

**To:** California Air Resources Board

**From:** Judson Jaffe and Jonathan Borck, Analysis Group\*

**Date:** October 21, 2008

**Re:** Comments on the Economics Analysis Supplement to the Draft Scoping Plan\*\*

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## **I. Executive Summary**

**The California Air Resources Board (CARB) should be commended for seeking to evaluate its Scoping Plan's economic impact. Economic analysis can play two valuable roles in supporting AB 32's implementation.** First, and most importantly, it can inform policymakers about how best to design policies to minimize the cost of achieving California's objectives. Second, it can inform policymakers and the public about the likely costs of those policies.

**Unfortunately, CARB's economic analysis falls far short with respect to both roles.**

- **First, CARB's analysis cannot be used to determine whether the Scoping Plan reflects the most cost-effective means of reducing greenhouse gases (GHGs). Its analysis also fails to address key questions about the optimal design of emission reduction policies. As a result, with this analysis, CARB has unfortunately missed an important opportunity to inform policy design through sound economic analysis.** One of CARB's explicit goals for its analysis is to use it to "refine the overall program design."<sup>1</sup> Yet, CARB's analysis focuses only on estimating the aggregate economic impact of one set of emission reduction policies: those identified in its Scoping Plan. It does not compare the cost of the policies included in the Plan with alternative means of achieving AB 32's target. It also does not address whether particular modifications to the Plan's policies could reduce the cost of meeting AB 32's target. As a result, CARB's economic analysis cannot be used to determine whether its Scoping Plan reflects the most cost-effective means of reducing GHGs. More generally, the analysis provides little guidance to policymakers faced with important policy design choices. We address these critical problems in Section II.

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\* Judson Jaffe is a Vice President at Analysis Group. He has written and presented extensively on the costs of climate policy and on the economic implications of alternative policy design choices. Prior to joining Analysis Group, Mr. Jaffe served on the staff of the White House Council of Economic Advisers, where he provided economic expertise relating to various environmental and energy policy areas, including climate policy. He received an M.Phil. in Economics from Cambridge University, and an A.B. *summa cum laude* in Environmental, Science, Public Policy, and Economics from Harvard University. Jonathan Borck is an Associate at Analysis Group. In November, Mr. Borck will receive a Ph.D. in Public Policy from Harvard University, and he previously received a B.S. *summa cum laude* in Civil Engineering from Rice University. At Harvard, he taught undergraduate courses on the economic analysis of environmental policy. These comments were prepared at the request of the AB 32 Implementation Group. However, while the AB 32 Implementation Group provided funding for the development of these comments, they reflect independent analysis by Analysis Group, and do not necessarily reflect the views of the AB 32 Implementation Group or any of its members.

\*\* This memo provides comments on the Economic Analysis Supplement that CARB released in September 2008. While we have not had an opportunity to review fully the updated analysis that accompanied CARB's Proposed Scoping Plan, where we are aware of updates to CARB's analysis that affect our comments, we mention them here.

<sup>1</sup> Climate Change Draft Scoping Plan, June 2008 Discussion Draft, p. ES-4.

- **Second, CARB’s analysis cannot be considered a reliable or economically sound assessment of the Scoping Plan’s economic impact.** A sound policy analysis assesses a policy’s *incremental* impact relative to a “baseline” or “business-as-usual” scenario, which reflects how the economy would evolve without that policy. In so doing, such an analysis isolates a policy’s *incremental economic effects above and beyond what would occur even in the policy’s absence*. Yet, CARB analyzes the Scoping Plan’s impact relative to a baseline scenario that is arbitrarily defined and internally inconsistent. As a result, while CARB recognizes that some of the Scoping Plan’s policies will significantly increase energy prices (for example, an 11% increase in electricity prices and an 8% increase in natural gas prices) and will impose costs on the order of billions of dollars per year, CARB’s analysis offsets these clear economic impacts by giving the Scoping Plan credit for various cost-saving energy-efficiency improvements. Yet, if the opportunities for these cost-saving energy-efficiency improvements are in fact real, many of them likely will occur even without the Scoping Plan’s implementation (i.e., they will occur even in the baseline). CARB has not made any serious effort to distinguish which of these cost-saving energy-efficiency opportunities should truly be attributed to the Scoping Plan, and which would occur even in the Plan’s absence. Thus, it cannot credibly claim that the Scoping Plan’s significant costs and impacts on energy prices will be offset by the energy-efficiency improvements that it believes are only possible through the Scoping Plan. This renders CARB’s analysis unreliable and unsound as an assessment of the Scoping Plan’s true *incremental* impact on California’s economy. We address these critical problems in Section III.

