of transportation fuels by 25 percent (a further decrease from the 10 percent level set for 2020);
- Increasing energy efficiency and green building efforts so that the savings achieved in the 2020 to 2030 timeframe are approximately double those accomplished in 2020; and
- Continuing to implement sound land use and transportation policies to lower VMT and shift travel modes.

The effects of these strategies are presented in Table 33.

Table 33: Potential Distribution of California Greenhouse Gas Emissions by Sector in 2030

Sector	Potential Emissions ($MMTCO_2E$)
Transportation Fuels*	102
Other Fuel Use*	149
Uncapped Sectors	33
Total	**284**

* Capped sector

With these polices and measures in place, per-capita electricity consumption would decrease by another five percent. Well over half of our electricity demand could be met with zero or near zero greenhouse gas emitting technologies, assuming nuclear and large hydro power holds constant at present-day levels. In response to a lower cap on emissions, existing coal generation contracts would not be renewed, or carbon capture and storage would be utilized to minimize emissions. The remaining electricity generation would come from natural gas combustion either in cogeneration applications or from highly efficient generating units.

By 2030, the transportation sector would undergo a similarly massive transition both in terms of the vehicle fleet and the diversity of fuel supplies. Due to the combination of California's clean car standards (ARB's ZEV program and the Low Carbon Fuel Standard), the number of battery-electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles would increase dramatically, to about a third of the vehicle fleet. Flex-fuel vehicles would comprise a large fraction of the remaining fleet, with more efficient gasoline and diesel vehicles making up the difference. Electricity, advanced biofuels, improved gasoline and diesel, renewable natural gas and hydrogen would all play a role in powering this high-tech fleet of efficient vehicles.

Regional land use and transportation strategies would grow in importance and would reverse the trend of per-capita vehicle miles traveled, a reduction of about eight percent below business-as-usual in 2030. With ambitious but reasonable action, statewide passenger vehicle greenhouse gas emissions could be reduced to half of 2020 levels in 2030, which is also about half of business-as-usual for 2030. Efficiency strategies and low carbon fuels for heavy-duty and off-road vehicles, as well as for ships, rail, and aviation, would need to be greatly expanded in order to achieve additional reductions from the transportation sector in 2030.

In tandem with efficiency measures that lower demand for electricity, natural gas and transportation fuels, California's cap-and-trade program would incent large industrial sources as well as commercial and residential natural gas customers to further reduce emissions. By tightening the cap over time, it is expected that facilities in the industrial and natural gas sectors would achieve reductions well beyond those needed to meet the 2020 emissions cap.

The Proposed Scoping Plan proposes several measures for reducing high GWP gases that collectively, will substantially reduce emissions. With a transition toward reduced consumption of these gases, improved containment in their end uses, and substitution of low GWP alternative gases, it is expected that emissions from this sector could decrease by 75 percent between 2020 and 2030.

For uncapped sectors, we assume that the agriculture sector will reduce emissions by about 15 percent between 2020 and 2030. Net forest uptake of CO_2 must be preserved or enhanced, likely through both expansion of forests and reduction in carbon loss from forest fires, which are predicted to increase over this time period. This example assumes a 10 percent reduction in direct landfill emissions from the recycling and waste sector; however, aggressive implementation of the suite of measures proposed in this Plan could further reduce emissions from this sector by 2030.

In total, the measures described above would produce reductions to bring California's statewide greenhouse gas emissions to an estimated 284 $MMTCO_2E$ in 2030. While the potential mix of future climate policies articulated in this section is only an example, it serves to demonstrate that the measures in the Proposed Scoping Plan can not only move California to its 2020 goal, but also provide an expandable framework for much greater long-term greenhouse gas emissions reductions.

D. Conclusion

California's commitment to address global warming has never been greater. The vast amount of interest, support, and input that ARB has received since this plan began to take shape is evidence of a clear understanding of the need to take action and support for the State's efforts to lead the way. The time has come to shift away from a 'business-as-usual' approach to climate change and to move toward the lasting and sustainable goal of a clean energy future.

Reaching our goals will take a great deal of leadership, commitment, and a willingness to embrace new approaches and seek out new solutions. California's plan to reduce greenhouse gas emissions must also take into account the impacts of this transition and be designed in particular to address the needs of low-income communities, small businesses, and California's working families.

Reaching our goals will also require involvement and support from all levels of government in California, and a coordinated effort with other states, regions, and countries. The solutions and technologies we develop here will be used around the world to help others transition to a clean energy future and contribute to the fight against global warming.

Reaching our goals will also require flexibility. As we move forward, we must be prepared to make mid-course corrections. AB 32 wisely requires ARB to update its Scoping Plan every five years, thereby ensuring that California stays on the path toward a low carbon future.

This plan is part of a new chapter for California that in many ways began with the passage and signing of AB 32. It proposes a comprehensive set of actions designed to reduce greenhouse gas emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health. The challenge California has taken on is large but the opportunities are even greater. It is now time to turn this plan into action.

ACKNOWLEDGMENTS

This Proposed Scoping Plan was prepared by the Air Resources Board. This document was made possible by the hard work of numerous contributors. Below is a list of advisory committees and State agencies that directly provided input to this Proposed Scoping Plan.

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

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

Department of Food and Agriculture

California Energy Commission

California Public Utilities Commission

California Transportation Commission

Department of Conservation

Department of Forestry and Fire Protection

Department of General Services

Department of Parks and Recreation

Department of Public Health

Department of Toxic Substances Control

Department of Transportation

Department of Water Resources

Housing and Community Development

Integrated Waste Management Board

Office of Environmental Health Hazard Assessment

State Water Resources Control Board

Department of Pesticide Regulation

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CURRENT REGULATIONS FOR SMALL OFF-ROAD ENGINES

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the California regulations for small off-road engines (SORE).

DATE: November 20, 2008

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, CA

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., November 20, 2008, and may continue at 8:30 a.m., November 21, 2008. This item may not be considered until November 21, 2008. Please consult the agenda for the meeting, which will be available at least 10 days before November 20, 2008, to determine the day on which this item will be considered.

For individuals with sensory disabilities, this document and other related material can be made available in Braille, large print, audiocassette or computer disk. For assistance, please contact ARB's Reasonable Accommodations/Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services, or go to http://www.arb.ca.gov/html/ada/ada.htm

If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to sections 2403, 2405, 2406, 2408 and 2409, within chapter 9, article 1, title 13, California Code of Regulations (CCR); proposed amendments to the incorporated "California Exhaust Emission Standards and Test Procedures for 2005 and Later Small Off-Road Engines," as adopted July 26, 2004.

Background: Health and Safety Code sections 43013 and 43018 direct ARB to achieve the maximum feasible and cost-effective emission reductions from all mobile source categories, including small off-road engines, through the setting of emission standards and other requirements.

In 1990, the Board approved exhaust emission control regulations for new small off-road engines. Small off-road engines are equal to or less than 19 kilowatts (kW) and include both handheld equipment (such as string trimmers and chain saws) and nonhandheld equipment (such as lawn mowers and generators, as well as industrial equipment).

In 1998, the Board revised the standards and required manufacturers to meet the emission standards for the life of the engine instead of just when the engines are new. In addition, the Board adopted an emissions credit program.

In 2003, ARB adopted evaporative emissions standards and more stringent catalyst-based exhaust standards. The tier 3 hydrocarbon plus oxides of nitrogen ($HC+NO_x$) emission standards for engines less than 50 cubic centimeters (cc) went into effect with the 2005 model year. The new catalyst-based standards were to be implemented with the 2007 model year for engines between 80 and 225 cc, and with the 2008 model year for engines 225 cc and above. Overall, these catalyst-based standards represented an additional 35 percent reduction in engine-out exhaust emissions from the previous $HC+NO_x$ emission standards.

As noted above, one of the changes made in 1998 was the establishment of an emissions credit program. The program involved two types of credits: certification credits and production credits. A manufacturer obtains certification emission credits when it certifies an engine to a family emission level (FEL) below the standards. The other method of obtaining credits is through the production emission credit program. Manufacturers can obtain emission credits for the amount the production line test results are below the FEL.

Currently, manufacturers have banked in excess of 10,000 tons of HC+NOx emissions reduction credits as of the end of the 2007 model year. At the same time, the tier 3 emissions standards for engines greater than 80 cc are coming into effect in 2007 and 2008. Because of the large amount of emissions credits banked, however, the air quality benefits of the new tier 3 standards are not being realized. Manufacturers are building very few engine families that meet the tier 3 standards, relying instead on banked credits to meet the tier 3 requirements. In other words, these temporary banked emission reductions, reductions that will be returned to the ambient air as they are used, are postponing the beneficial effects of the permanent reductions that come from compliance with the tier 3 standards.

Description of the Proposed Regulatory Action:

Staff's proposal addresses issues that have developed since the Board's 2003 rulemaking and enhances alignment with other ARB and United States Environmental Protection Agency (U.S. EPA) regulations. The major changes would:

- eliminate the generation of production emission credits after model year 2009;
- modify the use of existing production emission credits; and
- limit the lifetime of future certification emission credits to five model years.

The elimination of production emission credits would bring the SORE regulations in alignment with other emissions credit programs.

The proposal also includes other minor changes as follows:

- an option to accept the use of a certification fuel with up to ten percent ethanol content;
- requirements for an English-speaking contact for warranty issues; and
- Executive Officer discretion to make technical modifications.

A more detailed description of staff's proposal is included in the Staff Report: Initial Statement of Reasons for Rulemaking to Consider Amendments to the Current Regulations for Small Off-Road Engines.

COMPARABLE FEDERAL REGULATIONS

Small off-road engines are currently subject to federal regulations contained in title 40 Code of Federal Regulations (CFR), part 90. On September 4, 2008, U.S. EPA approved its "Final Rule: Control of Emissions of Air Pollution from New Nonroad Spark-Ignition Engines, Equipment, and Vessels" for nonroad spark-ignition engines and equipment that would institute "phase 3" standards that generally harmonize with existing tier 3 California exhaust standards for SORE. These changes will be placed in 40 CFR part 1054.

Neither the existing federal regulation nor the final federal rule includes production emission credits. The U.S. EPA certification credit program will impose limitations on the use of certification credits to meet the phase 3 standards. Emission credits which are above the new standard and obtained before the standard change could be used for two years after the phase 3 emission standards are implemented. However, emission credits generated by engines under the phase 3 exhaust averaging, banking, and trading program are proposed to have an unlimited credit life.

The proposed regulations are expected to indirectly reduce emissions by insuring full implementation of the tier 3 emission standards, beyond what would be accomplished by the existing federal regulations. Thus, the need for the separate California program is justified by the benefit to human health, public welfare, and the environment. In addition, Health and Safety Code sections 43013 and 43018 authorize the differences from the federal program.

BENEFITS OF THE PROPOSAL

Staff's objectives in recommending the revisions to California's SORE regulations are to provide harmonization with other regulatory programs and the federal requirement. It is also Staff's objective to address the unlimited accumulation of emission credits. Small off-road engine manufacturers possess over 10,000 tons of banked $HC+NO_x$ emission credits. If those credits were to be expended over the proposed credit lifetime of five years, it would represent an increase of over five tons per day of $HC+NO_x$ emissions. The proposed changes would not modify the emission standards themselves.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: "Staff Report: Initial Statement of Reasons for Rulemaking, Public Hearing to Consider Amendments to the Current Regulations for Small Off-Road Engines."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and ~~strikeout~~ format to allow for comparison with the existing regulations, may be accessed on the ARB's web site listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on November 20, 2008.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's web site listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Scott Rowland, at (626) 575-6676 or srowland@arb.ca.gov, or Ms. Yun Hui Park, at (626) 450-6263 or ypark@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533.
The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at www.arb.ca.gov/regact/2008/sore2008/sore2008.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary cost or savings to state or local agencies. The ARB may incur additional implementation or enforcement costs at some future time.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action would have some impact, although not significant, on small businesses that buy and sell off-road equipment using these engines.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the board or that has otherwise been

identified and brought to the attention of the board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and in writing or by e-mail before the meeting. To be considered by the Board, written comments submissions not physically submitted at the meeting must be received **no later than 12:00 noon, November 19, 2008**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests but does not require that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39600, 39601, 43013, 43018, 43101, 43102, 43104, and 43105. This action is proposed to implement, interpret and make specific sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5, and 43210-43212.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

James N. Goldstene
Executive Officer

Date: September 23, 2008

California Environmental Protection Agency

Air Resources Board

STAFF REPORT
INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING
PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CURRENT REGULATIONS FOR SMALL OFF-ROAD ENGINES

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This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **2**

1. INTRODUCTION **3**

2. BACKGROUND **4**

2.1 LEGAL AUTHORITY 4
2.2 REGULATORY HISTORY 4
2.3 EMISSIONS INVENTORY 6
2.4 RELATED FEDERAL REGULATIONS 7
2.5 PUBLIC PROCESS 7

3. DISCUSSION **8**

3.1 CERTIFICATION EMISSIONS CREDITS 8
3.2 PRODUCTION EMISSION CREDITS 10
3.3 ZERO EMISSION EQUIPMENT CREDITS 12
3.4 WARRANTY CONTACT 13
3.5 DURABILITY PERIOD 13
3.6 ETHANOL BLEND CERTIFICATION FUEL OPTION 13

4. ENVIRONMENTAL AND ECONOMIC IMPACTS **14**

4.1 ENVIRONMENTAL IMPACT 14
4.1.1 Emission Reductions *14*
4.1.2 Environmental Justice *14*
4.2 COST AND COST-EFFECTIVENESS 15
4.3 ECONOMIC IMPACT ON THE ECONOMY OF THE STATE 15
4.3.1 Legal Requirement *15*
4.3.2 Businesses Affected *15*
4.3.3 Engine Manufacturers *16*
4.3.4 Impact on Small Businesses *17*
4.3.5 Potential Impact on Distributors and Dealers *17*
4.3.6 Potential Impact on Business Competitiveness *17*
4.3.7 Potential Impact on Employment *17*

5. ALTERNATIVES CONSIDERED **17**

5.1 NO ACTION 18
5.2 MORE STRINGENT EMISSION STANDARDS TO COMPENSATE FOR THE BANKED EMISSION CREDITS 18
5.3 HARMONIZATION WITH THE U.S. EPA'S CREDIT PROGRAM 18
5.4 ISSUES OF CONTROVERSY 19
5.5 SUMMARY OF ALTERNATIVES EVALUATED 19

6. CONCLUSIONS AND RECOMMENDATIONS **19**

7. REFERENCES **20**

APPENDIX A: Proposed Amendments to the Small Off-Road Equipment and Engines Exhaust Emission Regulation

APPENDIX B Proposed Amendments to the California Exhaust Emission Standards and Test Procedures for 2005 and Later Small Off-Road Engines

EXECUTIVE SUMMARY

The amendments proposed herein to the California emissions regulations and test procedures for new small off-road engines (SORE) and equipment are intended to address issues that have developed since the Air Resources Board (Board or ARB) last considered the regulations (September 2003) and to enhance alignment with other ARB and United States Environmental Protection Agency (U.S. EPA) regulations.

