

Supplement to the AB 32 Scoping Plan Functional Equivalent Document



June 13, 2011

This page intentionally blank.

TABLE OF CONTENTS

1.0	INTRODUCTION AND BACKGROUND	1
1.1	Purpose and Scope of Supplement.....	2
1.2	AB 32 Background and the Proposed Scoping Plan Overview	3
	Statutory and Regulatory Framework	3
	Scoping Plan Objectives.....	4
	Proposed Scoping Plan Description	6
2.0	SCOPING PLAN ALTERNATIVES	13
2.1	Alternatives Development and Approach to Analysis	13
	California Environmental Quality Act and Functional Equivalency	13
	Requirements for Alternatives Analysis	13
	Direction from the Superior Court Regarding the Alternatives Analysis.....	14
2.2	Description and Analysis of Alternatives.....	15
	Introduction.....	15
	Range and Description of Alternatives	15
2.3	Alternative 1: No-Project Alternative	19
	Goal of Alternative 1	19
	Role of Alternative 1 in the Range of Alternatives	19
	Precedents or Examples of the Approach in Alternative 1.....	20
	Attributes of Alternative 1	20
	Alternative 1 Impact Discussion.....	32
2.4	Alternative 2: Adopt a Program Based on Cap-and-Trade for the Sectors Included in the Cap	37
	Goal of Alternative 2	37
	Role of Alternative 2 in the Range of Alternatives	38
	Precedents or Examples of the Approach in Alternative 2.....	38
	Attributes of Alternative 2	45
	Alternative 2 Impact Discussion.....	51
2.5	Alternative 3: Adopt a Program Based on Source-Specific Regulatory Requirements with No Cap-and-Trade Component	60
	Goal of Alternative 3	60
	Role of Alternative 3 in the Range of Alternatives	60
	Precedents or Examples of the Approach in Alternative 3.....	61
	Attributes of Alternative 3	62
	Alternative 3 Impact Discussion.....	74
2.6	Alternative 4: Adopt a Program Based on a Carbon Fee or Tax	83
	Goal of Alternative 4	83
	Role of Alternative 4 in the Range of Alternatives	83
	Precedents or Examples of the Approach in Alternative 4.....	84
	Alternative 4 Impact Discussion.....	95

2.7 Alternative 5: Adopt a Variation of the Combined Strategies or Measures..... 102
 Goal of Alternative 5 102
 Role of Alternative 5 in the Range of Alternatives 102
 Precedents or Examples of the Approach in Alternative 5..... 102
 Attributes of Alternative 5 104
 Alternative 5 Impact Discussion..... 106
 2.8 Comparison of the Proposed Scoping Plan, Project Alternatives, and their Environmental Tradeoffs 109
 3.0 REFERENCES CITED 113

Tables

Table 1.2-1 Greenhouse Gas Reduction Measures and Estimated Reductions as Originally Proposed in 2008 9
 Table 1.2-2 Updated 2020 Business-as-Usual Emissions Forecast 11
 Table 1.2-3 Estimate of Emissions Reductions Needed from Proposed Scoping Plan Measures Not Yet In Place 12
 Table 2.3-1 Measures That Compose the No-Project Alternative 22
 Table 2.5-1 Summary of Emission Reductions in Alternative 3 74
 Table 2.6-1 Current Examples of Carbon Fees or Taxes..... 85
 Table 2.6-2 Representative Criteria for Setting the Carbon Fee or Tax Level 87
 Table 2.6-3 Potential Points of Regulation for Fee or Tax Assignment..... 90
 Table 2.7-1 Summary of Emission Effects from Alternative 5 106
 Table 2.8-1 Comparative Likelihood That Alternatives Achieve Project Objectives 112

1.0 INTRODUCTION AND BACKGROUND

This document is a Supplement to the AB 32 Scoping Plan Functional Equivalent Document (FED) that was included as Appendix J (Volume III) to the AB 32 Scoping Plan document (ARB 2009) prepared in accordance with the California Environmental Quality Act (CEQA) and the Air Resources Board's (ARB or Board) certified regulatory program (title 17, California Code of Regulations (CCR) sections 60006-60008). In 2008, ARB, acting as the lead agency, prepared a FED for the AB 32 Scoping Plan (2008 Scoping Plan). The 2008 Scoping Plan outlines the State's strategy to reduce greenhouse gas (GHG) emissions to 1990 levels by 2020, as required by the Global Warming Solutions Act of 2006 (AB 32; Núñez, Chapter 488, Statutes of 2006). A "scoping plan" is required by one provision of AB 32 (Health and Safety Code (HSC) section 38561), and ARB's adoption of GHG reduction measures is authorized under a separate provision (HSC section 38562). It is not required that a particular measure be encompassed in a scoping plan in order for ARB to pursue such a measure as a proposed regulation.

In this FED Supplement, "2008 Scoping Plan" refers to the plan considered by the Board in December 2008, with final adoption May 11, 2009 (ARB 2009), and "Proposed Scoping Plan" refers to the plan being brought back to the Board for reconsideration along with this Supplement. (See Section 1.1 below for a description of the anticipated process for environmental review and Board action.)

The 2008 Scoping Plan considered a range of GHG emission reduction measures, including direct regulations, Alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, a market-based cap-and-trade system, and a fee regulation to fund the program. A draft of the 2008 Scoping Plan was released for public review and comment on June 26, 2008, followed by workshops in July and August 2008. On October 15, 2008, the 2008 Scoping Plan was released for a 45 day public review and comment period along with a FED that analyzed the potentially significant environmental impacts that could result from implementing the measures considered in the plan. The FED included an analysis of a range of five alternatives to the proposed 2008 Scoping Plan, including: a "no project" alternative, a plan relying primarily on a cap-and-trade program for the sectors included in a cap, a plan relying more on source-specific regulatory requirements with no cap-and-trade component, a plan relying on a carbon fee or tax, and a plan relying on a variation of proposed strategies and measures. Following the public review and comment period, the 2008 Scoping Plan and the FED were considered by the Board at a December 11, 2008 public hearing, and were subsequently finally approved by the Board's Executive Officer on May 11, 2009.

As discussed in the next section, subsequent events have caused ARB to create a supplement to the FED and to schedule a Board hearing in order to facilitate the Board's reconsideration of its previous decision, based on an expanded environmental analysis of the project alternatives.

1.1 Purpose and Scope of Supplement

This Supplement is being prepared to provide an expanded analysis of the five project alternatives discussed in Section V of the 2008 Scoping Plan FED (ARB 2009). The Supplement provides a revised analysis that, if approved by the Board, will supersede and replace the project alternatives section of the FED found at pages J-74 to J-90.

In currently pending litigation, a California State trial court found that the analysis of the alternatives identified in the FED was not sufficient for informed decision-making and public review under CEQA (*Association of Irrigated Residents, et al. v. California Air Resources Board, et al.*, San Francisco Superior Court, Case Number CPF-09-509562, May 20, 2011). ARB disagrees with the trial court finding and has appealed the decision. However, to remove any doubt about the matter, and congruent with ARB's interest in public participation and informed decision-making, ARB is revisiting the Scoping Plan alternatives. Therefore, staff is providing this supplemental analysis of the project alternatives.

Based on the expanded analysis of project alternatives in this Supplement, the Board will reconsider its approval of the 2008 Scoping Plan. As explained in Section 1.0 above, since the Plan is being brought back for reconsideration, it is referred to in this Supplement as the "Proposed Scoping Plan." The Proposed Scoping Plan contains the same objectives and framework for GHG reduction as the 2008 Scoping Plan. There are, however, a few changes that have occurred since the 2008 Scoping Plan was adopted that are taken into account in this new expanded alternatives analysis. First, this Supplement relies on emissions projections updated in light of current economic forecasts (i.e., accounting for the economic downturn since 2008). In addition, the Proposed Scoping Plan excludes one measure identified in the 2008 Scoping Plan that has been adopted as of publication of this Supplement, and one measure no longer under consideration by ARB. More detailed information about these changes is provided below in Section 1.2 under the heading 'Proposed Scoping Plan Description.'

The five alternatives analyzed in this Supplement are the same as those considered in the 2008 FED, i.e., the No-Project Alternative, as required by CEQA, and four action alternatives. Each of the action alternatives is a feasible alternative to the proposed project that could potentially attain most of the project's basic objectives, including reducing statewide GHG emissions to 1990 levels by 2020, as mandated by AB 32. This document, like the FED it supplements and others typical for policy and regulatory matters, contains a programmatic level of environmental review. (See CCR section 15168 ["Program EIR"].) One of the purposes of a program environmental document is to consider broad policy and regulatory alternatives to a proposed project (see CCR section 15168(b)(4)), which is the primary goal of this Supplement. The level of detail in this Supplement reflects that the project is a broad plan, and therefore, the analysis does not provide the level of detail that will be provided in subsequent environmental documents prepared for each regulation ARB pursues to reduce GHGs. (See CCR section 15152.)

1.2 AB 32 Background and the Proposed Scoping Plan Overview

To provide context for the analysis of the project alternatives, this section presents an overview of the statutory and regulatory framework behind the Proposed Scoping Plan, followed by a description of Scoping Plan objectives and a brief description of the Proposed Scoping Plan.

Statutory and Regulatory Framework

On September 27, 2006, Governor Schwarzenegger signed Assembly Bill AB 32. By requiring in law a reduction of GHG emissions to 1990 levels by 2020, California set the stage for its transition to a sustainable, clean energy future. ARB is the lead agency for implementing AB 32, which set major milestones for establishing the overall program.

More specifically, AB 32 includes the following requirements for ARB:

- Identify the statewide level of GHG emissions in 1990 to serve as the emissions limit to be achieved by 2020 (HSC section 38550). In December 2007, the Board approved the 2020 emission limit of 427 million metric tons of carbon dioxide equivalent (MMTCO₂E) of GHGs.
- Adopt a regulation requiring the mandatory reporting of GHG emissions (HSC section 38530). In December 2007, the Board adopted a regulation requiring the largest industrial sources to report and verify their GHG emissions.
- Identify and adopt regulations for Discrete Early Actions that could be enforceable on or before January 1, 2010, (HSC section 38560.5). Beginning in 2007, the Board identified and approved nine Discrete Early Action measures including regulations affecting landfills, motor vehicle fuels, refrigerants in cars, port operations and other sources.

Develop a “Scoping Plan” that outlines the State’s strategy to achieve the 2020 GHG emissions limit. A Scoping Plan sets forth those strategies that, at the time of the adoption of the Plan, ARB believes would be best to pursue. Adoption of a Scoping Plan does not, however, mean that ARB is giving final approval to every strategy contained in that Plan. A substantial number of the strategies contained in an approved Scoping Plan will require their own regulatory processes, at the end of which ARB may choose a course that is different from that set forth in a Scoping Plan. Furthermore, adoption of a Scoping Plan is not a condition precedent for the adoption of greenhouse gas reduction measures ARB may pursue under other provisions of AB 32.

- 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 section 38591). The EJAC met numerous times, providing comments on the proposed Early Action measures and the

development of the Scoping Plan, and submitted its comments and recommendations on the 2008 draft Scoping Plan.

- Appoint an Economic and Technology Advancement Advisory Committee (ETAAC) to provide recommendations for technologies, research and GHG emission reduction measures (HSC section 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 2008 draft Scoping Plan.
- On or before January 1, 2011, adopt greenhouse emission limits and emission reduction measures by regulation to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions in furtherance of achieving the statewide greenhouse emissions limit, to become operative beginning on January 1, 2012 (HSC section 38562).

Scoping Plan Objectives

The objectives in adopting a Scoping Plan are important in considering the Proposed Scoping Plan and the project alternatives. In addition to discussing the environmental effects of the project alternatives, this Supplement also addresses whether and how the Proposed Scoping Plan and the project alternatives meet these objectives. The following objectives are derived from the requirements of AB 32 for the Scoping Plan (HSC section 38561) and for the adoption of emission reduction measures by regulation (HSC section 38562), including market-based regulations (HSC section 38570). ARB's consideration of the ability of the Proposed Scoping Plan and the project alternatives to meet these objectives is conducted at a programmatic level, and the analysis herein does not replace the more detailed "project level" review for proposed measures or regulations pursued pursuant to Health and Safety Code sections 38562 and 38570.

1. Establish regulations to meet the 2020 goal – to establish regulations that implement reduction strategies covering the state's GHG emissions in furtherance of California's mandate to reduce GHG emissions to 1990 levels by 2020;
2. Reduce fossil fuel use – to reduce California's reliance on fossil fuels and diversify energy sources while maintaining electric system reliability;
3. Link with partners – to link, where feasible, with other Western Climate Initiative (WCI) partner programs to create a regional market system;
4. Design an enforceable, amendable program – to design a program that is enforceable and that is capable of being monitored and verified;
5. Ensure emission reductions – to pursue emissions reductions that are real, permanent, quantifiable, verifiable and enforceable;

6. Achieve technologically feasible and cost-effective reductions – to achieve the maximum technologically feasible and cost-effective reductions in GHG emissions in the aggregate from sources or categories of sources under the cap, in furtherance of achieving the statewide GHG emissions limit (HSC section 38562, subd. (a) and (c));
7. Avoid disproportionate impacts – to ensure, to the extent feasible, that activities undertaken to comply with the regulations do not disproportionately impact low-income communities (HSC section 38562, subd. (b)(2));
8. Credit early action - to ensure, to the extent feasible, that entities that have voluntarily reduced their GHG emissions prior to the implementation of regulations receive appropriate credit for early voluntary actions (HSC section 38562, subd. (b)(3));
9. Complement existing air standards – to ensure, to the extent feasible, that activities undertaken pursuant to the regulations complement, and do not interfere with, efforts to achieve and maintain national and California Air Quality Attainment Standards and to reduce toxic air contaminant (TAC) emissions (HSC, section 38562, subd. (b)(4));
10. Consider a broad range of public benefits – to consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health (HSC section 38562, subd. (b)(6));
11. Minimize administrative burden – to minimize, to the extent feasible, the administrative burden of implementing and complying with the regulation (HSC section 38562, subd. (b)(7));
12. Minimize leakage – to minimize, to the extent feasible, leakage of emissions to states and countries without a mandatory GHG emission cap (HSC section 38562, subd. (b)(8));
13. Weigh relative emissions – to consider, to the extent feasible, the contribution of each source or category of sources to statewide emissions of GHGs (HSC section 38562, subd. (b)(9));
14. Achieve real emission reductions in market-based strategies – to ensure that GHG emission reductions achieved through any market-based compliance mechanisms are real, permanent, quantifiable, verifiable and enforceable by the Board (HSC section 38562, subd. (d)(1));
15. Achieve reductions over existing regulation using market-based strategies – to ensure that the reductions from any market-based compliance mechanisms are in addition to any GHG emissions reductions otherwise required by law or

- regulation, and any other GHG emissions reduction that would otherwise occur (HSC section 38562, subd. (d)(2));
16. Complement direct measures – to ensure, if applicable, that the GHG emissions reduction from a market-based compliance mechanism occurs over the same time period and is equivalent in amount to any direct emissions reduction required pursuant to AB 32 (HSC section 38562, subd. (d)(3));
 17. Consider emissions impacts – to consider, to the extent feasible, the potential for direct, indirect, and cumulative emissions impacts from a market-based compliance mechanism, including localized impacts in communities that are already adversely impacted by air pollution (HSC section 38570, subd. (b)(1));
 18. Prevent increases in other pollutant emissions – to design, to the extent feasible, any market-based compliance mechanism to prevent any increase in the emissions of criteria air pollutants or toxic air contaminants (TACs) (HSC section 38570, subd. (b)(2));
 19. Maximize co-benefits – to maximize, to the extent feasible, additional environmental and economic benefits for California, as appropriate (HSC section 38570, subd. (b)(3)); and
 20. Avoid duplication – to ensure that electricity and natural gas providers are not required to meet duplicative or inconsistent regulatory requirements HSC sections 38501(g) and 38561(a)).

Proposed Scoping Plan Description

The Proposed Scoping Plan referenced in this Supplement is substantially the same Scoping Plan considered by the Board in 2008, and therefore, contains the same objectives and framework of measures for GHG reduction described in the 2008 Scoping Plan (ARB 2009).

The Proposed Scoping Plan, as described within the 2008 Scoping Plan document, was developed by ARB in coordination with the Climate Action Team and considers a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health. The Plan analyzes a mix of measures that provide a comprehensive approach to reduce GHG emissions to achieve the 2020 target, and to initiate the transformations required to achieve the long range target reflected in California Executive Order S-3-05 (an 80 percent reduction from 1990 levels by 2050). The emission reduction measures are described in detail in the Scoping Plan document (ARB 2009). A description of the proposed actions is also provided in the FED at pp. J-20 - J-21, Volume III of the 2008 Scoping Plan (ARB 2009, pp. J-20 - J-21). The information below is provided to summarize and supplement that description to provide context for this expanded analysis of project alternatives.

Overview of Strategies in the Proposed Scoping Plan

Because discussions of the alternatives sometimes use the Proposed Scoping Plan as a point of comparison, it is helpful to summarize the key strategies in the Proposed Scoping Plan as a foundation of the alternatives analysis. A description of the Proposed Scoping Plan actions is also provided in the FED at pp. J-20 - J-21, in Volume III of the 2008 Scoping Plan (ARB 2009, pp. J-20 - J-22).

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 GHGs. ARB's comprehensive GHG emissions inventory lists sources ranging from the largest refineries and power plants to small industrial processes and farm livestock. The measures in the Proposed Scoping Plan were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving 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 California on a path to meet the long-term 2050 goal of reducing California's GHG emissions to 80 percent below 1990 levels. This trajectory is consistent with the reductions that are needed globally to help stabilize the climate.

In developing the 2008 Scoping Plan, ARB staff evaluated a comprehensive array of candidate approaches and tools that could best achieve these emission reductions. Based on available data and literature, staff concluded that reducing GHG emissions from the wide variety of sources could best be accomplished through a comprehensive set of measures that includes market-based regulatory approaches, other regulations, voluntary measures, fees, policies, and programs. This comprehensive approach is still reflected in the Proposed Scoping Plan. ARB will monitor implementation of the measures pursued to ensure that the state meets the 2020 limit on GHG emissions. As proposed, an overall limit on GHG emissions from most of the California economy – the “capped sectors” – would be established by the Cap-and-Trade Program. Within the capped sectors, some of the reductions would be accomplished through direct regulations, such as improved building efficiency standards and GHG emission standards for vehicles. Whatever additional reductions are needed to bring emissions within the cap would be mandated by the firm cap on emissions; the actions taken to reduce emissions would be motivated by the emissions allowance prices. Together, direct regulation and the emissions cap assure that emissions are brought down cost-effectively to the level of the overall cap. Staff also recommends specific measures for the remainder of the economy, i.e., the “uncapped sectors.”

Key elements of Proposed Scoping Plan for reducing California's GHG emissions to 1990 levels by 2020 include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;
- Achieving a statewide electricity generation portfolio consisting of 33 percent renewable sources;
- 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 GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets; and
- 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 (LCFS).

The total reduction for the measures recommended in the 2008 Scoping Plan was originally estimated at 174 MMTCO₂E, as measured against the level of emissions that would result if there were no reductions measures, and if the State were to proceed on its pre-AB 32 emissions track. This benchmark is referred to as "business as usual", or "BAU." Staff notes that after the passage of AB 32, the BAU level of emissions is prohibited by law, because AB 32 requires the State to adopt regulations to achieve the maximum technologically feasible GHG emissions reduction in order to reduce GHGs. The measures listed in Table 1.2-1 would lead to emission reductions from sources within the capped sectors and from both sources or sectors not covered by the Cap-and-Trade Program. Table 1.2-1 also lists several other recommended measures that would 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.

This mix of measures builds on a strong foundation of previous action in California to address climate change and broader environmental issues. The Proposed Scoping Plan relies on implementing existing laws and regulations that were adopted to reduce GHG emissions and other policy goals; strengthening and expanding existing programs; implementing the Discrete Early Actions adopted by the Board beginning in 2007; and proposed measures developed during the Scoping Plan process, itself.

Table 1.2-1 Greenhouse Gas Reduction Measures and Estimated Reductions as Originally Proposed in 2008

Recommended Reduction Measures	Reductions Counted Toward 2020 Target (MMTCO ₂ E)
Estimated Reductions Resulting from the Combination of Measures	146.7
California Light-Duty Vehicle Greenhouse Gas Standards <ul style="list-style-type: none"> • Implement Pavley standards • Develop Pavley II light-duty vehicle standards 	31.7
Energy Efficiency <ul style="list-style-type: none"> • Building/appliance efficiency, new programs, etc. • Increase CHP generation by 30,000 GWh • Solar Water Heating (AB 1470 goal) 	26.3
Renewables Energy Portfolio Standard (33 Percent by 2020)	21.3
Low Carbon Fuel Standard	15
Regional Transportation-Related GHG Targets ¹	5
Vehicle Efficiency Measures	4.5
Goods Movement <ul style="list-style-type: none"> • Ship Electrification at Ports • System-Wide Efficiency Improvements 	3.7
Million Solar Roofs <ul style="list-style-type: none"> • Medium/Heavy Duty Vehicles • Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency) • Medium-and Heavy-Duty Vehicle Hybridization 	2.1
High Speed Rail	1.0
Industrial Measures (for sources covered under Cap-and-Trade Program) <ul style="list-style-type: none"> • Refinery Measures • Energy Efficiency & Co-Benefits Audits 	0.3
Additional Reductions Necessary to Achieve the Cap	34.4

Table 1.2-1 Greenhouse Gas Reduction Measures and Estimated Reductions as Originally Proposed in 2008

Recommended Reduction Measures	Reductions Counted Toward 2020 Target (MMTCO₂E)
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) <ul style="list-style-type: none"> 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 (MMTCO₂E)
State Government Operations	1-2
Local Government Operations	TBD
Green Buildings	26
Recycling and Waste <ul style="list-style-type: none"> Mandatory Commercial Recycling Other measures 	9
Water Sector Measures	4.8
Methane Capture at Large Dairies	1.0

¹ This number represents an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target. ARB established 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. Source: ARB 2009

Updated BAU Emissions Projections

Since 2008, ARB has updated projected BAU emissions based on current economic forecasts (i.e., as influenced by the economic downturn) and reduction measures already in place. The BAU projection for 2020 GHG emissions in California was originally estimated to be 596 MMTCO₂E. Table 1.2-2 indicates an updated calculation of the Proposed Scoping Plan's estimates for projected emissions in 2020 as of October 2010, based on current economic forecasts. ARB staff derived the updated emissions estimates by projecting emissions from a past baseline estimate using three-year average emissions, by sector, for 2006-2008 and considering the influence of the recent recession and reduction measures that are already in place. Growth factors specific to each of the different economic sectors were used to forecast emissions to 2020. This

three-year average of known emissions dampened unusual variations in any single year that would make the baseline year unrepresentative for forecasting.

Table 1.2-2 Updated 2020 Business-as-Usual Emissions Forecast

Sector	MMTCO ₂ E	Percent
Uncapped Sectors (electricity, industrial, transportation, agriculture/forestry, commercial, residential, high GWP gases)	97.9	19.3
Broad Scope Fuels Capped Upstream (gasoline, distillate, propane, natural gas)	236.3	46.6
Capped Industrial (cement, cogeneration, hydrogen plants, refineries, other, construction)	74.2	14.6
Imported Electricity (capped)	53.5	10.6
In-state Electricity (capped)	44.8	8.8
Emissions Total	506.8	

Considering the updated BAU estimate of 507 MMTCO₂E by 2020, a 16 percent reduction below the estimated BAU levels would be necessary to return to 1990 levels (i.e., 427 MMTCO₂E) by 2020. No one sector has a sufficiently large share of GHG emissions to become the primary focus for emission reductions. Significant reductions are needed in the transportation, electricity, commercial and residential, and industrial sectors, as well as contributing reductions from the other sectors of the economy. Consequently, multi-faceted GHG emissions strategies have been initiated and are underway since the 2006 enactment of AB 32.

While ARB has compiled, analyzed, and described its full range of proposed, necessary GHG strategies as part of the Proposed Scoping Plan, many of these strategies have either been implemented and are ongoing or have authority under other statutes and will proceed regardless of the outcome of the reconsideration of the Proposed Scoping Plan. (Please refer to the more detailed discussion and measures listed in the Section 2.3, Table 2.3-1, under the No-Project Alternative.) One measure identified in the 2008 Scoping Plan, Refrigerant Management Program, was proposed and approved by the Board following their initial approval of the Scoping Plan in 2008. The regulations for the Refrigerant Management Program are in effect, and therefore, this measure will proceed because it is already codified. The 2008 Scoping Plan also included a measure to reduce GHG emissions from high global warming potential (GWP) gases via a fee. However, staff's evaluation of this measure since the 2008 Scoping Plan was initially developed, indicates that at this time a regulation to levy a fee to reduce emissions from high GWP gases would not be feasible. Therefore, this measure will no longer be pursued as part of the Proposed Scoping Plan (see discussion under Alternative 3).

Considering the ongoing, approved, or otherwise authorized measures that would occur even if no Scoping Plan measures were implemented (a result not allowed under AB 32), and the updated calculation of the estimated BAU emissions, the shortfall from the AB 32 target that would need to be obtained by remaining measures in the Proposed Scoping Plan would be approximately 22 MMTCO₂E. This estimate is summarized in Table 1.2-3, below.

Table 1.2-3 Estimate of Emissions Reductions Needed from Proposed Scoping Plan Measures Not Yet In Place

Emission Category	2020 MMTCO₂E
Revised 2020 Baseline (Business-as-Usual) Forecast	507
Reductions from measures (other than the Cap-and-Trade Program and Advanced Clean Cars)	58
2020 Emissions Target set by AB 32 (i.e., 1990 level)	427
Reductions Needed from Cap-and-Trade and Advanced Clean Cars as Proposed	22

The shortfall of the AB 32 target is the allocation of GHG reduction that has been estimated to be gained from a Cap-and-Trade Program (18 MMTCO₂E) and an advanced clean car program (4 MMTCO₂E) that are included as measures to be pursued as part of the Proposed Scoping Plan.

The mix of measures in the Proposed Scoping Plan provides a comprehensive approach to reduce emissions to achieve the 2020 target, and to initiate the transformations required to achieve the 2050 target set forth in Executive Order S-03-05 (80% below 1990 levels by 2050). The Cap-and-Trade Program included in the Proposed Scoping Plan would cover about 85 percent of GHG 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, would help ensure that the 2020 target is met.

2.0 SCOPING PLAN ALTERNATIVES

This section provides an overview of the regulatory requirements and guidance regarding the alternatives analyses under CEQA, a description of each of the alternatives to the Proposed Scoping Plan, a discussion of whether and how each Alternative meets the project's objectives, and an analysis of each alternative's environmental impacts.

2.1 Alternatives Development and Approach to Analysis

California Environmental Quality Act and Functional Equivalency

ARB's process of adopting regulations is a Certified State Regulatory Program under CEQA. Public Resources Code (PRC) section 21080.5 allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report once the Secretary of the Natural Resources Agency has certified the regulatory program. The California Secretary for Natural Resources has determined that ARB's regulatory program meets the criteria for a Certified State Regulatory Program (CCR section 15251(d)). This certification allows ARB, when adopting rules, regulations, standards and plans, to use a substitute, functional equivalent document in lieu of formal Initial Studies, Negative Declarations, or Environmental Impact Reports (EIRs) required by CEQA. The 2008 Scoping Plan FED and this Supplement was prepared pursuant to the ARB Certified Regulatory Program to assess the potential environmental effects of the GHG emissions reduction programs and strategies.

Requirements for Alternatives Analysis

ARB's Certified Regulatory Program (CCR sections 60005 – 60007) requires that where a contemplated action may have a significant effect on the environment, a staff report shall be prepared in a manner consistent with the environmental protection purposes of the state board's regulatory program and with the goals and policies of CEQA. Among other things, staff reports are required to address feasible alternatives to the proposed action that would substantially reduce any significant adverse impact identified. The regulation specifies that:

Any action or proposal for which significant adverse environmental impacts have been identified during the review process shall not be approved or adopted as proposed if there are feasible mitigation measures or feasible alternatives available which would substantially reduce such adverse impact. For purposes of this section, "feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors, and consistent with the state board's legislatively mandated responsibilities and duties (CCR section 60006).

No more specific guidance (e.g., number, nature, location, or characteristics of alternatives) is provided in the regulation.

While ARB, by virtue of its Certified Regulatory Program, is exempt from Chapters 3 and 4 of CEQA and corresponding sections of the State CEQA Guidelines, the Guidelines nevertheless contain useful information for preparation of a thorough and meaningful alternatives analysis. CEQA Guidelines section 15126.6(a) speaks to evaluation of “a range of reasonable alternatives to the project, or the location of the project, which would feasibly attain most of the basic project objectives but would avoid or substantially lessen any of the significant effects, and evaluate the comparative merits of the alternatives.” The purpose of the alternatives analysis is to determine whether or not a variation of the project would reduce or eliminate significant project impacts, within the basic framework of the objectives, a principle that is consistent with ARB’s Certified Regulatory Program requirements.

Thus, alternatives considered in an environmental document should be feasible and should attain basic project objectives. Under AB 32, ARB is required to adopt a Scoping Plan to guide its future regulatory efforts under AB 32. Objectives of a Scoping Plan are described in Section 1.2, above, and speak primarily to GHG emissions reduction, and creation of a system to achieve those reductions that is administratively feasible, enforceable, cost-effective, efficient, and fair.

The range of alternatives studied in an environmental document is governed by the “rule of reason,” requiring evaluation of only those alternatives “necessary to permit a reasoned choice” (CCR 15126.6(f)). Further, an agency “need not consider an Alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative” (CCR 15126.6(f)(3)). The analysis should focus on alternatives that are feasible (defined above) and that take economic, environmental, social, and technological factors into account. Alternatives that are remote or speculative need not be discussed. Furthermore, the alternatives analyzed for a project should focus on reducing or avoiding significant environmental impacts associated with the project as proposed.

Direction from the Superior Court Regarding the Alternatives Analysis

On May 20, 2011, the San Francisco County Superior Court (Case Number CPR-09-509562) issued its Final Order. The Order stated, inter alia, that “ARB... failed to proceed in a manner required by law by inadequately describing and analyzing Project Alternatives sufficient for informed decision making and public participation.” The court further ordered ARB to “set aside Board Resolution 08-47 and Executive Order G-09-001 adopting and approving the Climate Change Scoping Plan to reduce greenhouse gases in California (“Project”) as it relates to cap-and-trade.” As stated above, while ARB disagrees with these findings and is appealing the decision, and has not taken action to set aside Board Resolution 08-47 and Executive Order G-09-001 at this time, in the interest of public participation and informed decision-making, this FED

Supplement has been prepared to elaborate on the Project Alternatives. (See Section 1.1, Purpose and Scope of This Supplement.)

The Court did not find the number and nature of alternatives considered in the Scoping Plan FED to be insufficient. Therefore, this FED Supplement addresses the same alternatives, but with more in-depth description of those alternatives, and more expansive analysis of potential environmental impacts.

As noted above, ARB will reconsider its decision to adopt the Proposed Scoping Plan. At a public meeting, the Board will make a new decision whether to adopt the Proposed Scoping Plan, one of the action alternatives discussed in this Supplement, or a variation of the Proposed Scoping Plan or an alternative, based on the information contained in the FED, the Supplement, public comments, and responses to comments.