**CARB’s analysis also suffers from several other significant flaws and omissions that render it unreliable.** These flaws and omissions, which we elaborate on in Section IV, include:

- CARB does not account for important interactions among the policies that it analyzes, leading it to underestimate the cost of achieving AB 32’s 2020 target by double counting certain low-cost emission reductions that are available to meet that target
- CARB does not acknowledge substantial uncertainty in its cost estimates, and the implications of that uncertainty for optimal policy design
- CARB does not address the Scoping Plan’s substantial upfront costs, and the near-term demands that it will place on household budgets and businesses’ capital budgeting
- CARB’s analysis of the Scoping Plan’s competitiveness impacts is simplistic and flawed, as CARB fails to consider the significant variation in climate policy’s impacts across economic sectors, and the impacts on the most energy-intensive sectors of California’s economy

**Finally, looking forward, Section V describes how CARB could refine its analysis to address some of the fundamental flaws described above and to offer more policy-relevant insight.** These recommendations focus on:

- Evaluating the relative cost of alternative policy approaches, and particularly evaluating the implications of greater reliance on a cap-and-trade program
- Developing more rigorous and informative assessments of competitiveness impacts
- Developing better estimates of the Scoping Plan’s overall economic impact

## **II. CARB's analysis does not address key questions about policy design and cannot be used to determine whether its Scoping Plan is cost-effective**

**Despite CARB's goal of using its economic analysis to help "refine the overall program design," CARB's analysis provides very few policy-relevant insights.<sup>2</sup>** Consequently, CARB's analysis is of limited help to policymakers who must decide not whether to create a GHG reduction program – a decision that has already been made – but rather what combination of GHG reduction strategies would best achieve California's goals.

**CARB's current analysis does not and cannot address whether the policies proposed in the Scoping Plan represent the most cost-effective means of achieving California's 2020 emissions target.** To be cost-effective, the Scoping Plan must offer the least costly means of achieving California's 2020 target. While CARB attempts to assess its Plan's aggregate economic impact, it does not examine whether there are alternative ways of achieving the same 2020 emissions target at lower cost or greater benefit to the economy. These alternatives include relying more heavily on the cap-and-trade program or relaxing certain GHG reduction strategies while expanding others. Consequently, CARB's analysis cannot be used as a basis for determining whether its Scoping Plan represents a cost-effective portfolio of emission reduction policies.

**While CARB recognizes the merits of a cap-and-trade program, it has not evaluated whether greater reliance on its proposed cap-and-trade program would reduce the cost of its Scoping Plan.** CARB repeatedly recognizes the benefits of a cap-and-trade program, noting that it has the potential to realize "substantial cost savings" because it "take[s] advantage of heterogeneity" of emissions-reduction opportunities among firms "to minimize costs."<sup>3</sup> CARB explains that a cap-and-trade program "allows covered sources to find the least expensive way to comply" with GHG emissions limits.<sup>4</sup> CARB even notes that "[c]ompared to direct regulations alone, a broad-based cap-and-trade program is likely to yield additional opportunities for lower cost reductions, thereby reducing the cost of achieving the overall emission target."<sup>5</sup> Despite these strong endorsements, however, CARB has not offered any analysis of the relative economic cost of obtaining emission reductions from its various narrowly targeted policies, as opposed to relying more heavily on a broad cap-and-trade program to achieve needed reductions. CARB notes that it is difficult to compare these alternative approaches.<sup>6</sup> However, even if a definitive quantitative comparison is not feasible, economic analysis can and should be used to offer important insights about the relative cost of the two approaches so that policymakers can make informed decisions in designing and implementing the Scoping Plan (see Section V).

**While CARB has not performed a sufficient evaluation of the issue, CARB's analysis strongly suggests that greater reliance on a cap-and-trade program would reduce the Scoping Plan's cost.** For instance, the Scoping Plan's 33% Renewable Portfolio Standard (RPS) offers an example of a policy that CARB's own analysis suggests is far more costly than relying

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<sup>2</sup> Climate Change Draft Scoping Plan, June 2008 Discussion Draft, p. ES-4.