In addition to the changes discussed below, staff is proposing that the Board modify the SORE regulations to address the excessive accumulation of emission credits. Specifically, staff proposes the removal of the mechanisms which allow for generation of new production emission credits. Staff also proposes limiting the lifetime of existing production emission credits and new certification emission credits. These proposed changes would result in a more balanced emission credit program which should encourage introduction of new cleaner technology, yet keep in check excessive emission credit balances. If the proposed changes are not adopted, emissions related to the more than 10,265 tons of combined certification and production emission credits could represent an increase of 5.4 tons per day over a 5-year period, if all the current certification and production emission credits were spent. Without the limitations proposed by staff, the large bank of HC+NOx credits could jeopardize the State's Implementation Plan.

To encourage the increased use of zero emission equipment (ZEE) such as electrics, staff proposes to allow certification emission credit generation for advanced technology ZEE capable of performing at the same level as professional-grade equipment.

Staff is also proposing to streamline the regulations and harmonize with U.S. EPA to the extent feasible.

Staff is proposing other minor amendments including:

- Durability period to include a "years" definition
- Clarification of warranty contact requirement
- Permitting the use of fuel with up to ten percent ethanol in certification testing

A more in depth description of staff's proposal is included in Chapter 3 of this report.

Staff recommends that the Board adopt this proposal.

1. INTRODUCTION

Small off-road engines (SORE) are spark-ignition engines rated at or below 19 kilowatts (25 horsepower). The vast majority of these engines use gasoline, but some use an alternative fuel such as liquefied petroleum gas (LPG) or compressed natural gas (CNG). SORE are used to power a broad range of lawn and garden equipment including lawn mowers, leaf blowers, and lawn tractors, as well as generators and small industrial equipment. Exhaust and evaporative emissions from off-road equipment are a significant source of hydrocarbon (HC) and oxides of nitrogen (NO_x) emissions in California. Both NO_x and HC emissions contribute to the State's ozone problem.

This report presents proposed changes to the current SORE regulations. These proposed changes include the elimination of "production emission" credit generation and limitations on the lifetime and usage of "certification emission" credits, as well as other minor changes. These terms, and the overall credit generation provisions, are discussed in greater detail later in this report. The changes to the credit program would help ensure advancement of cleaner engine technology, while preserving manufacturer flexibility.

This report addresses the need for the proposed regulatory changes, provides a summary of the proposed amendments, presents the environmental and economic impacts of the proposal, and discusses alternatives to staff's proposal. Appendix A contains the Proposed Amendments to the Small Off-Road Engine Exhaust Emission Control Regulations. Appendix B contains the Proposed Amendments to the California Exhaust Emission Standards and Test Procedures for 2005 and Later Small Off-Road Engines.

2. BACKGROUND

2.1 Legal Authority

In 1988, the Legislature enacted the California Clean Air Act (CCAA), which declared that attainment of state ambient air quality standards is necessary to promote and protect public health, particularly the health of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practicable date. Specifically, Health and Safety Code (HSC) sections 43013 and 43018 direct ARB to achieve the maximum feasible and cost-effective emission reductions from all off-road mobile source categories, which includes the SORE category addressed in this proposal.

2.2 Regulatory History

In December 1990, the Board approved exhaust emission control regulations for new SORE. These engines are equal to or less than 19 kilowatts and include both handheld equipment (such as string trimmers and chain saws) and nonhandheld equipment (such as lawn mowers and generators, as well as industrial equipment).

The SORE regulations include exhaust emission standards, emissions test procedures, and provisions for warranty and production compliance programs (See Title 13, California Code of Regulations, sections 2400-2409 and the documents incorporated therein). The SORE category was the first off-road category subject to emission control regulations. The adopted regulations consisted of two tiers. The first tier began in 1995, while the Tier 2 standards were to become effective with the 1999 model year.

In March 1998, the Board revised the Tier 2 standards and delayed their implementation from 1999 to 2000, but required manufacturers to meet the emission standards for the life of the engine instead of just when the engines are new. In addition, the Board approved an emissions credit program. The program involved two types of credits: certification emission credits and production emission credits.

Certification emission credits are similar to those used in other ARB emission programs (e.g., the heavy-duty diesel program) to provide flexibility to manufacturers. Certification emission credits are generated when a manufacturer certifies an engine to a family emission limit (FEL) below the applicable emission standard. Thus, they represent real and enforceable emissions reductions beyond those required by regulation. The value of the credits is determined by the following formula:

Certification Emission Credits
= (Standard – FEL) x Sales x Power x Emission Durability Period x Load Factor

Production emission credits are generated based on the amount the production line test result, or Compliance Level (CL), is below the FEL, using a similar formula:

Production Emission Credits
= (FEL – CL) × Sales × Power × Emissions Durability Period × Load Factor

Production emission credits were originally intended for a manufacturer to use to offset compliance problems, but no manufacturer has had to use production emission credits for that purpose to date. The manufacturer also is allowed to convert production emission credits to certification emission credits at a rate of 1.1 production emission credits to 1.0 certification emission credit. When a manufacturer accumulates a large amount of production emission credits, it tends to convert them to certification emission credits, which in turn allows the continued production of engines which emit above the standard. Because they are based on the manufacturer's compliance level, production emission credits do not necessarily represent emission reductions beyond those required by regulation. Manufacturers traditionally target a compliance level below the actual standard to ensure compliance in production, even without the possibility of obtaining production emission credits; any air quality benefit from the compliance level is achieved regardless. (This is addressed further in Section 3.2.) In short, the production emission credits have been more of a detriment to air quality than a benefit.

The adoption of production emission credits was unique, in that no other existing mobile source category was allowed to generate and use production line credits for compliance purposes. At the time the 1998 proposal was drafted, the United States Environmental Protection Agency (U.S. EPA) was also considering the use of production emission credits and staff's proposal was intended to harmonize with the anticipated, future U.S. EPA rulemaking. Ultimately, however, U.S. EPA decided against offering production emissions credits as an option for these engines and equipment in its final rule.

In 2003, the Board adopted more stringent exhaust emissions standards. These new standards applied to engines above 80 cc (generally used in nonhandheld equipment such as lawn mowers and generators), and were based on reductions achievable with the use of a catalyst. The new catalyst-based standards were to be implemented with the 2007 model year for engines with displacements between 80 and 225 cc, and with the 2008 model year for engines 225 cc and above. Overall, these catalyst-based standards represented an additional 35 percent reduction in exhaust emissions from the previous HC+NOx emission standards.

The current exhaust emission standards for spark-ignition SORE are shown in Table 2.1.

Table 2.1. Tier 3 Exhaust Emission Standards for Spark-Ignition Engines
(grams per kilowatt-hour)

Model Year	Displacement Category	Durability Periods (hours)	Hydrocarbon plus Oxides of Nitrogen[(1)(3)]	Carbon Monoxide	Particulate
2005 and subsequent	<50 cc	50/125/300	50	536	2.0[(2)]
	50-80 cc, inclusive	50/125/300	72	536	2.0[(2)]
2007 and subsequent	>80 cc - <225 cc	125/250/500	10.0	549	
2008 and subsequent	≥ 225 cc	125/250/500/1000	8.0	549	

(1) The Executive Officer may allow gaseous-fueled (i.e., propane, natural gas) engine families, that satisfy the requirements of the regulations, to certify to either the hydrocarbon plus oxides of nitrogen or hydrocarbon emission standard, as applicable, on the basis of the non-methane hydrocarbon (NMHC) portion of the total hydrocarbon emissions.

(2) Applicable to all two-stroke engines.

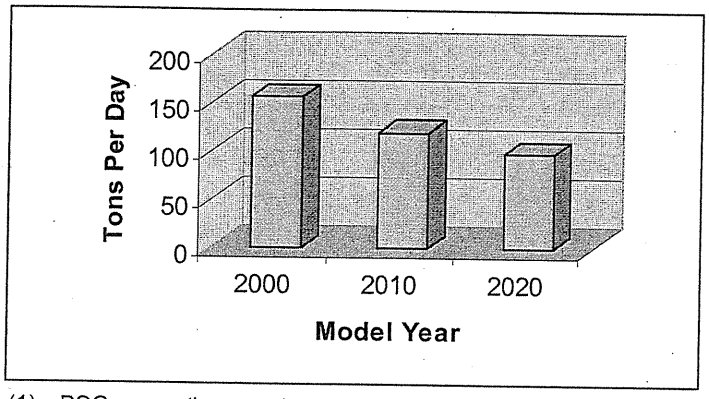
(3) Engines used exclusively to power products which are used exclusively in wintertime, such as snowthrowers and ice augers, at the option of the engine manufacturer, need not certify to or comply with standards regulating emissions of $HC+NO_x$ or $NMHC+NO_x$, as applicable. If the manufacturer exercises the option to certify to standards regulating such emissions, such engines must meet such standards. If the engine is to be used in any equipment or vehicle other than an exclusively wintertime product such as a snowthrower or ice auger, it must be certified to the applicable standard regulating emissions of $HC+NO_x$ or $NMHC+NO_x$ as applicable.

During the extensive public process before the Board meeting in 2003, many of the engine and equipment manufacturers strongly opposed the use of catalysts on the small off-road equipment, claiming the use of catalysts created safety issues. Since safety issues dominated the discussions, potential emission credit issues were overshadowed. Staff did not foresee that the potential for accumulation of credits would become so overwhelming that engine manufacturers would not need to make modifications to their engines for years past the introduction of the more stringent emission standards. In fact, as of the end of the 2007 model year, manufacturers have banked over 10,265 tons of combined certification and production HC+NOx emission credits, and are expending the credits to avoid using catalysts and avoid producing engines that meet the Tier 3 emission standards. This means that even though the new Tier 3 emission standards are in effect, California is not fully achieving the cleaner air these standards were intended to deliver. If the combined credits were expended over a five-year period typical of equipment life, emissions would be 5.4 tons per day higher than if the engines met the standards. These credit issues, the focus of staff's proposal, are discussed in greater detail in Section 3 of this report.

2.3 Emissions Inventory

Figure 2.1 illustrates the contribution of SORE to statewide HC+NOx emission levels for calendar years 2000, 2010, and 2020. Since the implementation of exhaust emission standards for small engines, the emissions contribution has declined and was projected to decline further over the next decade as a result of the emission standards adopted in 2003. However, due to the large amount of banked certification and production emission credits, the exhaust emission levels may not decline for years.

Figure 2.1. SORE Evaporative and Exhaust Emissions Inventory
Statewide ROG(1) + NOx Emissions



(1) ROG, or reactive organic gases, is the reactive part of hydrocarbon emissions which contribute to the formation of ozone in the presence of sunlight and other gases.

2.4 Related Federal Regulations

Federally, SORE are regulated under title 40, Code of Federal Regulations, part 90. The federal "phase 2" standards currently in effect are equivalent in stringency to the California Tier 2 standards. Although the federal program allows generation and use of certification emission credits, it does not include any provision for production emission credits.

In September 2008, the U.S. EPA adopted changes to several equipment categories including regulations for SORE which would reduce hydrocarbon emissions by about 35 percent compared to their current levels. These "phase 3" standards will bring the national emission standards down to the same levels as California Tier 3 standards. The new exhaust emission standards are to begin in 2011 or 2012, depending on the size of the engine. U.S. EPA also included new requirements to reduce evaporative emissions from these fuel systems. The U.S. EPA's evaporative emission standards, which will also go into effect in 2011 and 2012, are comparable in stringency to ARB's program, which was adopted in 2003 and went into effect in 2007.

2.5 Public Process

Staff conducted public workshops on November 14, 2007 and April 21, 2008 to aid in developing the proposed regulations. Workshop notices were sent out via email on the msprog listserve list and orspark listserve list to all stakeholders, including environmental organizations, engine manufacturers, equipment manufacturers, and trade associations, as well as other interested parties. At the workshops and subsequently, staff has shared draft proposed regulatory language with all stakeholders. Public information concerning the development of this proposal was also made available on ARB's website at www.arb.ca.gov/msprog/sore/sore.htm.

During development of this proposal, staff also met with many of the engine and equipment manufacturers individually to discuss their concerns. A list of meetings held with a number of stakeholders is summarized in Table 2.2 below.

Table 2.2
List of Meetings and Telephone Calls

Stakeholder	Date(s)
American Honda Co.	2/8/08, 8/12/08
Andreas Stihl AG & Co.	10/4/07, 2/8/08, 3/27/08, 8/12/08, 8/22/08
Briggs & Stratton Corp.	2/8/08, 4/3/08, 8/12/08
ECHO Incorporated	2/8/08, 3/10/08, 4/24/08, 8/12/08, 8/22/08
Engine Manufacturers Association	2/8/08, 4/24/08, 6/24/08, 8/12/08
John Deere	8/12/08
Kawasaki Motors Corp.	2/8/08, 8/12/08
Kohler Co.	2/7/08, 2/8/08, 4/21/08, 4/24/08, 8/12/08, 8/22/08
Lion Cells	7/14/08
MECA	11/29/07
Outdoor Power Equipment Institute	2/8/08, 4/24/08, 8/12/08, 8/22/08
RedMax/Zenoah America, Inc.	2/8/08, 8/12/08
Robin America (Fuji Heavy)	8/12/08
Shindaiwa Inc.	2/8/08, 3/27/08, 8/12/08, 8/22/08
Tecumseh	8/12/08
The Toro Company	2/8/08, 4/24/08, 8/12/08, 8/22/08
TTI/Techtronic Industries	2/8/08, 8/12/08

As a result of the oral and written comments received, staff made significant changes to the proposed regulations, which are reflected in the staff's proposal.

3. DISCUSSION

3.1 Certification Emissions Credits

Certification emission credits were intended to provide flexibility to manufacturers. In concept, manufacturers would earn certification emission credits by introducing some engine families with cleaner technologies (e.g., catalysts) earlier than necessary, then have more time to improve other engine families that were smaller in volume or were otherwise more challenging to bring into compliance. Staff's expectation was that averaging, banking and trading of certification emission credits would provide manufacturers with another tool to manage compliance, while also encouraging early introduction of clean engines.

While the certification emission credit program did provide flexibility, it has had mixed results with regards to advancing technology. Instead of using catalysts, which are a technically feasible and cost-effective means to comply with the Tier 3 standards,

manufacturers have been able to use banked credits (which could include production emission credits that have been converted to certification emission credits), allowing them to certify "dirtier" engines. Most importantly, this is not a situation involving just one or two manufacturers. As shown in Table 3.1, for 2008 model year engines with a displacement between 80 and 225 cc, over 90 percent exceeded the HC+NOx standard through the use of credits. Overall, seven out of ten new 2008 model year SORE exceed the certification emission standard.