2.2 Description and Analysis of Alternatives

Introduction

If adopted and approved by the Board, this alternatives description and analysis of the alternatives will supersede and replace the alternatives discussion presented in the Scoping Plan FED, released in October 2008, at pp. J-20 - J-21, in Volume III of the 2008 Scoping Plan (ARB 2009, pp. J-20 – J-21). (A Notice of Decision regarding the Board's action on the Scoping Plan was filed with the Secretary of the California Resources Agency on May 9, 2009.) This document expands the description and analysis of the alternatives to assist both the Board and the public in their consideration of alternatives to the Scoping Plan. The five alternatives discussed are the same as those that were originally presented in the 2008 Scoping Plan FED; however, they have been updated and re-ordered to reflect current circumstances. The order in which the alternatives are discussed is changed from the FED to the Supplement to present the alternatives that focus on single strategies first, followed by the alternatives considering a combination of those strategies.

Range and Description of Alternatives

Because a Scoping Plan is a framework document made up of a set of numerous individual GHG emission reduction measures that can be combined in different ways, there is, in theory, an almost limitless number of potential alternatives that could serve as the Proposed Scoping Plan. The five alternatives discussed in this section represent a reasonable range of representative alternatives that will allow the public and Board to understand the differences between different types or combination of approaches.

ARB staff developed the range of representative alternatives based on a thorough, informed, and public process. In 2008, ARB staff originally determined the range of alternatives based on extensive input from the public and advisory committees during the course of a lengthy public process in the development of its Proposed Scoping Plan. In addition to input from the public, ARB received and relied upon input on Scoping Plan alternatives from three specially formed advisory committees. The

Environmental Justice Advisory Committee (EJAC) and the Economic and Technology Advancement Advisory Committee (ETAAC), both formed by ARB pursuant to HSC section 38591, provided both oral and written recommendations and comment to ARB. Further, ARB received input from the Market Advisory Committee (MAC), formed in 2006 by Governor Executive Order S-20-06. The MAC included leading experts from universities, government, non-governmental organizations and private industry.

ARB staff and Board members also met with representatives of national and sub-national governments that are currently operating programs to reduce GHG emissions, including emissions trading programs. For example, ARB staff and/or Board members met with representatives of the U.S. Environmental Protection Agency (U.S. EPA), which manages the Acid Rain and NO_x emissions trading programs; the South Coast Air Quality Management District (SCAQMD), which administers the Regional Clean Air Incentives Market (RECLAIM) emissions trading program; the Environmental Ministry of British Columbia, which has established a carbon fee program for GHG emissions from transportation fuels and is developing a cap-and-trade program for industrial and power sector GHG emissions; and the British Government and the European Commission, which oversees the European Union's Emissions Trading Program (EU-ETS).

Further, ARB staff has collected and reviewed an extensive library of literature on reduction programs, including cap-and-trade, fees, taxes, source-specific standards and limits, and other regulatory approaches. Documents incorporated by reference are listed in Section 3.0.

Adoption of Regulations for Any Alternative

Typically, air quality and GHG controls would be implemented by adoption of regulations. If ARB pursued regulations to implement any of the GHG reduction alternatives discussed in this Supplement, each regulation would go through the Administrative Procedure Act (APA) process. It is a rigorous process that includes technical, environmental, and economic analysis, as well as public review and input. The APA provides very specific rules for this process of adopting new regulations. This process must be completed within one year of the notice date (see below), pursuant to Government Code section 11346.4(b).

First, a notice of proposed action must be filed with the Office of Administrative Law (OAL), consistent with Government Code section 11346.5. The Initial Statement of Reasons (ISOR), also known as the Staff Report, is published at the same time as the notice, and contains all of ARB's reasoning for the proposed regulations (Government Code section 11346.2(b)). Concurrently with the publication of the notice and ISOR, the specific terms of the proposed regulation(s) must also be made available (Government Code section 11346.2(a)). The initial publication of the notice, ISOR, and proposed regulations results in the "notice date."

The public is given at least 45 days to provide comments on the proposed regulation and, if a public hearing is scheduled (which ARB does for almost all regulations), the commenters may also provide comment at the hearing (Government Code

section 11346.4(a)). ARB must consider public comments and, in conjunction with any Board direction, make any substantive changes warranted in light of the comments or Board direction. Substantive changes must be made available for an additional 15 days of public review (Government Code section 11346.8(c)). If additional substantive changes are required after the 15-day review, the regulations must be made available for subsequent 15-day periods until all substantive changes are complete.

After the conclusion of all 15-day public comment periods, ARB prepares a Final Statement of Reasons (FSOR), which includes ARB's responses to each comment received during the public comment periods. After final approval by ARB, staff also compiles the remainder of the rulemaking file, which includes the Updated Informative Digest, all of the comments received, the transcript of the hearing, the final regulation text, the table of contents of the rulemaking file, various economic analyses required by the Department of Finance, and mailing statements.

Within the one year provided from the initial notice date, ARB must file the documents listed above with OAL. Within 30 working days, OAL must review the file to ensure that ARB complied with all of the APA requirements, and must make a decision on whether to approve or disapprove the regulation. A regulation does not become legally effective unless it is approved by OAL. When OAL approves a regulation, it is filed with the California Secretary of State and becomes effective 30 days after filing, although an earlier effective date may be requested.

Analysis of Alternatives

This Supplement examines the "range of reasonable alternatives" to the project to evaluate whether reasonable alternatives to the Proposed Scoping Plan would reduce or eliminate the project's significant effects on the environment, while meeting at least most of the basic project objectives. (See CCR section 15126.6(a).) Pursuant to ARB's Certified Regulatory Program, the second part of this section contains an analysis of each alternative's feasibility and its ability or inability to substantially reduce any significant adverse environmental impacts identified in the FED's analysis of the Proposed Scoping Plan (CCR sections 60005(b) and 60006).

The basic project objectives of the Proposed Scoping Plan are discussed in Part 1.2, above. The analysis that follows the descriptions of the alternatives includes a discussion of the degree to which each Alternative meets those basic project objectives.

Range of Alternatives

The five alternatives to the Proposed Scoping Plan evaluated by ARB in this Supplement are:

- **Alternative 1: No-Project Alternative.** The No-Project Alternative is based on existing conditions and what would be reasonably expected to occur in the foreseeable future. As a result, the description of this Alternative has been updated to reflect the current status of ARB programs. Existing conditions, therefore, include the suite of GHG reduction actions that are in operation, such

as the million-solar-roofs program, the AB 1493 (Pavley) motor vehicle GHG emission standards, and the Low Carbon Fuels Standard. In addition, for purposes of this analysis, ARB has included as “reasonably expected to occur in the foreseeable future,” those GHG reduction actions with additional statutory authority, such as the 33 percent Renewable Energy Portfolio Standard (RPS) for electricity generation, which is now authorized by Senate Bill 2 of the first extraordinary sessions of 2011 (Simitian, Statutes of 2011) (SB1X 2), but excluded rulemakings pursuant to AB 32 that are still in process, such as the California Cap on GHG Emissions and Market-Based Compliance Mechanisms (also known as the Cap-and-Trade Regulation). ARB believes that the proposed Cap-and-Trade Regulation and other emission reduction measures are independently authorized by the HSC section 38562, irrespective of the Scoping Plan; however, the issue is presently the subject of the litigation noted in Section 2.1, above.

- **Alternative 2: Adopt a Program Based on Cap-and-Trade for the Sectors Included in the Cap.** This Alternative relies primarily on a cap-and-trade program for achieving the remaining reductions (i.e., approximately 22 MMTCO₂E after other ongoing, implemented, or otherwise authorized measures) needed to meet the 2020 GHG reduction target. The description of Alternative 2 has been updated to reflect the October 2010 proposed Cap-and-Trade Regulation that has been evaluated in a separate FED that ARB released for public review in October 2010 (ARB 2010b).
- **Alternative 3: Adopt a Program Based on Source-Specific Regulatory Requirements.** Under this alternative, ARB would adopt a program that relies on additional direct regulatory control of specific sector sources of GHG emissions to achieve the remaining reductions (i.e., approximately 22 MMTCO₂E after other ongoing, implemented, or otherwise authorized measures) needed to meet the 2020 GHG reduction target. Also sometimes called a direct regulatory approach, Alternative 3 would involve adopting regulations that establish source-specific emissions limits or performance standards and require regulated entities to stay within those limits.
- **Alternative 4: Adopt a Program Based on a Carbon Fee or Tax.** Under this alternative, ARB would adopt a program that relies on a carbon fee or tax program to achieve the remaining reductions (i.e., approximately 22 MMTCO₂E after other ongoing, implemented, or otherwise authorized measures) needed to meet the 2020 GHG reduction target. Alternative 4 could involve a regulation setting fees payable to the state based on the GHG emissions by covered entities, and directing the expenditure of the fee revenue for specified uses, subject to substantial administrative constraints. The description also discusses a carbon tax, which would require a legislative supermajority for authorization, but is not subject to the same administrative constraints.

- **Alternative 5: Adopt a Variation of the Proposed Strategies or Measures.** Under this alternative, ARB would adopt either a subset or a different combination of the measures considered among the other previous three action alternatives.

As presented previously, a shortfall of approximately 22 MMTCO₂E from the AB 32 target in 2020 would occur after accounting for the ongoing, approved, or otherwise authorized GHG reduction measures that would continue if the full scope of the Proposed Scoping Plan did not proceed. The alternatives described below are discussed in light of the need to achieve this additional 22 MMTCO₂E reduction.

Detailed descriptions of the five alternatives are presented below.

2.3 Alternative 1: No-Project Alternative

Goal of Alternative 1

The goal of Alternative 1 is to describe a reasonably expected scenario if ARB did not adopt the Proposed Scoping Plan or any of the action alternatives to the Proposed Scoping Plan. The No-Project Alternative is included only to assist in the analysis and consideration of the Proposed Scoping Plan and the action alternatives. ARB cannot adopt the No-Project Alternative described in this document because AB 32 requires ARB to prepare and approve a Scoping Plan (HSC section 38561(a)).

Role of Alternative 1 in the Range of Alternatives

ARB's Certified Regulatory Program does not mandate consideration of a "No-Project Alternative." (See CCR section 60006.) Under the Certified Regulatory Program, the alternatives ARB considers, among other things, must be "consistent with the state board's legislatively mandated responsibilities and duties" (CCR section 60006). Here, ARB is legislatively mandated to produce a Scoping Plan "as that term is understood by the Board, for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions from sources or categories of sources of GHGs by 2020 under this division"(HSC section 38561).

Although not in response to a regulatory mandate, it is useful to include a "No-Project Alternative" in this analysis for the same reasons that this type of Alternative is called for in the State CEQA Guidelines. As noted in the Guidelines, "the purpose of describing and analyzing a no-project Alternative is to allow decision-makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project" (CCR section 15126.6(e)(1)). In addition, the No-Project Alternative also provides an important point of comparison to understand the potential environmental benefits and impacts of the other alternatives. In addition, while CEQA documents typically assume that the adoption of a No-Project Alternative would result in no further action by the project proponent or lead agency, this is not true for some of the actions identified in the Scoping Plan, which pre-date and have been approved or implemented prior to its adoption or are underway pursuant to other statutory

authority. The State CEQA Guidelines indicate that the no-project Alternative can address the continuation of an existing plan or policy into the future (CCR section 15126.6(e)(3)(A)). For purposes of this analysis, the No-Project Alternative takes into account the components of the Proposed Scoping Plan that are either already implemented or being carried out under authority additional to AB 32.

Precedents or Examples of the Approach in Alternative 1

The No-Project Alternative is not modeled after a precedent or example from other GHG reduction programs. Rather, it is defined using the suite of reduction strategies that have already been implemented by the State or are reasonably expected to occur even without a Scoping Plan.

Attributes of Alternative 1

The No-Project Alternative has been updated in this Supplement to reflect current conditions. The primary condition that has changed since the original formulation of the Proposed Scoping Plan in 2008 is the implementation of a portion of the strategies included within it in the interim period. To understand the relative environmental impacts of instituting a No-Project Alternative in 2011, it is important to factor in the GHG reduction strategies that are already underway and reducing emissions at this time, or would be reasonably expected to continue because they are approved as part of AB 32 implementation or authorized by other statutes.

To determine the emissions resulting from the No-Project Alternative as defined above, this document first presents updated forecasts of the GHG emissions that would be expected from all sources by 2020, assuming (for the purposes of analysis) no further regulatory controls (i.e., business-as-usual, or BAU). The document then discusses the GHG emission reductions from measures that have been implemented or would be implemented independent of any upcoming action on the Proposed Scoping Plan by ARB and compare the resulting emissions to the AB 32 target, i.e., 1990 emissions levels.

If GHG reduction measures in the Proposed Scoping Plan were not implemented and BAU resource and energy use occurred at the rates existing when AB 32 was enacted (based on extrapolating 2004 data, the most current data available in 2006), 2020 GHG emissions in California were originally estimated to be 596 MMTCO₂E.

Table 2.3-1 indicates an updated calculation of the Proposed Scoping Plan's estimates for projected BAU emissions in 2020 as of October 2010. ARB staff derived the updated emissions estimates by projecting emissions from a past baseline estimate using three-year average emissions, by sector, for 2002-2004 and considering the influence of the recent recession and measures that are already in place. Growth factors specific to each of the different economic sectors were used to forecast emissions to 2020. This three-year average of known emissions dampens unusual variations that could make any single year unrepresentative for forecasting purposes. As shown in Table 1.2-2 (Section 1.2, above), the updated BAU estimate is 507 MMTCO₂E by 2020, which is 16 percent above 1990 levels (i.e., 427 MMTCO₂E).

The measures identified in the Proposed Scoping Plan that have already been implemented include actions that preceded the Proposed Scoping Plan and discrete early-action measures intended to begin to reduce GHG while the more complicated proposals in the Proposed Scoping Plan were being evaluated. These precedent and discrete early-action strategies would continue as part of the No-Project Alternative. In addition, two measures have separate authority, Senate Bill 375 (Steinberg, Statutes of 2008) authorizing reductions in car and light truck GHG emissions through adoption of Sustainable Communities Strategies or Alternative Planning Strategies and achievement of a 33-percent RPS as authorized by SB1X 2. Implementation of these programs is reasonably expected to continue regardless of further action by ARB on a Scoping Plan, so they are included as part of the No-Project Alternative. One measure listed in the Proposed Scoping Plan, Refrigerant Management Program, has already been approved by ARB and regulations are in effect; therefore, this measure will proceed, because it is already codified. Consequently, it is included in the No-Project Alternative. The ongoing, approved, or foreseeable measures that constitute the No-Project Alternative are summarized in Table 2.3-1.

The two main drivers of GHG emissions in the No-Project Alternative involve population growth and current laws and regulations. Population growth in California will result in more vehicle miles traveled, more goods movement, greater water and energy demands, and more consumer products. In coordination with the local air districts, ARB submits a State Implementation Plan to the U.S. EPA Administrator that provide for implementation, maintenance, and enforcement of the ozone and particulate matter national ambient air quality standards. The SIP would remain in place, even if the Scoping Plan were not adopted, and would have an influence on GHG emissions.

Presented below is a summary of sector-based conditions that would reasonably be expected in the event that the No-Project Alternative could be implemented. Descriptions of the 2020 BAU forecasts for the major sectors of the emissions inventory, summarized in Table 1.2-2 (Section 1.2) are provided in the discussion. Reduction strategies that are ongoing, already implemented, or approved based on additional authority would reduce emissions below the BAU forecasts, as summarized in Table 2.3-1, but not sufficiently to meet the AB 32 goal by 2020.

As discussed below, the shortfall from the AB 32 target would be approximately 22 MMTCO₂E. This shortfall reflects the absence of the Cap-and-Trade Program (18 MMTCO₂E) and advanced clean car program (4 MMTCO₂E), which are not a part of the No-Project Alternative.

Table 2.3-1 Measures That Compose the No-Project Alternative**1) MEASURES IN PROCESS PRIOR TO THE PROPOSED SCOPING PLAN**

Measure (Measure No.)	Status	Reduction (If Applic.)
Title 24 Building and Appliance Energy Efficiency Standards (E-1, CR-1)	Ongoing	11.9
20 Percent Renewable Portfolio Standard (E-3)	Ongoing	12.0
Million Solar Roofs (E-4)	Ongoing; Began Jan 2007	1.1
Pavley I	Considered by Board Sept 2004; Operative Oct 2005; Effective Jan 2006	26.1

2) DISCRETE EARLY ACTION MEASURES UNDERWAY

Measure (Measure No.)	Status	Reduction (If Applic.)
Shore Power (T-5)	Considered by Board Dec 2007; Effective Jan 2009; Amended June 2010	0.2
High GWP Consumer Products (H-4)	Considered by Board June 2008; Effective July 2009	0.2
Smart Ways - Heavy-Duty Trucks (T-8, T-9)	Considered by Board Dec 2008; Effective Jan 2010; amended May 28, 2009 (on-board diagnostics); Amendments considered by Board Dec 2010; Due to OAL Oct 28, 2011	0.9
Reductions from Mobile Air Conditioners (DIY Cans) (H-1)	Considered by Board Jan 2009; Effective March 2010	0.2
Semiconductor Manufacturing (H-3)	Considered by Board Feb 2009; Effective Jan 2010	0.2
SF6 Reductions (Non Electrical) (H-6)	Considered by Board Feb 2009; Effective Jan 2010	0.0
Tire Pressure Regulation (T-4)	Considered by Board Mar 2009; Effective Sept 2010	0.6
Low Carbon Fuel Standard (T-2)	Considered by Board April 2009; Effective April 2010	15.0
Landfill Methane Capture (RW-1)	Considered by Board June 2009; Effective June 2010	1.5

Measure (Measure No.)	Status	Reduction (If Applic.)
Energy Efficiency Audits for Industrial Sources (I-1)	Considered by Board July 2010; Filed with OAL May, 2011	0.0
SF ₆ Leak Reduction in Electrical Appliances (H-2)	Considered by Board Feb 2009; Effective Jan 2010	0.1

3) MEASURES IN THE PROPOSED SCOPING PLAN, BUT HAVE AUTHORITY OUTSIDE AB 32

Measure (Measure No.)	Status	Reduction (If Applic.)
SB 375 Implementation (T-3)	Regional Targets established by Board Sept 2010	3.0
33-Percent Renewable Energy Portfolio Standard (E-3)	Authorized by SB1X 2 (Statutes of 2011); Planning and development actions underway.	11.4
High Speed Rail (T-9)	In design and development by High Speed Rail Authority. Voters approved Proposition 1a.	1.0

4) MEASURES IN THE PROPOSED SCOPING PLAN, ONLY AB 32 AUTHORITY, FINALIZED THROUGH OAL

Measure (Measure No.)	Status	Reduction (If Applic.)
Refrigerant Management Program (H-6)	Considered by Board Dec 2009; Effective Nov 2010	5.8

Source: ARB 2010c, updated October 28, 2010

State and Local Governments

State government would continue its current practices, policies, investments, and its influence with California local governments and other states. California state government would influence emissions from agricultural activities, forests, water use, resource use, electricity, vehicle fleets, buildings, planes, trains, and automobiles. The state owns and operates prisons, hospitals, military bases, veterans' homes, fairs, and office buildings. State government also leases hundreds of buildings, vehicles, and pieces of equipment, and can affect thousands of companies with whom it does business. State government's contribution to BAU conditions is included in the sectors below.

Local governments have authority over how and where business, commercial, and residential land uses are developed and operated in their communities. Working closely with metropolitan planning organizations, ARB recently adopted regulations that set transportation-related GHG reduction targets for automobiles and light trucks pursuant to SB 375. The intent of the law and the reduction targets are to help shift land use patterns, improve transit opportunities and use, and build on successful planning processes that support environmentally sustainable communities. This law is related to but independent of AB 32. Local governments' contribution to BAU conditions is included in the sectors below.

Transportation

Petroleum-based fuels supply 96 percent of California's transportation needs and will continue to provide a substantial portion into the future. The BAU forecast of GHG emissions in 2020 from the transportation sector as a whole are expected to increase from current levels to 225.4 MMTCO₂E. This forecasted increase is dominated by increases in emissions from on-road transportation, i.e., passenger cars and heavy-duty trucks. To forecast on-road transportation emissions, ARB staff used 2007 fuel sales data obtained from the California Board of Equalization and estimated 2020 emissions based on the growth in projected vehicle miles traveled (VMT) derived from the 2007 Emissions Factor Model (EMFAC2007). This BAU forecast assumes no change in vehicle fleet mix over time. The BAU forecast also assumes no reductions in VMT or airplane traffic due to the High Speed Rail (HSR) by 2020, although the HSR has completed environmental evaluations and is continuing through the design and development process independently of AB 32 implementation. Measures that are already in place to reduce transportation emissions are Pavley 1 and the Low Carbon Fuel Standard (LCFS). Pavley 1 was considered by the Board in September 2004 and went into effect in January 2006, with a reduction target of 26.1 MMTCO₂E. The LCFS was considered by the Board in April 2009 and made effective April 2010 with a reduction target of 15.0 MMTCO₂E.

Goods movement activities in California are projected to increase up to 250 percent between 2006 and 2020, as the United States increases its exports and imports in the globalized economy. This increase translates to more ship and truck trips in and around ports, and more truck activity between and at rail yards and distribution centers. Rail trips will probably not increase, as improvements in locomotive efficiencies accommodate larger hauls. Some of this growth may require new infrastructure to relieve traffic congestion and improve efficiencies, such as port and highway expansions. ARB adopted and is implementing a Goods Movement Emission Reduction Plan to reduce emissions from goods movement activities and to address regional ozone and particulate matter standards, as well as impacts on already adversely affected communities, which can be located near ports, railyards, and distribution centers.

California Energy Commission's (CEC) *2009 Integrated Energy Policy Report* indicates that by 2020, at current trends, more than 44 million Californians will consume between 14.5 and 15 billion gallons of gasoline and diesel fuel each year (after peaking at about

16 billion gallons in 2014). Such consumption, while decreasing somewhat as a result of high prices, improved efficiency, and Alternative fuels, would still require major investments in petroleum refinery and delivery infrastructure (CEC 2009, pp. 147-150). Assembly Bill 1007 (Pavley, Chapter 371, Statutes of 2005) directed the CEC and ARB to develop a plan to increase the use of Alternative fuels in California, effectively reducing California's demand on refineries. California's refineries also supply other western states, which are currently expected to increase their demands for gasoline and diesel into the future due to population growth. Fuel diversity has also been identified as a major policy objective in the CEC's 2003 *Integrated Energy Policy Report*, and Governor Schwarzenegger's Executive Order S-06-06 and resultant Bioenergy Action Plan.

California's population is continuing to grow at 1.2 percent per year. Changes in land use decision-making will be needed to foster more compact, urban and transit-served development, which directly relates to the number of vehicle miles traveled (VMT). VMT growth further degrades air quality and increases detrimental health effects. A substantial proportion of the gains made by introducing cleaner vehicles and fuels could be eroded by increased VMT unless more efficient methods of urban and community planning and transit service measures are implemented.

Electricity and Natural Gas

Under the No-Project Alternative, population growth in California will affect electricity demand in two ways: the number of residents will increase the overall demand for electricity and natural gas, and the location of those residents, primarily in the state's inland areas, will change the pattern of energy use. Electricity demand is expected to increase from slightly under 63,000 MW in 2010 to 71,000 MW by 2020 (CEC 2009, p. 55). Trends toward larger homes and increases in electronic equipment will also increase demand. Historically, California's appliance and building efficiency standards were able to hold our per capita electricity and natural gas demands steady, but under a BAU scenario these programs will not be able to continue this trend through 2020 and new capacity would be needed (CEC 2007). As demands increase, older, less efficient and dirtier power plants would be expected to operate more frequently.

The pattern of energy use is important, because the electrical system is sized to accommodate peak demands. The base of the state's electrical demand is a minimum amount of energy demanded by the state all the time. The peak demand is the difference between this base and the maximum amount of energy needed, usually during periods of extreme weather. Power plants that provide base energy are the most cost-effective, because they are run fairly constantly. "Peaker" power plants, on the other hand, can be run as little as 4 hours a day on a few very hot summer days, and the low duration of operation tends to result in higher co-pollutant emissions than their base counterparts on a per MW basis. Power plants are typically dispatched starting with the most efficient sources, which are generally also those with the lowest emissions. Under BAU conditions, many new power plants will need to be built in California to accommodate load growth and to replace the existing fleet of aging power plants that have low efficiencies and relatively high co-pollutant emissions. There are

also several coastal plants that could be closed in response to proposed environmental requirements for their once-through cooling systems (SWRCB 2010).

Power plants are typically located close to power recipients, suggesting that new power plants would most likely follow population growth in the state. Repowering old plants or constructing new plants in the South Coast, where the state's greatest demand is located, has been identified as particularly problematic due to the region's air quality constraints and permitting requirements.

Along with reliable power plants, important components of a reliable electricity system are distribution, transmission, and availability of fuel supplies. Like power plants, distribution systems are aging, and require substantial infrastructure investments to ensure their continued reliability. The construction of new transmission lines is needed to increase the state's renewable electricity sources to meet the existing statutory goals of 33 percent. If these goals are not met, the price of electricity could increase as utilities incur financial penalties. These issues have all been identified in the 2007 and 2009 Integrated Energy Policy Reports (IEPR) as high priorities for the state in the near term (CEC 2007; CEC 2009).

A third challenge is from the effects of climate change such as increasing frequency and magnitude of extreme weather events. This could drastically affect the duration and magnitude of peak demands, increasing reliance on aging power plants. During the summer months, California also imports energy generated by hydropower from the Northwest to meet peak demand. Decreasing snowpack within California and throughout the west is likely to reduce the availability of this clean and relatively inexpensive hydropower source, further exacerbating the problem. In addition, a large number of power plants in California are located along the coast. The potential for sea level rise associated with climate change could impact the operation of those plants.

The 2020 BAU greenhouse gas emissions forecast for the electric power sector is 139.2 MMTCO₂E. These emissions are the result of in-state power generation plus specified and unspecified imported power. BAU forecasted emissions assume that all growth in electricity demand by 2020 will be met by either unspecified imports or in-state natural gas-fired power plants. Measures that are already in place to reduce energy-generation and use emissions are the 20 Percent RPS and the energy efficiency program. The 33 Percent RPS was enacted by SB1X 2 and is expected to result in about 12 MMTCO₂E in 2020.

The 2020 BAU forecast for emissions from specified sources of imported electricity (i.e., power received from specific out-of-state power plants) is assumed to decrease resulting from the closure of one coal-fired power plant previously supplying imported electricity. The demand previously served by the closed plant was replaced by in-state natural-gas generation. Based on outputs from the CEC electricity demand models, in-state electricity generation and specified imports would not meet the state's full electricity demand in 2020. The remaining demand is assumed to be met by

unspecified imported electricity (i.e., power received from a mix of power generating sources outside the state).

The Emissions Performance Standard (EPS) was established by SB 1368 (Perata, Chapter 598, Statutes of 2006), and will effectively reduce emissions from imported, coal-generated electricity. Regulations adopted pursuant to SB 1368 by the CPUC for investor-owned utilities and by the CEC for publicly-owned utilities prevent all California utilities from entering into long-term contracts that fail to meet an emissions performance standard. As existing agreements expire, coal-intensive electric utilities will need to respond to the established EPS with lower emission portfolios to maintain their California contracts. Such utilities will need to plan to replace coal-generated electricity with energy efficient, renewable and less carbon-intensive resources. ARB does not consider the EPS in the forecasted 2020 emissions. This allows the Scoping Plan reductions from increasing renewable power generation to be counted against with the BAU forecasted 2020 emissions without double-counting the reductions.

The California Public Utilities Commissions (CPUC) recently promulgated a Decision to approve a settlement on CHP that had been negotiated by utilities and CHP proponents. The settlement requires investor owned utilities (IOUs), electrical service providers (ESPs), and community choice aggregators (CCAs) to reduce emissions from the electrical sector. The subject utilities have until 2020 to meet the targets. One of the purposes of the settlement was to develop a method for CPUC jurisdictional utilities to achieve their portion of the Proposed Scoping Plan CHP measure. The electricity demand forecast in the 2011 Integrated Energy Policy Report being prepared by the California Energy Commission will include GHG reductions from CHP.

Electricity and Natural Gas in Residential and Commercial Properties

The Commercial and Residential sector is expected to contribute 46.7 MMTCO₂E or about eight percent of the total statewide GHG emissions in 2020. Forecasted BAU emissions from the Commercial sector include combustion emissions from natural gas and other fuels (e.g., diesel) used by office buildings and small businesses. Residential emissions result primarily from natural gas combustion used for space heating and for hot water heaters. Growth in emissions from the Commercial and Residential sector is due primarily to the expected increase in population and assumed increased use of natural gas. Emissions from the use of other fuels, such as diesel fuel, are assumed to remain relatively constant over time.

Population growth in California will continue to increase electricity demand. The extent of the increase depends on natural gas used and the location of the users. Trends towards larger homes and increases in electronic equipment will also increase demand.

According to the Attorney General, since 2007, an unprecedented number of communities across the state implemented environmentally sensitive, or "green" building requirements to increase energy efficiency and decrease GHG emissions and other environmental impacts within their jurisdictions. In the first half of 2008 alone, nearly a dozen mandatory green building ordinances have taken effect, requiring private

developers to utilize and document green building practices used throughout the construction and life of the project. Other California cities, like San Francisco, San Leandro, Santa Rosa, Hayward and Los Altos Hills are currently developing ordinances for enactment in the near future.

In January 2010, the California Building Standards Commission adopted the nation's first mandatory green building code. Called "CalGreen," the code became effective in early 2011 and lays out specific requirements for newly constructed buildings. It requires builders to install plumbing that cuts indoor water use by as much as 20 percent, to divert 50 percent of construction waste from landfills to recycling, and to use low-pollutant paints, carpets, and floors. It also mandates inspection of energy systems to ensure that heaters, air conditioners, and other mechanical equipment are working efficiently. For non-residential buildings, it requires the installation of water meters for different uses. The code also allows local jurisdictions to retain stricter green building standards, if they already exist, or to adopt stricter versions of the state code if they choose. The Scoping Plan encourages communities to adopt building codes that go beyond the state code (ARB 2009, pp. 57-59).

The experience of municipal actions and the adoption of the CalGreen building code have shown that bold, ambitious action to reduce carbon emissions is possible. These efforts have taken place without the Green Building measures being adopted as part of the Scoping Plan.

Water

California's water system is stressed today, and will likely be more so in 2020. The California Water Plan Update 2009 presents three potential scenarios for conditions in 2050 (DWR 2009, pp. 12-17). All three scenarios indicate a growing demand for water and increasing stresses on a complicated system. The Colorado, Delta, and Klamath water supply systems are experiencing serious conflicts among ecosystem, agricultural, and urban needs, and many infrastructure solutions under discussion today will likely not be in place by 2020.

All sectors will be affected by the changing dynamic in the amounts of water stored in the state's snowpack. Balancing the water needs of the state, the expected increase in water demand for energy production and industrial uses, consumption by an increasing population, increase in demand to grow crops, all balanced with maintaining water quality and healthy ecosystems, will become more complex, challenging and expensive.

Water is intricately linked with energy and the state is already experiencing the need to conserve both water and electricity. In California, hydropower provides about 15 percent of the total electricity while approximately 19 percent of the state's electrical demand comes from transporting, treating and using water. California's economy is built upon both reliable and affordable fuels and water. If the state does not implement the water measures identified in this Plan, the already over-allocated water system will face additional shortages. Without action to improve water supplies, water shortages could get worse at rate of approximately two to three percent per year. This rate is

likely to be much higher, given the likely impacts that global warming will have on the state's water system. These measures are needed, at a minimum, to meet increasing demand from a growing population.