<sup>3</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 6.

<sup>4</sup> Climate Change Draft Scoping Plan, June 2008 Discussion Draft, p. 16.

<sup>5</sup> Climate Change Draft Scoping Plan, June 2008 Discussion Draft, Appendix C, p. C-16.

<sup>6</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 7.

more heavily on a cap-and-trade program. CARB estimates that the average cost of GHG reductions under the RPS is \$133 per ton, 13 times greater than CARB's estimate of the cost of achieving additional emission reductions from the cap-and-trade program, which is \$10.<sup>7</sup>

**Similarly, CARB does not evaluate whether the Scoping Plan's cost could be reduced by expanding some of its proposed policies while pursuing fewer reductions from others.** CARB analyzes the aggregate cost of numerous greenhouse gas reduction policies. But it does not provide any information about how the Plan's overall cost would change if any of those policies were expanded or relaxed. For example, CARB projects that measure E-2, the Combined Heat and Power (CHP) initiative, will result in substantial cost savings; yet CARB also notes that the use of CHP could be much greater than proposed in the Plan.<sup>8</sup> Unfortunately, CARB does not assess whether the Scoping Plan's overall economic cost could be reduced by promoting CHP to a greater extent in order to achieve additional emission reductions that would otherwise have to come from other, more costly policies.

**CARB's analysis does not recognize the substantial uncertainty in emission reduction costs and the relative merits of alternative policies in light of this uncertainty.** While analysts can debate the best estimates of the costs of particular emission reduction measures, none should question that those costs are highly uncertain. For example, the costs of energy-efficiency measures depend on technology costs and future fuel prices, both of which are subject to significant uncertainty. Importantly, given this uncertainty, a cap-and-trade program has substantial advantages over more narrowly targeted prescriptive regulations. If the costs of certain emission reduction measures turn out to be greater than anticipated, sources covered by a cap-and-trade program can adjust to rely more heavily on other, less costly measures. By contrast, more narrowly targeted prescriptive regulations will lock California in to emission reduction measures that may turn out to be far more costly than anticipated. CARB's analysis fails to recognize this important advantage of a cap-and-trade program and its implications for the relative cost-effectiveness of alternative regulatory approaches.

**CARB's analysis provides no insight into the economic impact of many other consequential policy choices, such as decisions regarding offset use in a cap-and-trade program.** In the debate about California climate policy, some have suggested two potential limits on the use of offsets in a cap-and-trade program: a quantitative limit on the number of offsets that each regulated firm can use, and a geographic limit on the location of offset projects. CARB recognizes that restricting offsets could raise the overall costs of a cap-and-trade program.<sup>9</sup> Yet, despite the fact that other studies have sought to evaluate the economic implications of

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<sup>7</sup> CARB's Appendix I of its Economic Analysis Supplement misrepresents the per-ton cost of emission reductions from the RPS because it compares the cost of increasing renewable generation from 20% to 33% with the emission reductions associated with increasing renewable generation from baseline levels (about 10%) to 33%. This leads CARB to substantially understate the per-ton costs of emission reductions from increasing renewable generation, which CARB elsewhere recognizes to be \$133 per ton. Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 13 and Appendix I-7; and Climate Change Draft Scoping Plan, Measure Documentation Supplement, p. 28.

<sup>8</sup> Climate Change Draft Scoping Plan, June 2008 Discussion Draft, Appendix C, p. C-73 – C-74.

<sup>9</sup> CARB notes that "[h]igh quality offset projects located outside California can help lower compliance costs in California." Climate Change Draft Scoping Plan, June 2008 Discussion Draft, p. 44.

alternative offset policies,<sup>10</sup> in its own analysis, CARB provides no estimate of the costs of potential limits on the use of offsets. Thus, CARB's analysis offers policymakers little guidance regarding the effects of such restrictions on offset use.