Table 3.1. 2008 Model Year SORE Engines which Exceed the SORE Tier 3 HC+NOx Standard

Engine Displacement	Total Estimated Sales	Number of engines exceeding the standard	Percentage of engines exceeding the standard
Less than or equal to 80 cc	894,707	164,227	18.4%
From 80 to 225 cc	3,295,601	3,005,791	91.2%
Greater than or equal to 225 cc	399,147	149,756	37.5%
Total	4,589,455	3,319,774	72.3%

Note: Excluding cold-weather only equipment which do not need to meet HC+NOx standard.

Manufacturers that do certify with catalyst-equipped engines tend to be smaller companies which are new or are not able to obtain many certification or production emission credits. Other manufacturers who may not have intended to use the credit program found it necessary to participate in the credit program to remain competitive with manufacturers who used emission credits. Overall, the effect has been to delay implementation of cleaner technology. Furthermore, the large bank tends to indicate that the emission standards themselves are not as stringent as they could be, in that many more credits were generated than were needed.

There are other reasons that can further explain how this situation has occurred. Some manufacturers made incrementally cleaner engines and banked many certification emission credits over a long period of time. Specifically, manufacturers have been able to bank certification emission credits since 1999, when the emission standards were much more lenient (i.e., 16.1 g/kW-hr for lawn mower engines). Relatively minor modifications made at that time enabled manufacturers to come in well below the emission standard, and thus generate and bank credits for years. Although the current standards are now more stringent (i.e., 10 g/kW-hr for lawn mower engines), some of the same engine families which were used to accumulate certification emission credits before the emission standard change were able to use emission credits to meet the current emission standard without improvements.

To further exacerbate the situation, the certification emission credits remain available for use indefinitely, even though the engines from which the emission credits were generated deteriorate, fall out of warranty, and are taken out of service. Thus, since certification emission credits are intended to represent air quality benefits which are

time sensitive, allowing the credits to be banked for an indefinite time period has led to large credit banks which slow progress towards cleaner engines and results in dirtier air.

To remedy this issue, staff proposes that the certification credit lifetime be limited to five years. This limit coincides with the useful lifetime of SORE equipment. Although many lawn mowers or other engines remain in service much longer than five years, staff is unaware of any supporting evidence that would suggest that these mowers remain in emissions compliance beyond that time period, nor is there any mechanism to enforce emissions compliance beyond the emissions durability period. Staff believes limiting the credit life to five years strikes a balance between not allowing for credits at all and keeping credits from accumulating indefinitely.

3.2 Production Emission Credits

Production emission credits also contribute to the problem of excessive credit banks. As mentioned previously, manufacturers design their engines such that during production line testing, the engines will perform "comfortably" below the emission standard, or FEL. Thus, in general, any emissions margin observed during production testing is used by manufacturers as an emissions "cushion" to ensure compliance. However, only in the SORE program[1] are manufacturers permitted to use the emissions margin to generate production emission credits. It was envisioned that these generated/banked credits could be used at a later date if emissions compliance problems were encountered. However, no such problems have been encountered since the adoption of the SORE credit program in 1998. Thus, the production emission credit balances continue to grow.

In a sense, manufacturers are getting a double benefit from their compliance margins. Credits are recognition that an engine is cleaner than the required emission standard. In contrast, the primary purpose of any production compliance margin is to ensure that the chance of exceeding the emission standards in actual production is minimized. Thus, it is essentially part of the design strategy to meet the emission standards, not an additional effort to go beyond the requirements. As noted, no other ARB program allows generation and use of credits based on production line emission results that fall below the emission standard or FEL.

In addition to allowing a manufacturer to benefit from its compliance margin, production emission credits are intrinsically inflated beyond the actual value of the compliance margin. This inflation occurs because of the differences between certification testing and production line testing. Whereas certification testing is conducted on the worst-case engine model within an engine family, production line testing can be on any engine

(1) Although the U.S. EPA had considered using production emission credits at one time for small spark-ignition engines, it ultimately rejected the idea. When the U.S. EPA emission standards went into effect, the manufacturers of small engines were able to make the transition to the phase 2 emission standards without the use of production emission credits. The U.S. EPA has not introduced production emission credits for their phase 3 emission standards. Thus, termination of the production emission credit program would harmonize with U.S. EPA.

model. There is no guarantee that the engines used for production line testing are representative of the worst-case engine model. Thus, the amount of production emission credits generated can exceed the value of the nominal compliance margin.

This leads to yet another concern in that the existing program allows production emission credits to be converted to certification emission credits. As the production emission credits, which provide no real emission benefits, are converted to certification emission credits, the overall credit banks grow even larger. Although only a small amount of production emission credits are currently banked as production emission credits, over 4,500 tons have already been converted to certification emission credits. Overall, production emission credits represent more than half of the total banked credits, as shown in Table 3.2.

Table 3.2. Comparison of Production Emission Credits to Total Banked Emission Credits

	Tons HC+NOx	Percentage of Total Banked Credits
Total Banked Credits	10,265	
Production Credits Banked	782	7.6 %
Production Credits Converted to Certification Credits	4,526	44.1 %
Total Contribution of Production Credits	5,308	51.7 %

Note: Credit values, incorporating 2007 model year reports received as of August 22, 2008

Finally, it must be recognized that production emission credits are not necessary to meet current SORE requirements. Production emission credits are being used to delay compliance with the current Tier 3 standards, even though cost-effective technology is available to sufficiently reduce emissions. If the production credit program is removed, manufacturers would still have an incentive to produce cleaner engines because the manufacturer would still be able to claim certification credits for the cleaner-than-required engines.

For these reasons, staff has concluded that the production emissions credit program has not functioned as envisaged; it has resulted in higher emissions and needs to be eliminated. Staff therefore proposes to end generation of new production emission credits in 2009, but to allow manufacturers an additional year, until 2010, to use or convert production credits to certification credits. This period would ensure that those manufacturers who have already converted their production emission credits to certification credits do not have an unfair advantage over those who have not yet converted them.

3.3 Zero Emission Equipment Credits

The Board has long been interested in ways to expand the use of electric equipment in the SORE category. In 2004, staff reported to the Board specifically on potential electrification programs, concluding at that time that the residential market has significant penetration of electric equipment, but that current electric equipment cannot meet the demands of the commercial user. However, advances in similar equipment such as power tools, and advances in battery development have led staff to propose modifications to the SORE program to encourage manufacturers to develop professional grade zero-emission equipment (ZEE). In addition to providing reductions in criteria pollutants, increased use of ZEE would provide greenhouse gas reductions.

Although electric equipment can be classified and labeled as "Blue Sky" equipment under the current regulations, such equipment are not eligible to participate in the emission credit program. Staff proposes to modify the program, to allow certification emission credit generation for advanced technology ZEE capable of performing at the same level as commercial gasoline-powered equipment. To insure that real air quality benefits are achieved, staff proposes that this equipment meet the following requirements.

- The equipment must be able to perform at a level equivalent to that of currently available, professional level SORE equipment (i.e., equipment used by professional gardeners).
- The equipment must not be powered by an electric cord. Corded equipment already exists and is generally not conducive to professional usage, and so awarding emission credits for it would not advance technology beyond its current state.
- Each recharge or refueling should allow the equipment to perform at a professional performance level for the same duration as typical professional equipment of the same type. Furthermore, the time to repower (e.g., time to replace battery pack) the ZEE should be equivalent to the time of refueling typical spark-ignition equipment.
- The equipment must be as durable as the equivalent professional SORE equipment. Thus, it should be able to be operated over the appropriate SORE test cycle repeatedly for the maximum durability period for that equipment.

To obtain certification, a manufacturer would need to provide a description of the equipment (including performance data showing that it meets the ZEE criteria), a description of the power source, and an energy density or specific energy test. All other standard certification requirements such as providing the warranty, labels, etc. would also need to be met. Upon certification of advanced technology ZEE, the manufacturer would receive credits determined by the following equation:

ZEE Certification Emission Credits
= Equivalent HC+NOx Emissions Standard x Sales x Power x EDP x Load Factor

In general, ZEE credits could be averaged, banked, and traded as normal certification emission credits, and would be subject to the same five-year credit life. However, because ZEE emission credits could be generated by manufacturers not currently in the SORE category (e.g., those who produce electric equipment, but not engines), staff proposes some additional limitations on ZEE usage to ensure that any potential influx of emissions credits does not result in the delay of improvements to engine-powered equipment that has been seen under the current credit program. Specifically, staff proposes that ZEE credits can be used only up to 40 percent above the standard. If an engine family's emissions are higher than 40 percent above the standard, they would need to use other certification credits to cover the difference. Staff believes that the addition of ZEE credits will promote advanced technology and allow manufacturers additional flexibility. Staff intends to follow the implementation of the ZEE credit program closely to ensure it accomplishes its goal of encouraging advanced technology.

3.4 Warranty Contact

Currently, warranty guidelines require that manufacturers provide an American toll free number with the assumption that the receiver of the call would speak English. Although this guideline has been in place for several years, some newer manufacturers are not complying with this requirement or its intent. Staff therefore proposes to place this requirement in regulatory language to clarify what is needed to protect the consumers who purchase such equipment in the State of California. Manufacturers are generally in support of this proposed provision.

3.5 Durability Period

Most ARB and U.S. EPA engine programs include a useful life definition in terms of years of use, extent of engine operation in hours, or vehicle usage in miles. Currently, the SORE and equipment durability period is only defined in terms of hours. These engines do not typically have hour meters on them, so there is no way of determining how long an engine has been operated and whether or not it meets the time requirements. Staff proposes to amend the durability period to add five years of use as an alternative to hours. For example, for engines which currently have a durability period of 125 hours, the durability period would become either five years or 125 hours, whichever comes first. The five-year period is equivalent to a typical median life of SORE equipment; U.S. EPA also uses this time period in their new rule.

3.6 Ethanol Blend Certification Fuel Option

Staff proposes to allow manufacturers the option to use a certification fuel with up to ten percent ethanol content, provided that they use the same fuel for certification with the U.S. EPA. This option would enhance harmonization with U. S. EPA, and could reduce testing costs for some manufacturers.

4. ENVIRONMENTAL AND ECONOMIC IMPACTS

4.1 Environmental Impact

4.1.1 Emission Reductions

The intent of the proposed regulations is to obtain the emission reductions from small engines and equipment which was expected from the previously adopted Tier 3 standards. By 2010, on an annual average basis, the Tier 3 emission standards would result in statewide emission reductions of 3.2 tons per day of NOx and 18.5 tons per day of HC. In 2020, the estimated reductions increase to 7.5 and 42.0 tons per day for NOx and HC, respectively. Although there are no new incremental benefits from this proposal, the proposal will assure these benefits are realized. If the proposed changes are not adopted, emissions related to the more than 10,265 tons of combined certification and production emission credits could result in an increase of 5.4 tons per day for 5 years, if all the current certification and production emission credits were spent.

The emission reductions from fully meeting the Tier 3 standards are part of the reductions needed to attain health-based air quality standards in California. As such, these reductions are included in the State Implementation Plan (SIP). Extensive usage of banked credits that allow engines to emit above the standards would interfere with attainment and exceed the emission limits in the SIP. Specifically, without the limitations proposed by staff, the large bank of HC+NOx credits could jeopardize the SIP.

4.1.2 Environmental Justice

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Stats 1999, Ch. 690; Government Code § 65040.12(c)). The Board has established a framework for incorporating environmental justice into the ARB's programs consistent with the directives of State law. The policies developed apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low income and minority communities, which sometimes experience higher exposures to some pollutants as a result of the cumulative impacts of air pollution from multiple mobile, commercial, industrial, area wide, and other sources. Over the past twenty-five years, the ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air quality in California. However, some communities continue to experience higher exposures than others as a result of the cumulative impacts of air pollution from multiple mobile and stationary sources and thus may suffer a disproportionate level of adverse health effects. Since the same ambient air quality standards apply to all regions of the State, all communities, including environmental justice communities, will benefit from the air quality benefits associated with the proposal. Alternatives to the proposed recommendations, such as

recommending no change to the current program could adversely affect all communities. As additional relevant scientific evidence becomes available, the small off-road engine standards will be reviewed again to make certain that the health of the public is protected with an adequate margin of safety.

To ensure that everyone has an opportunity to stay informed and participate fully in the development of the proposal, staff has held workshops in El Monte and has distributed information through the internet, as described in section 2.5 of this report.

4.2 Cost and Cost-Effectiveness

The proposed changes to the SORE program should not change the cost of complying with the Tier 3 standards as estimated in 2003, because the estimates at the time did not assume extensive use of credits to comply. No additional expenses are expected for the engine manufacturers other than those already assumed previously.

4.3 Economic Impact on the Economy of the State

The proposed regulations are not expected to impose a significant cost burden, if any, to engine or equipment manufacturers. As noted in Section 4.2, the proposed regulations should not increase costs beyond those accounted for in the 2003 rulemaking. Based on the above assumptions, staff expects the proposed regulations to impose no adverse impact on California competitiveness and employment. The following sections are intended to fulfill ARB's legal requirements related to economic analysis and economic impact for stakeholders affected by these proposed regulations.

4.3.1 Legal Requirement

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulations. The assessment shall include a consideration of the impact of the proposed regulations on California jobs, business expansion, elimination or creation, and the ability of California business to compete.

Also, section 11346.5 of the Government Code requires State agencies to estimate the cost or savings to any state, local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the state.

4.3.2 Businesses Affected

Any business involved in the manufacturing of SORE and equipment will potentially be affected by the proposed regulations. Also, potentially affected are businesses that

supply engines and parts to these manufacturers, and those businesses that buy and sell equipment in California.

4.3.3 Engine Manufacturers

There are currently 60 SORE manufacturers that market certified engines in California, as shown in Table 4.2. Sixteen of these manufacture only engines less than or equal to 80 cc for use in such applications as chainsaws, trimmers, and other handheld products. Twenty-nine exclusively manufacture engines greater than 80 cc for use in such applications as walk-behind and riding mowers, portable generators, and other nonhandheld products. Fifteen manufacturers produce engines for both handheld and nonhandheld applications. None of the manufacturers is located in California although some have small repair and distribution operations in California. Some manufacturers of the evaporative emission components are located in California, but they would not be affected by these proposed modifications.