Green Buildings

There are several policies, codes, and plans in place to increase the environmental efficiency of new and existing commercial, residential, and state buildings by 2020, including the new mandatory California Green Building Standards Code adopted by the Building Standards Commission adopted in January 2010, and made effective in early 2011. The California Public Utilities Commission (CPUC) also has established "zero net energy" (ZNE) goals for new construction in California. By 2020, the goal is that all new homes will be ZNE. For commercial buildings, the target date is 2030. In the best case, if the state is able to transform new housing and building stock into "net zero energy" stock, and existing buildings are retrofitted for greater energy and water efficiency, the demand for water and energy from buildings will be similar to or lower than what it is today. This will depend on both the degree to which new stock is built or existing stock is converted and the degree to which they incorporate environmental efficiency over the next twelve years.

Industry

The Industry Sector as defined in the Scoping Plan includes refineries, oil and gas facilities, cement and glass manufacturing, and industrial facilities that employ boilers or general combustion engines. The BAU assumptions for refineries are discussed in the transportation section above. Activity in California oil and gas fields are driven by price and availability, and may therefore expand in the future if current price trends continue. Off-shore drilling would most likely hold steady, due to the limited yield and potential for severe environmental impacts. While the demand for cement will grow with population growth, most of the demand is likely to be met through out of state production while the current rate of in-state production holds steady. Overall manufacturing is expected to slightly decline, while the commercial sector increases. Manufacturing will likely remain concentrated in the South Coast and Bay Area, with agricultural and food processing concentrated in the San Joaquin Valley.

Emissions for this sector are forecasted to grow to 100.5 MMTCO₂E by 2020, an increase of approximately five percent from the average emissions level of 2002-2004. BAU-forecasted emissions for this sector are variable, but overall are not expected to grow substantially. Most of the growth from this sector comes from the fuel use and process emissions of three industries: cement plants, oil and gas production, and refining. Emissions from the combustion of natural gas are expected to grow for some industries (e.g., cement plants) and decline for others (e.g., food processors). These assumptions of growth and decline in natural gas demand are based on outputs from energy demand modeling conducted by CEC staff for the 2007 Integrated Energy Policy Report (IEPR).

Recycling and Waste Management

California disposed an estimated 31 million tons of waste in landfills in 2009, which reflects a continuing decline from the state's peak of 42.5 million tons in 2005. Per capita waste disposal has also continued to decrease, most recently measured to be 4.5 pounds/resident/day in 2009, down from 5.1 pounds/resident/day in 2008 (CalRecycle 2010). The reduction in waste disposal reflects the state's high rate of waste diversion from landfills and the recession. Over 55 percent of California's waste is diverted from landfills and recycled or repurposed. Most of the remainder of California's waste is sent to landfills in the state. In the future, the need for new landfills will be determined by both population growth and by how well the state implements its waste management goals. One supporting goal is to halve the volume of organics going to landfills by 2020. These goals will require the development of new facilities for composting to recycle and reuse waste, but will also reduce the need for new landfill capacity.

Forecasted BAU emissions in 2020 for landfills are 5.0 MMTCO₂E. This forecast uses a recognized landfill gas emissions model developed by the Intergovernmental Panel on Climate Change (IPCC) and data from Cal Recycle. The forecast reflects assumptions regarding the continued decay of existing waste in landfills and estimates on the amount and character of new waste deposited in landfills through 2020.

Forests

The forest sector is unique to California's GHG inventory because it combines both positive and negative emissions into a current sink of approximately -5 MMTCO₂E (2002-2004 average). This net number is negative because the annual gross emission rate from fires, decomposition, harvesting, land conversion, and wood waste is less than the atmospheric uptake of carbon dioxide from forest growth. In addition to being a GHG sink, forests also provide multiple ecological benefits like habitat, structure, and nutrient cycling, as well as a suite of other human benefits or services such as water storage, soil stability, air and water quality, wood products, and recreation. The BAU inventory shows that forest sector emissions are increasing while forest growth is remaining the same. Two factors addressed in the Proposed Scoping Plan which may cause a decline in forest carbon sinks over time, are land conversion and the increased incidence and intensity of wildfires.

As seen in summer of several recent years, wildfires can significantly impact air quality and threaten public safety. Wildfires in water supply watersheds can also impact drinking water quality for years after they occur. Population growth will increase pressure to develop forest lands and development in close vicinity of forests can further increase risk. Climate change is also likely to increase risks associated with the forest sector through changes to weather patterns which can impact forests, both directly and indirectly, by creating hospitable conditions for pests and catastrophic fires.

High Global Warming Potential Gases

Consumer demand, vehicle use patterns, and increased electrical demand due to population growth will increase the amount of high-GWP gases released to the atmosphere. The rates of increase vary by type of activity.

The forecasted BAU 2020 emissions of high-GWP gases are 46.9 MMTCO₂E. High-GWP gases, including sulfur hexafluoride (SF₆) from electric utility applications, substitutes for ozone depleting substances (ODS) (primarily hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs)), and other high-GWP gases used in semiconductor manufacturing and other industrial processes are combined under one sector for purposes of the Scoping Plan. The forecast of BAU emissions of high-GWP gases is derived from the U.S. EPA Vintaging Model, which outputs predicted annual consumption and emissions of all high GWP gases based on end-use equipment, the amount of gas required for manufacture and maintenance, and disposal emissions. Emissions of HFCs and PFCs as ODS-substitutes occur from their use in refrigeration and air conditioning systems, among other commercial and industrial applications. The high BAU forecasted emissions in 2020 comes about as ODS's are rapidly replaced by ODS substitutes, as more ODS's are phased out. In addition, ARB assumes that the effect of an expansion of the electrical transmission system infrastructure, combined with the technical improvements to the equipment in the system, will result in no net change in SF₆ emissions in 2020.

Agriculture

The agriculture sector includes emissions from livestock, i.e., digestive processes and manure management; combustion of liquid and gaseous fuels used for irrigation and crop production; emissions from fertilizer use and application of other soil additives; and emissions from agricultural residue burning. By 2020, there is significant potential for continued conversion of farmlands to urban, commercial, or industrial development or other uses.

Agricultural residue burning and livestock emissions were forecast using ARB's criteria pollutant forecasting approach. Forecasted emissions from the combustion of natural gas were estimated using outputs from the 2007 IEPR developed by CEC. Other agriculture-related emissions were either held constant or extrapolated using historical trends to obtain a 2020 BAU estimate. BAU emissions from the agriculture sector are forecasted to increase about seven percent from current levels to 29.8 MMTCO₂E in 2020, due exclusively to the assumed increase in livestock population. In spite of current measures to preserve farmlands and open space through Williamson Act contracts, state land purchase, and general plan land use designation or zoning, population increases will continue to pressure the conversion of farmlands to urban, commercial, and industrial development or other uses.

Summary of Alternative 1 Strategy

In summary, recognizing BAU estimates and the continuation of some GHG reduction programs already implemented as part of the Scoping Plan (e.g., pre-existing programs and discrete early action measures) or because of other legislative authorities (e.g., SB 375, SB1X 2), GHG emissions under the No-Project Alternative exceed the 2020 reduction goal in AB 32 by 22 MMTCO₂E. With this shortfall, the No-Project Alternative would be inconsistent with the AB 32 statutory mandate.

Alternative 1 Impact Discussion

Objectives

The No-Project Alternative would not meet the fundamental objective of the Scoping Plan and AB 32 to reach 2020 emissions goals, because the GHG emissions reductions of the existing programs and strategies authorized by other statutes would fall short of the mandated goal to of decreasing emissions to 1990 levels by 2020. The expected shortfall would be approximately 22 MMTCO₂E, because the Cap-and-Trade regulation and Advanced Clean Car program would not be a part of this alternative.

Environmental Impacts

The No-Project Alternative includes GHG reduction measures that are ongoing, already implemented as part of the Scoping Plan, or developed under authorities additional to AB 32. Direct and indirect environmental effects of these measures would result from implementation of the No-Project Alternative. This would include resource-related environmental effects associated with the development of renewable energy projects in response to the existing 33-percent RPS, including major utility-scale facilities in remote areas, and the construction and operation of the California high speed rail project being pursued by the High-Speed Rail Authority, which are the two existing measures that would result in the most substantial, landscape-altering construction projects. As a result, the No-Project Alternative would incur a substantial portion of the adverse environmental impacts of the Proposed Scoping Plan (which would add the Cap-and-Trade Program, including offset protocols, and the Advanced Clean Car program) without achieving comparable environmental benefits of reduced GHG and co-pollutant emissions. Consequently, the No-Project Alternative would not be environmentally advantageous, compared to the Proposed Scoping Plan.

Aesthetic impacts of the Proposed Scoping Plan, with its Cap-and-Trade Program and advanced clean car program, would be less than significant, because they would not involve substantial construction actions that would alter scenic resources or important views and vistas (ARB 2009, p. J-23). The No-Project Alternative would not avoid any significant aesthetic effects of the proposed programs. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as potential scenic resource and aesthetic impacts of developing utility-scale renewable energy projects, the high-speed rail project, or the million solar roofs program.

Agriculture and forest resources impacts of the Proposed Scoping Plan may be significant, because large-scale renewable energy facilities and the high-speed rail

project could affect agricultural land (ARB 2009, pp. J-41 – J-42). The sources of potentially significant adverse agricultural and forest resource impacts would not include a Cap-and-Trade Program and Advanced Clean Car program, because compliance responses would not involve use of agricultural lands or conversion of forest land to non-forest uses (ARB 2010b, p. O-15). The No-Project Alternative would not avoid any significant agricultural or forest conversion-related effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures of the Proposed Scoping Plan would continue to occur, such as potential conversion of important farmland related to developing utility-scale renewable energy projects or the high-speed rail project.

Air quality impacts of the Proposed Scoping Plan were identified as less than significant in the FED (ARB 2009, pp. J-24 – J-40) and included beneficial reduction of co-pollutant emissions on a statewide basis. Subsequently, the potential for significant localized air quality impact was further assessed for the Cap-and-Trade Regulation proposed in October 2008 (ARB 2010b, pp. O-15 – O-16). Localized air quality impacts resulting from compliance responses by covered entities and the development of offset credits related to that proposed Cap-and-Trade Regulation found impacts highly unlikely and the specific locations and impact of any such emission increases uncertain. To address the possibility of unanticipated localized air impacts caused by the Cap-and-Trade Regulation, ARB incorporated an adaptive management approach into the proposed regulation. The adaptive management approach reflects ARB's commitment to monitoring the data on localized air quality impacts and to adjusting a Cap-and-trade Regulation adopted, if warranted. Even with these considerations, ARB has taken a conservative approach by concluding that the remote possibility of localized air impacts as potentially significant under CEQA. Therefore, the adoption of the No-Project Alternative would avoid this potentially significant, localized air quality effect of a Cap-and-Trade Program included in the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as construction-related or operational criteria pollutant emissions from the development of utility-scale renewable energy projects or the high-speed rail project. Also, environmental benefits related to statewide reduction in GHG emissions from the Cap-and-Trade Program and Advanced Clean Cars program, along with corresponding co-benefits of reductions in criteria air pollutants and TACs, would not be realized with the No-Project Alternative.

Biological impacts of the Proposed Scoping Plan would result from the Cap-and-Trade Program component, including compliance responses by covered entities and the development of offset credits (ARB 2009, pp. J-43 – J-45; ARB 2010b, p. O-16 and O-311 – O-314). These biological impacts would be potentially significant related to facility construction to reduce GHG emissions at existing facilities of cap-covered entities where natural resources could be present. Also, to the extent that new or modified fueling facilities for Advanced Clean Cars required construction on undeveloped land, additional landscape alteration may occur. Therefore, the adoption of the No-Project Alternative could avoid these potentially significant biological effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise

authorized measures of the Proposed Scoping Plan would continue to occur, such as LCFS and 33-percent RPS, which will require the siting and construction of facilities with potentially substantial alteration of natural landscapes. Substantial landscape alteration from the development of utility-scale renewable energy projects or the high-speed rail project could affect sensitive habitats and special-status species.

Cultural resources impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and Advanced Clean Car Program, could involve potentially significant effects related to facility construction at existing facilities where archaeological or historic resources could be present (ARB 2009, p. J-46; ARB 2010b, p. O-17). This could include facilities constructed for purposes of reducing GHG at Cap-and-Trade Program covered entity locations and new or modified vehicle fueling stations for advanced clean cars. Therefore, the adoption of the No-Project Alternative would avoid these potentially significant cultural resources effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, however, such as the potential to disturb cultural resources from construction related to the development of utility-scale renewable energy projects or the high-speed rail project.

Energy impacts of the Proposed Scoping Plan with the Cap-and-Trade Program and Advanced Clean Car Program would be less than significant, because the programs would not require substantial net additional energy demand to implement. In addition, considering the energy efficiency improvements expected as a result of compliance responses, the lower GHG emission standards for motor vehicles, the use of renewable transportation fuels, beneficial reduction of energy consumption would occur with the Proposed Scoping Plan (ARB 2009, p. J-47 – J-48; ARB 2010b, p. O-17). Therefore, the adoption of the No-Project Alternative would not avoid any significant energy effects of the Proposed Scoping Plan and certain beneficial energy efficiency effects would not occur. The beneficial energy effects of other ongoing, implemented, or otherwise authorized measures, such as utility-scale renewable energy projects and the high-speed rail project, would not be realized.

Geological, soils, and mineral resources impacts of the Cap-and-Trade Program and Advanced Clean Car Program components of the proposed Scoping Plan could involve potentially significant effects related to facility construction at existing facilities where substantial earthwork would be required (ARB 2009, p. J-49 – J-50; ARB 2010b, p. O-17 – O-18). Therefore, the adoption of the No-Project Alternative would avoid these potentially significant effects of the proposed Scoping Plan to geology, soils, or mineral resources. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, however, such as from the potential for substantial grading and erosion from construction related to the development of utility-scale renewable energy projects or the high-speed rail project.

The GHG-related impacts of the Proposed Scoping Plan, including the Cap-and-Trade Regulation and Advanced Clean Car program, would be beneficial, because GHG reduction is the objective of the plan. Therefore, the adoption of the No-Project Alternative would not avoid any significant GHG effects of the Proposed Scoping Plan;

however, the beneficial GHG reduction effects of the Cap-and-Trade Program and Advanced Clean Car Program would not be realized. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as potential GHG benefits resulting from development of utility-scale renewable energy projects or the high-speed rail project.

Hazards and hazardous materials impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and an Advanced Clean Car Program, would be less than significant, because any waste stream from the programs would be handled by existing regulated handling and disposal requirements and new or more severe hazards would not result from facilities needed to implement the programs (ARB 2009, p. J-50 – J-54; ARB 2010b, p. O-18). The most substantial waste stream from the Scoping Plan programs would be spent batteries from the advanced clean car program. Battery recycling and disposal requirements would be included to minimize and properly handle hazardous materials in the battery waste stream. Therefore, the adoption of the No-Project Alternative would not avoid any potentially significant hazard or hazardous materials effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, however, such as the potential for accidental hazardous materials releases from major construction projects related to the development of utility-scale renewable energy projects or the high-speed rail project.

Hydrology and water quality impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and Advanced Clean Car Program, could involve potentially significant effects related to construction of facilities for GHG reduction at Cap-and-Trade covered entity sites or related to new or modified fueling stations for advanced clean cars, where water resources are present (ARB 2009, p. J-64 – J-69; ARB 2010b, p. O-19). The effects could include alteration of drainage or accidental contaminant releases during construction. Therefore, the adoption of the No-Project Alternative would avoid these potentially significant effects of the Cap-and-Trade Program and Advanced Clean Car Program components of the Proposed Scoping Plan to hydrology and water quality. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, however, such as the potential for substantial drainage, flood hazard, and water quality effects from major construction projects related to the development of utility-scale renewable energy projects or the high-speed rail project.

Land use and planning impacts of the Proposed Scoping Plan with the Cap-and-Trade Program and Advanced Clean Car Program could involve potentially significant conflict with local plans and policies related to avoided conversion projects under the Forest Protocol of the Cap-and-Trade Program, where actions to protect a forest may conflict with locally adopted land use or development plans (ARB 2009, p. J-54 – J-57; ARB 2010b, p. O-19 – O-20 and O-322 – O-324). Therefore, the adoption of the No-Project Alternative would avoid this potentially significant land use plan conflict effect of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as the potential for

substantial land use and planning conflicts related to the development of utility-scale renewable energy projects or the high-speed rail project.

Noise impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and Advanced Clean Car Program, could involve potentially significant effects related to construction and operational activities occurring as a result of installing livestock digesters under the proposed Cap-and-Trade Regulation offset protocol (ARB 2009, p. J-58 – J-59; ARB 2010b, p. O-20 and O-252 – O-256). Also, construction of new or modified fueling facilities for advanced clean cars could result in temporary, significant noise impacts, if facility locations are near sensitive receptors. Therefore, the adoption of the No-Project Alternative would avoid these potentially significant effects of the Proposed Scoping Plan to noise conditions. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, however, such as the potential for substantial noise generation related to the development of utility-scale renewable energy projects or development and operation of the high-speed rail project.

Employment, population, and housing impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and Advanced Clean Car Program would be less than significant, because facility or operational changes at Cap-and-Trade covered entities or related to the Advanced Clean Car Program would not change socioeconomic conditions sufficiently to cause substantial physical environmental effects (ARB 2009, p. J-59 – J-60; ARB 2010b, p. O-20). In addition, considering the potential for facility improvements expected as a result of Cap-and-Trade Program, compliance responses, and an Advanced Clean Car Program, beneficial job generation would occur with these proposed programs (although not substantial enough in number to significantly affect local population or housing demands). Therefore, the adoption of the No-Project Alternative would not avoid any significant employment, population, or housing effects of the Proposed Scoping Plan and certain beneficial job formation effects would not occur. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as potential job forming benefits resulting from development of utility-scale renewable energy projects or the high-speed rail project.

Public service impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and Advanced Clean Car Program, would be less than significant, because facility changes resulting from compliance responses would take place in areas already receiving community public services (ARB 2009, p. J-60 – J-61; ARB 2010b, p. O-21). Therefore, the adoption of the No-Project Alternative would not avoid any significant public services effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as potential public service demands resulting from development of utility-scale renewable energy projects (including remote-area emergency service demands when energy facilities are located substantially far from existing communities) or the high-speed rail project.

Recreation impacts of the Proposed Scoping Plan with the Cap-and-Trade Program and Advanced Clean Car program would be less than significant, because the location of

potential facility changes in response to these programs would not likely be near or in conflict with existing recreation areas or facilities (ARB 2009, p. J-61; ARB 2010b, p. O-21). Therefore, the adoption of the No-Project Alternative would not avoid any significant recreation effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as potential conflict with recreation resource lands from developing utility-scale renewable energy projects on public lands.

Transportation and traffic impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and advanced Clean Car Program, could involve potentially significant temporary effects related to construction activity traffic where substantial facility improvements are implemented as a compliance response (ARB 2009, p. J-63 – J-64; ARB 2010b, p. O-21 – O-22). Therefore, the adoption of the No-Project Alternative would avoid these potentially significant effects of the Proposed Scoping Plan to traffic conditions. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, however, such as the potential for substantial traffic generation during the construction phase of major, utility-scale renewable energy projects or the construction and operation of the high-speed rail project.

Utility and service system impacts of the Proposed Scoping Plan, including the Cap-and-Trade Program and Advanced Clean Car Program, would be less than significant, because facility changes resulting from compliance responses would take place in areas already receiving community utility services (ARB 2009, p. J-64; ARB 2010b, p. O-22). Therefore, the adoption of the No-Project Alternative would not avoid any significant utility and service system effects of the Proposed Scoping Plan. The effects of other ongoing, implemented, or otherwise authorized measures would continue to occur, such as potential utility or service system demands resulting from development of utility-scale renewable energy projects, including in remote areas, or the high-speed rail project.

2.4 Alternative 2: Adopt a Program Based on Cap-and-Trade for the Sectors Included in the Cap

Goal of Alternative 2

The goal of Alternative 2 is to consider an Alternative that focuses on a cap-and-trade program as the primary source of GHG emission reductions for the 22 MMT shortfall identified above. The intended advantage of a cap-and-trade program is that total GHG emissions decrease in compliance with a cap (i.e., allowable emission limit) that declines over time, while covered entities are afforded flexibility to pursue the most cost-effective actions to reduce emissions. In Alternative 2, the Advanced Clean Car Program is not included.

Role of Alternative 2 in the Range of Alternatives

The role of Alternative 2 in the range of alternatives is to assess the effectiveness and potential environmental effects of a GHG reduction approach where compliance relies more heavily on non-prescriptive measures that are adaptable to market and economic factors. A cap-and-trade program can involve many variations in the details of requirements for reporting, meeting surrender obligations, marketing tradable compliance allowances, and providing compliance flexibility with offsets. It is not feasible or meaningful to examine the very wide range of potential details for cap-and-trade programs, because the possible combinations of details are innumerable. However, describing a reasonable and practical approach to illustrate how a cap-and-trade program can reduce GHG emissions will enable an understanding of the relative potential of this market mechanism and its compliance responses to cause environmental impacts.

Precedents or Examples of the Approach in Alternative 2

Several precedents for cap-and-trade approaches have been reviewed while developing California's GHG emissions market-incentive program. Two federal market-incentive programs administered by the U.S. EPA provide a history of performance of cap-and-trade approaches to emissions reductions to consider. The two programs are directed at reducing NO_x emissions and acid rain. The South Coast Air Quality Management District (SCAQMD) has established a RECLAIM program for NO_x and SO₂ reduction. Two early GHG cap-and-trade programs are the Regional Greenhouse Gas Initiative (RGGI) in the Northeast United States and the European Union – Emissions Trading System (EU-ETS).

The Market Advisory Committee (MAC) established to help design the California cap-and-trade program recognized that the prior programs can provide lessons learned in their design and implementation. While not all features of the design of the prior programs worked well, like the absence of allowance banking in the RECLAIM program, the MAC report to ARB indicated that cap-and-trade had a strong potential to achieve GHG reductions in capped sectors at relatively low cost (MAC 2007, pp. 15-17). Independent evaluations of the effectiveness of cap-and-trade systems have identified both advantages and shortcomings from previous and ongoing programs. Some relevant conceptual studies are noted below, followed by a summary of precedential programs. The historic performance, both positive and negative, of market-incentive programs has provided guidance in the design of a California approach.

Conceptual Studies on Emissions Trading vs. Other Options

There is a vast literature that examines the pros and cons of cap-and-trade, and although authors vary in their conclusions, most agree that, if properly designed, cap-and-trade can be an effective tool for reducing emissions. This section presents a brief summary of recent studies on the fundamental considerations when selecting emissions trading as a policy tool.

In 2007, Resources for the Future released a report summarizing work conducted as part of an inter-industry U.S. Climate Policy Forum (RFF 2007). In addition to other topics, this report analyzed three general climate policy options: emissions trading, emissions taxes, and regulatory standards. With respect to carbon pricing policies, this report concludes the following key points:

- There are many similarities between CO₂ taxes and tradable allowances or permits. Both reduce emissions by associating a uniform price with emitting activities at any point in time, leading to efficient, low-cost emission reductions. Both can incorporate offset project opportunities and provide emissions leakage protection (through free allocation in the case of tradable permits or through rebates in the case of the tax).
- A predictable price, as imposed by a carbon tax, tends to have advantages over fixing the level of emissions through emissions trading for a short time horizon of several years. Over longer horizons fixed emissions targets through emissions trading become increasingly advantageous.
- The theoretical differences between a tax and trading policy are easily blurred in a hybrid emissions trading system where some allowances are auctioned to raise government revenue and where banking, borrowing or other flexible cost-containment mechanisms are in place to help stabilize prices.
- Traditional forms of regulation—technology and performance standards—represent an Alternative to emissions trading or CO₂ taxes, but can be much more costly because they do not allow the flexibility to shift efforts toward the cheapest mitigation opportunities. As a complement to emissions trading or CO₂ taxes, however, flexible standards can address possible additional market failures and potentially lower costs.

In February 2008, the U.S. Congressional Budget Office (CBO) released a study on policy options for reducing CO₂ emissions (CBO 2008). In this study, CBO compared three key criteria (i.e., efficiency, implementation, and international consistency considerations) for incentive-based approaches (i.e., CO₂ tax, cap with a ceiling and either banking or a price floor, cap with banking and either a circuit breaker or managed borrowing, and inflexible cap). The study explores ways in which policymakers could preserve the structure of a cap-and-trade program, but still achieve some of the advantages of a tax. These include setting a ceiling or a floor on the price of emission allowances, permitting firms to transfer emission-reduction requirements across time by banking allowances in one year for use in future years (or borrowing future allowances for use in an earlier year), and modifying the stringency of the cap from year to year on the basis of the price of allowances.

According to another study, published in the Oxford Review of Economic Policy in 2008 (Stavins 2008), the most efficient approach for the short to medium term in the U.S. in regards to addressing climate change would be a cap-and-trade system (also, see the study in the Harvard Environmental Law Review (Stavins 2007)). The study identifies

that the integrity of a domestic program could be maximized (and its costs and risks minimized) by:

- targeting all fossil-fuel-related CO₂ emissions through an upstream, economy-wide cap;
- setting a trajectory of caps over time that begins modestly and gradually becomes more stringent, establishing a long-run price signal to encourage investment;
- adopting mechanisms to protect against price uncertainty; and
- including linkages with the climate-policy action of other countries.

It is also stated that a well-designed, cap-and-trade system would minimize the costs of achieving any given emissions target through flexibility regarding how much a facility would emit and the ability to trade emission allowances. Also, the cost of achieving significant emission reductions in future years would depend on the availability and cost of low- or non-emitting technologies. A cap-and-trade system that establishes caps extending decades into the future provides important price signals and, hence, incentives for firms to invest in the development and deployment of such technologies, thereby lowering the future costs for achieving emission reductions. However, it is noted that a cap-and-trade system alone may not encourage the socially desirable level of investment in research, development, and deployment of new technologies that could reduce future emission-reduction costs and thus, to achieve this, additional policies may be necessary to provide targeted additional action.

Summary of Existing Emissions Trading Systems

NO_x Reduction Programs

From 1999 to 2002, the Ozone Transport Commission (OTC) NO_x Budget Program was implemented to reduce summertime NO_x emissions, which contribute to ozone formation, in the northeast United States. The program capped summertime NO_x emissions at 219,000 tons in 1999 and 143,000 tons in 2003, less than half of the 1990 baseline emission level of 490,000 tons. The OTC NO_x Budget Program used an allowance trading system that harnessed free market forces to reduce pollution. The NO_x Budget Trading Program (NBTP) replaced the OTC NO_x Budget Program in 2003. It was established as a market-based, cap-and-trade program created to reduce the regional transport of NO_x emissions from power plants and other large combustion sources that contribute to ozone nonattainment in the eastern United States. The program was a central component of the NO_x State Implementation Plan, otherwise known as “NO_x SIP Call,” promulgated in 1998. All 20 states covered by the NO_x SIP Call were in the NBTP. In 2009, the Clean Air Interstate Rule’s ozone season program began, effectively replacing the NBTP in the East to achieve further summertime NO_x reductions from the power sector (U.S. EPA 2011b; U. S. EPA 2009, pp. 1-2).

Acid Rain Program

The overall goal of the Acid Rain Program was to achieve substantial environmental and public health benefits through reductions of SO₂ and NO_x, which are the primary pollutants that cause acid rain. To achieve this goal at the lowest cost to society, the program employed both traditional and innovative, market-based approaches for controlling air pollution.

For SO₂ reduction, Title IV of the Clean Air Act set a goal of reducing annual emissions by 10 million tons below 1980 levels. To achieve these reductions, the law required a two-phase tightening of the restrictions placed on fossil fuel-fired power plants. Phase I began in 1995 and affected 263 units at 110 mostly coal-burning electric utility plants located in 21 Eastern and Midwestern states. An additional 182 units joined Phase I of the program as substitution or compensating units, bringing the total of Phase I affected units to 445. Emissions data indicate that 1995 SO₂ emissions at these units nationwide were reduced by almost 40 percent below their required level (U.S. EPA 2011).

Phase II of the SO₂ program, which began in the year 2000, lowered the annual emissions limits imposed on these large, higher emitting plants and also set restrictions on smaller, cleaner plants fired by coal, oil, and gas, encompassing over 2,000 units in all. The program affected existing utility units serving generators with an output capacity of greater than 25 megawatts and all new utility units.

The Clean Air Act also called for a 2 million ton reduction in NO_x emissions by the year 2000. A substantial portion of this reduction has been achieved by coal-fired utility boilers that have been required to install low NO_x burner technologies and to meet new emissions standards.

The Acid Rain Program was implemented through an integrated set of rules and guidance designed to accomplish three primary objectives: (1) achieve environmental benefits through reductions in SO₂ and NO_x emissions; (2) facilitate active trading of allowances and use of other compliance options to minimize compliance costs, maximize economic efficiency, and permit strong economic growth; and (3) promote pollution prevention and energy efficiency strategies and technologies. The program consisted of the following components (U.S. EPA 2011):

- The allowance trading system created low-cost rules of exchange that minimize government intrusion and make allowance trading a viable compliance strategy for reducing SO₂.
- The opt-in program allowed non-affected industrial and small utility units to participate in allowance trading.
- The NO_x emissions reduction rule set new NO_x emissions standards for existing coal-fired utility boilers and allowed emissions averaging to reduce costs.

- The permitting process afforded sources maximum flexibility in selecting the most cost-effective approach to reducing emissions.
- The continuous emission monitoring (CEM) requirements provided credible accounting of emissions to ensure the integrity of the market-based allowance system and to verify the achievement of the reduction goals.
- The excess emissions provision provided incentives to ensure self-enforcement, greatly reducing the need for government intervention.

SCAQMD RECLAIM Program

RECLAIM, the Regional Clean Air Incentives Market, is a multi-industry cap-and-trade program adopted by SCAQMD Governing Board in 1993. RECLAIM sets a factory-wide pollution limit for each covered business, and lets businesses decide what equipment, processes and materials they will use to meet their emission limits. Under RECLAIM, these allowable emission limits decline a specific amount each year for each covered factory. Companies are free to choose the most cost-effective, economical ways to reduce pollution. Companies that can reduce emissions more than required can then sell excess emission reductions to other firms. Buyers of the emission reduction credits are companies that need more time to clean up or find the cost of buying credits cheaper than buying and installing new equipment (SCAQMD 2007, pp. EX-1 – EX-2; SCAQMD 2011). The RECLAIM program required industries and businesses to cut their emissions by a specific amount each year, resulting in a 70 percent reduction for nitrogen oxides NO_x and a 60 percent reduction for SO_x by 2003. SO_x annual targets have been met every year. NO_x annual emissions have met the target every year except 2000 and 2001, when California experienced an energy shortage (SCAQMD 2007, p. EX-3; SCAQMD 2011).

On November 5, 2010, the Governing Board of the SCAQMD adopted amendments to its RECLAIM program that will result in cumulative reductions of 5.7 tons per day, or more than 51 percent reduction, of oxides of sulfur (SO_x) from all RECLAIM facilities by 2019. The changes are to be implemented in phases: 3 tons per day in 2013, 4 tons per day in each year from 2014 through 2016, 5 tons per day in 2017 and 2018, and 5.7 tons per day in 2019 and beyond.

Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is the first market-based, regulatory program in the United States to focus on GHG emissions. Covered entities are limited to electricity generation facilities. Ten Northeastern and Mid-Atlantic states currently participate in the program. The Governor of New Jersey recently announced his intention to withdraw New Jersey from the program at the end of the first control period, December 31, 2011. The RGGI states have capped and committed to reduce CO₂ emissions from the power sector 10 percent by 2018. States sell nearly all emission allowances through auctions and invest proceeds in consumer benefits that include energy efficiency, renewable energy, and other clean energy technologies.

RGGI is composed of individual CO₂ Budget Trading Programs in each of the participating states. Through independent regulations, based on the RGGI Model Rule, each state's CO₂ Budget Trading Program limits emissions of CO₂ from electric power plants, issues CO₂ allowances, and establishes participation in regional CO₂ allowance auctions. Regulated power plants can use a CO₂ allowance issued by any of the participating states to demonstrate compliance with an individual state program. In this manner, the state programs, in aggregate, function as a single regional compliance market for CO₂ emissions (RGGI 2007).