### **III. CARB's assessment is unreliable and unsound because it measures the Scoping Plan's impact against an arbitrarily defined and internally inconsistent baseline scenario**

**A policy's impact depends on how that policy will change the behavior of firms and households relative to a baseline (or business-as-usual) scenario that reflects what would have occurred in the absence of that policy.** Consequently, a flawed forecast of this baseline scenario will render conclusions about a policy's impact unreliable. As the U.S. EPA notes in its *Guidelines for Preparing Economic Analyses*, "specification of baseline conditions can have profound influence on the measurement and interpretation of analytic results."<sup>11</sup>

**CARB commits two fundamental errors in characterizing the baseline scenario that cause it to significantly underestimate the cost of the Scoping Plan.** First, CARB is inconsistent in its decisions about whether to treat existing state policies as part of the baseline or instead as part of the Scoping Plan's impact. Second, CARB has adopted a baseline that is arbitrarily defined and internally inconsistent given its assumptions about future energy prices.

**Because CARB fails to develop an appropriate baseline scenario, its analysis cannot be considered a sound assessment of the Scoping Plan's incremental economic impact.**

#### **A. CARB makes inconsistent decisions about whether to treat existing policies as part of the baseline scenario, or instead as part of the Scoping Plan's impact**

**In developing its baseline scenario, CARB fails to include the effects of some existing policies that will be implemented even without the Scoping Plan. Because they would be implemented even if the Scoping Plan were not, all such policies should be incorporated in the baseline. Instead, CARB selectively attributes the effects of some of those policies (such as the Pavley standards) to the Scoping Plan, while treating others as part of the baseline. As a result, CARB's analysis fails to isolate the incremental effects of those policies that have yet to be decided upon.** That is, CARB's estimates confound the effects of policies that have already been approved with the effects of policies upon which policymakers must still decide. Consequently, CARB's analysis fails to provide a policy-relevant assessment of the impacts of those policies that remain under consideration.

**CARB makes internally inconsistent choices about which existing policies to include in the baseline and which to treat as part of the Scoping Plan's impact.** A clear example is CARB's inconsistent treatment of the Million Solar Roofs policy, the Renewable Portfolio Standard (RPS), and the Pavley standards. CARB includes the economic impacts of the Million Solar Roofs policy in the baseline scenario based on the argument that those economic impacts "are the result of existing state policies and are therefore not attribut[able] to the AB 32 GHG

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<sup>10</sup> For example, see Charles River Associates, "The Role of Offsets in Enhancing the Cost-Effectiveness of AB 32," Prepared for Chevron Corporation, April 23, 2008.

<sup>11</sup> U.S. EPA, *Guidelines for Preparing Economic Analyses*, September 2000, p. 21.

emissions reduction program.”<sup>12</sup> For the same reason, in evaluating the contribution of the RPS to the Scoping Plan’s economic impact, CARB calculates only the incremental cost of increasing renewable generation from 20% to 33%, treating the cost of achieving the first 20% of renewable generation as part of the baseline scenario. On the other hand, CARB *excludes* the economic impacts of the Pavley I standards from the baseline, and instead attributes those impacts to the Scoping Plan because it wishes “to ensure that the economic impacts of all the measures in the draft Scoping Plan are fully assessed.”<sup>13</sup> Yet, just like the Million Solar Roofs policy and the first 20% of renewable electricity generation under RPS, the Pavley I standards are the result of existing state policy and should therefore be included in the baseline scenario.

**CARB’s arbitrary and inconsistent choices about which policies to include in the baseline scenario have a substantial and systematic effect of reducing its estimate of the Scoping Plan’s cost.** In choosing whether to treat the Million Solar Roofs measure, RPS, and the Pavley standards as part of the baseline or instead as part of the Scoping Plan’s impact, CARB makes logically inconsistent decisions that consistently reduce its estimate of the Scoping Plan’s cost. Given CARB’s estimate that the RPS will impose significant net costs, its decision to treat the first 20% of renewable generation as part of the baseline reduces CARB’s estimate of the Scoping Plan’s overall cost. Likewise, CARB’s estimate of the substantial cost of an Expanded Million Solar Roofs measure makes clear that its decision to incorporate the cost of the original Million Solar Roofs measure in the baseline further reduces its estimate of the Scoping Plan’s cost. By contrast, because it expects the Pavley standards to yield significant cost savings, CARB’s logically inconsistent decision to treat those standards as part of the Scoping Plan’s impact, rather than as part of the baseline, also reduces its estimate of the Scoping Plan’s cost.