Table 4.2
Manufacturers with Small Engines Certified in California (Model Year 2008)

Produce ≤ 80 cc	Produce > 80 cc	Produce Both
Andreas Stihl	Alto U.S.	Champion Power
China Xingyue Group	Briggs & Stratton	Honda Motor
Homelite Consumer	Chongqing AM-Pride	Kawasaki Heavy Industries
Husqvarna AB	Chongqing Dajiang Power	Mitsubishi Heavy Industries
Husqvarna Outdoor	Chongqing Huawei Lianlong	Ningde Cue
Husqvarna Zenoah	Chongqing Hybest	Shandong Huasheng Zhongtian
Kioritz	Chongqing Lifan	Shanghai Alton
Makita Numazu	Chongqing Maifeng	Shindaiwa
Maruyama	Chongqing Sanding	Suzhou Erma Machinery
McCulloch	Chongqing Weima	United Power Equipment
MTD Southwest	Chongqing Zongshen	Wenling Zhengjiang Vehicle
Nikko Tanaka Engineering	Cummins Power Generation	Wuxi Kipor Power
Suzhou Honbase	Eagle Solutions	Yamaha
Suzhou Tiger	Fuji Heavy Industries	Yancheng Jiangdong
Yongkang Apollo	Generac Power Systems	Zhejiang Robot
Zhejiang Zomax	Jiangsu Changfa Group	
	Jiangsu Sumec-Linhai	
	Kohler	
	Kohler Power Systems	
	Kubota	
	Liquid Combustion	
	Loncin	
	Onyx Environmental	
	Power Solutions	
	Shanghai Grow Development	
	Tecumseh Power	
	Tecumseh Products	
	Tornado	
	Westerbeke	

4.3.4 Impact on Small Businesses

The proposed regulations have only a minor impact on small businesses that buy and sell off-road equipment. Any impacts that the small businesses might experience due to the Tier 3 standards were already considered at the 2003 Board Hearing.

4.3.5 Potential Impact on Distributors and Dealers

Most engine and equipment manufacturers sell their products through distributors and dealers, some of which are owned by manufacturers and some are independent. Most independently owned dealers are small businesses. Some low-volume manufacturers also deal directly with their customers. The distributors and dealers sell about 1,700,000 units of small engine equipment per year in California. Although they are not directly affected by the proposed amendments, the amendments may affect them indirectly. If an increase in the price of engines and equipment reduces sales volume, dealers' revenue would be affected adversely. But again, no significant price increase, if any, is expected.

4.3.6 Potential Impact on Business Competitiveness

The proposed amendments would have no significant impact on the ability of California engine and equipment manufacturers to compete with manufacturers of similar products in other states. This is because all manufacturers that produce these engines and equipment for sale in California are subject to the proposed amendments regardless of their location. Furthermore, all of the engine manufacturers, and most of the equipment manufacturers, are located outside of California.

4.3.7 Potential Impact on Employment

The proposed regulations are not expected to cause a reduction in California employment because, as previously noted, the economic impact of the proposal should be minimal. Also, California accounts only for a small share of manufacturing employment in off-road engine, equipment, and component production.

5. ALTERNATIVES CONSIDERED

Staff evaluated three additional alternatives to the currently proposed regulations. These included:

- Take no action.
- Set more stringent emission standards to compensate for the banked emission credits.
- Harmonize with the U.S. EPA's credit program.

These alternatives are discussed in detail below.

5.1 No Action

The first alternative evaluated was to take no action. Under this alternative, many of the engine and equipment manufacturers would be able to continue to delay implementation of the new SORE emission standards across their entire product line for years. If the Board adopted yet more stringent standards later, the same situation would likely occur; the manufacturers would have so many credits banked that cleaner engines would not be offered until years after the nominal implementation of the new standards. In particular, the production emission credits which are obtained from the compliance margin would continue to reduce emission benefits that were intended to provide improved air quality. Additionally, with the adoption of U.S. EPA's new emission standards, it is possible that manufacturers could produce SORE for California that have higher emissions than those in the rest of the country. Thus, staff believes that keeping the production emission credits and allowing an unlimited lifetime for the certification emission credits would be a detriment to California's air quality in the near future. As noted in Section 4.1.1, if the proposed changes are not made, the usage of banked credits could jeopardize SIP attainment.

5.2 More Stringent Emission Standards to Compensate for the Banked Emission Credits

Another alternative would be to require that SORE standards be set at a level that would force the banked credits to be redeemed more quickly. The more stringent standard would likely need to be based on either alternative fueled engines or electric powered equipment to be stringent enough to ensure that the existing credit banks are reduced to zero within five years. There are advantages to this scenario in that as the credit banks disappear the engines would have to be much cleaner. However, those manufacturers who did not obtain any emission credits previously would need to meet the emission standards immediately, putting them at a great competitive disadvantage. Also, as different manufacturers exhausted their credit accounts, they might not be able to meet the more stringent standards and thus could be forced out of the California market. This option was considered in the previous rulemaking for this category and was shown to be cost-ineffective.

5.3 Harmonization with the U.S. EPA's Credit Program

Another alternative would be to adopt the U.S. EPA's SORE credit program. At first glance, this may seem to work toward harmonization between the California and federal program. It would eliminate the production emission credit problem. However, because the time frames for implementing the emission standards for the California and federal programs are different, this could cause major confusion for the engine manufacturers in tracking the emission credits. There are benefits to the U.S. EPA's program in that the phase 2 emission credits will expire within two years of a change in emissions standards. The concern however is that the new phase 3 emission credits would not

expire until after the next standard change is made and thus could be in place and result in higher emissions for a long period of time.

5.4 Issues of Controversy

There are several issues related to this proposal on which staff and industry continue to disagree. These include the termination of the production emission credits program, credit lifetime, and incentives for advanced technology.

With regards to the production emissions credits program, staff's rationale is described in section 3.1.1. With regards to credit lifetime, staff had presented some alternatives during the workshop process that allowed longer lifetimes, either with discounting of credits, or with extended warranty coverage to ensure that engines remained in service for the full life of the credits. Industry rejected these options, and did not provide sufficient evidence that the equipment life was greater than the proposed credit life. Manufacturers also claimed that the limitation on the lifetime of the emission credits would hinder development of new technology. However, a review of the number of engines which exceed the standards (shown in Table 3.1) shows that the current unlimited credit life has not encouraged early introduction of new emission control technologies. Regardless, staff intends to continue to investigate how the program may be modified to encourage advanced technologies in applications for which they are currently not in widespread use.

5.5 Summary of Alternatives Evaluated

After carefully considering the remaining issues and the suggested alternatives, staff believes its proposal is the best option.

6. CONCLUSIONS AND RECOMMENDATIONS

In developing the proposed regulations, staff's goal has been to achieve the greatest possible emissions reductions in a technologically feasible and cost-effective manner. Meeting the requirements of the proposed modifications is achievable using existing technologies and manufacturing processes and would add no costs that have not already been considered by the Board. The proposed regulations are necessary to meet air quality emissions reduction goals and to achieve health based ambient air quality standards.

No alternatives considered by the Board would be more effective in achieving the purpose for which the regulations are proposed or would be as effective as or less burdensome to affected private persons than the proposed regulations.

The staff recommends that the Board approve its proposal.

7. REFERENCES

ARB 1998: California Air Resources Board, Public Hearing to Consider Amendments to the 1999 Small Off-Road Engine Regulations, February 1998 (Staff Report).

ARB 2001: California Air Resources Board, Policies and Actions for Environmental Justice, December 2001.

ARB 2003: California Air Resources Board, Public Hearing To Consider The Adoption Of Exhaust And Evaporative Emission Control Requirements For Small Off-Road Equipment And Engines Less Than Or Equal To 19 Kilowatts, August 8, 2003 (Staff Report).

ARB 2004: California Air Resources Board, Report to the Board on the Potential Electrification Programs for Small Off-Road Engines, April 2, 2004 (Staff Report).

ARB 2007: California Air Resources Board, Public Hearing to Consider Amendments to the California Reformulated Gasoline Regulations and Other Changes, April 27, 2007 (Staff Report).

U.S. EPA 2007: United States Environmental Protection Agency, Control of Emissions from Nonroad Spark-Ignition Engines and Equipment; Proposed Rule, 72 Federal Register 28097-28393, May 18, 2007.

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CURRENT REGULATIONS FOR LARGE SPARK-IGNITION ENGINES WITH AN ENGINE DISPLACEMENT LESS THAN OR EQUAL TO ONE LITER

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the California regulations for large spark-ignition (LSI) engines with engine displacements less than or equal to one liter (≤ 1.0 L).

DATE: November 20, 2008

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 "I" Street
Sacramento, CA 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., November 20, 2008, and may continue at 8:30 a.m., November 21, 2008. This item may not be considered until November 21, 2008. Please consult the agenda for the meeting, which will be available at least 10 days before November 20, 2008, to determine the day on which this item will be considered.

For individuals with sensory disabilities, this document and other related material can be made available in Braille, large print, audiocassette or computer disk. For assistance, please contact ARB's Reasonable Accommodations/Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services, or go to http://www.arb.ca.gov/html/ada/ada.htm

If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to section 2433, chapter 9, article 4.5, title 13, California Code of Regulations (CCR), and proposed amendments to the incorporated "California Exhaust and Evaporative Emission Standards and Test Procedures For New 2010 and Later Off-Road Large Spark-Ignition Engines," as adopted March 2, 2007.

Background: Health and Safety Code sections 43013 and 43018 direct ARB to achieve the maximum feasible and cost-effective emission reductions from all mobile source categories, including LSI engines, through the setting of emission standards and other requirements.

In 1998, the Board adopted regulations for LSI engines and equipment, including provisions for exhaust emission standards and test procedures, labeling requirements, warranty, in-use compliance testing, and production line testing. New LSI engines above 19 kilowatts (kW) which power off-road equipment must be certified under the CCR, title 13, chapter 9, sections 2430 through 2439, which incorporates two sets of emission standards based on engine displacement.

For the larger displacement engines, those greater than one liter in size (> 1.0 L), the emission control requirement began with the 2001 model year (MY). This engine size category is almost exclusively made up of automotive-derived engines which are readily adapted to use existing automotive controls. The smaller displacement engines, LSI engines ≤ 1.0 L, are typically used in such applications as portable generators (about 40%), large turf care equipment (about 30%), and industrial equipment (about 30%). At the time of the initial rulemaking for these engines in 1998, industry argued that the engines were more similar to a different category of off-road engines known as "small off-road engines" than to the LSI engines > 1.0 L and therefore it would be more appropriate that they be required to meet the small off-road engine emission standards. The Board agreed and approved emission standards equivalent to those for the small off-road engines. Later, in 2003, the Board approved more stringent emission standards for the small off-road engines, but no consideration was given at time to align the LSI and small off-road engine emission standards. Thus, the LSI engines ≤ 1.0 L remained subject to the less stringent emission standards adopted in 1998.

In May of 2006, the Board approved a 0.8 g/kW-hr of $HC+NO_x$ emission standard for the LSI engines > 1.0 L category. LSI engines ≤ 1.0 L were not affected by this emission standard change and, again, remained subject to the emission standards adopted in 1998.

Description of the Proposed Regulatory Action:

Staff proposes a new set of exhaust emission standards for new LSI engines ≤ 1.0 L. These emission standards are both technologically feasible and cost-effective. The proposed exhaust emissions standards are presented in the table below, as are the existing emission standards for comparative purposes.

Proposed Emission Standards for LSI Engines ≤ 1.0 L

Model Year	Engine Displacement	Durability Period	$HC+NO_x$ (g/kW-hr)	CO (g/kW-hr)
2002 – 2010 (current requirement)	≤ 1.0 L	1,000 hours or 2 years	12.0	549
2011 and subsequent	≤ 825 cc	1,000 hours or 2 years	8.0	549
2011 - 2014	> 825 cc - ≤ 1.0 L	1,000 hours or 2 years	6.5	375
2015 and subsequent	> 825 cc - ≤ 1.0 L	1,000 hours or 2 years	0.8	20.6

Staff also proposes that LSI engines ≤ 1.0 L meet the same evaporative emission requirements applicable to small off-road engine equipment starting in 2011. Currently, evaporative emissions from this equipment are uncontrolled.

Additionally, staff proposes that LSI engines used in vehicles which are substantially similar to off-highway recreational vehicles would be required to meet the proposed LSI engine emission standards but would demonstrate compliance using the off-highway recreational vehicle test procedures. Specifically, LSI engines used in vehicles that meet the "Off-Road Sport Vehicle," or "Off-Road Utility Vehicle" definitions (except for payload capacity) in CCR, title 13, section 2411, would be subject to the proposed LSI engines ≤ 1.0 L emission standards beginning in 2011.

A more detailed description of staff's proposal is included in the Staff Report: Initial Statement of Reasons for Rulemaking to Consider Amendments to the Current Regulations for Large Spark-Ignition Engines with an Engine Displacement Less Than or Equal to One Liter.

COMPARABLE FEDERAL REGULATIONS

LSI engines are regulated federally under title 40, CFR, part 1048, which is generally harmonized with the California emission standards until 2010, when more stringent California standards go into effect for LSI engines > 1.0 L.

The U.S. EPA program requires manufacturers of LSI engines ≤ 1.0 L to certify their engines under the nonroad spark-ignition regulation, which is the federal equivalent of ARB's small off-road engine regulation, with a 30 kW cap. U.S. EPA's Phase 3 standards are less stringent than the proposal's exhaust emissions standards and evaporative emission standards.

The proposed regulations are expected to reduce emissions from ozone precursors in a cost-effective manner, beyond what would be accomplished by the existing federal regulations. Thus, the cost of the separate California program is justified by the benefit to human health, public welfare, and the environment. In addition, Health and Safety Code sections 43013 and 43018 authorize the differences from the federal program.

BENEFITS OF THE PROPOSAL

The intent of the proposed regulations is to reduce emissions from LSI engines ≤ 1.0 L and equipment utilizing technologies that are technologically feasible and cost-effective. By 2020, the proposal would reduce approximately 4.5 tons per day of reactive organic gases plus oxides of nitrogen (ROG+NO_x) at an estimated cost, which varies by equipment type, of approximately $0.01 to $12.20 per pound of ROG+$NO_x$ emissions reduced.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: "Staff Report: Initial Statement of Reasons for Rulemaking, Public Hearing to Consider Amendments to the Current Regulations for Large Spark-Ignition Engines with an Engine Displacement Less Than or Equal to One Liter."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and ~~strikeout~~ format to allow for comparison with the existing regulations, may be accessed on the ARB's web site listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on November 20, 2008.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's web site listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Scott Rowland, at (626) 575-6676 or srowland@arb.ca.gov, or Mr. Hung-Li Chang, at (626) 575-6683 or hchang@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries, concerning the proposed administrative action, may be directed are Ms. Lori Andreoni, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533.