European Union – Emissions Trading System

The European Union – Emissions Trading System (EU-ETS) cap-and-trade program was launched in 2005. Within the cap, companies receive emission allowances that they can sell to or buy from one another, as needed. The limit on the total number of available allowances supports their value. At the end of the trading period, each company must surrender enough allowances to cover all its emissions; otherwise, fines are imposed. If a company reduces its emissions, it can keep the spare allowances to cover its future needs or sell them to another company that is short of allowances. The flexibility of trading promotes cost-effective reduction strategies. The number of allowances is reduced over time so that total emissions decrease. In 2020, emissions are planned to be 21 percent lower than in 2005.

The EU-ETS operates in 30 countries (the 27 EU Member States plus Iceland, Liechtenstein and Norway). It covers CO₂ emissions from installations such as power stations, combustion plants, oil refineries, and iron and steel works, as well as factories making cement, glass, lime, bricks, ceramics, pulp, paper and board. Nitrous oxide emissions from certain processes are also covered. Between them, the installations currently in the scheme account for almost half of the EU's CO₂ emissions and 40 percent of its total GHG emissions.

Airlines are scheduled to join the system in 2012. The EU-ETS will be further expanded to the petrochemicals, ammonia, and aluminum industries and to additional gases in 2013, when the third trading period starts. Also, based on lessons learned during the first two trading periods, a series of system changes will be implemented (European Commission Climate Action 2011).

California Cap on GHG Emissions and Market-Based Compliance Mechanisms

The examples listed above are of existing cap-and-trade programs adopted by other entities. In developing Alternative 2, ARB staff also considered the work it has done in recent months as part of its proposal to the Board to adopt a Cap-and-Trade Regulation in California. As discussed above, the process is currently ongoing, and the Board has made no final decision on whether to adopt a Cap-and-Trade Regulation. Staff's recent work has, however, helped to inform the development and analysis of Alternative 2.

In 2010, ARB staff proposed the adoption of a Cap-and-Trade Regulation with fully developed strategies for defining the declining cap, emissions reporting, establishing

marketable emissions allowances, setting the timing for surrendering compliance instruments, formulating protocols for using carbon offsets, and creating an adaptive management approach. This program is described in detail in the FED for the California Cap on GHG Emissions and Market-Based Compliance Mechanisms regulation, released for public review in October 2010 (ARB 2010a, Appendix O). Relevant components of Alternative 2 are summarized from this Cap-and-Trade Regulation FED. Alternative 2, like the proposed Cap-and-Trade Regulation, includes use of offsets to achieve part of its reduction goals and help manage allowance prices. The applicable features of the Cap-and-Trade Regulation presented in that FED serve as the basis for the description in Alternative 2 (including the declining cap, a range of covered entities, requirements to surrender allowances at the end of compliance periods, and a commitment to adaptive management); however, Alternative 2 uses cap-and-trade to meet the entire 22 MMTCO₂E shortfall from the AB 32 emissions goal identified above (rather than the 18 MMTCO₂E target in the proposed regulation). The Cap-and-Trade rulemaking process is still underway and no final action to adopt the rule has been taken by ARB.

Independent Evaluations of Previous and Ongoing Cap-and-Trade Programs

As mentioned above, several trading programs exist in the U.S. and Europe and a broad spectrum of scientific, economic, legal and policy analyses of cap-and-trade programs have found that well designed and implemented programs for certain air pollutants have been effective (Burtraw and Swift 1996, Tietenberg 2006). The U.S. EPA's Acid Rain program is widely viewed as being very successful, bringing about large reductions for lower-than-expected costs. Specifically, the program resulted in cost savings of \$1 billion annually, compared with costs under direct regulatory alternatives, and SO₂ emissions from the power sector decreased from 15.7 MT in 1990 to 10.2 MT in 2005 (Carlson et al. 2000). Banking provisions contributed to the program's cost-effectiveness (Ellerman et al. 2000). Analyses of the program indicate that it did not produce unintended consequences of concentrating SO₂ emissions in minority communities, and improved air quality for minority and low-income populations (Ringquist, 2011: and U.S. EPA, 2005).

In the NO_x program, compliance cost savings of 40-47 percent have been estimated for the period 1999-2003, compared to a base case of continued command-and-control regulatory alternatives without trading or banking (Farrell et al 1999, as cited in Stavins 2008).

RECLAIM does not allow banking because of concerns that unacceptably high emissions would occur in a future year. The lack of banking is thought to have contributed to a substantial price spike for NO_x emission rights in 2000. Specifically, a heat wave caused an increase in demand for electricity, while the availability of imported power from other states declined. This increased demand was met by operating old-gas fired generating facilities in California that resulted in a significant rise in cost (i.e., tenfold) of RECLAIM trading credits and contributed to high wholesale electricity prices during that period (CBO 2008). Overall, trading under the RECLAIM

program was restricted in several ways, with some negative consequences, but despite these problems, NO_x and SO_x emissions in the regulated area were reduced significantly. The program reduced compliance costs for regulated facilities (i.e., 42 percent cost savings) (Anderson 1997).

The EU-ETS is a real-world example of a cap-and-trade system working in tandem with other complimentary climate policies (IIDRI, 2011). Creation of the EU-ETS was challenging (Convery, 2009); once the program was in place, several issues arose during implementation of the initial phase that involved member states relying on emission estimates rather than actual emissions as a result of insufficient historic data. This led to less stringent caps than anticipated, and the market price for allowances dropped significantly when the over-allocation became apparent (Grubb et al., 2011). The system overcame these start-up issues, and the EU-ETS now represents an example of a functioning CO₂ market achieving emissions reductions from sources covered by the program (Ellerman et al. 2010).

Attributes of Alternative 2

Alternative 2, like any cap-and-trade program, would need to undergo rigorous review during development of the regulation. For the purposes of this analysis, however, this Supplement will make certain assumptions about Alternative 2's attributes. Alternative 2 would cover the major sources of GHG emissions in the state, including refineries and power plants, industrial facilities and transportation fuels, which would include up to 85 percent of California's emissions. The program would impose an enforceable emissions cap that would steadily decline over time. The state would distribute allowances, which are tradable permits, equal to the cap. Sources under the cap would need to turn in allowances equal to their emissions at the end of each compliance period. Sources with more allowances than emissions can trade (i.e., sell) their surplus allowances to firms who find it more expensive to reduce their emissions than to purchase allowances from others. Alternative 2 would include a number of cost-containment strategies for smoothing the transition into the program, such as disturbing allowances for free in the early stages of the program, allowing those covered by the program to focus on investing in emission reductions and cleaner technologies, and limiting any concerns about competitiveness and emissions leakage.

Under the Alternative 2 cap-and-trade program, offset credits can be used by covered entities to meet a small portion of their compliance obligation. An offset is a credit that represents a reduction of GHGs resulting from an activity that can be measured, quantified, and verified. Each offset credit represents a metric ton of emission reductions from a source not directly covered by the cap-and-trade program.

The regulation would include strict rules for reporting emissions and trades, with substantial penalties for violations. Transparency in the trading process is important to avoid market manipulation.

Each design element is discussed in more detail later in this chapter.

Cap-and-Trade

In this Alternative 2 program, a cap that declines over time is placed on emissions from all covered sectors. The total number of allowances created would be equal to the cap set for cumulative emissions from all the covered sectors. In addition to allowances, a limited amount of offsets could be used for compliance. The use of offsets would allow emissions in the capped sectors to slightly exceed the allowances issued, though these additional emissions from capped sectors would be matched by emission reductions that result from offset projects. The term *compliance instrument* covers both allowances and offsets. Both types of compliance instruments may be traded among entities. At the end of each three year compliance period, covered entities are required to turn in, or *surrender*, enough compliance instruments to match their emissions during this time period. These compliance instruments are permanently retired, thereby reducing the allowable emissions under the cap over time. Each allowance equals one metric ton of carbon dioxide equivalent. Since the program includes some GHGs (e.g., methane) that are more effective at trapping heat than carbon dioxide, all emissions are measured in units relative to the heat trapping potential of carbon dioxide or CO₂E, the “E” standing for “equivalent”.

Because a cap-and-trade program allows compliance instruments to be traded, the price for those instruments becomes a price on emitting carbon. This price provides incentives for GHG emission reductions and innovation. It can stimulate reductions for all covered sectors without requiring individual regulations for all GHG emissions. Pricing carbon in this way ultimately creates a market for finding the most cost-effective emission reductions. Providing entities the flexibility to find the most cost-effective reductions lowers the overall cost of the program. Creating a market provides more flexibility than direct regulation can and provides incentives for investment and deployment of low carbon technologies.

Fundamental Elements of the Cap-and-Trade Program

The following discussion highlights the basic elements of the Alternative 2 Cap-and-Trade Program. These elements closely follow the elements of the proposed Cap-and-Trade Program presented in the Proposed Scoping Plan. For Alternative 2, the targeted emissions reductions are 22 MMTCO₂E, instead of the 18 MMTCO₂E target for the Proposed Scoping Plan.

Scope

The Cap-and-Trade Program phases sectors into the program. Under this phased approach, entities in the following sectors would be covered in the program according to the following timelines:

Starting in the first compliance period:

- Electricity generation, including electricity imported from outside California; and
- Large industrial sources with GHG emissions at or above 25,000 metric tons of carbon dioxide equivalent (MTCO₂E).

Starting in the second compliance period, the program expands to include fuel distributors in order to cover emissions associated with:

- Combustion of gasoline, diesel, natural gas, and propane from sources with emissions below 25,000 MTCO₂E, including all commercial, residential, and small industrial sources; and
- Fuels used for transportation.

All sectors listed above would be covered through 2020.

The Cap

The limit on GHG emissions, i.e., the cap, is a critical part of a Cap-and-Trade Program design because it determines the number of total allowances ARB would issue. The cap is set in the regulation and consists of annual cap numbers, also referred to as “budgets.”

Based on the 2010 proposed program, the initial cap level would be set at the level of emissions expected from covered sources for that year, which, based on current projections would be 165.8 million MTCO₂E (MMTCO₂E). The cap would decline starting in 2013 until 2015. In 2015 the cap would then be expanded to include GHG emissions from fuel suppliers. This expansion is based on the level of GHG emissions expected from the covered fuels for the year 2015, resulting in a cap for 2015 of 394.4 MMTCO₂E. The cap would then continue to decline from 2015 to 2020, to a level of about 334 MMTCO₂E.

The level of the cap is critical to the environmental effectiveness of a cap-and-trade program. If the cap is not set at a stringent enough level to drive GHG emission reduction activities, the environmental goals of the program may not be met even if all sources comply with program requirements. The intended design of such a program would be sufficiently stringent to motivate GHG emission reductions to achieve AB 32 goals. As discussed above, the cap in the Proposed Scoping Plan Cap-and-Trade Program would be about 334 MMTCO₂E for 2020, which is designed to allow California to achieve the AB 32 target.

The cap is also an important element of the entire program design as it serves as a backstop for ensuring that the 2020 target is met. As the program covers about 85 percent of the emissions, any failure of the other measures will be addressed through compliance with this cap. This ability to serve as a flexible backstop to other policies is one of the most fundamental strengths of a cap-and-trade program.

Allowances

As discussed previously, an allowance is equal to one metric ton of CO₂E. ARB would issue a total of approximately 2.7 billion allowances for the Cap-and-Trade Regulation through the year 2020. This amount of allowances is about the same as the originally proposed Cap-and-Trade Regulation. Annual allowance budgets for calendar years 2012–2020 are established by regulation, so that the total number of allowances issued

in each year through 2020 are known. At the end of a compliance period, each covered entity is required to surrender allowances (and if it elects, a limited amount of offsets) equal to its total GHG emissions during that compliance period. ARB would also require entities to surrender compliance instruments to match a portion of their reported emissions each year during the three-year compliance period to reduce the risk of non-compliance at the end of the three year period. When compliance instruments are surrendered, ARB would permanently retire them.

Covered entities are not the only entities that may hold and trade allowances in the program. Entities in covered sectors with emissions less than 25,000 MTCO₂E may voluntarily elect to become covered entities. Other non-covered entities may be eligible to participate voluntarily. Some examples of these non-covered entities include financial institutions or brokers, offset project developers, and those who may want to obtain and voluntarily retire allowances. Once an entity holds an allowance, it can: 1) surrender it to comply with an obligation under the regulation; 2) bank it for future use; 3) trade it to another entity; or 4) ask ARB to retire it.

A gradual transition into the program would occur through the design of the allocation system. As with the program identified in the Proposed Scoping Plan, ARB would rely primarily on free allocation at the start of the program to minimize near-term costs to California consumers and businesses and to minimize emissions leakage. The allocation design would reward those who have invested in energy efficiency and GHG emission reductions and would encourage continued investment in clean and efficient technologies in the future.

The outset of the program would include an auction that includes a consignment feature for allowances allocated to electricity distribution utilities. The auction would allow for broad participation by diverse market players and minimize the chances for manipulation. The auction is set up in a way to ensure that allowances go to those market participants that place the highest value on them.

Cost Containment Mechanisms

The Cap-and-Trade Regulation includes a number of mechanisms designed to minimize the costs of reducing GHGs without compromising the environmental integrity of the program. Some of the mechanisms in the proposed Cap-and-Trade Regulation are three-year compliance periods, banking, the Allowance Price Containment Reserve, offsets and linkage to other trading systems.

A number of major sources of California emissions are subject to significant year-to-year variations – for example, electricity sector emissions increase in low water years as lower hydropower production is replaced with natural gas generation. For this reason, the Alternative 2 program has been designed with a three-year compliance cycle to help smooth out these annual variations, and to provide sources with greater flexibility to reduce emissions.

In a cap-and-trade program, banking allows participants to hold spare allowances and use them for compliance in a later period. The ability to bank allowances provides an incentive for covered entities to make early reductions since the declining cap could push allowance prices higher over time. Staff proposes to allow banking of allowances without restriction.

Alternative 2 would include an Allowance Price Containment Reserve (the Reserve). The Reserve would be an account that is filled with a specified number of allowances removed from the overall cap at the beginning of the program. Covered entities may purchase reserve allowances at specified prices during direct quarterly sales. Covered entities gain flexibility through access to the Reserve if prices are high or entities expect prices to be high in the future.

Under the Alternative 2 program, covered entities may use offset credits to satisfy a small portion of their compliance obligation. In addition to providing compliance flexibility, the inclusion of offsets in the program would support the development of innovative projects and technologies from sources outside capped sectors that can play a key role in reducing emissions both inside and outside California.

Offsets must meet rigorous criteria that demonstrate that the emissions reductions are real, permanent, verifiable, enforceable, and quantifiable. To be credited as an offset, the action or project must also be additional to what is required by law or regulation or would otherwise have occurred. Under the Cap-and-Trade Program in Alternative 2, ARB would issue or recognize an offset credit that could be used by a covered entity instead of turning in an allowance for the equivalent amount of CO₂E emitted.

The Alternative 2 program imposes a limit on the amount of offsets that an individual covered entity can use for compliance. Allowing a limited number of offsets into the program provides benefits and ensures that some GHG emission reductions occur within the sectors covered by the Cap-and-Trade Program. The Alternative 2 Cap-and-Trade Program includes provisions that would allow a maximum of 232 million MTCO₂E of offsets through the year 2020. This limit would be enforced through a limit on the use of offsets by an individual entity equal to eight percent of its compliance obligation. Combined with the Allowance Price Containment Reserve (described above), this limit ensures that a majority of reductions from the program come from sources covered by the program at expected allowance prices, while use of the reserve would relax that constraint if prices rise.

Linkage is the reciprocal acceptance of compliance instruments issued by another system. California could decide to link its Cap-and-Trade Program to other emissions trading systems of similar scope and rigor, and has been working with our WCI partners to create the framework for a regional system of linked programs. Linkage can expand the coverage of the Cap-and-Trade Program to include emission reduction opportunities for sources covered in another program. The proposed Cap-and-Trade Regulation establishes a framework for linkage. Each program considered for linkage would be subject to Board action, and would undergo a case-by-case analysis by staff as part of a formal rulemaking process.

Although linkage to any programs is not included in this alternative, three programs are candidates for future linkage. Currently three other WCI partners are working to implement cap-and-trade programs consistent with the Design for the WCI Regional Program by 2012 or 2013: British Columbia, Quebec, and Ontario. Linking to WCI partners would have several advantages for California. The reduction of GHG emissions that can be achieved collectively by the WCI partner jurisdictions are larger than what can be achieved through a California-only program. The broad scope of a WCI-wide market would provide additional opportunities for reduction of emissions, therefore providing greater market liquidity and more stable carbon prices within the program.

Compliance and Enforcement

A robust enforcement program would play a vital role in the success of a cap-and-trade program by discouraging gaming of the system and deter and punish fraudulent activities. One allowance is needed to cover one metric ton of a covered entity's emissions, if they are turned in by the compliance deadline. If an entity does not meet the compliance deadline it would need to surrender additional allowances. The Alternative 2 program would need to be designed to remove, to the extent possible, financial incentives for noncompliance and to make sure that every ton of GHG emitted is covered by a valid compliance instrument.

To develop an enforcement program for a cap-and-trade program, ARB staff could consult with legal and enforcement staffs from state and federal agencies to gain insight in this area. These agencies may include the California Environmental Protection Agency, California Attorney General's Office, the California Energy Commission, the California Public Utilities Commission, the Department of Water Resources, the United States Department of Justice, the United States Securities and Exchange Commission, and the United States Commodities and Futures Trading Commission. In addition, staff could consult with academic institutions, such as University of California Berkeley's Center for Law, Energy, and the Environment and legal and market expert scholars from other universities.

Adaptive Management

A cap-and-trade program would be made up of many elements and would serve a large number of important objectives at the same time. Accordingly, unanticipated effects and results could occur over the life of the Alternative 2 program. ARB, therefore, would be committed to using an adaptive management process to review and revise policies, protocols, and procedures as more information becomes available. Among other purposes, the adaptive management commitment would be useful in monitoring whether environmental impacts were arising and defining how a program could be modified to avoid or reduce them.

Summary of Alternative Strategy

Implementation of Alternative 2 would involve a strategy that is similar to the emphasis on a Cap-and-Trade Program in the Proposed Scoping Plan, except that the emissions reduction would need to account for 22 MMTCO₂E to make up for the amount allocated

in the Scoping Plan for both Cap-and-Trade and Advanced Clean Cars. It would be expected to enable the state to reach its AB 32 goal by 2020, although the absence of the advanced clean car measure from this Alternative would place more GHG reduction burden on the market mechanisms of the Cap-and-Trade Program. As a result, allowance prices may be higher.

Alternative 2 Impact Discussion

Objectives

Alternative 2 would be expected to meet the fundamental objective of reaching the 2020 emissions reduction goal. The Proposed Scoping Plan Cap-and-Trade Program was designed to reduce GHG emissions by 18 MMTCO₂E. This Alternative is required to further reduce GHG emissions by 4 MMTCO₂E, because it must also account for the reduction assigned in implementation of the Proposed Scoping Plan to Advanced Clean Cars (4 MMTCO₂E). It would be reasonable to expect that the additional reduction could be achieved by more aggressive reductions within the existing covered entities and/or addition of other covered entities, because the cap establishes a firm emissions limit that must be met. Because reductions are not mandated for Advanced Clean Cars under this alternative, there would be less economic incentives for technological changes in that sector since emissions reduction may occur in any of the capped sectors.

The achievement of other objectives of the Proposed Scoping Plan would also be expected by Alternative 2, because a market-driven GHG reduction program has the characteristics sought by the objectives. For instance, it would reduce fossil fuel use through fuel switching compliance responses. Emissions reductions would be ensured by the establishment of the mandatory, declining cap. Reductions would be expected to occur in the most cost-effective manner, because the cost of reductions or the cost of allowances that can be purchased are determined by the market. Leakage would be minimized by the market-driven pricing of carbon and the availability of lower cost offsets for a portion of the reductions to help manage allowance prices. The allocation strategy would also include free allowances for trade-exposed industries. Many co-benefits would occur with an effective market-driven GHG reduction program, such as energy conservation and efficiency, reduced fossil fuels use, reduction of regional co-pollutants, and job-forming economic opportunities related to facility modifications and development of energy efficiency technologies.

Environmental Impacts

As described above, Alternative 2 focuses on a Cap-and-Trade Regulation and program designed to reduce GHG emissions sufficiently to achieve 22 MMTCO₂E reductions by 2020, including compliance responses by covered entities and use of offsets according to specified protocols. Under this alternative, compliance responses by covered entities could include upgrading equipment, switching to lower intensity carbon fuels, implementing maintenance and process changes at existing facilities, and reducing operations of carbon-intense facilities in favor of increased operations of more carbon-efficient facilities. Implementation of carbon offset programs under specified

protocols could also occur. The four offset protocols proposed as part of the Proposed Scoping Plan's Cap-and-Trade Program would also be applicable for this alternative: Ozone Depleting Substances (ODS), Livestock, Urban Forest, and Forest. Construction-related activities associated with these compliance responses could occur. The general approach, covered entities, and offset protocols of a Cap-and-Trade Program under Alternative 2 would be reasonably expected to be similar to the Proposed Scoping Plan's Cap-and-Trade Program, except that the reduction target would be increased from 18 to 22 MMTCO₂E, because the reductions allocated in the Proposed Scoping Plan to the Advanced Clean Car program (4 MMTCO₂E would also need to be covered) (ARB 2010b).

Aesthetic impacts of the Alternative 2 compliance responses of this Alternative would be less than significant, because they would not change the character of the facility sites. The ODS Offset Protocol would not introduce activities that would disrupt aesthetic or visual settings. The Livestock Offset Protocol would include the construction of digesters in agricultural settings. Digesters are consistent with agricultural uses and would not represent an adverse change to the visual character of the vicinity. The Urban Forest Offset Protocol would improve the quality of the urban visual environment and would be considered aesthetically beneficial. The Forest Offset Protocol would not increase the amount of forest activities, but could shift activities to projects that increase carbon sequestration. This shift could change the visual character of offset project sites over time, but would not pose an adverse visual impact. Managing forests to increase cover and remove dead and diseased trees may be a visually beneficial effect.

Agricultural and forest resources effects of Alternative 2's compliance responses would not be expected to affect agriculture or forest resources, because they would occur at existing facilities of the covered entities. The ODS Offset Protocol would not include activities that affect agriculture or forest resources. The Livestock Offset Protocol would include the construction of digesters in agricultural settings. Digesters are consistent with agricultural uses and would not represent an adverse change to agriculture or forest resources. The Urban Forest Offset Protocol would not affect agriculture or forest resources. The Forest Offset Protocol would not increase the amount of forest activities, but could shift activities to projects that increase carbon sequestration. Managing forests to increase cover and remove dead and diseased trees may be considered a beneficial impact to forests. The Forest Offset Protocol includes all existing mechanisms under current state law to limit clear cutting. Further, the Forest Offset Protocol does not include actions that would encourage the conversion of agricultural land to forest.

Air quality impacts of Alternative 2 would be mostly less than significant and would also include beneficial reduction of co-pollutant emissions on a statewide basis. However, a remote potential for significant localized air quality impact exists, as discussed below. This Alternative focuses on a cap-and-trade program designed to reduce GHG emissions sufficiently to achieve a 22 MMTCO₂E reduction by 2020, including compliance responses by covered entities and use of offsets according to specified

protocols. In general, measures that reduce GHG emissions also provide co-benefits in terms of reductions in regional criteria air pollutant and TACs on a statewide basis, because of their similarities in source types. Thus, implementation of this Alternative would reduce statewide levels of criteria air pollutants and TACs resulting in a beneficial effect. Under this alternative, compliance responses by covered entities could include upgrading equipment, switching to lower intensity carbon fuels, implementing maintenance and process changes at existing facilities, and reducing operations of carbon-intense facilities in favor of increased operations of more carbon-efficient facilities

The combination of placing a price on carbon and setting a declining cap on emissions is expected to incentivize investment in more efficient processes and equipment, reducing criteria pollutant emissions and TACs. ARB staff evaluated the potential for criteria pollutant emissions increases under the proposed Cap-and-Trade Regulation in the Co-Pollutant Emissions Assessment (ARB, 2010a). The Assessment examined some hypothetical possibilities for potential increases in criteria pollutant emissions from certain facility types in four community-specific case studies and determined that any increase in co-pollutants is highly unlikely (ARB, 2010a).

Construction-related activities associated with these responses could adversely impact air quality due to the temporary generation of criteria air pollutants and TACs (e.g., use of diesel-fueled heavy-duty equipment and fugitive particulate matter dust emissions). Construction-related best management practices exist (e.g., watering) to reduce this potentially significant air quality impact. In addition, increasing operations of more carbon-efficient equipment could result in localized increases in emissions. For both of these potential impacts, the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. In addition, project-specific mitigation details are not available at the programmatic stage of analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts.

Although localized air quality impacts resulting from compliance responses by covered entities and the development of offset credits related to Alternative 2 are highly unlikely, they cannot be entirely ruled out. For example, the use of compliance instruments (allowances and offsets) may result in an increase in actual emissions up to the permitted level of a facility. Also, the specific locations and impact of any such emission increases are uncertain. To address the possibility of unanticipated localized air impacts caused by the cap-and-trade program, ARB would incorporate an adaptive management program into the alternative. This means that ARB would be committed to monitoring the data on localized air quality impacts and to adjusting the program, if warranted. Even with these considerations, ARB has taken a conservative approach by concluding that the remote possibility of localized air impacts for Alternative 2 would be considered potentially significant and unavoidable under CEQA.

Biological resources may be affected by the compliance responses in Alternative 2. The upgrading of equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at covered facilities could affect natural habitats and sensitive species, if they are present around existing facilities. Construction, grading and trenching have the potential to adversely affect any protected biological resources that might exist at those locations. Recognized measures exist to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant impact may be unavoidable.

Biological effects of the offset protocols in Alternative 2 would vary, depending on the offset. The ODS Offset Protocol would not include activities that potentially affect biological resources. The Livestock Offset Protocol would include the construction of digesters at or adjacent to existing livestock operations where natural habitats are expected to be absent or limited. As such, the Livestock Offset Protocol would result in less than significant impacts to biological resources. The Urban Forest Offset Protocol recognizes tree improvement projects in urban settings, and as such would not be expected to significantly affect biological resources. The Forest Offset Protocol would not increase total forest activities, but could shift activities to projects that increase carbon sequestration. Reforestation projects conducted under the Forest Offset Protocol could change existing habitat and disrupt wildlife. Alternative 2 would include adaptive management to monitor and, where feasible, reduce this impact. The authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, it is premature to be able to define project-level mitigation at the stage of programmatic analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, the FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that Alternative 2 may result in this potentially significant impact and it may be unavoidable.

Cultural resources may be adversely affected by construction related to the compliance responses under Alternative 2. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. Construction, grading and trenching have the potential to adversely impact any cultural resources that might exist at those locations. Recognized measures exist to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the

potentially significant impacts. Consequently, the FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant impact may be unavoidable.

Cultural resources effects of the offset protocols in the Alternative would vary, depending on the offset. The ODS Offset Protocol would not include activities that potentially impact cultural resources. The Livestock Offset Protocol would include the construction of digesters at or adjacent to existing livestock operations where cultural or historic features could exist. Similarly, the Urban Forest Offset Protocol includes projects in urban settings where cultural and historic resources could exist. Although recognized mitigation measures exist to reduce these potential impacts, the authority to require project-specific mitigation lies with local permitting agencies and not ARB. Consequently, these impacts are conservatively identified as significant and unavoidable for purposes of CEQA compliance. The Forest Offset Protocol could change the type of forest projects that are undertaken, but would not alter the overall level of forest activities, and as such would not increase potential impacts to cultural resources. This impact of the Forest Offset Protocol would be less than significant.

Energy-related effects of Alternative 2 would be beneficial, because the GHG reduction strategy of cap-and-trade also results in improved energy efficiency and reductions in fossil fuel use. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes, all of which would be expected to improve energy efficiency. These actions would reduce overall energy demand and are considered beneficial effects. Projects implemented under the compliance offset protocols would not increase energy demand and, as such, pose no impacts or less than significant impacts to energy demand and use.

Geology, soils, and mineral resource effects could occur as a result of Alternative 2. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities, which could require construction of new facilities. Construction, grading and trenching have the potential to result in adverse soil erosion, dust generation, and sedimentation of local waterways. Recognized measures exist to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, the FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant impact may be unavoidable.

Geology, soils, and mineral resources impacts of the offset protocols in Alternative 2 would vary depending on the offset. The ODS Offset Protocol would pose no significant impacts on geology, soils and mineral resources. The Livestock Offset Protocol would

include the construction of digesters that would be subject to regulations considered sufficient to mitigate potential impact to geology, soils and mineral resources to a less than significant level. The Urban Forest Offset Protocol would result in only minor soil disturbance and would not be expected to adversely impact geology, soils or mineral resources. This impact would be less than significant. The Forest Offset Protocol would not increase total forest activities, but could shift activities to projects that increase carbon sequestration. Because the overall level of forest activities would not change, this impact would be less than significant.

GHG emission reduction is the goal of the Cap-and-Trade Program of Alternative 2, so its implementation would continue to improve GHG emissions conditions in the state. The existing condition of emissions (without GHG reduction measures) projected to 2020 is estimated to be 507 MMTCO₂E. The AB 32 emissions reduction target is 427 MMTCO₂E. Alternative 2 would need to reduce emissions by 22 MMTCO₂E to contribute to reaching the target, i.e., the balance needed to reach the target if all of the other Proposed Scoping Plan measures achieve their expected reductions (except the advanced clean car program, which would not be included in the Alternative). Thus, GHG-related impacts of this Alternative would be beneficial because of the fundamental objective of this program to reduce GHGs. The potential for leakage is a consideration, but can be addressed in the design of cap-and-trade programs by incorporating offsets as well as through the fee allocation of allowances for sectors with a high risk of leakage.

Hazard and hazardous materials-related environmental impacts of Alternative 2 would be less than significant. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. The use of hazardous materials is common practice in industrial settings. Implementation of compliance responses could include the use of hazardous materials, but this would be considered simply a continuation of existing business practices for the covered entities, controlled by existing practices and regulations, and, thus, considered less than significant. Offset projects implemented under the proposed offset protocols may result in the use or transport of hazardous materials that require special handling and disposal. All projects would be required to comply with established local, state, and federal laws pertaining to the use, storage, and transportation of these materials. Assuming compliance with applicable laws and regulations, the impacts would be less than significant.

Hydrology and water quality effects could occur as a result of Alternative 2. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. Construction, grading and trenching have the potential to result in adverse soil erosion resulting in sedimentation and degradation of local waterways. Recognized measures exist to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the

degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, the FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant impact may be unavoidable.

Hydrology and water quality effects of the offset protocols in Alternative 2 would vary depending on the offset. The ODS Offset Protocol would have no adverse impacts on hydrology and water quality. The Livestock Offset Protocol would include the construction of digesters that would be subject to regulations which are considered sufficient to mitigate potential impacts to hydrology and water quality to a less than significant level. The Urban Forest Offset Protocol would result in only minor soil disturbance resulting in less than significant impacts to hydrology or water quality. The Forest Offset Protocol would not increase total forest activities, but could shift activities to projects that increase carbon sequestration. Because the overall level of forest activities would not change, the potential to adversely impact hydrology and water quality would not change.