**Unfortunately, absent an explanation of some logic behind CARB’s inconsistent approach, the inescapable conclusion from evaluating CARB’s analysis is that it is selectively giving the Scoping Plan credit for those existing policies that it expects to yield cost savings, while, wherever possible, treating those policies that will impose net costs as part of the baseline.**

**B. CARB adopts a baseline scenario that is arbitrarily defined and internally inconsistent given its assumptions about future energy prices**

**CARB’s assessment of the Scoping Plan’s economic impact is driven by a belief that the Plan will unlock substantial cost-saving energy-efficiency improvements that would otherwise go unrealized in the baseline scenario.** CARB estimates that, because of the Plan, personal income (a measure of economic well being) will be \$14 billion greater in 2020 than it otherwise would be. CARB states that “[i]ncreased economic growth is anticipated primarily because the investments motivated by several measures [in the Scoping Plan] ... result in substantial energy savings that more than pay back the costs of the investments.”<sup>14</sup> Included among these measures are energy-efficiency improvements in buildings and the transportation sector.

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<sup>12</sup> Climate Change Draft Scoping Plan, Measure Documentation Supplement, September 2008, p. 28.

<sup>13</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 10.

<sup>14</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. ii.

**CARB's assumptions that these cost-saving energy-efficiency measures are possible *and can only be realized through the Scoping Plan* drive its assessment of the Scoping Plan's economic impact by outweighing other negative economic impacts that CARB projects.** For example, whereas CARB concludes that numerous energy-efficiency measures will yield annual net cost savings of \$16 billion in 2020, CARB projects that the Plan's remaining individual policies will impose annual net costs on California's economy of at least \$2 billion, and will increase electricity and natural gas prices by 11% and 8%, respectively.<sup>15</sup>

**Therefore, CARB's conclusions about the Plan's overall economic impact depend fundamentally on the accuracy of its forecast that many cost-saving opportunities *would not be adopted without the Scoping Plan* — that is, they would not be adopted in the baseline.<sup>16</sup> Unfortunately, the baseline scenario against which CARB measures the Scoping Plan's impact is arbitrarily defined, calling the accuracy of this forecast into question.** On the one hand, CARB recognizes that there will be continuing improvements in California's energy efficiency in the baseline scenario as Californians adopt various cost-saving means of reducing their energy use.<sup>17</sup> On the other hand, CARB implicitly and arbitrarily assumes that many other cost-saving energy-efficiency improvements will not be realized in that baseline scenario, and can only be realized through the policies incorporated in the Scoping Plan. CARB offers no explanation of how it determined which cost-saving energy-efficiency measures would be adopted in the baseline scenario, and which could only be realized through the implementation of its Scoping Plan.

**CARB's baseline scenario implies that Californians' energy use would be grossly inefficient in the absence of the Scoping Plan.** CARB's analysis implies that, in the baseline scenario in 2020, Californians' failure to take advantage of cost-saving energy-efficiency measures would cause them to spend at least 20 percent more than necessary on energy.<sup>18</sup> While it is reasonable to believe that Californians may forgo *some* cost-saving energy-efficiency opportunities in the absence of the Scoping Plan, CARB does not explain why it expects Californians' energy use to be so inefficient in the absence of that Plan.

**CARB's baseline scenario is internally inconsistent with its forecast of energy prices and its own commentary on present-day conditions, causing it to grossly overstate the potential cost savings from the Scoping Plan. This is most evident in CARB's analysis of the Pavley standards.** Two key determinants of CARB's estimate of cost savings from the Plan are its forecast of future energy prices and its forecast of the extent to which the targeted cost-saving energy-efficiency measures would be adopted in the baseline scenario. A sound policy analysis must recognize that these two determinants are interrelated, and such an analysis must adopt internally consistent assumptions for each. That is, while higher energy prices will tend to

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<sup>15</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, Table I-2 (pp. I-6 – I-8) and Table IV-2 (p. IV-3).

<sup>16</sup> In Section IV, we address several other flaws in CARB's analysis that also substantially affect its conclusions.