The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at www.arb.ca.gov/regact/2008/lsi2008/lsi2008.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary cost or savings to state or local agencies. The ARB may incur additional implementation or enforcement costs at some future time.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. ARB is not aware of any cost impacts that a representative person would necessarily incur in his or her private capacity in reasonable compliance with the proposed action. Manufacturers of LSI typically pass some of the cost of compliance on to their customers. Accordingly, ARB anticipates that affected businesses would similarly pass on some of the costs incurred by this regulation. As a result, staff anticipates a representative individual may incur small additional costs (as discussed in the Initial Statement of Reasons) because of a possible increase in manufacturing costs.

Further, ARB staff has estimated possible costs of compliance for affected businesses in the Initial Statement of Reasons. These estimates, and the bases for them, are also discussed in the Initial Statement of Reasons.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action would have some impact, although not significant, on small businesses that buy and sell large turf care equipment, portable generators, and industrial equipment. During the initial years of implementation, the increased cost of equipment may lead to a slight drop in demand that could result in lower profits for small businesses.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and in writing or by e-mail before the meeting. To be considered by the Board, written comments submissions not physically submitted at the meeting must be received **no later than 12:00 noon, November 19, 2008,** and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests but does not require that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39600, 39601, 43013, 43018, 43101, 43102, and 43104. This action is proposed to implement, interpret and make specific sections 43013, 43017, 43018, 43101, 43102, 43104, 43105, 43150-43154, 43205.5, and 43210-43212.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

James N. Goldstene
Executive Officer

Date: September 23, 2008

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our Web –site at www.arb.ca.gov.

California Environmental Protection Agency

Air Resources Board

STAFF REPORT
INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING
PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CURRENT REGULATIONS FOR LARGE SPARK-IGNITION ENGINES WITH AN ENGINE DISPLACEMENT LESS THAN OR EQUAL TO ONE LITER

Date of Release: October 3, 2008
Scheduled for Consideration: November 20, 2008

Location:

Air Resources Board
Byron Sher Auditorium
1001 "I" Street
Sacramento, CA 95814

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 2

1. INTRODUCTION 4

2. BACKGROUND 4

2.1 LEGAL AUTHORITY 4
2.2 REGULATORY HISTORY 5
2.3 EMISSIONS INVENTORY 6
2.4 RELATED FEDERAL REGULATIONS 7
2.5 PUBLIC PROCESS 8

3. DISCUSSION 9

3.1 EXHAUST EMISSION STANDARDS 9
3.1.1 Overview *10*
3.1.2 Engines ≤ 825 cc *11*
3.1.3 Engines > 825 cc - ≤ 1.0 L *11*
3.2 EVAPORATIVE EMISSION REQUIREMENTS 14
3.3 OFF-HIGHWAY RECREATIONAL VEHICLES 15

4. ENVIRONMENTAL AND ECONOMIC IMPACTS 16

4.1 ENVIRONMENTAL IMPACT 16
4.1.1 Emission Reductions *16*
4.1.2 Environmental Justice *16*
4.2 COST AND COST-EFFECTIVENESS 17
4.2.1 Near-Term (2011) Emission Standards *17*
4.2.2 Long-Term (2015) Emission Standards *20*
4.3 ECONOMIC IMPACT ON THE ECONOMY OF THE STATE 22
4.3.1 Legal Requirement *23*
4.3.2 Businesses Affected *23*
4.3.3 Impact on Small Businesses *24*
4.3.4 Potential Impact on Distributors and Dealers *24*
4.3.5 Potential Impact on Business Competitiveness *25*
4.3.6 Potential Impact on Employment *25*

5. ALTERNATIVES CONSIDERED 25

5.1 TAKE NO ACTION 25
5.2 ADOPT MORE STRINGENT LSI ENGINE EMISSION STANDARDS 26
5.3 ADOPT THE U.S. EPA'S EMISSION STANDARDS FOR LSI ENGINES ≤ 1.0 L 26
5.4 ADOPT EMA'S PROPOSAL 26
5.5 SUMMARY OF ALTERNATIVES EVALUATED 27

6. CONCLUSIONS AND RECOMMENDATIONS 27

7. REFERENCES 28

APPENDIX A: Proposed Amendments to the Large Spark-Ignition Engines Exhaust Emission Regulation
APPENDIX B: Proposed Amendments to the California Exhaust and Evaporative Emission Standards and Test Procedures for New 2010 and Later Off-Road Large Spark-Ignition Engines

EXECUTIVE SUMMARY

To address California's acute air quality problems, the federal Clean Air Act granted California the unique authority to adopt and enforce rules to control mobile source emissions within California. The California Clean Air Act requires the Air Resources Board (ARB or Board) to achieve the maximum degree of emission reductions possible from vehicular and other mobile sources in order to attain the State ambient air quality standards by the earliest practicable date.

The large spark-ignition (LSI) engine category is defined as off-road spark-ignition engines greater than 19 kilowatts. New LSI engines with an engine displacement less than or equal to one liter (≤ 1.0 L) are typically used in such applications as portable generators, large turf care equipment, and industrial equipment. The Board initially adopted exhaust emission standards for these engines in 1998. The existing regulations for LSI engines ≤ 1.0 L include exhaust emission standards, emissions test procedures, and provisions for warranty and production compliance programs (California Code of Regulations, Title 13, Chapter 9, Sections 2430 through 2439). The regulations were first implemented in 2002.

In May of 2006, the Board approved more stringent regulations for LSI engines with an engine displacement greater than one liter. LSI engines ≤ 1.0 L were not addressed in that regulation. In recent years, the population of LSI engines ≤ 1.0 L, the number of engine families, and the maximum power ratings of these engines have grown significantly, making emissions from these engines a greater concern. To address this concern, staff's proposal would amend the existing California exhaust emission regulations for new LSI engines ≤ 1.0 L to include more stringent exhaust emission standards and, for the first time, evaporative emissions requirements. The proposed exhaust emissions standards are presented in the following table.

Current and Proposed Exhaust Emissions Standards for LSI Engines ≤ 1.0 L

Model Year	Engine Displacement	$HC+NO_x$ (g/kW-hr)	CO (g/kW-hr)
Current 2002 - 2010	≤ 1.0 L	12.0	549
2011 and subsequent	≤ 825 cc*	8.0	549
2011 - 2014	> 825 cc* - ≤ 1.0 L	6.5	375
2015 and subsequent	> 825 cc* - ≤ 1.0 L	0.8	20.6

* cc: cubic centimeters

The major proposed amendments include the following:

- More stringent exhaust emission standards,
- Evaporative emission standards and requirements,
- Off-highway recreational vehicles (OHRV) test procedures for LSI engines used in OHRV-like applications.

Staff's proposal would reduce hydrocarbons plus oxides of nitrogen ($HC+NO_x$) by 4.5 tons per day in 2020, at an estimated cost of $0.01 - $7.16 per pound.

Staff held two public workshops to allow for continuing public involvement and input throughout the development of the proposed regulations. In addition, staff considered alternatives to the proposal, including taking no action, setting more stringent standards, adopting the United States Environmental Protection Agency emission standards, and adopting an Engine Manufacturers Association proposal. Staff has determined that adopting its current proposal is both technologically feasible and cost-effective.

PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CURRENT REGULATIONS FOR LARGE SPARK-IGNITION ENGINES WITH AN ENGINE DISPLACEMENT LESS THAN OR EQUAL TO ONE LITER

1. INTRODUCTION

Off-road large spark-ignition (LSI) engines run on gasoline or an alternative fuel such as liquefied petroleum gas (LPG) or compressed natural gas (CNG), and are rated above 19 kilowatts (kW). Typical applications for off-road LSI engines include forklifts, portable generators, large turf care equipment, irrigation pumps, welders, air compressors, scrubber/sweepers, airport ground support equipment, and a wide array of other agricultural, construction, and general industrial equipment. Exhaust and evaporative emissions from LSI engines and equipment are a significant source of hydrocarbon (HC) and oxides of nitrogen (NO_x) emissions in California.

This report presents staff's proposal for amending the current LSI engine regulations to include more stringent exhaust and evaporative emission requirements for LSI engines less than or equal to one liter (≤ 1.0 L) in displacement. Compliance with the proposed emission standards will substantially reduce HC and NO_x emissions from new 2011 and later engines.

This report addresses the need for the proposed regulatory changes, provides a summary of the proposed changes, presents the environmental and economic impacts of the proposal, and discusses alternatives to staff's proposal. Appendix A contains the proposed amendments to the current regulation, and Appendix B contains the proposed amendments to the test procedures.

2. BACKGROUND

2.1 Legal Authority

In 1988, the Legislature enacted the California Clean Air Act, which declared that attainment of state ambient air quality standards is necessary to promote and protect public health, particularly the health of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practicable date.

Health and Safety Code sections 43013 and 43018 direct ARB to achieve the maximum feasible and cost-effective emission reductions from all off-road mobile source categories.

2.2 Regulatory History

The Board first approved regulations for LSI engines and equipment in 1998. The regulations include exhaust emission standards and test procedures, labeling requirements, warranty, in-use compliance testing, production line testing, and fleet requirements (California Code of Regulations (CCR), Title 13, Chapter 9, Sections 2430 through 2439).

The LSI engine category is divided based on engine displacement. For LSI engines larger than one liter (> 1.0 L) in displacement, emission control requirements were implemented beginning with the 2001 model year (MY). This engine size category is almost exclusively made up of automotive-derived engines which are readily adapted to use existing automotive emission controls. The smaller displacement engines, LSI engines ≤ 1.0 L, are typically used in such applications as portable generators (approximately 40 percent), large turf care equipment (approximately 30 percent), and industrial equipment (approximately 30 percent). At the time of the initial rulemaking for LSI engines in 1998, industry argued that the LSI engines ≤ 1.0 L were more similar to small off-road engines (SORE) than to the LSI engines > 1.0 L and therefore it would be more appropriate that they be required to meet the SORE emission standards. The Board agreed and approved emission standards equivalent to those for SORE engines greater than or equal to 225 cubic centimeters (SORE ≥ 225 cc). Thus, beginning with the 2002 MY (see Table 2.1, below), LSI engines ≤ 1.0 L were subject to a 12.0 grams per kilowatt-hour (g/kW-hr) HC+NO_x standard and a 549 g/kW-hr carbon monoxide (CO) standard. In 2003, the Board approved an 8.0 g/kW-hr HC+NO_x standard for SORE ≥ 225 cc for 2008 MY and later. Staff did not propose to tighter the smaller LSI engine exhaust emission standards at that time.

Table 2.1
Exhaust Emission Standards
For SORE ≥ 225 cc and LSI Engines ≤ 1.0L

Model Year	Engine Category	HC+NO_x (g/kW-hr)	CO (g/kW-hr)
2002	SORE ≥ 225 cc	12.0	549
	LSI ≤ 1.0 L	12.0	549
2008	SORE ≥ 225 cc	8.0	549
	LSI ≤ 1.0 L	12.0	549

In May 2006, the Board approved new regulations for LSI engines > 1.0 L. As shown in Table 2.2, for the 2007 through 2009 MY, these engines are required to meet emission standards of 2.7 g/kW-hr HC+NO_x and 4.4 g/kW-hr CO. For 2010 and subsequent MY, the HC+NO_x emission standard drops to 0.8 g/kW-hr. Note that the CO emission standard was relaxed to allow for the "trade-off" of significantly more HC+NO_x benefits. Like the 2003 rulemaking, this rulemaking did not include revisions to the emission standards for LSI engines ≤ 1.0 L.

Table 2.2
Exhaust Emissions Standards for LSI Engines > 1.0 L

Model Year	HC+NO_x (g/kW-hr)	CO (g/kW-hr)
2007 - 2009	2.7	4.4
2010 and subsequent	0.8	20.6

2.3 Emissions Inventory

Figures 2.1 and 2.2 illustrate the total statewide population and HC+NOx emissions inventory, respectively, for LSI engines ≤ 1.0 L in 2000, 2010, and 2020. Since the implementation of exhaust emission standards for these engines, their engine-out emission levels have decreased substantially. However, as a result of population growth between 2010 and 2020, the emissions contribution from these engines is expected to rise.

Figure 2.1
LSI Engines ≤ 1.0 L
Statewide Population Estimates

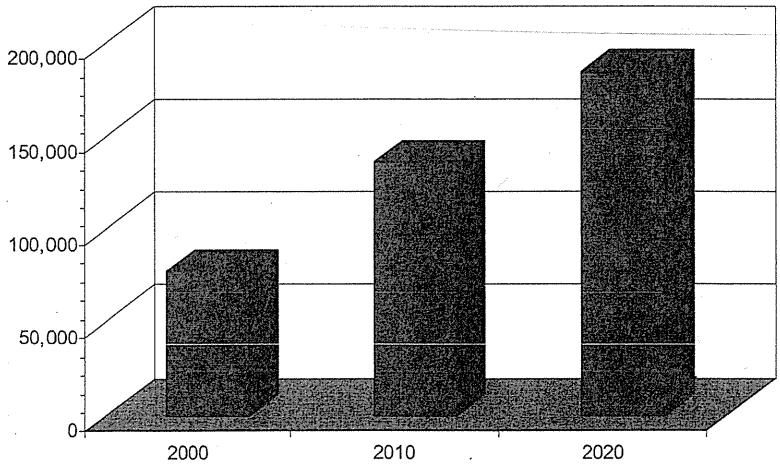
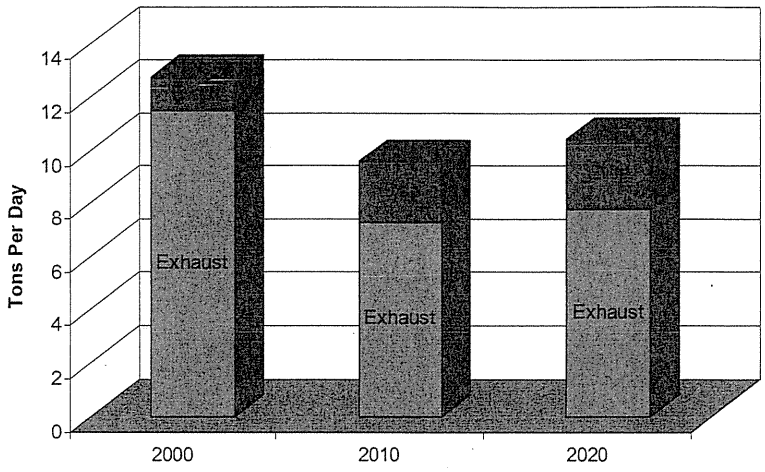


Figure 2.2
LSI Engines ≤ 1.0 L
Statewide HC+NO_x Emissions



2.4 Related Federal Regulations

Large spark-ignition engines are regulated federally under Title 40 of the Code of Federal Regulations (CFR), part 1048, which generally harmonizes with the California emission standards until 2010, when more stringent California standards go into effect for LSI engines > 1.0 L. The federal LSI engine regulations allow manufacturers to certify LSI engines ≤ 1.0 L that are between 19 kW and 30 kW to the nonroad spark-ignition engines (i.e., SORE) requirements of 40 CFR Part 90 or 1054.