Land use impacts of the Alternative 2 compliance responses of this Alternative would be less than significant, because they would not change the fundamental use of facility sites. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities and, as such, would be consistent with the existing land use and would pose a less than significant land use and planning impact. The ODS Offset Protocol would use existing facilities, representing a less than significant impact to land use and planning. The Livestock Offset Protocol would allow the construction of digesters in agricultural settings. Digesters are an allowed use in agricultural areas. As such, their construction would not conflict with existing land use plans, and thus would be a less than significant impact. Projects implemented under the Urban Forest Offset Protocol would not conflict with land use plans, resulting in a less than significant impact.

Land use effects of the Forest Offset Protocol could occur as a result of avoided conversion projects that may conflict with local land use plans envisioning development or other uses of forested areas. The authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, the FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that the potentially significant impact described as possible conflicts between the “avoided conversion” element of the Forest Offset Protocol and land use plans may be unavoidable.

Noise impacts of the compliance responses of the Alternative 2 covered entities and use of offsets would vary depending on the activity. Under this alternative, compliance responses by covered entities could include upgrading equipment, switching to lower

intensity carbon fuels, implementing maintenance and process changes at existing facilities, and reducing operations of carbon-intense facilities in favor of increased operations of more carbon-efficient facilities. Construction-related activities associated with these responses could adversely affect noise due to the generation of short-term levels that exceed acceptable ambient conditions (e.g., use of heavy-duty equipment). Construction-related best management practices currently exist (e.g., limiting activities to the less noise-sensitive daytime hours and maintaining equipment in proper working condition) to reduce this potentially significant noise impact. In addition, construction generated noise levels would be intermittent and temporary in nature and similar to the types of noise sources and associated levels that currently exist within these industrial settings.

With respect to potential operational increases, noise levels associated with increased carbon-efficient activities would likely be similar (in type and level) to those from existing carbon-intense and other activities that currently exist within these industrial settings. Thus, these impacts would be considered less than significant. However, under this alternative, the use of offsets according to specified protocols could result in both construction- and operational-related impacts due to the generation of noise levels that exceed ambient conditions at existing sensitive receptors. For example, a particular protocol could allow the construction of noise sources in non-industrial areas near sensitive receptors where sources of this nature do not currently exist. Best management practices currently exist (e.g., limiting construction activities to the less noise-sensitive daytime hours and obstructing the line of sight between sources and receptors for operational activities) to reduce this potentially significant noise impact.

The authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. In addition, project-specific mitigation details are not available at the programmatic stage of analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Also, the specific locations and impact of any such noise increases are uncertain from protocols. Thus, the FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this noise impact would be considered potentially significant and unavoidable.

Adverse population, employment, and housing effects of Alternative 2, including the compliance responses and associated offset projects would not occur, because the compliance activities would not substantially change socioeconomic conditions. All impacts to population, employment, and housing would be less than significant.

Public services impacts of the Alternative 2 compliance responses of this Alternative would be less than significant, because these activities would occur at existing facility sites where public services are already provided. The Alternative 2 Cap-and-Trade Program, including the proposed compliance offset protocols and associated offset projects would not result in increased demands for public services. All potential impacts to public services would be less than significant. The covered entity compliance

responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes. These projects would not substantially increase the level of public services beyond that already provided to existing facilities. The ODS Offset Protocol, the Livestock Offset Protocol, and the Urban Forest Protocol and associated projects would not result in a need for an increased level of public services beyond that already provided to existing facilities. The Forest Offset Protocol would not alter the extent of forest activities, but would shift some activities to projects that sequester carbon. Because the level of overall forest activities would not change, the consequential need for public services would not change. Thus, this public services impact is less than significant.

Recreation impacts of the Alternative 2 compliance responses of this Alternative would be less than significant, because these activities would occur at existing facility sites. The Alternative 2 Cap-and-Trade Program's expected compliance responses and associated offset projects would not result in increased demand for or adverse impacts to recreation resources. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes. These actions would have a less than significant impact on recreation resources. The ODS Offset Protocol, the Livestock Offset Protocol, the Urban Forest Offset Protocol, and associated offset projects would result in a less than significant impact on recreation resources. Forest management activities could disrupt opportunities for forest recreation, but such disruptions exist under current conditions. Offset projects developed under the proposed offset protocol would include the construction of roads, temporary closures for tree installation and periodic increases in truck or construction equipment traffic that could disrupt recreational activities, but forest projects developed under the Forest Offset Protocol would occur on land that was historically forested or currently forested, and consequently, the overall impact to recreational resources would be less than significant.

Transportation or traffic impacts from implementation of compliance responses under Alternative 2 would not be significant. Under this alternative, compliance responses by covered entities would not adversely impact transportation or traffic because any increases due to construction traffic would be temporary and mitigated through ingress and egress controls, traffic controls, and reduced speed zones to ensure safety; and operational traffic levels would be similar to existing conditions. Thus, these impacts would be considered less than significant. However, under this alternative, the use of offsets according to specified protocols could result in both construction- and operational-related impacts due the use of heavy-duty equipment on rural roads, potentially creating unsafe conditions, such as for construction of livestock digesters in rural areas. Best management practices exist to reduce this potentially significant impact. However, the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. In addition, project-specific mitigation details are not available at the programmatic stage of analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, the FED Supplement takes the conservative approach in its post-mitigation significance

conclusion and discloses, for CEQA compliance purposes, that this potentially significant traffic impact may be unavoidable.

Utility and service system impacts of the Alternative 2 compliance responses of this Alternative would be less than significant, because these activities would occur at existing facility sites where utility systems are already provided. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes. These projects would not increase the level of utilities beyond that already provided to existing facilities. The availability and extension of utilities is subject to approval of the local utility provider, and readily implemented in a manner that would be less than significant. The ODS, Livestock, and Urban Forest offset protocols would not result in a demand for a significant increase in the level of utilities or service systems that may serve existing sites. Construction of new facilities could require the incidental extension of utilities and services. The availability and extension of utilities is subject to approval of the local utility provider, and thus mitigated to less than significant. The Forest Offset Protocol would not alter the extent of forest activities, but could increase forest projects to sequester carbon. Because the level of overall forest activities would not change, the consequential need for utility service systems associated with those activities would not change. Thus, this impact is considered less than significant.

2.5 Alternative 3: Adopt a Program Based on Source-Specific Regulatory Requirements with No Cap-and-Trade Component

Goal of Alternative 3

Instead of pursuing a cap-and-trade program or a carbon fee or other alternatives, ARB could pursue source-specific emissions limits by regulation to make up the emissions reductions that the Proposed Scoping Plan identifies as coming from Cap-and-Trade and Advanced Clean Car regulations (i.e., 22 MMTCO₂E). The goal of Alternative 3 is to evaluate this direct regulatory approach.

Role of Alternative 3 in the Range of Alternatives

Direct regulations typically establish performance-based limits on emissions, activities, or outputs at specified sources that are designed to achieve emission reductions in a cost-effective and technologically feasible manner. In some cases, a specific pollution abatement technology is required to achieve the emission reductions. In establishing source-specific limits, flexibility is often provided by using performance standards and allowing for such actions as averaging among individual units at different operations in complex facilities to improve the cost-effectiveness of the measure.

Direct regulations can be applied to a wide range of sources in different sectors. Example sectors include many types of industrial production operations, oil production and refining, agriculture, electricity generation, ports, railyards, and transportation fuels, among others. For Alternative 3, sources have been selected to present a reasonable

scenario for a potentially feasible strategy to help reach the 2020 reduction target. Different combinations of sources could also be defined; however, the definition of the Alternative below provides a reasoned analysis of the potential environmental effects of a direct, source-specific regulatory approach.

Precedents or Examples of the Approach in Alternative 3

California has a long history of developing, adopting, and successfully implementing source-specific air quality regulations. These regulations provide a broad range of potential approaches to consider in formulating Alternative 3. Both ARB and local air districts in California have extensive experience with regulating the wide variety of sources that emit smog-forming and toxic air emissions including cars, trucks, fuels, consumer products, agricultural sources, electricity generating facilities, and many types of industrial sources. Many of these sources also emit GHGs. Most of these regulations have been in the form of rules that focus on a specific sector such as automobiles, refineries, power plants, cement plants, gasoline, or consumer products, such as paint, deodorants, or hairspray.

Source-specific regulations have been widely used to regulate air emissions in the United States since the 1960's. Much of the progress in reducing levels of urban smog can be attributed to strong requirements to achieve specified emission reductions through the use of control equipment on cars, trucks, and industrial sources. ARB has largely pursued performance-based standards. These regulations specify a level of allowable emissions, but provide flexibility to regulated entities to choose the solutions that work best for their operations. ARB and the local air districts have most often pursued "intensity-based" regulations that require regulated entities to reduce the emissions associated with a given unit of output (e.g., the grams of pollution per mile for an automobile or pounds of emissions per KWh for electricity generation) instead of absolute limits on total emissions or activity. In some situations, limits are placed on the amount of emissions or other surrogates (e.g., hours of operation) to ensure there are no localized adverse effects.

Although intensity-based regulations do not provide a hard cap on emissions from a sector, they have been effective in reducing overall emissions despite growth in activity and, thus, improving air quality, even during periods of high economic growth. For example, although the number of miles driven by cars in California increased by 137 percent between 1980 and 2010, the smog-forming emissions from cars decreased by about 80 percent. In limited cases, ARB has adopted regulations that prescribe specific practices. For example, a measure to reduce hexavalent chromium for hard-chrome plating facilities has specific housekeeping measures to limit fugitive dust emissions.

Air agencies have also developed and implemented regulations to achieve reductions of emissions for complex sources that provide some degree of flexibility as to how those reductions are achieved. These regulations generally apply to a specific sector or groups of larger sources, and incorporate an emission-related performance standard

and, in some cases, an averaging and/or emission trading component. For example, the ARB's Low-Emission Vehicle regulations – designed to lower tailpipe emissions of smog-forming and other pollutants -- set a performance standard not for individual vehicles models, but for each manufacturer's fleet of cars. Manufacturers who outperformed the standard could bank the extra emission reductions for use in future years or sell to other manufacturers. Electric utilities have had to meet regional performance standards for NO_x, but were provided with the flexibility to have different control levels at individual units so long as the regional standards were met. Other examples of flexible compliance mechanisms include the U.S. EPA acid rain trading program and SCAQMD RECLAIM program. See Alternative 2 for a discussion of these market-based programs.

The emissions of CO₂, the most common GHG, are somewhat unlike pollution that California has controlled successfully with direct regulation. Technology is available to control many other pollutants, but there is no device that can be placed at the top of a smokestack or converter that can be attached to a combustion engine to reduce or permanently capture the most common GHG – carbon dioxide. Carbon capture and storage is developing as a technology, but it has yet to be proven as a cost-effective, viable GHG reduction technology (IPCC 2005, p. 8). Most of the potential GHG emission reductions available from direct regulation of existing industrial sources are based on approaches that, in one way or another, result in reduced combustion of fossil fuels, such as energy efficiency improvements or building new renewable generation (thus reducing overall electricity demand including fossil-fueled generation); switching fuel supplies (e.g., from coal, a much more carbon-intensive fuel, to natural gas or from using oil to biofuels); or reducing fugitive or process emissions, for example, from natural gas extraction processes or pipelines.

Attributes of Alternative 3

Because a very wide range of potential direct regulations could be adopted to reduce GHG emissions in regulated sectors, it would not be feasible to consider all the possible combinations. The description that follows presents the process for identifying regulatory measures and a reasonable scenario for a potential direct regulatory approach to GHG emissions reduction in California.

Regulatory Development, Implementation and Enforcement

Regulatory development typically begins with staff researching potential control technologies at all stages of development – from systems that have been deployed in the field to technologies that are still in the research phase. Regulatory staff evaluates the industries that are candidates for regulation to understand their operations. This helps them determine how control technologies or methods could be integrated and gain a better understanding of potential barriers to implementation. For example, if a packinghouse uses loading equipment around the clock, battery-operated equipment that requires extended recharging time each day may not be feasible. Staff must also consider how regulations would affect other essential systems. For example, requiring

the least efficient power plants to cease operation could reduce the reliability of the electricity grid.

If ARB pursues direct regulations to implement AB 32, each regulation would go through the rigorous Administrative Procedure Act (APA) process. The APA provides very specific rules for adopting new regulations. This process must be completed within one year of the notice date (see below), pursuant to Government Code section 11346.4(b). Information about the APA process is presented in Section 2.2 above. In addition, any GHG measure adopted under the authority of AB 32 has additional, specific statutory requirements that must be met.

The ultimate staff regulatory proposal depends upon an extensive knowledge of where emissions come from, the potential means to reduce emissions, the feasibility and cost of these technologies, environmental impacts of compliance responses, and how each industry operates to assess whether the proposal is workable. Staff proposals are vetted in public workshops to provide opportunities for the public and the potential affected industry to both provide additional information, identify alternatives and to comment on the staff's proposal. Proposed regulations also undergo environmental review consistent with ARB's certified regulatory program under CEQA. For ARB, regulations are proposed to the Board for consideration and adoption. Following Board adoption, regulations are transmitted to the Office of Administrative Law for entry into the California Code of Regulations, at which time they become law.

Once regulations are adopted and become law, ARB transitions to implementation and enforcement. The approach to implementation and enforcement depends upon both the type of regulation and the sources affected. Regulations that apply to a small number of vehicle or engine manufacturers can usually be implemented and enforced with fewer resources than regulations that apply to thousands of equipment owners and operators.

Description of Alternative 3

Alternative 3 has been designed to identify additional measures that use direct regulations that could achieve another 22 MMTCO₂E reductions by 2020 to cover the shortfall necessary to meet the emission target required by AB 32. To develop Alternative 3, ARB assessed the sources of remaining GHG emissions in 2020 and considered potential source-specific reduction opportunities in the major sectors. It should be noted that the measures needed for Alternative 3 are in addition to many performance-based approaches that are already included in the No-Project Alternative. ARB based this evaluation on a number of studies including the compliance pathway analysis in the Initial Statement of Reasons for the Cap-and-Trade Regulation (ARB 2010a), the draft Scoping Plan (ARB 2008) which outlined a number of potential source-specific measures that were not ultimately included in the 2008 Scoping Plan (ARB 2009), suggestions from the public, and ARB staff's knowledge about emission sources and current and emerging control technologies. The potential reductions estimated in this analysis are generally based on those typically found in the United

States. These estimates should be considered a conservatively high estimate, because California sources are typically more efficient than national counterparts.

To identify sources for a direct regulation, an analysis of candidate sectors was undertaken to identify the potentially feasible sources that could be subject to direct regulation. Based on the analysis of the multiple sectors presented below, three specific sectors were chosen as the focus of Alternative 3. These sectors are: coal-fired electricity generation, three industrial sectors (refineries, cement, and oil and gas extraction), and advanced clean cars in the transportation sector. These sectors were also generally chosen based on their potential for reductions in criteria pollutants and TACs, along with local benefits. The analysis below shows that direct regulation of these sectors may be technologically feasible, but substantial additional analysis would need to be done to ensure that the APA and AB 32 requirements could be met.

Transportation

Transportation is the largest source of GHG emissions in California. This sector includes the GHG emitted when transportation fuels, predominantly gasoline and diesel fuel, are burned in car, truck and off-road engines to move both people and freight. This sector is estimated to emit 184 MMTs of GHGs in 2020 in the revised baseline forecast, which includes the clean car standards already adopted by ARB. The current estimate is that, excluding reductions that might occur with a Cap-and-Trade Program in place, this sector's emissions will be reduced by about 24 MMTCO₂E, to approximately 160 MMTCO₂E by 2020 through programs such as Low Carbon Fuel Standard (LCFS), GHG emission reductions targets under SB 375 (Chap. 728, Statutes of 2008) and strengthening of the clean cars standards for new vehicles produced between 2017 and 2020.

GHG emissions in the transportation sector can be reduced in three primary ways: by reducing the GHG emissions emitted by vehicles and off-road engines; by reducing the carbon intensity of the fuel burned in these vehicles and engines; and by reducing the need to use these vehicles and off-road engines. As stated above, ARB has already adopted source-specific regulations or is pursuing programs in all three of these arenas. ARB has adopted limits on the GHG emissions from passenger vehicles. Similar limits have also been adopted by the federal government and the California and federal programs are aligned through 2016. ARB has also adopted and is implementing the LCFS to reduce the carbon intensity of transportation fuel by 10 percent by 2020. In addition, under SB 375, ARB has set GHG emission reduction targets for passenger vehicles for 2020 and 2035. These targets mark the first step toward a statewide program to integrate long-range land use, housing, and transportation planning at the regional level, which is designed to reduce travel by cars and light trucks.

The compliance pathway analysis prepared in 2010 notes that the transportation sector offers the potential for low-cost emission reductions (ARB 2010a). However, it is unlikely that substantial additional emission reductions could be realized from the transportation sector by 2020 by adopting additional traditional regulations other than those already in the Proposed Scoping Plan. Under the Advanced Clean Car Program,

ARB is already pursuing additional rulemaking to further reduce GHG emissions from passenger vehicles produced in the 2017 to 2020 period. The Advanced Clean Car Program is currently under development, with the Board anticipated to consider the regulation in late 2011. Based on adjustment of the estimate in the Proposed Scoping Plan, ARB has estimated 3.8 MMTCO₂E of “foreseeable” emission reductions from this measure. The Advanced Clean Car Program is also expected to achieve significant reductions in criteria pollutants and TACs. For all of these reasons, the Advanced Clean Car Program is included in Alternative 3.

As discussed above, the LCFS requires fuel providers to achieve a 10 percent reduction in the carbon intensity of transportation fuels by 2020. This is an ambitious target and the rule itself calls for periodic reviews to determine if adjustments in the emission reduction targets are needed. The first comprehensive review is now underway, but will not be completed until the end of 2011. It is expected that sufficient low carbon fuels will be available by 2020 to enable additional reductions to be achieved, but it is uncertain at this time. Thus, it is not feasible at this time to target additional emission reductions from this source category.

Electricity

Electricity generation, both within California and from sources that import electricity into the state, are a significant source of GHG emissions. The current estimate is that, excluding reductions that might occur under a Cap-and-Trade Program, this sector’s emissions will be reduced by about 20 MMTs by 2020 through programs such as the 33-percent RPS (authorized by SB1X 2, Statutes of 2011) and expansion of energy efficiency efforts. The remaining emissions, would be expected to come from a combination of in- and out-of-state natural gas fired generation and out-of-state coal fired generation (approximately 23 MMTs).

There are four primary methods to reduce emissions from the electricity sector: (1) expanding the use of renewable generation and cogeneration technologies, (2) improving the efficiency of existing electricity generating facilities, (3) using electricity more efficiently, and (4) switching to lower-carbon fuels in those sources that use higher-carbon, fossil fuels to generate electricity.

Relative to expanded use of low GHG emitting renewable technologies, the No-Project Alternative already relies upon the further reduction of the electricity sector’s carbon footprint with a requirement that by 2020, 33 percent of the electricity delivered to retail customers come from renewable sources, such as wind, geothermal, biomass, and solar. This measure, which was originally approved as an ARB rule in 2010, has recently been enacted into law (SB1X 2, Statutes of 2011). Requirements for a higher percentage of renewable generation could be estimated. For example, a requirement could be established that 40 percent of the delivered electricity should come from renewable sources. This higher requirement could potentially result in an additional reduction of 6 MMTCO₂E by 2020. However, this requirement was not recommended for inclusion in Alternative 3. The underlying basis and rationale for such a standard

would need to be considered as part of an overall policy strategy on energy and would not likely be cost-effective from simply a GHG-reduction perspective.

Existing electricity generating facilities in California vary in age and efficiency. The primary methods to significantly reduce GHG emissions from older, inefficient existing facilities are to “re-power” them with a new unit at the existing site, or to retire them and replace their generation with a new facility at another location. Grid reliability is a critical issue that must be thoroughly evaluated in determining which facilities can be retired or re-powered.

Existing programs and regulations, as described in the No-Project Alternative, include substantial GHG reductions from increasing efficiency in the use of electricity and natural gas. The No-Project Alternative assumes that all cost-effective energy efficiency measures are implemented by 2020, although the specific methods are not identified. California law and existing policy require that energy efficiency codes and standards must be cost-effective. Achieving additional GHG emission reductions through energy efficiency beyond those already assumed in the No-Project Alternative is highly unlikely.

Fuel switching to reduce GHG emissions often refers to replacing high carbon fuels, such as coal, with lower carbon fuels, such as natural gas. In California, the vast majority of electricity generating facilities already operate on natural gas. The major opportunity for lower emissions from fuel switching is with in-state and out-of-state, coal-fired units. California’s existing Emissions Performance Standard (EPS) (Senate Bill 1368, Perata, Chapter 598, Statutes of 2006) prevents the state’s electric utilities from entering into new or extending existing long-term contracts with high-emissions intensity sources, such as coal.

Because electricity from existing coal-fired power plants is very inexpensive to produce, regulations to directly reduce use of coal-generated electricity in California could result in significant leakage, with the out-of-state electricity now used by California being sold in other markets. This switch from coal to gas-fired generation would be effective in reducing greenhouse gas emissions only if existing coal generation is retired as California consumed less of their production, or if the operation was curtailed through some other means. However, despite the potential drawbacks, a regulation to further curtail dependence on coal-fired generation is technically feasible and, of the available options, the most likely measure to gain significant reductions from the electricity sector in California’s GHG emission inventory via source-specific regulation. Estimates of these potential emission reductions are provided in the section titled, Summary of Alternative 3 Strategy.

Industrial Sources

Industrial sources account for almost 20 percent of GHG emissions in California. This sector is estimated to emit approximately 92 MMTs of GHGs in 2020 in the revised baseline forecast. Based on the analysis presented below, there are three industrial source categories where direct regulation is feasible. These are refineries, oil and gas extraction, and cement. Consequently, Alternative 3 would entail development of direct

regulations to obtain GHG emission reductions from these three specified industrial sources. Estimates of the potential emission reductions from the direct regulation of these sectors are presented in the section titled, Summary of Alternative 3 Strategy.

The industrial sector is composed of four large discrete sectors and one additional general sector. The largest discrete sectors, in terms of emissions in the 2020 baseline, include refining (35 MMTs), oil and gas extraction (16 MMTs), cogeneration related sources (10 MMTs) and cement production (9 MMTs), each with its own unique operating characteristics. Within some sectors, there may be significant variation in the types and size of sources. For example, refineries are individually designed to process specific types of crude oil into the desired transportation fuels. The last large sector, industrial combustion (15 MMTs), is composed of smaller sub-sectors, many with unique needs and operating characteristics.

Generally, there are no devices that can be placed at the top of a smokestack to reduce or permanently capture the most common GHG, i.e., carbon dioxide, from industrial sources. Most of the potential reductions available from industrial sources with combustion emissions are based improving energy efficiency, switching fuel supplies, or limiting the output of the units to maintain a specified emission level.

The compliance pathway analysis estimated approximately 5 MMTs of potential emission reductions from the industrial sector ranging in price from savings of \$100 per metric ton to costs of greater than \$200 per metric ton (ARB 2010a, Figure V-5). For boilers and other heat sources, low-cost or cost-saving strategies included maintenance strategies such as steam leak and steam trap maintenance generated cost savings, and high-cost strategies included process heater and boiler replacement. Developing a regulation to require certain types or schedules for maintenance would be administratively challenging. Because operating characteristics and requirements vary significantly across (and within) industries, ARB would likely be unable to prescribe a uniform maintenance schedule, but could develop specific maintenance practices for a multitude of applications. Implementation and enforcement of such a regulation would be extremely resource-intensive requiring site visits to hundreds of industrial facilities. Although there is substantial variation in boiler age, size and operating conditions, it would also be feasible to develop a regulation to mandate improved efficiency from existing industrial boilers, for example a boiler performance standard. The results from ARB's Energy Efficiency and Co-Benefits Assessment will be available in mid-2012, and would allow ARB staff to better evaluate the feasibility, cost, and cost-effectiveness of industrial boiler regulations.

A discussion of specific subsectors follows:

Refineries

A number of refinery-specific measures to reduce GHG emissions are possible. Such measures include process level or industry-wide performance standards, adding gas recovery at refinery flares, removing the methane exemption from determining if a leak is significant and needs to be addressed, and capping GHG emissions from

refineries. Though most large California refineries make similar products and have many common processes, the age, efficiency, state of upgrade, crude oil mix and potential cost and cost-effectiveness of modifications vary widely. While this presents potentially significant challenges for the development of process-level or industry-wide performance standards, such regulations may be feasible. Enhancing gas recovery capacity at flares and removal of the methane exemption in refinery leak-detection and repair regulations were included as Scoping Plan measures. However, ARB's preliminary evaluation indicates that emissions from flaring are lower than originally estimated, there are existing and effective measures in place at each of the three local air districts where major refineries are located, and the potential for reductions from these measures appear to be very small. ARB could establish a cap on GHG emissions for individual refineries. This approach would likely afford each source the greatest flexibility to meet its emission obligation relative to other direct regulation approaches. In addition, a refinery cap would likely provide co-benefits of reducing criteria pollutants and TACs. However, if a cap is set too low, some refineries may be induced to curtail output rather than invest in energy efficiency modifications. While this would reduce in-state GHG emissions, it might also reduce in-state production of transportation fuels, and result in out-of-state refineries needing to increase production to meet demand.

Cement Plants

The strategies to reduce GHG emissions from cement plants address the two sources of GHG emissions from cement facilities – coal combustion and the process emissions associated with calcinating the limestone to make cement. Blending of cement with supplementary cementitious materials (SCMs) would “stretch” the cement supply, reducing the need for imported cement. However, requiring the use of SCMs is unlikely to reduce direct GHG emissions from cement manufacturing within California since it occurs downstream from the production facility. ARB has explored the idea of a cement carbon intensity factor (CIF) which would assign a CIF performance standard that accounts for the fuel used to produce a given amount of cement. In order to meet the performance standard, cement plants would need to replace a portion of their coal with Alternative fuels such as natural gas or biomass. Each of these Alternative fuels presents implementation challenges from cost and fuel infrastructure (natural gas) to supply and availability (biomass).

Additional costs from the Alternative are likely to result in increased emissions leakage (such as from increased production in China). The cement industry is highly capital intensive and because of high fixed costs, facilities must operate at high capacity levels to maximize return on investment. If they cannot do so, an increase in imports from other countries is the most likely outcome. California's plants are among the lowest GHG-emitting facilities in the world. Any leakage would result in an increase in GHG emissions.

However, as with refineries, a cap on GHG emissions could be set for each individual cement facility. Such an approach would afford each facility the greatest flexibility to meet its emission obligation; however, if set too low, such a cap could induce some facilities to curtail output, rather than invest in energy efficiency modifications or make

fuel changes. As with refineries, a cap would likely provide co-benefits of reducing criteria pollutants and TACs. While a cap would reduce in-state GHG emissions, it would also reduce in-state production of cement, and could result in an increase of out-of-state facilities' output to meet California demand, causing substantial leakage.

Cogeneration

Cogeneration systems produce both electricity and useful heat for industrial or heating purposes. Cogeneration is widely used in California, but has the potential to significantly expand. Sometimes referred to as combined heat and power (CHP), cogeneration can reduce GHG emissions by displacing emissions from power plants. It often improves grid reliability, reduces dependence on transmission lines, and reduces electrical transmission and distribution energy loss. However, barriers have limited the recent growth of cogeneration, such as the reluctance of utilities to accept power from sources they do not control, the charging of fees even though electricity is not consumed (i.e., standby charges or interconnection fees), and the lack of a sufficient market price for electricity generated onsite. Because of actions taken by the CPUC, the expansion of CHP for investor-owned utilities (IOUs) is anticipated in the No-Project Alternative. Additional CHP may be an option for publicly owned utilities (POUs), but requires considerable analysis to determine if reductions are feasible.

Progress has been made recently to increase CHP. The CPUC has adopted a measure that is expected to increase CHP at IOUs by 3000 MW by 2020, which is expected to decrease GHG emissions by 4.8 MMTCO₂E. Assuming IOUs represent approximately three-quarters of electricity sales, ARB staff estimates that POUs could contribute an additional reduction of 1.6 MMTCO₂E.

Oil and Gas Extraction

The oil and gas extraction sector has emissions that result from combustion and venting operations, as well as fugitive emissions. Over 80 percent of the emissions are associated with combustion, with the vast majority using natural gas as the fuel.

The 2008 Scoping Plan included a measure to reduce GHG emissions that are either vented or are fugitive emissions from oil and gas extraction operations. ARB evaluation of this measure found that the emissions from this category were underestimated in the 2008 Scoping Plan. Staff now estimates that emission reductions of about 1 MMT could be feasibly achieved from this measure; however, the cost-effectiveness and feasibility of a potential regulation have not yet been fully evaluated.

Given the large emissions from this category and the fact that there are a significant number of large operations, there is also potential to apply facility-level emission caps. Such an approach would afford each facility the greatest flexibility to meet its emission obligation; although, if set too low, such a cap could induce some facilities to curtail production, rather than invest in energy efficiency modifications or improving operations in other ways. Presumably lost production would be replaced by greater imports of crude oil and natural gas, and GHG emissions would increase in the area where these supplies were extracted (i.e., emissions leakage). Consequently, while

additional GHG reductions from direct regulation of oil and gas extraction facilities may occur, leakage risk could be high.

Commercial and Residential Fuel Combustion

This category accounts for about 9 percent of GHG emissions in California, and is estimated to emit approximately 45 MMTs of GHGs in 2020 in the revised baseline forecast. Emissions occur when fuel is combusted in millions of individual homes, business or institutions and when the fuel is conveyed to the source. The fuel of choice is overwhelmingly natural gas. The vast majority of emissions in this sector are attributed to combustion. The No-Project Alternative includes slightly more than 4 MMTs of reductions from increased energy efficiency efforts targeting users of natural gas.

The Proposed Scoping Plan did include a measure to reduce GHG emissions from natural gas transmission and distribution, but not from the combustion of the fuel itself, which was proposed to be addressed in the Cap-and-Trade Regulation. ARB evaluation of this transmission and distribution measure found that the emissions from this category were overestimated in the 2008 Scoping Plan. ARB staff now estimates potential emission reductions of 0.5 MMT, down from a previously estimated 0.9 MMT. However, the cost, cost-effectiveness, and feasibility of a potential regulation have not yet been fully evaluated. Staff is continuing to evaluate this measure due to the potential co-benefits of reducing smog-forming, volatile organic compounds. ARB staff review of this category concluded that there is little additional potential to gain significant reductions from direct regulation of individual sources and, as with many other regulations affecting potentially millions of sources, would be challenging to administer if applied at the end-user level, i.e., the individual home or small- or medium-sized business.

High Global Warming Potential Gases

High GWP Gases are powerful global warming substances that pose unique challenges. Just a few pounds of high GWP gases can have the equivalent effect on global warming as several tons of carbon dioxide. Based on the warming potential and the persistence in the atmosphere, the impact of high GWP gases is normalized to the impact of carbon dioxide, and is represented by "CO₂ equivalents." This sector is estimated to emit approximately 38 MMTs of GHGs in 2020 in the revised baseline forecast.

ARB has adopted several measures to reduce GHG emissions from high GWP gases including standards for semiconductor manufacturing, restrictions on the use of sulfur hexafluoride (SF₆) in both electrical and non-electrical uses, limits on the use of refrigerant recharge canisters for automobiles (typically used by do-it-yourselfers), and a refrigerant management program for systems that use more than 50 pounds of high-GWP refrigerant. ARB is also considering additional measures to address installed high GWP gases in vehicles as part of the Advanced Clean Car regulatory development.