<sup>17</sup> For example, CARB projects that, in the baseline scenario, the average annual growth rate for electricity sales between 2006 and 2020 will be about half the average growth rate for California's Gross State Product. "Energy2020 Business-as-Usual Case," May 19, 2008 Scoping Plan Workshop ([http://www.arb.ca.gov/cc/scopingplan/meetings/051908/energy2020slides\\_arb.pdf](http://www.arb.ca.gov/cc/scopingplan/meetings/051908/energy2020slides_arb.pdf)).

<sup>18</sup> This calculation is based on the assumption that all of the fuel and electricity savings reported in Table 4 of the Climate Change Draft Scoping Plan Economic Analysis Supplement (p. 13) are attributable to cost-saving energy-efficiency measures, an assumption that appears to be supported by estimates presented in Appendix Table I-2.

increase the cost savings from the energy-efficiency measures targeted by the Plan, higher prices will also make households and firms more likely to adopt those measures voluntarily, which reduces the incremental energy savings (and hence cost savings) from the Plan's implementation.

**While CARB increased its energy price forecast (particularly for gasoline and diesel) relative to that used in past analyses, it did not account for how higher prices would lead to increased voluntary adoption of energy-efficiency measures, thereby reducing the incremental energy-efficiency improvements that should be attributed to the Scoping Plan.** In other words, CARB used an internally inconsistent set of assumptions about future energy prices and the baseline scenario, rendering its analysis of the Scoping Plan's incremental impacts unreliable.

**This is most apparent in CARB's analysis of the net cost savings from the Pavley standards, which account for almost 80% of the Plan's estimated \$14 billion in net savings in 2020.** CARB first analyzed the Pavley standards' impacts in 2004 based on a gasoline price forecast of \$1.93 (when adjusted to 2007 dollars) and a corresponding prediction of Californians' baseline vehicle purchasing and driving behavior. In its Scoping Plan analysis, CARB updated its forecast of gasoline prices to \$3.67 per gallon (in 2007 dollars), a 90% increase from its 2004 forecast. CARB made a corresponding adjustment to its forecast of the value of the future fuel savings from the Pavley standards, which it had previously estimated. However, CARB failed to make the second necessary adjustment to its analysis: adjusting its forecast of future baseline behavior to reflect the fact that consumers will voluntarily purchase more fuel efficient vehicles and drive less in the face of higher gasoline prices.

**Despite the dramatic increase in its fuel price forecast, CARB failed to adjust its forecast of baseline consumer behavior to reflect its higher fuel price forecast.** That is, CARB's analysis of the Scoping Plan's impact is driven in large part by the implicit, fundamentally flawed assumption that a 90% increase in gasoline prices would *not* affect consumers' baseline decisions about the cars they purchase or how much they drive, such that the incremental fuel savings attributable to the Pavley standards would be the same regardless of how costly gasoline is. Taken to the extreme, had CARB adjusted its gasoline price forecast to \$10 per gallon, its failure to adjust its forecast of the baseline scenario would have led it to conclude that the Pavley standards would save California nearly \$30 billion per year. In fact, the Pavley standards would likely have little if any economic impact in such a scenario, as the required improvements in vehicle fuel efficiency would likely occur even in the standards' absence.

**CARB's failure to adjust its baseline scenario to reflect its updated energy price forecast is a fundamental flaw in its analysis, and is inconsistent with CARB's own statements about present-day conditions.** CARB itself states that consumers are "chang[ing] their driving habits" today "in response to gasoline price increases."<sup>19</sup> Likewise, there is abundant evidence that higher fuel prices are affecting consumers' vehicle purchases. For example, nationwide full-size pickup truck and SUV sales in August 2008 were

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<sup>19</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 6.



respectively down 25% and 33% from August 2007 levels.<sup>20</sup> In light of this evidence, CARB's failure to update its projection of the baseline scenario is a fundamental shortcoming that renders its analysis of the Scoping Plan's economic impact unreliable.