On September 4, 2008, the United States Environmental Protection Agency (U.S. EPA) finalized its phase 3 HC+NO_x emission standard of 8.0 g/kW-hr for the SORE ≥ 225 cc and LSI engines ≤ 1.0 L starting in the 2011 MY, as shown in Table 2.3 (U.S. EPA 2008). Both the phase 2 and phase 3 U.S. EPA standards are less stringent than staff's proposed exhaust emissions standards for LSI engines ≤ 1.0 L.

Table 2.3
U.S. EPA Exhaust Emissions Standards for LSI Engines ≤ 1.0 L
(also apply to SORE ≥ 225 cc)

Model Year	HC+NO_x (g/kW-hr)	CO (g/kW-hr)
Phase 2 2005 - 2010	12.1	610
Phase 3 2011 and subsequent	8.0	610

2.5 Public Process

Staff met with interested stakeholders and solicited input numerous times during the development of this proposal. Staff conducted public workshops on November 14, 2007 and April 21, 2008 to aid in developing the proposed regulations. Workshop notices were sent out via email on the msprog listserve list and orspark listserve list to all stakeholders, including environmental organizations, engine manufacturers, equipment manufacturers, and trade associations, as well as other interested parties. At the workshops and subsequently, staff shared draft proposed regulatory language. Public information concerning the development of this proposal was also made available on ARB's website at www.arb.ca.gov/msprog/offroad/orspark/orspark.htm.

Staff met with many of the engine and equipment manufacturers to discuss individual concerns. Staff also sent an extensive survey to LSI engine and equipment manufacturers to help evaluate the level of technology currently utilized by industry as well as examine specific issues including equipment cost, engine durability, and market trends. Staff received replies from 14 manufacturers (including some who have indicated they do not intend to participate in the LSI engine ≤ 1.0 L market), representing approximately 70 percent of the market. A listing of stakeholder meetings, along with meeting dates, is shown below in Table 2.4.

Table 2.4
Stakeholder Meetings and Survey Responses

Stakeholder	Date(s)
Briggs & Stratton Corp.	2/8/08, 4/3/08, 8/12/08, 8/14/08
China Motor Company	3/14/08*
Daihatsu Motor Company, LTD	3/14/08*
Engine Manufacturers Association	2/8/08, 4/24/08, 6/24/08, 8/12/08
Generac Power Systems, Inc.	3/14/08*
John Deere	8/12/08
Kawasaki Heavy Industries, LTD	2/8/08, 8/12/08
Kohler Company	2/7/08, 2/8/08, 4/21/08, 4/24/08, 8/12/08
Kubota Corp.	3/16/08*
MECA	11/29/07, 5/16/08
Nissan Motor Co., Ltd.	2/27/08*
Outdoor Power Equipment Institute	2/8/08, 4/24/08, 5/6/08, 8/12/08
Polaris Industries Inc.	2/19/08, 4/8/08, 7/8/08
The Toro Company	2/8/08, 4/24/08, 8/12/08
Toyota Industrial Equipment Mfg. Inc.	2/27/08*
Vantage Power Vehicle, Inc.	3/5/08, 3/20/08
Wisconsin Motors	2/25/08*
Zenith Power Products, LLC	3/5/08*

* Survey only

As a result of the oral and written comments received, staff made significant changes to the proposed regulations and test procedures, which are reflected in the staff's proposal.

3. DISCUSSION

3.1 Exhaust Emission Standards

As shown in Figure 3.1, the current standards for LSI engines ≤ 1.0 L (2nd bar) are significantly less stringent than those for LSI engines > 1.0 L, and in fact are even less stringent than ARB's recently implemented tier 3 emission standards for SORE ≥ 225 cc. In addition, the growing population and power ratings within this category also concern staff. As shown previously in Figure 2.1, and shown below in Figure 3.2, the population and number of engine families of the LSI engines ≤ 1.0 L have grown significantly since 2002, when emission standards first went into effect.

Figure 3.1
Adopted HC+NO_x Emission Standards
for SORE ≥ 225 cc and LSI Engines

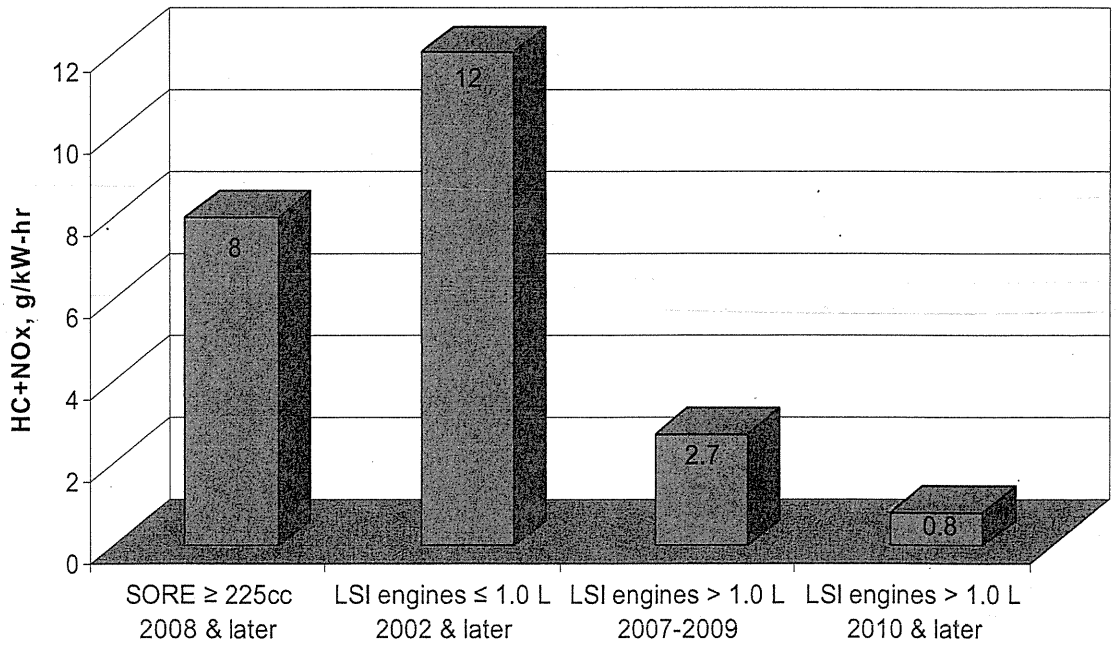
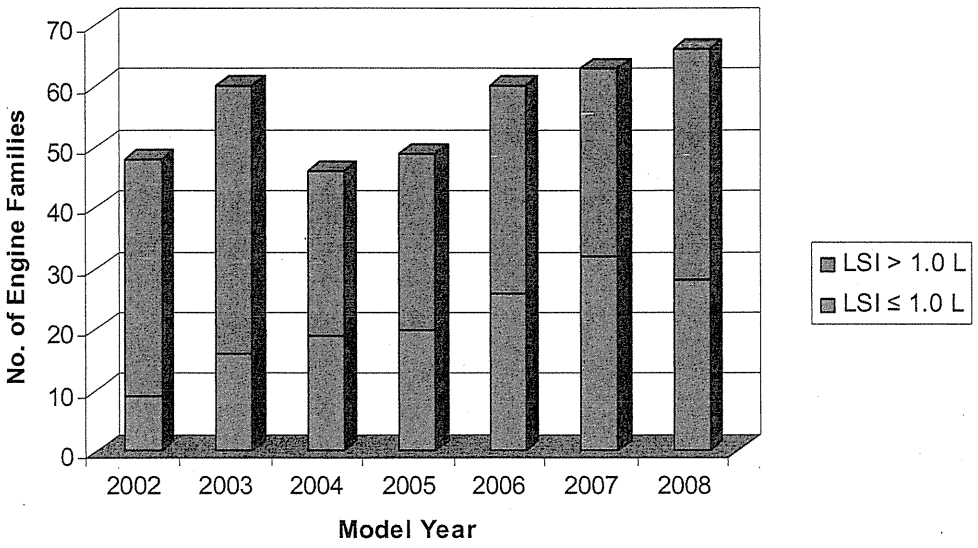


Figure 3.2
Number of Certified LSI Engine Families



3.1.1 Overview

To evaluate the industry's ability to meet more stringent standards, staff examined data from a variety of sources[1], including the most recent certification emission data submitted by manufacturers. As shown below in Table 3.1, the HC+NO_x emission levels for gasoline powered LSI engines ≤ 1.0 L without catalysts are in the range of 5.1 to 11.2 g/kW-hr (standard is 12.0 g/kW-hr). However, catalyst-equipped engines within the category display emission levels as low as 0.5 g/kW-hr HC+NO_x. This demonstrates the technical feasibility of achieving significantly lower HC+NO_x emissions utilizing currently available emission control technologies.

Table 3.1
HC+NO_x Emissions Levels of 2008 MY Certified LSI Engines ≤ 1.0 L (g/kW-hr)

2008 MY Certification Data		Gasoline Fueled LSI Engines ≤ 1.0 L without Catalyst	All LSI Engines ≤ 1.0 L
HC+NO_x	Max	11.2	11.2
	Avg	7.9	6.6
	Min	5.1	0.5

(1) Southwest Research Institute (1999), Southwest Research Institute (2004), U.S. EPA (2007), and MECA (2008).

Based on a review of the available data and an assessment of available technology, staff proposes the emissions standards summarized in Table 3.2 below. In addition to the more stringent emission standards, staff is proposing a new engine displacement cutpoint at 825 cc, as explained in further detail below.

Table 3.2
Current and Proposed Emission Standards for LSI Engines ≤ 1.0 L

	Model Year	Engine Displacement	$HC+NO_x$ (g/kW-hr)	CO (g/kW-hr)
Current	**2002 and subsequent**	≤ 1.0 L	12.0	549
Proposed	**2011 and subsequent**	≤ 825 cc	8.0	549
	2011 - 2014	> 825 cc - ≤ 1.0 L	6.5	375
	2015 and subsequent	> 825 cc - ≤ 1.0 L	0.8	20.6

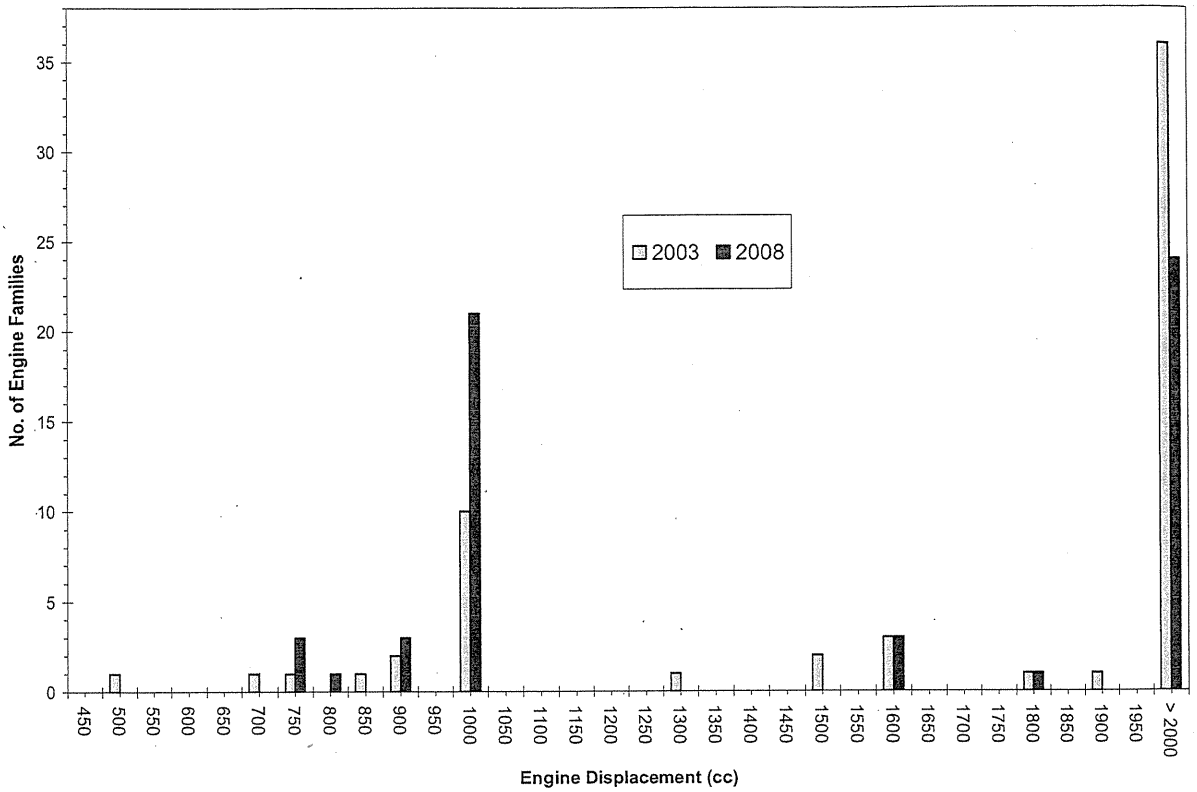
3.1.2 Engines ≤ 825 cc

There are currently no engine families certified with displacements between 775 cc and 850 cc. During development of staff's proposal, EMA suggested that engines below 825 cc should be treated separately from those between 825 cc and 1.0 L. Although the engines below 825 cc do not currently differ in technology from engines between 825 cc and 1.0 L, they do tend to be used in much less expensive equipment, which would be less able to absorb increased costs of more advanced technologies like an electronic fuel injection system. Thus, staff proposes that these engines meet emission standards equivalent to the tier 3 emission standards for SORE ≥ 225 cc. Most of these smaller LSI engines are designed for turf care equipment, and their performance and operation characteristics are comparable to those of SORE ≥ 225 cc. Currently, three out of four certified 2008 MY LSI engine families in this range can meet the proposed emission standards, demonstrating both the technical and the economic feasibility of the proposal.

3.1.3 Engines > 825 cc - ≤ 1.0 L

Engines greater than 825 cc are a larger concern. Currently, 86 percent of the certified 2008 MY LSI engine families ≤ 1.0 L have engine displacements greater than 825 cc. As shown in Figure 3.3, this is an increase of 11 engine families compared to the 2003 MY.