The 2008 Scoping Plan included a measure to reduce GHG emissions from high GWP gases via a fee. ARB staff evaluation indicates that, at this time, a regulation to levy a fee on purchases of high-GWP gases to reduce emissions and incentivize conservation and recovery from high GWP gases is not feasible. To address equity, competitiveness, and nexus issues – that is, to ensure that the fee raised is used directly to address a problem or issue related to the material on which it is levied -- a high-GWP fee would likely need to be levied on over 1,500 fee payers, many of which have not been subject to air quality requirements. The lack of an obvious regulated party for imported high-GWP gases presents a significant concern of leakage (i.e., high-GWP gases that are imported and circumvent the fee). As a result, this measure has significant enforcement issues. ARB staff also evaluated the potential of a regulatory phase-down or phase-out of high GWP gases. ARB believes that, although this option may have potential in the future, such a regulation is also not feasible at this time because there are not, at present, sufficient alternatives to replace high GWP gases.

Agricultural Sources

Agricultural sources of GHG are generally diffuse sources of emissions, such as enteric fermentation from livestock (a product of the digestion of ruminants such as cows), decomposition of manure from livestock, emissions from soil, and energy use in on-farm operations, such as agricultural pumps. No specific direct regulatory activities are proposed for these sources for a variety of reasons, including technical feasibility, animal welfare concerns, lack of technical data, and cost and cost-effectiveness issues.

Post-harvest activities, such as food processing, are generally considered industrial activities and potential emission reduction strategies are discussed in the general residential and commercial combustion portion of the industrial section. This sector is estimated to emit approximately 29 MMTs of GHGs in 2020 in the revised baseline forecast.

A discussion of specific subsectors follows:

Manure Management

The Proposed Scoping Plan identifies manure management through the use of digesters as a voluntary measure. After additional evaluation, ARB continues to believe that a voluntary approach is the appropriate path for manure digesters. In California, most dairies are located in the San Joaquin Valley, which requires that new emission sources (such as energy generation using methane as the fuel source from dairy digesters) meet strict smog standards. The quality of manure biogas generated in digesters makes it difficult and costly to meet those smog standards. Costs associated with gas clean-up systems, add-on emission controls, and ultra-clean technologies (fuel cells) make it cost prohibitive for many projects to proceed. A voluntary approach, supported by a voluntary offset program, allows the opportunity for technology testing to demonstrate a clean pathway to larger scale deployment of digesters.

Enteric Fermentation

Suggestions to reduce GHG emissions from enteric fermentation from livestock have included changes to feed or containment of livestock in barns with methane control technology. ARB does not believe that a direct regulatory approach is feasible for either of these approaches. In sectors that affect livestock, ARB must be particularly careful that potential regulations do not negatively impact animal health or welfare. For example, wholesale changes to livestock feed to reduce enteric fermentation emissions may jeopardize animal health and welfare. In addition, shifting from low-energy feed to the higher-energy feed that could reduce enteric fermentation may not reduce overall GHG emissions on a lifecycle basis. Requiring barn enclosures to trap enteric methane would rely on un-demonstrated technology to separate methane from barn air. If methane were collected, the issues associated with consuming or combusting the biogas would mirror the challenges currently facing manure digesters. In addition to potential animal welfare issues and cost, enclosed barns would also require cooling in the summer, potentially outweighing the GHG benefits of capturing the methane.

Soil Emissions

The Proposed Scoping Plan described a research program to evaluate nitrous dioxide (N₂O) emissions from soils as a result of fertilizer application. Some limited and localized research in California has found that decreases in fertilizer use may reduce N₂O emissions. However, generalizing those results statewide is difficult and highly uncertain due to differences in crop types, climate, soil type, soil moisture, soil pH, soil microbial activity, and individual farm management practices such as irrigation method, irrigation timing, tilling practices, crop rotation, fertilizer type, fertilizer application method and the timing of fertilizer application. ARB is continuing to fund research into N₂O emissions, and believes that given the number of outstanding questions, regulations are not feasible at this time.

Summary of Alternative 3 Strategy

The Alternative summarized below describes a technically feasible approach that allows as much flexibility as possible while still delivering the needed reductions, i.e., an additional 22 MMTs of GHG in 2020. This is the minimum quantity of emission reductions needed, and assumes that all other adopted and foreseeable measures achieve the estimated emission reductions. The strategy would consist of three major elements affecting automobiles and the largest emissions sources with reduction potential in the electricity or industrial sectors. These measures are summarized below.

The Advanced Clean Car standards included in Alternative 3 are based on the proposal being developed by ARB. This measure would reduce emissions of GHG, as well as criteria pollutants and TACs. The standards would update and link several existing programs that reduce pollution from vehicles into a single regulatory framework. This framework includes the Low-Emission Vehicle program (LEV III), the Zero-Emission Vehicle (ZEV) program and the GHG reduction program (often called Pavley standards). A Clean Fuels Outlet component (principally directed at the deployment of hydrogen fueling stations) would also be considered for inclusion in the alternative. All four elements are critical to reduce the level of criteria pollutants and GHG emissions

that new passenger vehicles sold in California will generate through model year 2025. The numbers of plug-in hybrids and zero-emission vehicles in California would be accelerated and supported, as well.

New performance standards in LEV III would provide auto manufacturers a clear target for meeting environmental standards over the next 15 years, and identify a pathway to even lower emissions by mid-century. To achieve this longer term goal, ARB also plans to integrate its ZEV requirements into this new effort. ZEVs include battery electric, fuel cell, and plug hybrid electric vehicles. These vehicles are just beginning to enter the marketplace, and are expected to be fully commercial by the end of this decade. Most vehicle manufacturers agree a portfolio of these technologies would be necessary to meet climate targets by 2050.

Alternative 3 includes a requirement that electric utilities displace at least 50 percent of their coal-based generation with generation that has no higher emissions than the emission rate set by CPUC and CEC for new, long term energy contracts pursuant to SB 1368, Statutes of 2006. In effect, this results in about a 26-percent reduction in emissions. The likely response to such a regulation would be construction of new, and expansion of existing, combined-cycle natural gas plants. Because of the difficulties in getting new plants constructed and permitted, particularly in California, such construction may take considerable time, and most new and expanded plants would be outside of California. The most likely location for new plants would be where existing natural gas lines and transmission lines are in close proximity. Extension of natural gas and/or transmission lines any considerable distance is a costly undertaking. An important consideration, though, is that the 2020 target leaves only nine years to site, build and permit plants.

To provide the balance of emission reductions needed to achieve the 22 MMT, three industrial categories have been identified. In each of these source categories, a GHG emission cap would be applied that, on average, reduces GHG emissions by 20 percent from the levels projected in the 2020 baseline forecast. The cap would be applied to the following source categories:

- Large refineries
- Cement production facilities
- Large oil and gas extraction facilities

Table 2.5-1 presents the baseline 2020 emissions, the reductions and the remaining emissions if the percentages used above were applied uniformly to each sector.

Table 2.5-1 Summary of Emission Reductions in Alternative 3

Major Emission Category	2020 GHG Emissions (MMT)	Reduction Target	GHG Reductions (MMT – 2020)
Electricity Generation			
Coal Fired	23.4	26%	6.2
Industrial Sector			
Refineries	35.0	20%	7.0
Oil & Gas Extraction	15.8	20%	3.2
Cement Production	9.2	20%	1.8
Advanced Clean Cars	--		3.8
Total			22.0

Source: ARB data, 2010a–f

The combined impact of these measures would produce the 22 MMTCO₂E of reductions needed to replace reductions associated with the Cap-and-Trade and Advanced Clean Car measures. The percentages presented above are not meant to be definitive, but do illustrate the magnitude of the minimum reductions needed to replace a cap-and-trade program. An extensive rulemaking process would be needed to determine the precise percent reductions and actual caps that would be applied to each sector, and then to each facility. This effort would also need to evaluate the best split of reduction burden between sources in the electricity sector and those in the industrial sector. A phase-in of facility caps and phase down of coal generated electricity would begin around 2015 with caps set at close to the expected BAU levels. To maintain as much flexibility as possible, facility caps could be applied on a biennial basis, and early reductions could be banked for later use. This approach could result in high control costs, due either to the need for expensive measures to reduce emissions, or to lost revenue due to curtailment of production to levels allowed by facility caps.

Alternative 3 Impact Discussion

Objectives

Alternative 3 could potentially meet the fundamental objective of reaching the 2020 emissions reduction target; however, the substantial risk of leakage to other unregulated states could undermine the benefits of this achievement and would be inconsistent with AB 32, because it could jeopardize grid reliability and increase consumer cost with reduced cost-effectiveness. This Alternative would seek to reduce GHG emissions by 22 MMTCO₂E through the use of source-specific performance standards for the Advanced Clean Car Program, electricity generation, and the industrial sources of refineries, cement production, and oil and gas extraction. Based on evaluations of current emissions, the availability of feasible reduction measures, and the enforceability of a direct regulation approach, it is expected that the necessary level of reduction would be achievable from the four source types.

The achievement of other basic objectives of the Scoping Plan would be variable for Alternative 3. For instance, it would reduce fossil fuel use through reduction of operations and create an enforceable program that would ensure in-state emission reductions. The co-benefits of reduced criteria pollutants and TACs would be expected within the facilities of the four sources and where disadvantaged communities are located. However, it is uncertain that Alternative 3 would result in the most cost-effective GHG emissions approach, because performance standards would be set administratively and not based on the market. Most importantly, the effectiveness of the approach would likely be hindered by substantial leakage, which would not be consistent with the Scoping Plan objectives and may not ultimately meet the environmental objectives or other substantive requirements of AB 32.

Environmental Impacts

This Alternative focuses on source-specific emission limitations by regulation to reduce GHG emissions sufficiently to achieve a 22 MMTCO₂E reduction by 2020. Specifically, the strategy for this Alternative would affect automobiles and the electricity generation and industrial sectors (i.e., refineries, cement production, and oil and gas extraction), which are the largest emission sources with reduction potential. As shown in Table 2.5-1, the strategy would consist of: requirements for various types of advanced clean cars; for electric utilities to displace at least 50 percent of their coal-based generation with lower-carbon fuel-based generation; and for application of a cap to large refineries, cement production facilities, and large oil and gas extraction facilities, which on average would reduce GHG emissions by 20 percent.

This approach would afford each facility the flexibility to meet emission obligations. Compliance responses for electricity and industrial sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. The likely response to the coal-displacement regulation would be construction of new, and expansion of existing, combined-cycle natural gas plants. Because of the difficulties in getting new plants constructed and permitted, particularly in California, such construction may take considerable time and most new and expanded plants would be outside of California. Compliance responses to the Advanced Clean Car Program would involve improved engine and transmission technologies, vehicle technologies, mass reduction, electrification and accessory technologies, and electric drive technologies including hybrid technologies. The improvements in vehicle technology would result in greater use of electricity and fuel cells for powering vehicles and construction of alternative fueling stations to serve plug-in hybrid, battery electric vehicles, and fuel-cell vehicles.

Aesthetic impacts resulting from Alternative 3 would be less than significant, because compliance responses are focused on small fueling facilities for Advanced Clean Car and modification of existing industrial facilities and uses. Under this alternative, in-state compliance responses for the industrial sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. Implementation of this Alternative would not be anticipated to result in adverse aesthetic impacts because any construction- or operational-related

activities would likely occur within existing industrial facilities, where the aesthetic character is already established and would not be substantially changed. An exception may be if new combined-cycle natural gas power plants are constructed (likely outside California), which would be of sufficient size to potentially cause significant adverse aesthetic impacts. Fueling stations for advanced clean cars would be expected where existing fuel stations are located or where local zoning allows such a use. Leakage issues for industrial sources could result in both construction and operational impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, aesthetic impacts resulting from compliance responses to source-specific performance standard regulations would be less than significant, with the exception of potential new combined-cycle, natural gas power plants built in response to a regulation to reduce coal-fired electricity generation.

Agricultural and forest impacts resulting from Alternative 3 would be less than significant, because compliance responses are focused on modification of existing industrial facilities and uses. Under this alternative, in-state compliance responses for industrial sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. Small Advanced Clean Car fueling stations would be near highways and in communities, rather than in important agricultural or forest resource areas. If a new fueling station is built next to a highway interchange, it may occupy the edge of some agricultural or forest area, but the encroachment would be minimal and would not be expected to substantially affect the overall resource. If new combined-cycle, natural gas power plants are built in response to a regulation to reduce coal-fired electricity generation, they would likely be located near existing transmission lines (probably outside California). While it is conceivable that a new electricity generation facility could affect agricultural or forest land, facilities would be expected to locate at or near existing electricity generation and transmission infrastructure, where adverse impacts to agricultural land and forests could be avoided. Implementation of this Alternative would not be anticipated to result in adverse agricultural or forest impacts because any construction- or operational-related activities would likely occur within existing industrial areas or where important agricultural or forest resources would not be located. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas (for industrial sources), within existing communities (for Advanced Clean Car fueling stations), or near existing electricity generation and transmission infrastructure (for repowered or new electricity generation facilities to displace coal-fired generation). Consequently, agricultural and forest impacts resulting from compliance responses to source-specific performance standard regulations would be less than significant.

Air quality impacts of Alternative 3, in general, would be regionally beneficial within the state because measures that reduce GHG emissions also provide co-benefits in terms of reductions in regional criteria air pollutant and TAC emissions because of their similarities in source types. Thus, implementation of this Alternative would reduce statewide levels of criteria air pollutants and TACs resulting in a beneficial effect.

However, implementation of this Alternative could result in substantial leakage for industrial sources and electricity generation, because the performance standards placed on the covered sectors are not defined by market conditions. For example, replacing high carbon fuels (e.g., coal) with lower carbon fuels (e.g., natural gas) could result in out-of-state electricity now being used by California being sold in other markets. Additional natural gas power plants could be built outside the state to meet the performance standard (if generators are seeking to avoid the regulatory restrictions in California), which could shift the location of pollutant emissions. Also, if the performance standard limit applied to refineries, cement production, and oil and gas extraction were set too stringently, such facilities could decide it is more cost-effective to curtail in-state output and shift operations out-of-state, rather than invest in energy efficiency or other modifications in California. If this occurred, it would reduce in-state GHG and co-pollutant emissions, but also increase out-of-state production and importation/transportation potentially resulting in increased out-of-state and transportation emissions. Consequently, implementation of this Alternative could result in adverse regional and local air quality impacts out-of-state associated with construction (e.g., use of heavy-duty equipment) and operational (e.g., higher facility production levels) increases in criteria air pollutants and TACs. Best management practices exist to reduce these potentially significant impacts. However, the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects and out-of-state environmental regulations are often not as protective as California's regulatory framework. In addition, project-specific mitigation details are not available at the programmatic stage of analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Also, the specific locations and impact of any such emission increases are uncertain. Thus, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that these air quality impacts would be potentially significant and unavoidable.

Adverse biological impacts resulting from Alternative 3 could occur, if compliance responses require modification of existing industrial facilities, construction of new fueling stations for Advanced Clean Cars, or development of new lower-carbon fuel electricity generation facilities where biological resources are present. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could affect natural habitats and sensitive species, if they are present around existing facilities or at construction sites for new facilities. Construction, grading and trenching have the potential to adversely affect any protected biological resources that might exist at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of

mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant biology impact may be unavoidable.

Adverse cultural resources impacts resulting from Alternative 3 could occur, if compliance responses require modification of existing industrial facilities, construction of new fueling stations for Advanced Clean Cars, or development of new lower-carbon fuel electricity generation facilities where archaeological or historic resources are present. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could disturb cultural resources, if they are present around existing facilities or at construction sites for new facilities. Construction, grading and trenching have the potential to adversely affect any potentially important cultural resources that might exist at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant cultural resources impact may be unavoidable.

Energy-related effects of Alternative 3 would be beneficial, because the GHG reduction strategy of direct, source-specific performance standards also results in improved energy efficiency and reductions in fossil fuel use. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. For Advanced Clean Cars, the use of batteries and other Alternative fuels would conserve fossil fuels. These actions would reduce overall energy demand in-state, particularly related to curtailed operations, and are considered beneficial effects. However, implementation of this Alternative could result in increased energy demand out-of-state associated with leakage (e.g., shifting production out-of-state resulting in greater operational emissions), because siting, permitting, and construction of new power plants in California may be difficult to accomplish within the time frame. The authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects in other states. Consequently, while the net change would still be beneficial (i.e., less total energy demand), the potential level of benefit would be diminished because of the potential for substantial leakage.

Adverse geology, soils, and mineral resources impacts resulting from Alternative 3 could occur, if compliance responses require modification of existing industrial facilities,

construction of new fueling stations for Advanced Clean Cars, or development of new lower-carbon fuel electricity generation facilities where new ground disturbance and landscape alteration are needed. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could affect local geology and soils. Construction, grading and trenching have the potential to cause soil erosion, dust generation, and sedimentation of local waterways at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant geology and soils impact may be unavoidable.

GHG emissions would be expected to decrease in California with the imposition of source specific regulations. This Alternative focuses on a performance-standard limitation by regulation on key emission sources to decrease GHG emissions sufficiently to achieve a 22 MMTCO₂E reduction by 2020. As described above, the strategy would consist of requiring and promoting Advanced Clean Car technologies, requiring electric utilities to displace at least 50 percent of their coal-based generation with lower-carbon fuel-based generation, and applying a cap to large refineries, cement production facilities, and large oil and gas extraction facilities. Thus, GHG-related impacts of this Alternative would be beneficial because of the fundamental objective of this program to reduce in-state GHGs. However, implementation of this Alternative could result in adverse GHG impacts out-of-state associated with increases in GHGs from leakage (e.g., shifting production out-of-state resulting in greater operational emissions). The authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects in other states. Consequently, while the net change would still be beneficial (i.e., less GHG emission than current conditions), the level of emissions would likely not achieve the 2020 target because of the potential for substantial leakage.

Hazard and hazardous materials-related environmental impacts of Alternative 3 would be less than significant. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and implementing other operational improvements. The use of hazardous materials is common practice in industrial settings. Implementation of compliance responses could include the use of hazardous materials, but this would be considered simply a continuation of existing business practices for the covered entities, controlled by existing practices and regulations, and, thus, considered less than significant. All projects would be required

to comply with established local, state, and federal laws pertaining to the use, storage, and transportation of these materials. The greater use of vehicle batteries and fuel cells would increase their production, storage, recycling, and ultimately disposal. An increase of batteries and fuel cells in the waste stream could result in potential hazardous materials and water quality effects; however, regulations exist for handling of hazardous materials and protection of water quality from waste disposal facilities and ARB is also considering specific regulatory requirements for further protection in the Advanced Clean Car Program design. Assuming compliance with applicable laws and regulations, the impacts would be less than significant.

Adverse hydrology and water quality impacts resulting from Alternative 3 could occur, if compliance responses require modification of existing industrial facilities, construction of new fueling stations for Advanced Clean Cars, or development of new lower-carbon fuel electricity generation facilities near local water features. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could affect local drainage and discharge of contaminants to local waterways. Construction, grading and trenching have the potential to cause soil erosion and sedimentation of local surface water resources at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant hydrology and water quality impact may be unavoidable.

Land use impacts of the compliance responses of Alternative 3 would be less than significant, because they would not change the fundamental use of facility sites and new facilities would be located where local planning and zoning allow them. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements and, as such, would be consistent with the existing land use and would pose a less than significant land use and planning impact. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas or at or near existing electricity generation and transmission infrastructure. Consequently, land use impacts resulting from compliance responses to source-specific performance standard regulations would be less than significant.

Adverse noise impacts could result from Alternative 3, because of the potential for substantial leakage of operations in covered sectors to other states. Under this

alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. Implementation of this Alternative would not be anticipated to result in adverse noise impacts at the facilities of existing in-state sources, because no major noise-generating construction- or operational-related activities would likely occur. If such were to transpire associated with onsite modification or improvements, they would be minor, intermittent and temporary in nature, and similar (or less) to the levels from sources that currently exist within these industrial settings. Construction of Advanced Clean Car fueling stations may result in temporary, construction noise within existing communities; however, local noise ordinances would be expected to maintain impacts at less-than-significant levels. Thus, these impacts would be considered less than significant. However, leakage issues could result in both construction and operational impacts out-of-state because of the generation of noise levels that exceed ambient conditions at existing sensitive receptors. For example, an out-of-state cement facility could expand current operations to increase production resulting in increased on-site noise levels from construction and operation, and offsite noise levels from increased truck travel associated with material transport. Best management practices currently exist (e.g., limiting construction activities to the less noise-sensitive daytime hours and obstructing the line of sight between sources and receptors for operational activities) to reduce these potentially significant noise impacts. However, the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. In addition, project-specific mitigation details are not available at the programmatic stage of analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Also, the specific locations and impact of any such noise increases are uncertain. Thus, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that these noise impacts would be potentially significant and unavoidable.

Adverse population, employment, and housing effects would not occur from the source-specific regulations in Alternative 3, including from the operational and facility-modification compliance response projects, because the compliance activities would not substantially change socioeconomic conditions. All impacts to population, employment, and housing would be less than significant.

Public services impacts of Alternative 3 would be less than significant, because direct regulation compliance response activities would occur at existing facility sites where public services are already provided. Under this alternative, in-state compliance responses for industrial or electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. All potential impacts to public services would be less than significant. These projects would not substantially increase the level of public services beyond that already provided to existing facilities. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas or at or near

existing electricity generation and transmission infrastructure. Consequently, public services impacts resulting from compliance responses to source-specific performance standard regulations would be less than significant.

Recreation impacts of Alternative 3 would be less than significant, because direct regulation compliance response activities would occur at existing facility sites or within communities at locations allowed by local zoning codes. The source-specific regulations, including the expected compliance responses, would not result in increased demand for or adverse impacts to recreation resources. The covered entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities in the state. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, recreation impacts resulting from compliance responses to source-specific performance standard regulations would be less than significant.

Adverse transportation impacts could result from Alternative 3, because of the potential for substantial leakage of operations in covered sectors to other states and the resulting need for additional transportation of affected products. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and implementing other operational improvements. Implementation of this Alternative would not be anticipated to result in adverse transportation or traffic impacts, because no major traffic-generating construction or operational activities would likely occur. If such were to occur, any construction traffic increases would be temporary and mitigated through ingress and egress controls, traffic controls, and reduced speed zones to ensure safety, and operational traffic levels would be similar to existing conditions. Thus, these impacts would be considered less than significant. However, leakage issues could result in both construction and operational impacts out-of-state because of the generation of traffic. For example, an out-of-state cement facility could expand current operations to increase production resulting in increased traffic on the local roadway network from additional employees and material transport. Also, new combined-cycle, natural gas power plants may be built in response to the requirement to displace coal-fueled electricity generation, resulting in substantial construction traffic. Increased interstate transport of products into California could also be required. Best management practices exist to reduce these potentially significant impacts. However, the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. In addition, project-specific mitigation details are not available at the programmatic stage of analysis, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Thus, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that these transportation impacts would be potentially significant and unavoidable.

Utility and service system impacts of Alternative 3 would be less than significant, because these activities would occur at existing facility sites where utility systems are already provided. Under this alternative, in-state compliance responses for industrial and electricity sources could include curtailing production, implementing energy efficiency modifications, making fuel changes, and other operational improvements. These projects would not increase the level of utilities beyond that already provided to existing facilities. The availability and extension of utilities is subject to approval of the local utility provider, and readily implemented in a manner that would be less than significant. Leakage issues could result in both construction and operational impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas or at or near electricity generation and transmission infrastructure. Consequently, utility and service system impacts resulting from compliance responses to source-specific performance standard regulations would be less than significant.

2.6 Alternative 4: Adopt a Program Based on a Carbon Fee or Tax

Goal of Alternative 4

The goal of Alternative 4 is to evaluate a reasonable approach to GHG emissions reduction relying on a carbon fee or tax program to achieve the remaining reductions (i.e., approximately 22 MMTCO₂E) needed to make up for the amounts intended to come from Cap-and-Trade and an Advanced Clean Car Program to meet the 2020 GHG reduction target. It is intended to help decision-makers consider whether a strategy based on carbon pricing assigned by ARB to regulated sources, instead of relying on an emissions cap would reduce or otherwise substantially change potential effects on the environment.

Role of Alternative 4 in the Range of Alternatives

Within the range of alternatives, a carbon fee represents an approach where pricing is set by the state. The carbon fee or tax is an example of a charge levied on an economic activity that causes a negative cost (i.e., costs incurred by the public and the state resulting from global warming risks, in this case) that would otherwise not be taken into account in the market price of the activity; these costs are sometimes called “externalities.” The primary purpose of a carbon fee is to reflect the externalities in the market price, thereby raising the cost of processes and products that generate the emissions and providing incentives to switch to lower emitting activity. The carbon fee or tax provides a clear signal of the price that parties will face for their GHG emissions. Setting the cost of carbon emissions on covered entities through a fee or tax does not guarantee a specific emissions outcome because there is neither a regulated cap (as in Cap-and-Trade) nor a defined performance standard (as in a direct, source-specific regulation). Defined administratively by statute and/or regulation, the carbon fee or tax would not typically adjust with changing market conditions (unless special provisions were included in legislation or regulations for automatic adjustments).

Precedents or Examples of the Approach in Alternative 4

A carbon fee or tax is a charge levied on the carbon content of a fuel or the equivalent emissions produced when the fuel is used. Many carbon fees (or taxes) have been enacted at national and state/province levels around the world, as summarized in Table 2.6-1. There is fairly wide variation in the rates imposed and the sources of carbon covered. In some jurisdictions, such as in Europe, the carbon fee is complementary to a comprehensive cap-and-trade program (EU-ETS). In other cases, such as Boulder, Colorado, the fee is a (perhaps temporary) substitute for a broader comprehensive program. In Canada, provincial taxes in Quebec, Alberta, and British Columbia provide a means to help achieve the emission reductions that Canada has agreed to under the UN Framework Convention on Climate Change's Kyoto Protocol, in light of the fact that Canada's federal government has not implemented a cap on emissions at the national level. Several countries other than those in Table 2.6-3 are either now considering a carbon fee or tax (United Kingdom, South Korea, Taiwan, South Africa) or recently deliberated on and decided against one (France, Slovenia, Japan, and New Zealand). Australia recently announced plans to implement a carbon tax in 2012 as a transitional strategy to a cap-and-trade program (Daley 2011).

The examples above suggest that carbon fees and taxes have been taken seriously by a number of other jurisdictions as a means to address GHG emissions. Several Scandinavian countries experimented with carbon-related taxes in the early 1990s, but they were often assigned to parts of the energy mix, not comprehensively, and have changed over time as climate and energy policy has evolved. The Kyoto Protocol agreement is structured around national caps, but individual countries can implement their own national strategies, including a fee or tax, if they choose. The existence of carbon fees or taxes in some European countries – which have also adopted national caps on emissions -- suggests that some governments there feel the need to supplement the cap-and-trade program, especially recognizing that not all sectors are covered by the EU-ETS.

Because many countries have just recently implemented a tax and the tax is often mixed with other strategies, it is not yet feasible to assess the program's success nor to segregate the success of the tax component from the overall program. For example, British Columbia uses a revenue-neutral approach to reduce personal and corporate income taxes. In terms of revenue, the carbon tax between 2008 and 2009 collected \$846 million and reportedly resulted in \$230 million net reductions to taxpayers there. Modeling anticipates that the British Columbia system will reduce emissions by five percent (Plumer 2010).

Table 2.6-1 Current Examples of Carbon Fees or Taxes

Location	Fee or Tax Rate	Comments
Denmark	\$17.47 (90 DKK/MT)	As of 2008 ^{1,2}
Norway	\$5-70 (25-380 NOK/MT)	As of 2011. Varies by emission level; some can be covered with emissions trading scheme.
Sweden	\$164.18 (€103/MT) for households and services \$31.88 (€22/MT) for sectors subjected to leakage and outside EU ETS \$21.73 (€15/MT) CO ₂ for sectors subjected to leakage and inside EU ETS	As of 2010 ³ . Much higher prices for general level compared to industry level. Various exemptions ⁴ .
Finland	\$43.47 - 72.45 (€30 -50/MT)	As of 2010; only traffic and heating fuels ⁵
Switzerland	\$40.43 (36 Swiss franc/MT)	As of 2010. Companies participating in cap-and-trade can be exempt. ⁶
France		Plan for \$24.62/MT (€17/MT) tax abandoned ⁷ .
Ireland	\$21.72 (€15/MT)	As of 2010. Relief for electricity generation, chemical reduction, and electrolytic/metallurgical processes. ⁸
Quebec, Canada	\$3.11 (C\$3/MT)	As of 2009 ^{9, 10}
British Columbia, Canada	\$20.79 (C\$20/MT)	As of 2011; will rise to \$31.19/MT (C\$30/MT) July 2012 ^{11, 12} .
Alberta, Canada	\$15.60 (C\$15/MT)	As of 2008 ¹³
Costa Rica	3.5% on fossil fuels market price	Steady percent rate since 1997 ^{14, 15}
India	\$3.19 (50 rupees/MT of coal (1 short ton of coal = 2.86 short ton of CO ₂ ¹⁶))	As of 2010, only for coal, both produced and imported to India.

Table 2.6-1 Current Examples of Carbon Fees or Taxes

Location	Fee or Tax Rate	Comments
California, USA	4.8 cents/MT	As of 2008, applies only to Bay Area Air Quality Management District ¹⁷ .
Colorado, USA	\$7.71/MT	As of 2008, on electricity consumption in the City of Boulder, CO ¹⁸ and expires by March 2013 ¹⁹ .
Maryland, USA	\$5 .51/MT	As of 2010, from any stationary source in Montgomery County, MD ²⁰

MT = metric ton

¹ http://www.ees.uni.opole.pl/content/03_10/ees_10_3_fulltext_01.pdf

² <http://www.nrel.gov/docs/fy10osti/47312.pdf>

³ http://www.norway.or.jp/Global/SiteFolders/webtok/PDF/20_Years_of_CO2_Taxation_in_Sweden.pdf

⁴ <http://www.iea.org/textbase/nppdf/free/2008/Sweden2008.pdf>

⁵ <http://www.environment.fi/default.asp?contentid=147208&lan=en>

⁶ <http://www.bafu.admin.ch/co2-abgabe/05179/05314/index.html?lang=de>

⁷ <http://www.telegraph.co.uk/finance/newsbysector/energy/7507015/France-ditches-carbon-tax-as-social-protests-mount.html>

⁸ http://www.taxireland.ie/TaxFind/ContentHTML/ParsedHTML/AITIManuals_HTMLFILES%5CITM_HTMLFILES%5Cc33.t2.st3.html

⁹ http://www.cdhowe.org/pdf/background%20118_English.pdf

¹⁰ <http://www.torys.com/Publications/Documents/Publication%20PDFs/CCB2007-6.pdf>

¹¹ <http://www.nytimes.com/cwire/2011/03/22/22climatewire-british-columbia-survives-3-years-and-848-mi-40489.html?pagewanted=2>

¹² http://www.sbr.gov.bc.ca/documents_library/notices/British_Columbia_Carbon_Tax.pdf

¹³ <http://www.cbc.ca/news/business/story/2008/01/08/renner-carbon.html>

¹⁴ <http://www.policyarchive.org/handle/10207/bitstreams/20176.pdf>

¹⁵ <http://www.nytimes.com/2009/04/12/opinion/12friedman.html>

¹⁶ <http://www.indiaenvironmentportal.org.in/files/India%20Taking%20on%20Climate%20Change.pdf>

¹⁷ http://articles.sfgate.com/2008-05-22/news/17155215_1_carbon-dioxide-greenhouse-gas-emissions

¹⁸ <http://nexus.umn.edu/Courses/Cases/CE5212/F2008/CS7/CS7PPT.pdf>

¹⁹ http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=7698&Itemid=2844

²⁰ <http://solveclimate.com/news/20100525/maryland-county-carbon-tax-law-could-set-example-rest-country>

The Table is generally taken from the following source: Murray, Mazurek, and Profeta 2011.

Attributes of Alternative 4

Key Carbon Fee or Tax Alternative Design Decisions

If a carbon fee or tax was implemented in California, four key design issues must be addressed, as outlined below. (The terms, “fee” and “tax,” are generally used interchangeably in the section that follows, because they both levy a price on carbon emissions, with the exception of the discussion of the administrative differences between implementation of a fee or a tax in California.)

Covered Sectors

The covered sectors must be identified. In California, the sectors potentially subject to the carbon fee or tax would be those that were slated to be covered under the proposed Cap-and-Trade Regulation (ARB 2010a). These would include electricity, transportation fuels, natural gas and large industrial sources of 25,000 metric tons or more.

Fee or Tax Level

The level of the fee or tax would need to be decided. The state must determine the carbon fee or tax level and whether and how to change it over time. Table 2.6-2 lists several criteria used by other jurisdictions for setting the carbon fee or tax level. A wide range of fees or taxes can result from consideration of the various criteria. The federal Interagency Work Group on the Social Cost of Carbon conducted a comprehensive exercise to estimate the social cost of carbon, which is one of the potential criteria. Mean values for 2010 ranged from about \$5 to \$35 per ton CO₂, depending on time discount rates (varying between 2.5 and 5 percent). The value that includes 95 percent of the range of fees or taxes, using a 4 percent discount rate, would be about \$65 per ton (IWGSCC 2010).

Table 2.6-2 Representative Criteria for Setting the Carbon Fee or Tax Level

Criterion	Description	Advantages	Disadvantages
Social cost of carbon (SCC)	Economic value of the damages caused by an additional ton of CO ₂ equivalent	Consistent with the underlying Pigovian concept that the fee or tax causes the product to reflect its true cost to society	Wide range of estimates depending on studies of varying methodologies and scope
“Pain threshold”	Level above which the economic costs of the fee or tax are deemed too burdensome for affected parties	Pragmatic, recognizing need to reduce shocks especially in early years. Can be combined with strategy to start fee low and phase-in increases over time.	Difficult to determine which single level meets this criterion. Easy to manipulate politically.

Table 2.6-2 Representative Criteria for Setting the Carbon Fee or Tax Level

Criterion	Description	Advantages	Disadvantages
Technology goal	Set at level sufficient to stimulate investment in key technologies deemed critical to achieving long-term reductions (e.g., renewable power, electric vehicles)	Clear rationale to avoid weak or stranded investment. May be easier to estimate initially than alternatives above.	Involves government picking “winner” technologies and may be difficult to match dynamics of technology and cost changes over time.
Comparable prices elsewhere	Set within range of carbon fees, taxes, or prices found in other systems (fee-based or cap-and-trade)	Easy to determine.	Other systems will reflect particular scope and criteria that may be at variance with values and objectives of California program
Environmental objective	Effectiveness in reducing emissions	Stable carbon price over the long term also means consistent, ongoing incentive to reduce emissions.	Indirect influence on emission level with absence of cap. Risk of leakage, if fee or tax does not reflect market price well.

Emissions Basis

The next decision is the exact quantity of emissions subject to the fee or tax. A standard approach would be for all emissions in the covered sector to be subject to the fee or tax. An Alternative would be to assess a *marginal fee or tax* only on emissions above a set level. To compare these approaches, consider a plant planning to generate one million tons of CO₂ emissions in a given year. If the carbon fee or tax is set at \$15 per ton, under the full-fee system, the plant would pay \$15 million in fees or taxes for the year. If the fee or tax is assigned on all emissions in excess of 900,000 tons, the plant would pay \$1.5 million in fees or taxes for the year. In both cases, the firm’s monetary incentive to reduce emissions from 1 million to 900,000 tons is the same (save \$1.5 million) but the total amount the government receives in revenue would be quite different. Importantly, however, there would be no incentive to reduce emissions below 900,000 tons under the marginal fee or tax approach but there would be a continued incentive to do so under the total fee or tax approach since all tons incur a cost.

If a marginal fee or tax were selected, the state would need to determine the threshold (baseline) level for each covered entity, below which no fee or tax would be assessed. This could be determined based on a range of factors, such as a fixed percentage of historic emissions, a sectoral threshold standard or benchmark (e.g., emissions per unit output), or customized for each individual plant's condition. The marginal fee or tax approach would minimize cost impacts to businesses and discourage leakage, so it is assumed for purposes of the alternatives analysis in the FED Supplement.

Point of Regulation

The point of regulation for the fee or tax is the next critical question. The appropriate point of regulation varies based on the sector. A carbon fee or tax could target the same points of regulation or any point within the state from fuel extraction to combustion to end use. This is often referred to as the point of regulation or point of fee assignment. Options for the point of regulation and their relative advantages are included in Table 2.6-3.

Cost-effectiveness would vary depending on the point of regulation, primarily related to administrative costs. The direct cost of a fee or tax to emitters would not change whether the point of regulation is set upstream, midstream, or downstream. As long as it coincides with the carbon (CO₂, GHG) contained or emitted and can be passed through, the amount charged would be the same no matter where the fee or tax is levied. However, the most substantial cost variations that arise with different points of regulation likely are administrative in nature. The monitoring and transaction costs associated with a fee or tax would generally be smaller on a per ton basis, if imposed at a point where there are relatively few entities responsible for relatively much carbon in an easy-to-monitor form. As suggested in Table 2.6-3, this is typically more likely with upstream regulation. For example, imposing a fee or tax on transportation carbon may be more easily (less costly) accomplished at the refinery or fuel supplier level, with relatively few suppliers transacting in fuel, rather than on emissions at the tailpipe level assessed downstream on millions of drivers. Midstream may involve assessment at thousands of gas pumps across the state. Therefore, in principle, there may be a reduction in administrative and monitoring costs, if assessed upstream. As suggested in Table 2.6-3, the most administratively advantageous point varies. For example, imposing a fee or tax on transportation carbon may be more easily (less costly) accomplished at the refinery or fuel supplier level, with relatively few suppliers transacting in fuel, rather than on emissions at the tailpipe level assessed downstream on millions of drivers. Implementing the fee or tax further downstream may involve assessment at thousands of gas pumps across the state. Therefore, in principle, there may be a reduction in administrative and monitoring costs, if assessed midstream.

Table 2.6-3 Potential Points of Regulation for Fee or Tax Assignment

Fee or Tax Assignment Point	Point of Regulation	Example	Advantages and Disadvantages
Midstream	On fuel content	Assign fee or tax on carbon content of all natural gas, coal, transportation fuels used in California	Relatively easy to administer, as number of fuel producers is small relative to number of users Difficult for “imported” emissions such as electric power generated in another state and transmitted to California Not easily imposed on non-fossil fuel sources (e.g., methane emissions from landfills)
Downstream	Assign fee or tax to final consumer of goods that are responsible for emission	Imposed at gas pump or in electric power bill, for all Californians, based on, consumption of the carbon-emitting product.	May have greater impact on use/efficiency if directly levied on final consumer. With upstream or midstream, cost may ultimately fall on final user anyway through market price adjustments. May have higher transaction costs if levied on millions of consumers directly
Downstream	At point of large stationary sources of combustion	Charged to power plants and factories based on actual GHG emissions there	Lower transaction costs since imposed on few, relatively large emitters. Direct incentives for emission reduction activities, emission leaks.

Source: Murray, Mazurek, and Profeta 2011.

It is important to note that a downstream system may have some indirect cost savings advantages, in terms of spurring efficiency improvements. The potential for savings turns on the assumption that those who most directly bear the price impact have a comparably large incentive to save energy and the attendant emissions reductions that efficiency improvements will bring. Under a system that imposes the fee or tax further upstream, such pricing effects may not be as apparent to the downstream energy user (Niemeier et al 2008) because the charge is imbedded in the cost of the input, rather than directly assessed based on the activity of the downstream party. ARB’s economic modeling of the Cap-and-Trade Regulation showed that savings from efficiency improvements significantly lowered the total compliance costs of the Cap-and-Trade Program.

One other possible advantage of downstream assessment is that it may be easier to target relief for low-income households if that is the point of regulation. Certain households could be exempted from the fee or tax. This would be more difficult, if the fee or tax is assessed further upstream and flows down to all households, although it could be addressed by uses of the revenue.

Despite the potential advantages of downstream regulation, from an implementation perspective, a more upstream point of regulation would be the most administratively cost effective approach. The points of regulation assumed in Alternative 4 are as follows. For purposes of this analysis, the point of regulation of electrical generation and industrial sources would be the facility operator (i.e., the generation or industrial facility). For electricity imports, the point of regulation would be the importer. For natural gas, the point of regulation would be the user or distributor of the gas. For transportation fuels, the point of regulation would be the first holder or supplier of refined gasoline or distillate fuel oil.

Administrative Features of a Potential Carbon Fee or Tax

The discussion above addresses four factors to consider in designing a carbon fee or tax program. The administrative steps to creating a fee or tax include: sectoral coverage, fee or tax level, emissions basis, and point of regulation (fee or tax assignment). In theory, a carbon fee or tax may be more straightforward to design and to administer, compared to the other regulatory alternatives. However, in practice, a levy of this nature may be more challenging to design and administer in California owing to legal distinctions between what constitutes a tax and a fee. The following discussion examines what administrative issues California would need to face in practice.

Data Collection and Monitoring

Once the decisions are made about the sectors to be covered, the level of the fee or tax, the emissions basis and the point of regulation, the next step would be to develop data to track the GHG emissions on which the fee or tax is assessed. The amount of data collection and analysis required depends on the point of regulation. An upstream system requires only data on carbon content in fuels and data on fuel quantities. A midstream fuels-based system requires data on carbon content in fuels and data on fuel quantities. A system designed to mimic sources targeted under the proposed Cap-and-Trade Regulation would require emissions data at the regulated source or emissions estimates in the production and use of the final product.

How the environmental effectiveness of a fee or tax would be monitored also depends, in part, on the point of regulation. Fuel use data would be necessary to monitor a fuel based system, whereas emissions estimates or product use would be necessary to monitor the environmental effectiveness of an emission based system.

Collection and Enforcement

In theory, a key administrative advantage to taxes is that they may be levied and enforced through established tax collection methods, rather than developed from the ground up through agencies charged with environmental regulation, which could be the case for a fee. For example, a federal carbon tax, similar to a fuel excise tax, could be levied and collected by the U.S. Department of the Treasury instead of the U. S. EPA. Under a fuel based system, fuel suppliers would account and pay in a manner much like other taxes to which they are accustomed. California corollary to administer Treasury's functions would be the State Board of Equalization or Franchise Tax Board. In British Columbia, a Western Climate Initiative partner to California, retail gasoline establishments collect the carbon tax and remit revenues along with other monies to the provincial revenue collection authority. Because the tax may be based on transaction records (e.g., fuel purchase) and not measurement of emissions, non-compliance could be achieved through financial cheating or evasion. Accordingly, enforcement against a transaction based tax would take place in large part through established tax auditing systems.

Revenue Uses

Depending on the emissions basis (e.g., marginal emissions or total emissions), a fee or tax holds the potential to generate a greater or lesser amount of revenue per year. As in the case of an allowance auction, a state with a carbon fee or tax must then decide how to use those revenues. ARB's Economic and Allocation Advisory Committee (EAAC 2010, p. 33-34) identified four potential uses of allowance revenues including reducing the disproportionate impact of higher fuel prices caused by a fee or tax on low income households; financing government expenditures; reducing income or sales taxes; or providing public dividends in such forms as direct payment or a trust fund for education. The Alaska Permanent Fund, which recycles oil-extraction royalties to Alaskans, is one example of a dividend model. Varying degrees of flexibility in revenue use apply in California, based on the different legal restrictions of fees versus taxes, as discussed below.

Avoiding Leakage

Because a fee or tax, like a cap-and-trade approach, would place a price on carbon emissions by in-state industrial sources, both systems are prone to leakage of economic activity and attendant emissions to jurisdictions without carbon regulation and pricing. Here, "leakage" refers to the incentive for regulated entities with high GHG emissions or energy costs to shift or to relocate activity to states without carbon regulation, fees, or taxes to avoid the added cost, which then could erase the emission reductions achieved in-state. A cap-and-trade program addresses leakage through the use of free allocation of allowances to trade-exposed, energy-intensive industries. For this alternative, implementation could result in leakage if not accounted for in the design of the alternative. For a fee or tax, administrative mechanisms may be necessary to address leakage, such as something called a border adjustment (which are import fees levied by a carbon-taxing jurisdiction on goods coming in from non-carbon-taxing jurisdiction to eliminate the cost avoidance advantage of relocation) or other mechanisms such as the use of rebates. For purposes of this analysis, the design of

this Alternative is assumed to include appropriate mechanisms that minimize the potential for leakage.

Administrative Issues Specific to California

“Fee” and “tax” have been used interchangeably in this discussion so far, because they both have the effect of pricing carbon and in some jurisdictions the terms are interchangeable in operation. In California, a fee and a tax have distinct legal characteristics, which bring different legal requirements and restrictions to bear. As a result, in practice a carbon tax could operate differently from a carbon fee in California. Both are discussed below.

Under California’s Constitution, as of 2006 – when AB 32 was enacted into law – a tax requires a legislative supermajority (two-thirds) vote, whereas a fee traditionally only requires a simple majority vote of the Legislature. For purposes of this analysis, ARB would adopt the carbon fee regulation under the authority of AB 32. If new legislation were required for ARB to adopt a carbon fee, the requirements of Proposition 26 (approved in 2010) – which expanded the definition of a “tax” – would determine whether a legislative majority or supermajority vote is required.

In general, with a tax, there are no restrictions on the level of the tax or how the money is appropriated for use. The tax levy and appropriation for use are defined by the Legislature. For example, the revenue from a tax may go into the state’s “general fund,” from which a wide variety of public services and programs are funded. By contrast, with a fee, the amount collected and the uses for which the money may be appropriated are subject to limitations based on a complex legal test. The purpose of this alternatives analysis is not to provide a legal opinion, but rather to discuss the limitations on fees in laypersons’ terms.

Generally speaking, the total amount collected via the fee must not exceed the reasonable cost of the government program, and the fee must be allocated reasonably among fee payers based on their responsibility for causing the burden that made the program necessary or the benefits they directly or indirectly receive from the program. Thus, subject to those restrictions, at the time AB 32 was enacted, the Legislature could, by a simple majority vote, authorize agencies to establish fees to pay for environmental damages and the costs to administer programs to address those damages. The revenues from a carbon tax could, however, be used to offset lower income or sales taxes or to create a trust fund for public education, or other legislatively authorized purposes; such use of revenue would not be available under a fee.

With these distinctions between a tax and a fee in California in mind, whether and how such programs might operate and who would operate them could look very different in practice. To implement a carbon tax in California, the Legislature would need to approve the tax by two-thirds supermajority. Such a scenario is extremely unlikely for the foreseeable future. Alternatively, a carbon tax could be placed on the ballot with sufficient signatures, but this scenario would require significant outside resources to

pass such a measure. The challenges surrounding approval of a carbon tax could make this approach infeasible as a practical matter.

Assuming hypothetically that such a tax would pass by legislative vote or by popular vote, the administrative steps to implementation would be consistent with those outlined above. Legislators or voters could set the tax and decide whether to return revenues to the general fund, return revenues to taxpayers, or use the value for other goals as outlined by the EAAC (2010). Under this statutory authority, ARB could establish the point of regulation, based on carbon content or emissions data. ARB could administer the program and monitor progress towards emissions reductions. However, an existing taxing agency, such as the State Board of Equalization or Franchise Tax Board, theoretically could levy, collect, and monitor the tax, as well as administer personal tax reductions, if the state were to implement such an approach. Because the primary goal of this tax would be to achieve targeted reductions in GHG emissions, it would be necessary to return to the Legislature or to voters to raise additional taxes, for example if monitoring shows that the program is failing to achieve GHG emission reduction targets (although the initial tax authorization could include an automatic adjustment).

In contrast to a tax, additional legal and administrative considerations would need to be brought to bear under a California carbon fee program. Here, the legal requirements for a fee would make such decisions as on what basis to levy a fee and where to apply to the point of regulation more complicated. As discussed above, the California Constitution and court decisions interpreting the Constitution also would likely constrain how ARB could charge and use revenues from a carbon fee.

Summary of Alternative 4 Strategy

Carbon fees or taxes assign a price to carbon and apply it administratively to a specific point of regulation, with the goal of encouraging emissions reduction to avoid the added cost. A fee or tax may be relatively straightforward to set and to administer, although it would be more challenging to ensure that the fee or tax achieves the required emission reductions. Moreover, taxes in theory may be levied and collected by tax authorities, rather than environmental regulatory agencies. In the case of a carbon fee, the uses of the revenues are restricted by state law, while a carbon tax approved by voters or the Legislature, revenues can be redirected to any number of potential uses, including offsetting income taxes, dividends or reducing comparably higher fuel bills to low income households that a carbon fee or tax would bring.

The most challenging constraint for a tax approach in California owes to the requirement that taxes must be approved either by legislative supermajority or voter initiative. Such measures would require time and potentially substantial resources to pass, and may be politically infeasible. Successful passage and creation turns in large part on confidence that government will use revenues wisely and return value to taxpayers or households. Importantly, while a fee or tax may be simple to administer, a central drawback is that a fee or tax addresses environmental goals or emissions limits indirectly (i.e., increasing the price of carbon, but without a specified emissions cap). Thus, there is uncertainty about whether the emission reduction target would be

met. If evidence shows that a tax is failing to sufficiently reduce emissions, it may be politically difficult to return to the Legislature or to voters to levy a higher tax to reduce more emissions (although an automatic adjustment could be included in the original authorization).

Alternative 4 Impact Discussion

Objectives

Alternative 4 would seek to reduce GHG emissions by 22 MMTCO₂E through the use of a carbon fee or tax on emissions from electricity, transportation fuels, natural gas and large industrial sources. The Alternative could potentially meet the fundamental objective of reaching the 2020 emissions reduction target; however, the absence of a firm cap or performance standard creates a substantial risk of either falling short of the target or over-complying, which may involve unnecessary additional costs. Also, if the carbon fee or tax does not reflect market conditions well, either leakage to other unregulated states could occur (if the levy is too high compared to the market) or actual reductions could fall short of what is needed to meet the state's target (if the levy is too low compared to costs of changes to reduce GHG).

The achievement of other basic objectives of the Proposed Scoping Plan would be variable for Alternative 4. For instance, Alternative 4 would reduce fossil fuel use through the potential compliance responses to the fee or tax, such as reduction of operations or enhancement of energy efficiency. The co-benefits of reduced criteria pollutants and TACs would be expected within the facilities of the affected sectors. However, it is uncertain that Alternative 4 would result in the most cost-effective GHG emissions approach, because the level of the fee or tax would be set legislatively or administratively, rather than being easily adjusted to the market. Disadvantaged communities would experience benefits of reduced co-pollutants where facilities cut back on operations or achieved more energy efficiency. Most importantly, the effectiveness of the approach has substantial risk of being hindered, because of the potential for the charge to be inconsistent with marketplace conditions, either resulting in substantial leakage, which would not be consistent with the Proposed Scoping Plan objectives, or falling short of the contribution needed to the state's 2020 reduction target. If pursued, this Alternative would need to be designed to include administrative mechanisms to minimize the potential for leakage.

Environmental Impacts

Alternative 4 relies on a carbon fee or tax program that would identify affected sectors, fee or tax level, emissions basis, and point of regulation to meet the 2020 GHG emissions reduction target. The sectors affected by this Alternative would be the same as those included as covered entities in the proposed Cap-and-Trade Regulation (i.e., electricity, transportation fuels, natural gas and large industrial sources). Under this alternative, compliance responses by affected entities could include fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. For purposes of this analysis, the point of regulation of electrical generation and industrial sources would

be the facility operator (i.e., the generation or industrial facility). For electricity imports, the point of regulation would be the importer. For natural gas, the point of regulation would be the user or distributor of the gas. For transportation fuels, the point of regulation would be the first holder or supplier of refined gasoline or distillate fuel oil. Setting the cost of carbon emissions on covered entities through a fee or tax provides an indirect influence on emitters to reduce their GHG emissions sufficiently to meet the 2020 target, because there is neither a regulated cap (as in Cap-and-Trade) nor a defined performance standard (as in a direct, source-specific regulation). Defined administratively by statute and/or regulation, the carbon fee or tax would not adjust with changing market conditions (unless special provisions are included in authorizing statute or regulation for adjustment). The carbon fee or tax provides a clear, long-term signal of the price that parties will face for their GHG emissions, which allows for long-term operational planning.

Aesthetic impacts resulting from Alternative 4 would be less than significant, because compliance responses are focused on modification of existing industrial facilities and uses. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. Implementation of this Alternative would not be anticipated to result in adverse aesthetic impacts because any construction- or operational-related activities would likely occur within existing facilities, where the aesthetic character is already established and would not be substantially changed. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, aesthetic impacts resulting from compliance responses to a carbon fee or tax would be less than significant.

Agricultural and forest impacts resulting from Alternative 4 would be less than significant, because compliance responses are focused on modification of existing industrial facilities and uses. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. Implementation of this Alternative would not be anticipated to result in adverse agricultural or forest impacts because any construction- or operational-related activities would likely occur within existing industrial areas, where important agricultural or forest resources would not be located. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, agricultural and forest impacts resulting from compliance responses to a carbon fee or tax would be less than significant.

Air quality impacts of Alternative 4, in general, would be regionally beneficial, because measures that reduce GHG emissions also provide co-benefits in terms of reductions in regional criteria air pollutant and TAC emissions because of their similarities in source types. Thus, implementation of this Alternative would reduce statewide levels of criteria

air pollutants and TACs resulting in a beneficial effect. However, implementation of this Alternative could result in substantial leakage because the cost of carbon in a fee or tax program would be set administratively, rather than by the market, resulting in the potential to be inconsistent with marketplace conditions. Unless administrative mechanisms are in place to minimize the potential for leakage, implementation of this Alternative could result in adverse regional and local air quality impacts out-of-state associated with construction- (e.g., use of heavy-duty equipment) and operational-related (e.g., relocated facilities) increases in criteria air pollutants and TACs. However, with such mechanisms in the design of the alternative, impacts to air quality would be reduced to a level of insignificance.

Adverse biological impacts resulting from Alternative 4 could occur, if compliance responses to the fee or tax require modification of existing industrial facilities and uses where biological resources are present. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could affect natural habitats and sensitive species, if they are present around existing facilities. Construction, grading and trenching have the potential to adversely affect any protected biological resources that might exist at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant biology impact may be unavoidable.

Adverse cultural resources impacts resulting from Alternative 4 could occur, if compliance responses to the fee or tax require modification of existing industrial facilities and uses where archaeological or historic resources are present. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could disturb cultural resources, if they are present around existing facilities. Construction, grading and trenching have the potential to adversely affect any potentially important cultural resources that might exist at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately

implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant cultural resources impact may be unavoidable.

Energy-related effects of Alternative 4 would be beneficial, because the GHG reduction strategy of the carbon fee or tax also results in improved energy efficiency and reductions in fossil fuel use. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. These actions would reduce overall energy demand in-state, particularly related to curtailed operations, and are considered beneficial effects. However, implementation of this Alternative could result in increased energy demand out-of-state associated with leakage (e.g., shifting production out-of-state resulting in greater operational emissions). The authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects in other states. Consequently, while the net change would still be beneficial (i.e., less total energy demand), the potential level of benefit would be diminished because of the potential for substantial leakage.

Adverse geology, soils, and mineral resources impacts resulting from Alternative 4 could occur, if compliance responses to the fee or tax require modification of existing industrial facilities and uses where new ground disturbance and landscape alteration are needed. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could affect local geology and soils. Construction, grading and trenching have the potential to cause soil erosion, dust generation, and sedimentation of local waterways at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant geology and soils impact may be unavoidable.

GHG emissions would be expected to decrease in California with the imposition of a carbon fee or tax. This Alternative relies primarily on a carbon fee or tax program that would identify covered sectors, fee or tax level, emissions basis, and point of regulation to meet the 2020 GHG emissions reduction target. Thus, GHG-related impacts of this Alternative would be beneficial because of the fundamental objective of this program to reduce in-state GHGs. However, although implementation of this Alternative would

reduce GHGs, it is important to note that a central drawback of this type of program is that the fee or tax addresses environmental goals or emission limits indirectly (i.e., without a defined emissions cap) resulting in less certainty that such are being met (i.e., AB 32 2020 GHG emissions reduction target). In addition, implementation of this Alternative could result in adverse GHG impacts out-of-state associated with increases in GHGs from leakage (e.g., operational emissions from relocated facilities). Unless administrative mechanisms are in place to minimize the potential for leakage, implementation of this Alternative could result in adverse GHG impacts. However, with such mechanisms in the design of the alternative, impacts related to GHGs would be reduced to a level of insignificance.

Hazard and hazardous materials-related environmental impacts of Alternative 4 would be less than significant. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. The use of hazardous materials is common practice in industrial settings. Implementation of compliance responses could include the use of hazardous materials, but this would be considered simply a continuation of existing business practices for the covered entities, controlled by existing practices and regulations, and, thus, considered less than significant. All projects would be required to comply with established local, state, and federal laws pertaining to the use, storage, and transportation of these materials. Assuming compliance with applicable laws and regulations, the impacts would be less than significant.

Adverse hydrology and water quality impacts resulting from Alternative 4 could occur, if compliance responses to the fee or tax require modification of existing industrial facilities and uses near local water features. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. The construction related to upgrading of equipment, switching to lower intensity carbon fuels, and implementing operational changes at covered facilities could affect local drainage and discharge of contaminants to local waterways. Construction, grading and trenching have the potential to cause soil erosion and sedimentation of local surface water resources at those locations. Recognized measures are available to reduce this potentially significant impact, but the authority to determine project-level impacts and require project-level mitigation lies with the permitting agency for individual projects. Further, the programmatic analysis does not allow project-specific details of mitigation, resulting in an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Consequently, this FED Supplement takes the conservative approach in its post-mitigation significance conclusion and discloses, for CEQA compliance purposes, that this potentially significant hydrology and water quality impact may be unavoidable.

Land use impacts of the compliance responses of Alternative 4 would be less than significant, because they would not change the fundamental use of facility sites. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities and, as such, would be consistent with the existing land use and would pose a less than significant land use and planning impact. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, land use impacts resulting from compliance responses to a carbon fee or tax would be less than significant.

Adverse noise impacts could result from Alternative 4, because of the potential for substantial leakage of operations to other states for sectors subject to the fee or tax. Under this alternative, compliance responses by covered entities could include fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. Implementation of this Alternative would not be anticipated to result in adverse noise impacts because no major noise-generating construction- or operational-related activities would likely occur. If such were to transpire associated with onsite upgrades or process changes, they would be minor, intermittent and temporary in nature, and similar (or less) to the levels from sources that currently exist within these industrial settings. Thus, these impacts would be considered less than significant. However, under this alternative, leakage issues could result in both construction- and operational-related impacts out-of-state due to the generation of noise levels that exceed ambient conditions at existing sensitive receptors. Unless administrative mechanisms are in place to minimize the potential for leakage, implementation of this Alternative could result in adverse noise impacts out-of-state associated with construction- (e.g., use of heavy-duty equipment) and operational-related (e.g., relocated facilities.). However, with such mechanisms in the design of the alternative, impacts to noise would be reduced to a level of insignificance.

Adverse population, employment, and housing effects would not occur from the carbon fee or tax in Alternative 4, including from the operational and facility-modification compliance response projects, because the compliance activities would not substantially change socioeconomic conditions. All impacts to population, employment, and housing would be less than significant.

Public services impacts of Alternative 4 would be less than significant, because compliance responses to the fee or tax would occur at existing facility sites where public services are already provided. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. All potential impacts to public services would be less than significant. These projects would not substantially increase the level of public services beyond that already provided to existing facilities. Leakage issues could

result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, public services impacts resulting from compliance responses to a carbon fee or tax would be less than significant.

Recreation impacts of Alternative 4 would be less than significant, because compliance responses to the fee or tax would occur at existing facility sites. The carbon fee or tax, including the expected compliance responses, would not result in increased demand for or adverse impacts to recreation resources. The affected entity compliance responses consist of upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities in the state. Leakage issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, recreation impacts resulting from compliance responses to a carbon fee or tax would be less than significant.

Adverse transportation impacts could occur from Alternative 4, because of the potential for substantial leakage of operations to other states for sectors subject to the fee or tax, resulting in the potential need for additional transportation of affected products. Under this alternative, compliance responses by covered entities could include fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, curtailing operations because of increased cost, and implementing maintenance and process changes at existing facilities. Implementation of this Alternative would not be anticipated to result in adverse transportation or traffic impacts because no major traffic-generating construction- or operational-related activities would likely occur. If such were to transpire, any increases due to construction traffic would be temporary and mitigated through ingress and egress controls, traffic controls, and reduced speed zones to ensure safety; and operational traffic levels would be similar to existing conditions. Thus, these impacts would be considered less than significant. However, under this alternative, leakage issues could result in both construction- and operational-related impacts out-of-state due to the generation of traffic. Unless administrative mechanisms are in place to minimize the potential for leakage, implementation of this Alternative could result in adverse transportation impacts out-of-state associated with construction- (e.g., use of heavy-duty equipment) and operational-related (e.g., relocated facilities). However, with such mechanisms in the design of the alternative, impacts to transportation would be reduced to a level of insignificance.

Utility and service system impacts of Alternative 4 would be less than significant, because compliance responses to the fee or tax would occur at existing facility sites where utility systems are already provided. Under this alternative, compliance responses to the fee or tax by affected entities could include the fee or tax payment, but also upgrading equipment, switching to lower intensity carbon fuels, and implementing maintenance and process changes at existing facilities. These projects would not increase the level of utilities beyond that already provided to existing facilities. The availability and extension of utilities is subject to approval of the local utility provider, and readily implemented in a manner that would be less than significant. Leakage

issues could result in both construction- and operational-related impacts out-of-state; however, these changes would again generally be expected to occur within existing industrial areas. Consequently, utility and service system impacts resulting from compliance responses to a carbon fee or tax would be less than significant.

2.7 Alternative 5: Adopt a Variation of the Combined Strategies or Measures

Goal of Alternative 5

The goal of Alternative 5 is to describe a reasonable variation of the components of the Proposed Scoping Plan reduction measures. It is intended to help decision-makers consider whether modifying the mix of reduction strategies would reduce or otherwise substantially change potential effects on the environment.

Role of Alternative 5 in the Range of Alternatives

The role of Alternative 5 in the range of alternatives is to assess whether the number and magnitude of environmental effects would be sensitive to varying the mix of reduction measures. Instead of adopting all the reduction measures in the Proposed Scoping Plan or a set of measures oriented to a specific, primary strategy (e.g., Cap-and-Trade, source-specific regulation, or carbon fee or tax, as described in other action alternatives), ARB could adopt some of the measures or a different mix of them. Numerous variations could be implemented when considering different subsets and/or combinations of the measures identified in the Proposed Scoping Plan. It is not feasible or meaningful to examine the numerous potential Alternative combinations in detail; too many different permutations exist. However, identifying a reasonable, Alternative combination of measures would illustrate whether the number and magnitude of environmental effects would be influenced substantially by altering the combination of measures.

Precedents or Examples of the Approach in Alternative 5

British Columbia

British Columbia has prepared a Climate Plan and is developing a multi-faceted climate program that includes comprehensive strategies and initiatives that will substantially reduce GHG emissions by 33 percent by 2020. The Climate Plan program includes some measures that are in the Proposed Scoping Plan, but differs in other substantial ways. British Columbia's Climate Plan includes a carbon tax, which has been in place since 2008, and a proposed cap-and-trade program that will be voted on in the near future. Incentive programs for energy efficiency are already being implemented. The carbon tax is applied to all fuels, except for bunker, aviation and marine vessel fuels. The cap-and-trade program would cover industrial sources and electricity. In-province electricity is generated largely from hydro and biomass facilities. Similar to California's proposed Cap-and-Trade Regulation, biomass emissions are exempted.