Figure 3.3
Comparison of the Number of Certified LSI Engine Families in 2003 MY and 2008 MY



The projected sales of LSI engines ≤ 1.0 L are approaching 50 percent of the total LSI engines sales, up from the 15 percent estimated in 2002. Simultaneously, the number of engine families offered with displacements between 1.0 L and 1.6 L has declined to zero. This suggests that there is a migration from the more stringently regulated LSI engines > 1.0 L category to the significantly more lenient LSI engines ≤ 1.0 L category. Staff's proposal would result in the same emission standard for LSI engines > 825 cc, in a two-step process.

3.1.3.1 Near-Term (2011) Emission Standards

As shown previously in Table 3.2, staff proposes a 6.5 g/kW-hr HC+NO_x emission standard to be implemented in 2011. During development of the 1998 LSI engine rulemaking, staff had originally considered a 6.5 g/kW-hr HC+NO_x emission standard, based on testing performed by the Southwest Research Institute (SwRI, 1999). But, as mentioned previously, industry argued that the engines had more similarities to SORE than to the larger LSI engines and therefore it would be more appropriate that they meet the less-stringent SORE standard. Currently, however, with the increase in engine size and power ratings, staff believes 6.5 g/kW-hr HC+NO_x and 375 g/kW-hr CO are appropriate near-term emission standards. These proposed emission standards are

already being met, as shown below in Table 3.3. Thirty-seven percent of the 2008 MY LSI engine families ≤ 1.0 L were certified with emissions of 6.5 g/kW-hr $HC+NO_x$ or less, representing 48 percent of the projected California sales.

Table 3.3
Engine Families Certified in 2008 Model Year
Meeting the Proposed Near-Term $HC+NO_x$ Emission Standard

Scenario	$HC+NO_x$ (g/kW-hr)	Engine Families	No. of Manufacturers	Projected Sales
Proposed > 825 cc - ≤ 1.0 L 2011 – 2014 standard	6.5	37% (9 out of 24)	8	48% (4,000)

3.1.3.2 Long-Term (2015) Emission Standards

For the longer term, beginning with the 2015 MY, staff proposes to harmonize the emission standards for LSI engines between 825 cc and 1.0 L with the existing emission standards for LSI engines > 1.0 L (0.8 g/kW-hr $HC+NO_x$, 20.6 g/kW-hr CO). As shown in Table 3.4, three engine families are already certified at the proposed long-term $HC+NO_x$ emission standard.

Table 3.4
Engine Families Certified in 2008 Model Year
Meeting Proposed Long-Term $HC+NO_x$ Emission Standard

Scenario	$HC+NO_x$ (g/kW-hr)	Engine Families	No. of Manufacturers	Projected Sales
Proposed > 825 cc - ≤ 1.0 L 2015 and later standard	0.8	12% (3 out of 24)	3	6% (500)

Some manufacturers have expressed concerns primarily over the economic impact of staff's proposal, citing that these three engine families represent only a small segment of the market, and that the engines are primarily used in vehicular applications, such as utility vehicles. Manufacturers have also indicated that the proposed emission standards would require liquid-cooling, closed-loop electronic fuel injection systems, and three-way catalysts.

Staff agrees with industry with regard to the technology most likely needed to comply with the proposed emission standards. However, although many engines in the category are air-cooled currently, almost every manufacturer has experience with liquid

cooling[2]. The 2008 MY certification applications show that 15 of the 24 engine families above 825 cc are liquid-cooled. Although some manufacturers have expressed concern that liquid-cooled engines might not be accepted in the market, liquid-cooled engines offer several advantages, primarily because they are capable of running cooler than air-cooled engines. With adequate cooling, a manufacturer can usually increase the horsepower of a given engine without increasing its size[3]. This trend of achieving more horsepower without increasing engine size is a common marketing tool and design goal of manufacturers. In addition, liquid-cooled engines run more fuel efficiently reducing production of carbon dioxide, a greenhouse gas.

Closed-loop electronic fuel injection and catalysts, although not as common in this category, are also well understood technologies commonly used on LSI engines > 1.0 L. Of the 24 engine families between 825 cc and 1.0 L that are certified for the 2008 MY, four of them have a three-way catalyst and closed-loop electronic fuel injection system.

While staff acknowledges industry's concerns, the feasibility of the proposed standards is technically sound. With regard to the potential economic impact, the proposed emission standards are also cost-effective, as discussed in greater detail later in this report. Furthermore, the proposed 2015 implementation would allow seven years of lead time for manufacturers who do not yet meet the proposed standards to develop the requisite technology to be compatible with their engine designs and products.

3.2 Evaporative Emission Requirements

As shown previously in Figure 2.2, equipment with LSI engines ≤ 1.0 L contribute 1.3 tons per day of evaporative HC emissions statewide in 2000. If left uncontrolled, the emissions will increase to 2.6 tons per day in 2020, due to population growth.

To control the evaporative emissions, staff proposes that 2011 and later MY equipment with LSI engines ≤ 1.0 L meet the same evaporative emission requirements as SORE ≥ 225 cc equipment, as shown below in Table 3.5. However, while the evaporative requirements for SORE equipment allow for a small volume exemption for fuel tanks produced in less than 400 units, staff's proposal for the LSI engines ≤ 1.0 L does not allow for this exemption. This is because there are several cost-effective solutions available that enable manufacturers to produce low-cost compliant fuel tanks[4].

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(2) Only one manufacturer of currently-certified LSI engines does not offer at least one liquid-cooled engine family in the SORE or LSI engine categories.
(3) For a given displacement engine, increasing horsepower is usually accomplished by modifying a variety of engine parameters (e.g., increased compression ratio, higher engine speeds). Because these modifications cause the engine to "work harder", more heat is generated.
(4) The cost of complying fuel tanks are also more easily absorbed for LSI engines and equipment than for SORE because of the higher base prices of LSI engines and equipment.

Table 3.5
Proposed Evaporative Emissions
Performance and Design Standards

Requirements		2011	2012	2013+
Performance Requirements	Diurnal Standard *g HC/day*	1.20 + 0.056 × tank vol.(L)		
Design Requirements	Fuel Hose Permeation *g ROG*/m²/day*	15		
	Fuel Tank Permeation *g ROG/m²/day*	2.5		1.5
	Carbon Canister or Equivalent Butane Working Capacity, *g* HC	1.4 g/L (tanks ≥ 3.78 L) or 1.0 g/L (tanks < 3.78 L)		

*ROG: Reactive Organic Gases[5]

3.3 Off-Highway Recreational Vehicles

Some LSI engines ≤ 1.0 L are used in vehicles that meet all the requirements of the "Off-Road Sport Vehicle," or "Off-Road Utility Vehicle" definitions in CCR, Title 13, Section 2411(a) (13),(17), or (18), with the exception of payload capacity. The current definitions of off-road sport vehicles and off-road utility vehicles include a maximum limit on rear payload capacity. This limit was established to ensure that the vehicles were truly designed and used for recreational purposes, rather than for industrial or commercial purposes. Staff now believes that this limit is inappropriate given that the current trend for recreational vehicles is to significantly increase payload, beyond the limits of the existing regulations.

Staff proposes that most LSI engines used in vehicles similar to off-highway recreational vehicles be subject to the proposed near-term 2011 emission standards, but be allowed to use the off-highway recreational vehicle test procedures and certification procedures. This would simplify the certification process and provide flexible testing options as the chassis-based testing becomes a federal requirement for off-highway recreational vehicles in 2014. These engines form a subset of LSI engines ≤ 1.0 L that would most appropriately be regulated in the off-highway recreational vehicle category. Therefore, this proposal would exclude these engines from the proposed 2015 standards; staff's long-term goal is to amend the current off-highway recreational vehicle regulations to incorporate this type of engine.

(5) Reactive organic gases (ROG) are a subset of hydrocarbons (HC) that excludes methane and other photochemically non-reactive hydrocarbons that do not contribute to the formation of ozone. The exhaust emission standards are usually established for HC, but the permeation standards and emission modeling for ozone impact use ROG.

4. ENVIRONMENTAL AND ECONOMIC IMPACTS

4.1 Environmental Impact

4.1.1 Emission Reductions

Table 4.1 shows the statewide emissions benefit of the staff's proposal in 2014 and 2020. In 2014, the statewide ROG+NO_x emissions would be reduced by 1.9 tons per day. In 2020, the proposal would reduce approximately 4.5 tons per day of ROG+NO_x.

Table 4.1
Estimated Benefit of the Proposal, Statewide Annual Average

Staff Proposal Element	ROG+NO_x Emission Reductions (tons per day)	
	2014 MY	2020 MY
Exhaust emission standards	1.7	4.1
Evaporative emission requirements	0.2	0.4
Total	1.9*	4.5*

* Benefits have been rounded to the nearest tenth.

4.1.2 Environmental Justice

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Stats 1999, Ch. 690; Government Code § 65040.12(c)). The Board has established a framework for incorporating environmental justice into the ARB's programs consistent with the directives of State law. The policies developed apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low income and minority communities, which sometimes experience higher exposures to some pollutants as a result of the cumulative impacts of air pollution from multiple mobile, commercial, industrial, area wide, and other sources. Over the past twenty-five years, the ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air quality in California. However, some communities continue to experience higher exposures than others as a result of the cumulative impacts of air pollution from multiple mobile and stationary sources and thus may suffer a disproportionate level of adverse health effects. Since the same ambient air quality standards apply to all regions of the State, all communities, including environmental justice communities, will benefit from the air quality benefits associated with the proposal. Alternatives to the proposed recommendations, such as recommending no change to the current program could adversely affect all

communities. As additional relevant scientific evidence becomes available, the LSI engine emission standards will be reviewed again to make certain that the health of the public is protected with an adequate margin of safety.

To ensure that everyone has an opportunity to stay informed and participate fully in the development of the proposal, staff has held workshops in El Monte and has distributed information through the internet, as described in section 2.5.

4.2 Cost and Cost-Effectiveness

To determine the economic impact of the proposed regulations, staff evaluated cost information supplied by engine and equipment manufacturers, the Outdoor Power Equipment Institute, Inc., Engine Manufacturers Association, Manufacturers of Emission Controls Association, and U.S. EPA.

4.2.1 Near-Term (2011) Emission Standards

4.2.1.1 Engine Development Costs

Based on responses to a survey sent to manufacturers, the proposed exhaust and evaporative emission standards would require minimal lead time and would impose relatively minor engine and equipment development costs, as shown in Table 4.2. The wide range of development costs reflect the situation where in some cases, there would be no need for additional engine development since the engine family already meets the proposed emission standards. In fact, 48 percent of the 2008 MY engine families already meet the proposed standards, as noted in Section 3.1.3.1.

Table 4.2
Estimated Engine and Equipment Development Costs
to Meet the 2011 Emission Standards

Item	Cost
Research, engine development, tooling, and equipment redesign cost per engine family	$0 - 100,000
Weighted average cost per engine*	$8.14

Source: LSI engine and equipment manufacturers survey results, April 2008.
* Weighted average cost per engine assumes 4 years of production meet the standards.

4.2.1.2 Emission Controls Costs

The 2011 exhaust emission standards should not require any additional emission control components. Engine modifications and air/fuel ratio calibration changes should be sufficient to bring the engines that do not meet the standards into compliance.

However, meeting the evaporative standards could require modifications to fuel tanks, fuel hoses, and fuel caps, as well as the addition of a carbon canister. Since the evaporative standards and procedures are equivalent to those for SORE ≥ 225 cc, staff has assumed costs identical to those noted in the 2003 SORE staff report. As shown in Table 4.3, the estimated emission controls cost for manufacturers of LSI engines ≤ 1.0 L would be in the range of $16.21 - $70.21 per unit.

Table 4.3
Estimated Emission Controls Cost
to Meet the 2011 Emission Standards

Item	Cost Range ($/engine)
Tank Permeation	$1.00-$27.00
Fuel Cap	$1.00
Fuel hose Permeation	$1.00 - $2.00
Venting Control (Carbon Canister)	$10.00 - $37.00
Testing	$3.21
Total	$16.21 - $70.21

Source: SORE 2003 evaporative control cost estimates.

Staff did not calculate a weighted average for the emission controls cost, since specific information is not available on whether a given currently certified engine family already is equipped with the necessary emissions controls (e.g., fuel tank permeation)[6]. Thus, it is unknown at this time whether all engines would require the addition of all the identified controls. However, to ensure that costs were not underestimated the worst case emission controls cost ($70.21) was used in all cost and cost-effectiveness calculations. Thus, the combined total engine costs would be approximately $78 per unit.

4.2.1.3 Equipment Redesign Costs

Industry did not provide specific cost-estimates for possible equipment redesign to accommodate the cleaner engines. However, the changes envisioned for the 2011 standards should not require any major equipment redesign, as engine changes would

(6) In general, information on a manufacturer's intent to use specific emission controls is provided in the manufacturer's application for certification. The emission controls discussed here are not required at this point. Thus, the information is not (yet) available because a manufacturer will not be required to note such information in its certification application until the proposed regulations are implemented.

be internal (e.g., calibration changes) and fuel system changes are primarily a matter of using improved components and the addition of a relatively small carbon canister.

4.2.1.4 Comparison of Cost Increase to Equipment Cost

The cost range for an LSI engine ≤ 1.0 L is $500 to $8,000, and equipment or vehicle costs range from $2,700 to $50,000 (covering both consumer products and professional products). A comparison of the estimated worst-case cost increase ($78) to the base price of equipment indicates that for extremely low-cost equipment, emission controls could approach three percent of the base cost. It should be recognized that many of these engines (both the smaller as well as the larger engines > 825 cc) meet the proposed exhaust standards already.

4.2.1.5 Cost-Effectiveness

To determine the cost-effectiveness of the near-term emission standards, staff divided the total cost by the ROG+NO_x emission reductions expected over the average lifetime of the equipment. Separate values were calculated for the major categories of equipment that use LSI engines ≤ 1.0 L. As shown in Table 4.4, the resulting cost-effectiveness ranges from $0.01 to $0.15 per pound of ROG+$NO_x$ reduced. The 2011 emission standards are very cost-effective when compared with recently adopted control measures.

Table 4.4
Lifetime Emission Reductions per Unit and Cost-Effectiveness
For the 2011 Emission Standards

Equipment Type	ROG, Exh (lb)	ROG, Evap (lb)	NO_x (lb)	ROG+NO_x (lb)	Cost-Effectiveness (Cost per pound ROG+NO_x reduced)
Generator Sets	2,966	746	496	4,208	$0.02
Lawn and Garden Tractors	277	338	63	678	$0.12
Commercial Turf Equipment	184	317	45	546	$0.14
Other Lawn and Garden Equipment	1,757	385	294	2,436	$0.03
Sweepers/Scrubbers	4,813	148	746	5,707	$0.01
Other General Industrial Equipment	285	173	63	521	$0.15

4.2.2 Long-Term (2015) Emission Standards

4.2.2.1 Engine Development Costs

Based on the responses to the survey sent to manufacturers, the proposed exhaust emission standards would require one to four years of lead time and would impose additional development costs, as shown in Table 4.5. The actual price increases for research and engine development are expected to be much lower than those estimated by the manufacturers, because the likely technologies to be used are the same as that used in the automotive industry for many years. Nevertheless, to be conservative, staff used the $840 figure shown in the table.