The Climate Plan positions British Columbia to benefit from growth in demand for high technology and clean energy products and services while addressing climate action in four key areas:

- Entrenching GHG reduction targets in law.
- Taking targeted action in all sectors of British Columbia's economy.
- Taking steps to help British Columbians adapt to the realities of climate change.
- Educating and engaging British Columbians on climate action.

The Plan highlights the revenue-neutral tax on pollution as a significant piece of climate action legislation which requires industry and individuals alike to pay the same rate on the purchase and use of fossil fuels. As a result of the Carbon Tax, individual British Columbians will see their personal income taxes reduced by two percent in 2008, rising to five percent in 2009 on taxable income up to \$70,000. This will mean British Columbians pay the lowest provincial income tax on earnings up to \$111,000. Every dollar raised by the revenue-neutral carbon tax will be returned to individuals and businesses through tax reductions. Failure to do so will result in a financial penalty for the Minister of Finance.

The Plan describes the three-year, \$60 million LiveSmart BC Efficiency Incentive Program, and lays out strategies specific to seven sectors:

- Transportation – Improved vehicle efficiency, vehicle scrapping, less tax on efficient vehicles, cleaner buses and trucks, reduced fuel carbon and expanded transit and cycling.
- Buildings – A Green Building Code, Energy Efficient Buildings Strategy, encouraging compact, green communities, and solar roofs on 100,000 BC buildings.
- Waste – Turning waste into energy, cleaning up landfills, increased composting, and making manufacturers more responsible for waste created by their products.
- Agriculture – Digesters to capture methane from manure, improved fertilizer application, community biomass projects, research on biomass fuels and green city farms.
- Industry – A carbon emissions cap-and-trade system to provide an incentive for large emitters to reduce their emissions, often by implementing made-in-BC solutions.

- Energy – PowerSmart incentives, a First Nations and remote community clean energy, Alternative energy development, solar energy, smart meters, BC Bioenergy Strategy.
- Forestry –Forests for Tomorrow, Trees for Tomorrow, accelerated forest growth and net-zero deforestation, bio-mass energy and cellulosic ethanol production (British Columbia 2008).

Stakeholder Contributions

During the Proposed Scoping Plan development, several committees and stakeholder groups offered recommendations for different approaches, including a “three-faceted approach”, which involved a combination of regulations and standards, incentives, and a price on carbon (i.e., a carbon fee or tax). Also proposed was a mix of approaches that includes performance standards, a price on carbon, and targeted incentives. Although the attributes of Alternative 5 are not the same as the committees’ recommendations, they serve as an example of a variation in the mix of strategies to consider when defining the reasonable set of measures included in Alternative 5.

Attributes of Alternative 5

Alternative 5 represents a suite of strategies rather than a single alternative. Instead of adopting all the measures identified in the Proposed Scoping Plan, ARB could adopt some of them or a different mix of them. Numerous alternatives exist to adopt various subsets and mixes of the measures identified in the Proposed Scoping Plan, and for the purposes of this analysis, ARB considered taking a three-faceted approach to reducing GHGs: a cap-and-trade system, a combination of regulation and standards, and putting a price on carbon via a carbon fee or tax. Further, for purposes of comparison, ARB examined a mix of traditional regulations, such as a direct regulation for light duty vehicles; a Cap-and-Trade Program for large sources that covers large stationary sources, electricity, refineries, and cement; and a fee on emissions from fuels not under Cap-and-Trade that includes transportation fuels and commercial and residential combustion.

Attributes of each component of this Alternative are individually described in Alternatives 2, 3, and 4.

Alternative 5 builds upon the No-Project Alternative (Alternative 1) by adding:

- a direct regulation that has been defined as technologically feasible and is expected to be cost-effective;
- a cap-and-trade approach for large industrial sources and electricity generation; and
- carbon fees on the transportation, commercial, and residential fuel sectors.

The application of a set of regulations, fees, and a Cap-and-Trade Program to other combinations of source categories is possible. The approach was selected based on the following reasoning:

- Direct regulations are preferred in cases where there is a high likelihood that cost-effective emission reduction technologies can be applied in a relatively uniform manner across the spectrum of sources affected.
- A cap-and-trade approach is most appropriate for those sources that are not good candidates for direct regulation, but can exercise a substantial degree of control over their emissions and/or usage in response to a cap-and-trade system. Under this approach facility operators have the flexibility to weigh the cost of reductions versus the cost of obtaining emission allocations and chose the less costly compliance option.
- A carbon fee approach is most appropriate for the remaining fuel combustion-related categories. In these categories, the regulated entity, such as a supplier of transportation fuels, has limited influence over the amount of fuel consumed. Under these conditions the principal impact of a cap-and-trade approach would be to gain reductions because as fuel prices increase to reflect the cost of carbon allowances. As described in Alternative 4, a fee approach would incentivize reductions in GHG levels, but the level of that reduction is less than certain than a cap.

Because most of the sources that could be best governed by direct regulations and meet the criteria described above are already included in Alternative 1, the new direct regulation element of Alternative 5 is limited to one major regulation, the ARB's advanced clean cars program. This program consists of strengthening clean cars standards for new vehicles produced between 2017 to 2020 to achieve an additional 3.8 MMTCO₂E of reductions by 2020.

The second element of Alternative 5 would be the application of a cap on the large source emission sector which consists of larger industrial sources and electricity generation facilities. (See Alternative 2 for more detail on the cap-and-trade approach) Collectively these sources are projected to emit about 192 MMTCO₂E in 2020 in ARB's most recent baseline forecast (ARB 2010e). Measures included in Alternative 1 are estimated to reduce emissions in 2020 to about 172 MMTCO₂E. The cap for the sources covered by the second element would be set at about 157 MMTCO₂E in order to meet the 2020 emissions limit (427 MMTCO₂E) established pursuant to AB 32. The derivation of the level of the cap is predicated on obtaining 7.2 MMTs from other elements of Alternative 5 (see Table 2.7-1 for more detail).

The final element of Alternative 5 would be the application of an emissions fee on transportation fuels, residential and commercial fuels and on fuels used by smaller industrial sources not subject to the cap. (See Alternative 4 for more detail on the emission fee approach.) Collectively, these sources are projected to emit about

229 MMTCO₂E in 2020 in ARB's most recent baseline forecast. Measures included in Alternative 1 and from an advanced clean cars program are estimated to reduce emissions in 2020 to about 204 MMTCO₂E. Under these elements, an emissions fee of \$50 per MT would be assumed, and is estimated to produce reductions on the order of 1.7 percent – about 3.4 MMTCO₂E in 2020. Table F-12 in Appendix F of the Cap-and-Trade Regulation statement of reasons estimated that a \$60 per MT allowance price would produce a 2 percent decrease in gasoline use (ARB 2010a). Based on this information, an estimated reduction of 1.7 percent was made for a \$50 per MT fee. A similar percent reduction was assumed for all transportation fuels and for natural gas usage, as well.

The emission reductions and remaining emissions estimated from implementing Alternative 5 are shown below in Table 2.7-1.

Table 2.7-1 Summary of Emission Effects from Alternative 5

Strategy Category	2020 Emissions MMTs(1)	Emission Reductions MMTs - 2020	Remaining Emissions in 2020
Direct Regulation (Advanced Clean Cars)		3.8	N/A
Sources in Cap & Trade	182	15	167
Fuels Subject to Fees	204	3.4	197(2)
Remaining Sources(3)	63	None	63
Totals	449	22.2	427

Notes:

¹ After measures included in Alternative 1 are accounted for and rounded to no more than three significant figures.

² Includes reductions from direct regulations, Advanced Clean Car Program.

³ Includes high GWP gases, Agriculture and Forestry.

Collectively, the elements in Alternative 5 are designed to achieve the 2020 emission target set by AB 32.

Alternative 5 Impact Discussion

Objectives

Alternative 5 would be expected to be able to meet the fundamental objective of reaching the 2020 emissions reduction target. The Proposed Scoping Plan Cap-and-Trade Program was designed to reduce GHG emissions by 18 MMTCO₂E, so achieving a contribution of 15 MMTCO₂E in this Alternative would also be feasible. The advanced clean car program has received initial evaluation by ARB sufficient to support the feasibility of a 3.8 MMTCO₂E contribution. The application of a carbon fee to transportation fuels is estimated to secure a 3.4 MMTCO₂E contribution, which is only 1.5 percent of the current emissions from that sector. It would be reasonable to expect that this combination of measures could achieve the 2020 GHG reduction target.

The achievement of other objectives of the Proposed Scoping Plan would also be generally expected by Alternative 5, because it uses a combination of market-driven GHG reduction strategies and direct regulations. For instance, it would reduce fossil fuel use through encouragement of decreased fuel consumption resulting from the advanced clean car program and fuel fee and from fuel switching in compliance responses to the Cap-and-Trade Program. Emissions reductions would be generally ensured by the establishment of the mandatory, declining cap for the majority of the reductions. Reductions would be expected to occur in the most cost-effective manner, because the cost of reductions or the cost of allowances that can be purchased are determined by the market under the Cap-and-Trade component, and the advanced clean car program uses performance standards that allow flexibility in specific strategies to achieve them. Leakage would be minimized by the market-driven pricing of carbon and the availability of lower cost offsets for a portion of the reductions to help manage allowance prices from the Cap-and-Trade Program. Limiting the carbon fee to transportation fuel would minimize leakage, as well, compared to levying a fee or tax on industrial sectors. However, with a pass-through of a transportation fuel fee, fuel costs for consumers would increase, which could increase cost burden on disadvantaged communities. Many co-benefits would occur with an effective market-driven GHG reduction program and advanced clean car program, such as energy conservation and efficiency, reduced fossil fuels use, reduction of regional co-pollutants, and job-forming economic opportunities related to facility modifications and development of energy efficiency and vehicle technologies.

Environmental Impacts

Alternative 5 focuses on a combination approach to meeting the 2020 GHG reduction target, by drawing elements of the strategy from Alternatives 2, 3, and 4. The Cap-and-Trade Program drawn from Alternative 2 is designed to reduce GHG emissions sufficiently to achieve a 15 MMTCO₂E reduction by 2020, including compliance responses by covered entities and use of offsets according to specified protocols. For this component of the alternative, compliance responses by covered entities could include upgrading equipment, switching to lower intensity carbon fuels, implementing maintenance and process changes at existing facilities, and reducing operations of carbon-intense facilities in favor of increased operations of more carbon-efficient facilities. Implementation of carbon offset programs under specified protocols could also occur. The four offset protocols proposed as part of the Scoping Plan's Cap-and-Trade Program would also be applicable for this alternative: Ozone Depleting Substances (ODS), Livestock, Urban Forest, and Forest. Construction-related activities associated with these compliance responses could occur. The general approach, covered entities, and offset protocols of a Cap-and-Trade Program under Alternative 5 would be reasonably expected to be similar to the Proposed Scoping Plan's Cap-and-Trade Program, except that the reduction target would be decreased from 18 to 15 MMTCO₂E.

This Alternative includes a source-specific emissions regulation through the adoption of the advanced clean car program currently being evaluated by ARB. An assessment of the program has been developed to evaluate its feasibility and emissions reduction

expectations (U.S. EPA, U.S. DOT, and ARB 2010). By regulation, ARB would seek to reduce GHG emissions by 3.8 MMTCO₂E. The program would establish more stringent tailpipe and GHG emission standards for new passenger vehicles. Combining the control of criteria pollutants and GHG emissions into a single coordinated package of standards is a new approach to ARB's motor vehicle standards. The new approach also includes efforts to support and accelerate the numbers of plug-in hybrids and zero-emission vehicles in California. Compliance responses to the program would involve improved engine and transmission technologies, vehicle technologies, mass reduction, electrification and accessory technologies, and electric drive technologies including hybrid technologies. The improvements in vehicle technology would result in greater use of electricity and fuel cells for powering vehicles and construction of Alternative fueling stations to serve plug-in hybrid, battery electric vehicles, and fuel-cell vehicles.

The third component of Alternative 5 would be a carbon fee levied on transportation fuels. The compliance responses to this measure would be expected to include reduced consumption of fossil fuels and fuel switching away from the affected transportation fuels.

The environmental impacts of this combination of strategies would be similar to the conclusions presented in Alternatives 2, 3, and 4 for the analogous components in Alternative 5. Rather than repeat the previously presented impact discussions for the Cap-and-Trade Program (please refer to Alternative 2), direct regulation strategies (please refer to Alternative 3), and carbon fee measure (please refer to Alternative 4), a summary discussion will be provided for the environmental impacts of the specific features of this Alternative not emphasized in the earlier.

The environmental effects of Alternative 5 would primarily involve a combination of the potential impacts of compliance responses to a Cap-and-Trade Program and the impacts of the Advanced Clean Car Program. The fee on transportation fuels in this Alternative would not be expected to result in significant environmental impacts, because the compliance response would consist of fuel switching, probably using facilities and infrastructure that are already in place or would need relatively minor modification. The environmental effects of a Cap-and-Trade Program are related primarily to compliance responses that involve potential construction-related impacts to sensitive resources, if they are present at construction sites, along with the remote possibility of localized air quality impacts, if covered entities shifted production to more carbon-efficient units, or of land use plan conflict or avoided forest conversion where local plans call for development (see discussion under Alternative 2). The potential environmental effects of the advanced clean car program component of Alternative 5 relate primarily to how to serve the changes in fuel sources for vehicles and the greater use of batteries and fuel cells. Construction of new or modified fueling stations could result in environmental impacts to resource-related issues, such as biological resources, cultural resources, geology and soils, hazardous materials, and hydrology and water quality, if sensitive resources are present on or near the construction locations. If these resources were present and adversely affected, the impact may be potentially

significant, similar to the construction-related conclusions for facility modifications expected in response to other GHG reduction measures. Land use related impacts would likely be less than significant, because the location and design of fueling stations would need to comply with local land use plans and zoning. Therefore, less-than-significant aesthetic, agriculture and forest resource, noise, socioeconomics, traffic/transportation, public services, utilities, recreation, and land use and planning effects would be expected.

Air quality, GHG, and energy demand impacts of the advanced clean car program would be beneficial, because the program seeks to combine strategies that control and reduce criteria pollutants and GHG together, which would also lead to reduced fossil fuel use and reduced energy demand for the affected motor vehicles. Propulsion would rely more on power from the electricity grid, which would be a beneficial fuel switch for air quality and GHG emissions as the renewable portfolio of electricity generation continues to transition toward the 33-percent RPS. The increased use of vehicle batteries and fuel cells would increase their production, storage, recycling, and ultimately disposal. An increase of batteries and fuel cells in the waste stream could result in potential hazardous materials and water quality effects; however, regulations exist for handling of hazardous materials and protection of water quality from waste disposal facilities and ARB is also considering specific regulatory requirements for further protection in the advanced clean car program design.

2.8 Comparison of the Proposed Scoping Plan, Project Alternatives, and their Environmental Tradeoffs

Each of the alternatives discussed in Section 2.0 of the FED Supplement possess environmental advantages and disadvantages. These advantages and disadvantages were discussed in more detail in the subsections devoted to each alternative. A summary of the preceding discussions is presented below to help the reader understand the most important differences among the alternatives, in terms of achievement of environmental objectives or potential for significant environmental impacts.

With the exception of Alternative 1, No-Project, all of the project alternatives are designed to cover the 22 MMTCO₂E reduction shortfall needed to achieve the AB 32-mandated GHG reduction target of 1990 levels by 2020 that would occur if the Proposed Scoping Plan was not implemented. The likelihood of reaching this target would be high for Alternative 2, Cap-and-Trade, and Alternative 5, Combined Strategy, because they include a market-based approach for covered sectors shown to have technologically feasible ways to reduce GHG and the opportunity to use offsets or purchase allowances from others to enhance cost-effectiveness through flexibility and choice of reduction strategies. Because of the potential for substantial leakage, there is a reduced likelihood that Alternative 3, Direct Source-Specific Regulation, or Alternative 4, Carbon Fee or Tax, would achieve the target. Both strategies could be effective in reducing in-state GHG emissions, but could cause adverse GHG emissions impacts elsewhere in unregulated states, if substantial shifting of operations out-of-state

occurred. All the action alternatives would create at least some benefits related to reduced GHG emissions, reduced regional criteria co-pollutants and TACs, and energy demand, compared to existing conditions.

Because Alternative 1, No-Project Alternative, does not reach the reduction target mandated by AB 32, it would not be environmentally advantageous compared to the Proposed Scoping Plan or the other action alternatives. Already implemented or ongoing measures in Alternative 1 include the sources of a major proportion of the potential significant environmental impacts of the full Proposed Scoping Plan, specifically utility-scale renewable energy projects and the high-speed rail project. Therefore, Alternative 1 would incur the majority of the environmental impacts of the Proposed Scoping Plan, but would not achieve the GHG reduction benefit needed to comply with AB 32.

Alternative 2, which uses a Cap-and-Trade Program to achieve the 22 MMTCO₂E reduction shortfall, would result in environmental impacts similar to the Proposed Scoping Plan, where Cap-and-Trade is also a central feature, and also somewhat similar to Alternative 5, Combined Approach (including Cap-and-Trade). The Cap-and-Trade Program offers an effective approach for achieving the AB 32 goals, so GHG-reduction benefits of Alternative 2 would be similar to the Proposed Scoping Plan. Potential significant environmental impacts are identified for Alternative 2, including the remote potential for localized air quality impacts, construction-related impacts of covered entities' compliance responses, and environmental effects of certain elements of the offset protocols (such as construction impacts related to livestock digesters and possible local land use planning conflicts from avoided forest conversion where local plans call for development). Compared to other action alternatives, the Proposed Scoping Plan and Alternative 2 present environmental trade-offs, because the Cap-and-Trade Program compliance responses and offset protocols could result in certain significant environmental impacts that other alternatives would not cause, while the Proposed Scoping Plan's and Alternative 2's effectiveness in reducing GHG and creating attendant air quality co-benefits would be stronger than Alternative 3 (Direct Regulation) or 4 (Carbon Fee or Tax), because of the lesser risk of leakage. Also, the smaller risk of leakage means that Proposed Scoping Plan and Alternative 2 would not have the potential for out-of-state environmental impacts, as either Alternative 3 or 4 would have.

Alternative 3, the source-specific regulatory approach, would result in some environmental impacts similar to the Proposed Scoping Plan, such as the construction-related environmental effects where compliance responses by industrial and electricity sources include changes or additions to facilities where sensitive resources may be present. Alternative 3 could result in significant additional environmental impacts from the potential for construction of electricity generation facilities using less carbon-intensive fuels than coal (such as combined-cycle, natural gas power plants). If new power plants were built, the impacts would likely take place outside California, because the siting, permitting, and construction of new electricity generation facilities in the state would be challenging in time to help achieve the

2020 target. Also, the advanced clean car program could result in environmental impacts related to construction of fueling stations and the increased use and ultimately disposal of batteries and fuel cells. The direct-regulation approach offers an effective strategy for reducing in-state GHG emissions, but may not achieve the AB 32 reduction target, because of the potential for substantial leakage. Compared to the Proposed Scoping Plan and other action alternatives, Alternative 3 presents environmental trade-offs, because the substantial leakage risk could cause out-of-state impacts not expected from the Proposed Scoping Plan or Alternatives 2 and 5; however, Alternative 3 does not include the use of offsets and their associated environmental impacts that occur with the Proposed Scoping Plan, Alternative 2, and Alternative 5. Alternative 3's effectiveness in reducing GHG and creating attendant air quality co-benefits would be less than the Proposed Scoping Plan, Alternative 2 (Cap-and-Trade), and Alternative 5 (Combined Approach), and similar to Alternative 4 (Carbon Fee or Tax), because of the risk of leakage in response to direct regulations.

Alternative 4, the carbon fee or tax approach, would also result in some environmental impacts similar to the Proposed Scoping Plan, such as the construction-related environmental effects where compliance responses by industrial and electricity sources include changes or additions to facilities where sensitive resources may be present. The carbon fee or tax approach offers a potentially effective strategy for reducing GHG emissions, but administrative challenges and legal constraints exist for fees and taxes in California that could constrain ARB's ability to implement such a program. Compared to the Proposed Scoping Plan and other action alternatives, the impacts of Alternative 4 would be similar to the Proposed Scoping Plan, Alternative 2, and Alternative 5 in most ways, except that Alternative 4 does not include the use of offsets with their associated environmental impacts. Alternative 4's effectiveness in reducing GHG and creating attendant air quality co-benefits would be similar to the Proposed Scoping Plan, Alternative 2 (Cap-and-Trade), and Alternative 5 (Combined Approach), and better than Alternative 3 (Direct Regulation), because of Alternative 3's risk of leakage in response to direct regulation.

Achievement of the Proposed Scoping Plan's project objectives varies among the alternatives, as well. Table 2.8-1 presents a summary of the likelihood of meeting the objectives presented in Section 1.2. The table represents a general summary, supported by analysis and discussion in the 2008 Scoping Plan FED, Cap-and-Trade FED, and this FED Supplement.

Table 2.8-1 Comparative Likelihood That Alternatives Achieve Project Objectives

KEY:

L (low) = No or low likelihood to achieve objective

M (medium) = Medium likelihood of achieving objective

H (high) = High likelihood to achieve objective

OBJECTIVES	ALTERNATIVES	Proposed Scoping Plan	# 1 No Project	# 2 Cap-and-Trade	# 3 Direct Regul.	# 4 Carbon Fee/Tax	# 5 Combo.
	1. Achieve reductions	H	L	H	M	M	H
	2. Reduce fossil fuel use	H	L	H	H	H	H
	3. Link with partners	H	L	H	L	L	H
	4. Enforceable, amendable program	H	L	H	H	H	H
	5. Ensure emissions reductions	H	L	H	H	M	H
	6. Technologically feasible, cost effect.	H	L	H	L	L	H
	7. Avoid disproportionate impacts	H	L	H	H	M	H
	8. Credit early action	H	L	H	H	L	H
	9. Complement existing air standards	H	L	H	H	H	H
	10. Consider a broad range of benefits	H	L	H	H	H	H
	11. Minimize administrative burden	H	L	H	M	H	H
	12. Minimize leakage	H	L	H	L	L	H
	13. Weigh relative emissions	H	L	H	H	H	H
	14. Achieve real emissions reductions	H	L	H	H	H	H
	15. Achieve incremental reductions over	H	L	H	H	H	H
	16. Complement direct measures	H	L	H	H	H	H
	17. Consider emissions impacts	H	L	H	H	H	H
	18. Prevent increases in other emissions	M	L	M	H	M	M
	19. Capture co-benefits	H	L	H	H	H	H
20. Avoid duplication	H	L	H	H	H	M	

3.0 REFERENCES CITED

- ARB. 2008. Discussion Draft - Climate Change Scoping Plan – A Framework for Change. June 2008.
- ARB. 2009. Climate Change Scoping Plan – A Framework for Change. Endorsed by ARB, December 2008. (Including the Functional Equivalent Document, Appendix J, and response to comments, May 2009).
- ARB. 2010a. Initial Statement of Reasons for the California Cap on GHG Emissions and Market-Based Compliance Mechanisms. October 28.
- ARB. 2010b. Functional Equivalent Document Prepared for the California Cap on GHG Emissions and Market-Based Compliance Mechanisms - Appendix O of the Initial Statement of Reasons. October 28.
- ARB. 2010c. Greenhouse Gas Reductions from Ongoing, Adopted, and Foreseeable Scoping Plan Measures, http://www.arb.ca.gov/cc/inventory/data/tables/reductions_from_scoping_plan_measures_2010-10-28.pdf. Updated October 28, 2010. Accessed May 18, 2011.
- ARB. 2010d. California GHG Emissions Forecast (2008 – 2020). http://www.arb.ca.gov/cc/inventory/data/tables/2020_ghg_emissions_forecast_2010-10-28.pdf. Updated October 10, 2010. Accessed May 20, 2011.
- ARB. 2010e. Greenhouse Gas Emission Forecast for 2020: Data Sources, Methods, and Assumptions - AB 32 Baseline Forecast. http://www.arb.ca.gov/cc/inventory/data/tables/2020_forecast_methodology_2010-10-28.pdf. October 28, 2010. Accessed May 17, 2011.
- Association of Irrigated Residents, et al. v. California Air Resources Board, et al.*, 2011. San Francisco Superior Court Case No. CPF-09-509562, Statement of Decision of Judge Ernest Goldsmith at pp. 27-32 (March 18, 2011). However, the Court did uphold the FED's impacts analysis. Id. at pp. 22-27.
- Avi-Yonah, Reuven, and David M. Uhlmann. 2009. "Combating Global Climate Change: Why a Carbon Tax is a Better Response to Global Warming Than Cap and Trade," *Stanford Environmental Law Journal* (February 2009).
- British Columbia, Province of. 2008. British Columbia Climate Action Plan, webpage summary. http://www.gov.bc.ca/forthecord/climate/cp_environment.html?src=/environment/cp_environment.html, Accessed April 29, 2010
- Burtraw, Dallas, and Byron Swift. 1996. "A New Standard of Performance: An Analysis of the Clean Air Act's Acid Rain Program," *Environmental Law Review*, 26: 10411–10421. CalEPA. 2011. Unpublished Comparison of Marginal Carbon Fee to Cap-and-Trade. On file with authors. April 6, 2011.

- California Energy Commission (CEC). 2007. Integrated Energy Policy Report. CEC-100-2007-008-CMF
- California Energy Commission (CEC). 2009. Integrated Energy Policy Report. CEC-100-2009-003-CMF
- CalRecycle. 2010. California's 2009 Per Capita Disposal Rate. Updated July 7, 2010. <http://www.calrecycle.ca.gov/LGCentral/GoalMeasure/DisposalRate/2009/default.htm>. Accessed April 19, 2011.
- Congressional Budget Office (CBO). 2008. Policy Options for Reducing CO2 Emissions. <http://www.cbo.gov/doc.cfm?index=8934>. February, 2008. Accessed June 5, 2011.
- Convery, Frank . 2009. "Origins and Development of the EU ETS," Environmental and Resource Economics Volume 43, Number 3 (Spring 2009).
- Daley, Gemma. 2011. *Australia to Set Carbon Tax Next Year Ahead of Trading Plan*. <http://www.bloomberg.com/news/2011-02-24/australia-to-set-tax-on-carbon-emissions-starting-july-2012-gillard-says.html> . February 23. Accessed April 19, 2011.
- Drury, Richard, Michael Belliveau, J. Scott Kuhn, and Shipra Bansal. 1999. "Pollution Trading and Environmental Injustice: Los Angeles 'Failed Experiment in Air Quality Policy,'" Duke Environmental Law & Policy Forum Volume 9, Number 231 (Spring 1999).
- EAAC (Economic and Allocation Advisory Committee). "Allocating Emissions Allowances Under a California Cap-and-Trade Program" Recommendations to the California Air Resources Board and California Environmental Protection Agency, March 2010.
- Ellerman et al. 2010. *Pricing Carbon: The European Union Emissions Trading Scheme*. Cambridge University Press.
- Ellerman et al. 2000. *Markets for Clean Air: The U.S. Acid Rain Program*. Cambridge University Press.
- Environmental Justice Advisory Committee (EJAC) on the Implementation of the Global Warming Solutions Act of 2006. 2008. *Recommendations and Comments on the Proposed Scoping Plan*. December. pp. 10-14.
- European Commission Climate Action. 2011. Emissions Trading System (EU ETS) FAQ. http://ec.europa.eu/clima/faq/ets/index_en.htm. Accessed May 12, 2011.

- Florida Governors Action Team on Energy and Climate Change. 2008. *Design Recommendations for the WCI Regional Cap-and-Trade Program*, September 23, 2008. Downloaded <http://www.flclimatechange.us/ewebeditpro/items/O12F16348.pdf>, downloaded on April 21, 2011
- Grubb et al. 2011. Ten insights from the EU Emissions Trading Scheme: *With Reference to Carbon Pricing in Australia*. Climate Strategies. <http://www.climatestrategies.org/research/our-reports/category/60/319.html>
- Guerin et al. 2011. Strengthening the European Union Climate and Energy Package: *To build a low carbon, competitive and energy secure European Union*. Institute for Sustainable Development and International Relations (IDDRI). Climate Strategies. <http://www.climatestrategies.org/research/our-reports/category/57/326.html>
- IWGSCC. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. Interagency Working Group on Social Cost of Carbon, United States Government. <http://www.epa.gov/oms/climate/regulations/scc-tsd.pdf>
- Market Advisory Committee (MAC). 2007. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California*. ARB-1000-2007-007. June 30.
- McAllister, Lesley. 2010. "The Enforcement Challenge of Cap-and-Trade Regulation," *Environmental Law* (Fall 2010).
- Murray, Brian C.; Mazurek, Jan V.; Profeta, Timothy H. 2011. Examination of the Carbon Fee Alternative for the State of California. April 26, 2011.
- Niemeier D., Gould G., Karner A., Hixson M., Bachman B., Okma C., Lang Z. and Heres Del Valle D., 2008. Rethinking downstream regulation: California's opportunity to engage households in reducing greenhouse gases. *Energy Policy* 36(9), 3436-3447
- Plumer, B. 2010. "B.C.'s Carbon-Tax Experiment Seems to Be Working." *The New Republic*. July 27, 2010. <http://www.tnr.com/blog/the-vine/76595/bcs-carbon-tax-experiment-seems-be-working> .
- Regional Greenhouse Gas Initiative. 2007. Overview of RGGI CO2 Budget Trading Program. October 2007.
- Resources for the Future (RFF). 2007. *Assessing U.S. Climate Policy options: A report summarizing work at RFF as part of the inter-industry U.S. Climate Policy Forum*. http://www.rff.org/News/Features/Documents/CPF_COMPLETE_REPORT.pdf.

- Ringquist, Evan J. 2011. *Trading Equity for Efficiency in Environmental Protection? Environmental Justice Effects from the SO₂ Allowance Trading Program*. Social Science Quarterly, Volume 92, Number 2, June 2001.
- South Coast Air Quality Management District (SCAQMD). 2011. Regional Clean Air Incentives Market (RECLAIM). <http://www.aqmd.gov/reclaim/reclaim.html>. Accessed April 19, 2011.
- State Water Resources Control Board (SWRCB). 2010. Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling. Adopted May 4, 2010.
- Stavins, R. N. 2001. "Experience with Market-Based Environmental Policy Instruments," Resources for the Future (November 2001).
- Stavins, R. N. 2007. "Faculty Research Working Paper Series: A U.S. Cap-and-Trade System to Address Global Climate Change," Harvard University, John F. Kennedy School of Law (October 2007).
- Stavins, R. N. 2008. "Addressing Climate Change with a Comprehensive U.S. Cap-and-Trade System," Oxford Review of Economic Policy Volume 24, Number 2 (2008): 298-321.
- Tietenberg, Tom. 2006. "Tradable Permits in Principle and Practice," 14 Pennsylvania State Environmental Law Review, 251.
- USEPA. 2005. *The Acid Rain Program and Environmental Justice: Staff Analysis*. Office of Air and Radiation, Clean Air Markets Division. September, 2005.
- USEPA. 2009. NO_x Budget Trading Program - Basic Information. <http://www.epa.gov/airmarkets/progsregs/nox/docs/NBPbasicinfo.pdf>. May 28, 2009. Accessed April 19, 2011.
- USEPA. 2011a. Acid Rain Program. <http://www.epa.gov/airmarkets/progsregs/arp/basic.html#princip>. Accessed April 19, 2011.
- USEPA. 2011b. NO_x Budget Trading Program/NO_x SIP Call, 2003-2008. <http://www.epa.gov/airmarkets/progsregs/nox/sip.html>. Accessed April 19, 2011.
- USEPA, USDOT, and ARB. 2010. Interim Joint Technical Assessment Report: Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2017-2025. September 2010.