Table 4.5
Estimated Incremental Engine and Equipment Development Costs to Meet the 2015 Emission Standards

Item	Cost
Research, engine development, and tooling cost per engine family	$0 - $15,000,000
Weighted average cost per engine*	$840

Source: LSI engine and equipment manufacturers survey results, April 2008.
*Weighted average cost per engine assumes 4 years of production meet the standards.

4.2.2.2 Emission Controls Costs

Each engine manufacturer has its own strategy to meet the proposed emission standards. Some of them would convert air-cooled engines to liquid-cooled engines equipped with a three-way catalyst and closed-loop electronic fuel injection system, while some already use these technologies and can meet the proposed HC+NO_x standards without the need for additional emission controls. Unlike the 2011 emission standard analysis, staff was able to calculate a weighted average for the emission control costs. As shown in Table 4.6, the weighted average emission controls cost for manufacturers of LSI engines ≤ 1.0 L would be $400 per unit. The combined weighted average engine costs would thus be approximately $1,240 per unit.

Table 4.6
Estimated Incremental Emission Controls Cost
to Meet the 2015 Emission Standards

Item	Cost Range ($/engine)
Air-cooled to liquid-cooled (radiators, etc.)	$0 - $200
Closed-loop Electronic Fuel Injection	$0 - $600
Catalyst	$0 - $150
Secondary air injection	$0 - $15
Exhaust gas recirculation	$0 - $40
Total	$0 - $1005
Weighted average cost per engine	$400

Source: LSI engine and equipment manufacturers' survey results, April 2008

4.2.2.3 Equipment Redesign Costs

Industry did not provide specific cost-estimates for possible equipment redesign to accommodate the cleaner engines and exhaust aftertreatment systems. However, some products such as zero turn radius mowers are currently offered in both air-cooled and liquid-cooled configurations, at a dealer reported cost differential of approximately $700. Staff considers this to be a reasonable estimate for the cost of equipment redesign. The resulting weighted average cost increase to comply with the regulations would thus be $1,940 per unit.

4.2.2.4 Comparison of Cost Increase to Equipment Cost

A comparison of the weighted average cost increase ($1,940) to the base price of equipment ($2,700 to $50,000) indicates that for the least expensive equipment, emission controls could be more than seventy percent of the base cost. However, it should be recognized that the long lead-time allows a longer period for amortization of research and development costs, although only four years was used in staff's calculations. Additionally, manufacturers would have the option to downsize the engines to displacements below 825 cc, which would subject them to more lenient and less costly emissions standards. Although some manufacturers have expressed the opinion that all engines in the category might be downsized to avoid the more stringent standards, staff believes that customer demand for greater power and the advantages offered by liquid-cooled and electronic controlled engines would prevent this from becoming an overall trend, particularly on equipment with a higher initial base cost.

4.2.2.5 Cost-Effectiveness

To determine the cost-effectiveness of the 2015 emission standards, staff divided the weighted average cost increase by the *incremental* ROG+NO_x lifetime emission reductions (i.e., above and beyond the near-term emission standard reductions). Again, separate values were calculated for the major categories of equipment that use LSI engines ≤ 1.0 L. As shown in Table 4.7, the resulting cost-effectiveness ranges from $0.52 to $7.16 per pound of ROG+$NO_x$ reduced. The 2015 emission standards are cost-effective when compared with recently adopted control measures.

Table 4.7
Lifetime Emission Reductions per Unit and Incremental Cost-Effectiveness For the 2015 Emission Standards

Equipment Type	ROG, Exh (lb)	NO_x (lb)	ROG+NO_x (lb)	Cost-Effectiveness (Cost per pound ROG+NO_x reduced)
Generator Sets	1,636	968	2,604	$0.75
Lawn and Garden Tractors	264	110	374	$5.19
Commercial Turf Equipment	195	76	271	$7.16
Other Lawn and Garden Equipment	967	573	1,540	$1.26
Sweepers/Scrubbers	2,255	1,500	3,755	$0.52
Other General Industrial Equipment	260	111	371	$5.23

4.3 Economic Impact on the Economy of the State

The proposed regulations are not expected to impose a significant cost burden to engine or equipment manufacturers. Staff anticipates manufacturers will pass on any added costs to consumers.

Although a price increase for equipment with LSI engines ≤ 1.0 L may persuade a consumer to delay the purchase in the short-term, it is not expected to significantly impact the long-term demand because equipment eventually wears out and is replaced. Based on the above assumptions, staff expects the proposed regulations to impose no adverse impact on California competitiveness and employment. The following sections are intended to fulfill ARB's legal requirements related to economic analysis and economic impact for stakeholders affected by these proposed regulations.

4.3.1 Legal Requirement

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulations. The assessment must include a consideration of the impact of the proposed regulations on California jobs, business expansion, elimination or creation, and the ability of California business to compete.

Also, section 11346.5 of the Government Code requires State agencies to estimate the cost or savings to any state, local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate must include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the state.

4.3.2 Businesses Affected

Any business involved in the manufacturing of LSI engines ≤ 1.0 L and equipment will potentially be affected by the proposed regulations. Also potentially affected are businesses that supply engines and parts to these manufacturers, and those businesses that buy and sell equipment in California. The focus of the discussion below, however, will be on the engine and equipment manufacturers because these businesses would be directly affected by the proposed regulations.

4.3.2.1 Engine Manufacturers

There are currently 13 manufacturers of LSI engines ≤ 1.0 L that market certified engines in California, as shown in Table 4.8. Some of these manufacturers produce engines for off-road utility vehicle or off-road sport vehicle applications, which have been certified under the off-highway recreational vehicles regulations starting with the 2008 MY. None of the manufacturers is located in California although some have small repair and distribution operations in California.

Table 4.8
Manufacturers with LSI Engines ≤ 1.0 L Certified in California

BRIGGS & STRATTON CORPORATION	POLARIS INDUSTRIES, INC.
DAIHATSU MOTOR CO., LTD.	TIGER TRUCK, LLC.
GENERAC POWER SYSTEMS, INC.	VANTAGE POWER VEHICLE, INC.
KAWASAKI HEAVY INDUSTRIES, LTD.	YAMAHA MOTOR CO., LTD.
KOHLER COMPANY	YANMAR DIESEL ENGINE CO., LTD.
KUBOTA CORPORATION	ZENITH POWER PRODUCTS, LLC
MAG INTERNATIONAL	

4.3.2.2 Equipment Manufacturers

There are over 1,000 manufacturers of equipment with LSI engines ≤ 1.0 L nationwide. Many are "small" manufacturers that do not, however, meet the definition of a "Small Business" as defined in Government Code Section 11342.610. The majority of equipment is manufactured outside California. These manufacturers produce a wide variety of products. The affected equipment manufacturers fall into different industry classifications. A list of the industries that staff has been able to identify is provided in Table 4.9.

Table 4.9
Industries with Potentially Affected Manufacturers

Standard Industrial Classification Code	Industry
3621	Motors and Generators
3523	Farm Machinery and Equipment
3524	Lawn and Garden Tractors/Equipment
3531	Construction Machinery
3561	Pumps and Pumping Equipment

4.3.3 Impact on Small Businesses

The proposed LSI engine regulations will have some impact, although not significant, on small businesses that buy and sell portable generators, large turf care equipment, and industrial equipment. For small retailers, during the initial years of implementation, the increased cost of equipment may lead to a slight drop in demand that could result in lower profits. The retailer would carry over unsold stock to the next year, possibly incurring less profit on the sale of these units.

4.3.4 Potential Impact on Distributors and Dealers

Most engine and equipment manufacturers sell their products through distributors and dealers, some of which are owned by manufacturers and some are independent. Most independently owned dealers are small businesses. Some low-volume manufacturers also deal directly with their customers. The distributors and dealers sell about 9,000 pieces of equipment with LSI engines ≤ 1.0 L per year in California. This number is expected to grow substantially by 2020, as evidenced by the expected overall population growth (Figure 2.1). Although distributors and dealers are not directly affected by the proposed amendments, the amendments may affect them indirectly. If an increase in the price of engines and equipment reduces sales volume, dealers' revenue would be affected adversely.

4.3.5 Potential Impact on Business Competitiveness

The proposed amendments would have no significant impact on the ability of California engine and equipment manufacturers to compete with manufacturers of similar products in other states. This is because all manufacturers that produce these engines and equipment for sale in California are subject to the proposed amendments regardless of their location. Furthermore, all of the engine manufacturers, and most of the equipment manufacturers, are located outside of California.

4.3.6 Potential Impact on Employment

The proposed regulations are not expected to cause a noticeable reduction in California employment because California accounts for only a small share of manufacturing employment in off-road engine, equipment, and component production. However, some small businesses operating outside of California may leave the California market due to cost increases, which may result in a few jobs being eliminated.

5. ALTERNATIVES CONSIDERED

Staff evaluated four additional alternatives to the currently proposed regulations. These included:

- Take no action
- Adopt More Stringent LSI Engine Emission Standards
- Adopt the U.S. EPA's Emission Standards for LSI Engines ≤ 1.0 L
- Adopt EMA's proposal

These alternatives are discussed in detail below.

5.1 Take No Action

The first alternative evaluated was to take no action. Under this alternative, it is likely that few, if any, engine and equipment manufacturers would voluntarily incorporate additional emission control technology into their designs. The few manufacturers that did would be at a competitive disadvantage compared to manufacturers electing not to incorporate the emission control technology. Clearly, most of the exhaust and evaporative emission control technologies used in cars have not been adapted for use in LSI engines ≤ 1.0 L and equipment because manufacturers perceive the costs outweigh performance and fuel usage benefits. As the emission standards for LSI engines > 1.0 L, SORE, and off-road compression-ignition engines become more stringent, manufacturers would have greater incentive to market products that would fall into the LSI engines ≤ 1.0 L category.

Therefore, this alternative would result in no emission reductions and would not contribute to the State Implementation Plan's (SIP) control strategy to attain Federal

and State ambient air quality standards for ozone. The cost to the state is the potential loss of Federal highway funding, should an adequate SIP not be implemented.

5.2 Adopt More Stringent LSI Engine Emission Standards

Another alternative considered was to propose emission standards for LSI engines ≤ 1.0 L to be set at 0.8 g/kW-hr earlier than the 2015 date being proposed. As noted in section 3.1, there are three engine families that meet that level today establishing both technical feasibility and some ability for the market to support the costs of cleaner engines. The emission benefits for this alternative would exceed those from staff's proposal. However, the earlier implementation would likely cause more disruption in the market, as manufacturers that do not currently offer liquid-cooled catalyst equipped engines would have less time to develop controls. Thus, this alternative was rejected in favor of a proposal which allows more time for development and cost recovery.

5.3 Adopt the U.S. EPA's Emission Standards for LSI Engines ≤ 1.0 L

A third alternative would be to adopt the U.S. EPA's emission standards for LSI engines ≤ 1.0 L. U.S. EPA's phase 3 HC+NO_x emission standard, starting in 2011 MY, is at the same level of stringency as the current SORE emission standard of 8.0 g/kW-hr. The LSI engine industry supported this alternative. Although the U.S. EPA's emission standards were based on nationwide economic and environmental impacts as a whole, they do not adequately address the unique and compelling circumstances faced in California. The federal emissions standards ignore the technical capability of cleaner engines that are already available. There would be minimal emission benefit from this alternative and it would not contribute sufficiently to the SIP's control strategy to attain the Federal and State ambient air quality standards for ozone. The cost to the state is the potential loss of Federal highway funding, should an adequate SIP not be implemented.

5.4 Adopt EMA's Proposal

In the development of this control measure, ARB staff has met with industry on numerous occasions to discuss emission standards and test procedures that would ensure emission reductions while addressing concerns raised by industry. Throughout this process, industry has raised several points, many of which have been integrated into staff's proposal. In the June 24, 2008 meeting with EMA and manufacturer representatives, a proposal was brought forth to add two new classes of engines under the SORE category. A new class of SORE with an engine displacement between 225 cc and 825 cc would have an HC+NO_x exhaust emission standard of 8.0 g/kW-hr, which is same as the current SORE ≥ 225 cc emission standard, beginning in 2011. For the larger engines with an engine displacement > 825 cc and ≤ 1.0 L, EMA proposed an HC+NO_x exhaust emission standard of 6.5 g/kW-hr, beginning in 2011, to be reduced to 5.0 g/kW-hr in 2014. CO standard levels for both engine classes would remain equal to the CO standard for SORE ≥ 225 cc.

Staff did incorporate the majority of the proposal for LSI engines ≤ 825 cc. However, for the LSI engines > 825 cc and ≤ 1.0 L, the EMA proposal would provide less emission reductions (only 3.8 tons per day HC+NO_x in 2020) and would not approach the emission levels being reached by some engines today. Similar to the alternative to adopt the U.S. EPA's emission standards, the cost to the state is the potential loss of Federal highway funding, should an adequate SIP not be implemented.

5.5 Summary of Alternatives Evaluated

Each of the alternatives to the proposal falls short of staff's proposal. The alternatives are either unnecessarily relaxed achieving little or no emission s benefit compared to staff's proposal or are overly aggressive and likely to cause major market disruption.

6. CONCLUSIONS AND RECOMMENDATIONS

In developing the proposed regulations for LSI engines ≤ 1.0 L, staff's goal was to achieve the greatest possible emission reductions in a technologically feasible and cost-effective manner. Meeting the requirements of staff's proposal is achievable using existing technologies and manufacturing processes, and the available lead time. The emission reductions are cost-effective when compared to recent control measures adopted by the Board. The proposed regulations are necessary to meet emissions reduction goals and to achieve health based ambient air quality standards.

No alternatives considered by the Board would be more effective in achieving the purpose for which the regulations are proposed or would be as effective as or less burdensome to affected private persons than the proposed regulations.

The staff recommends that the Board approve its proposal.

7. REFERENCES

Air Resources Board, "Staff Report: Public Hearing to Consider Adoption of Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines," September 4, 1998.

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U.S. EPA, 2008. "Regulatory Announcement: EPA Finalizes Emission Standards for New Nonroad Spark-Ignition Engines, Equipment, and Vessels, September 4, 2008.

APPENDIX A: Proposed Amendments to the Large Spark-Ignition Engines Exhaust Emission Regulation

APPENDIX B: Proposed Amendments to the California Exhaust and Evaporative Emission Standards and Test Procedures for New 2010 and Later Off-Road Large Spark-Ignition Engines