**Had CARB adopted a forecast of the baseline scenario that is internally consistent with its energy price forecast, CARB's estimate of cost savings from its energy-efficiency measures would be billions of dollars lower.** Taking the Pavley I standards as an example, estimates of consumer responsiveness to gasoline prices that the Congressional Budget Office has used in its own analyses suggest that CARB's estimate of the annual net cost savings from the Pavley standards alone could be reduced by more than \$5 billion if CARB adopted a baseline scenario that is internally consistent with its energy price forecast.<sup>21</sup>

### **C. CARB fails to provide adequate support to justify its baseline scenario forecast**

**CARB provides no support for its decision to adopt a baseline forecast that implies California's energy use would be so inefficient as to leave substantial cost-saving energy-efficiency opportunities unrealized absent the Scoping Plan.** CARB's estimate of the Scoping Plan's impact is a direct function of how inefficient CARB believes California's energy use would be in 2020 without the Plan. The more inefficient CARB assumes energy use will be, the greater its estimates will be regarding the cost-saving opportunities associated with the Scoping Plan. *Given the critical role of those assumptions in driving CARB's results, it is just as important for CARB to rigorously justify those assumptions as it is to justify assumptions about the cost of particular emission reduction technologies.* Yet, despite the fact that CARB's results are driven by its implicit assumptions about the baseline inefficiency of California's energy use, CARB offers no rigorous support for those assumptions. For example, CARB's analysis of the Pavley standards implies that many Californians could individually save more than \$400 *each year* if they purchase the more fuel-efficient vehicles that are required by the Pavley standards. However, CARB does not provide any rigorous assessment of why such substantial cost-saving opportunities would be left unrealized without the Pavley standards in place.

**To justify its forecast of the potential cost savings from the Scoping Plan, CARB would have to perform a rigorous assessment of the market failures that it believes prevent the voluntary adoption of the cost-saving measures that it currently attributes to the Scoping Plan.** Unfortunately, CARB provides no such analysis. To be fair, in the appendices to its Draft Scoping Plan, CARB discusses some of the factors that may limit the adoption of certain cost-saving energy-efficiency measures in the absence of policy intervention. For example, CARB

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<sup>20</sup> John K. Teahan, Jr., "An Ice-cold August for Auto Sales," *Automotive News*, September 8, 2008.

<sup>21</sup> This calculation uses estimates of the elasticity of consumer demand for fuel economy improvements and for vehicle miles traveled with respect to changes in gasoline prices that were used in Congressional Budget Office, *The Economic Costs of Fuel Economy Standards Versus a Gasoline Tax*, December 2003 (at p. 12). These elasticity estimates are 0.22 for fuel economy improvements and -0.2 for vehicle miles traveled. This calculation also reflects an estimate of the implicit increase in vehicle fuel economy from CARB's baseline scenario that CARB attributes to the Pavley standards. This estimate is based on CARB, "Addendum Presenting and Describing Revisions to: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles," September 10, 2004, p. 17 (Table 8.2-1). Finally, this calculation assumes that the baseline improvement in fuel economy that results from higher gasoline prices would proportionately reduce the incremental vehicle costs that are attributable to the Pavley standards.

notes that “building owners cannot always manage the up-front cost of [energy-efficiency] investments.”<sup>22</sup> However, while discussing such factors in qualitative terms, CARB does not offer the kind of rigorous assessment of the magnitude of those market failures that would be necessary to justify policy intervention, and to support its conclusion that the Scoping Plan will unlock billions of dollars in cost-saving opportunities.

**In fact, CARB’s assumptions in analyzing its proposed cap-and-trade program indicate that it does not believe there are significant impediments to the adoption of cost-saving emission reduction measures. This suggests that CARB should treat those measures and others like it as part of the baseline of what would occur even without the Scoping Plan.** For example, in evaluating emission reductions that would be achieved under the cap-and-trade program, CARB assumes that various cost-saving emission reduction measures would be adopted under the cap-and-trade program because “facilities will [voluntarily] choose to implement measures that cost less than anticipated allowance prices.”<sup>23</sup> Consistent application of this logic should have led CARB to conclude that all cost-saving measures would be adopted in the baseline scenario (i.e., even in the Scoping Plan’s absence), such that the Scoping Plan should not be credited with the cost savings that those measures generate.

**D. CARB fails to account for energy-efficiency improvements resulting from new federal law**

**On top of the various problems with CARB’s baseline scenario described above, CARB also fails to account for the fact that the recently enacted Energy Independence and Security Act of 2007 (EISA) would achieve much of the identified cost-saving energy-efficiency opportunities even in the absence of the Scoping Plan. Consequently, CARB’s analysis improperly gives the Scoping Plan credit for many cost-saving energy-efficiency improvements that would occur even in the Plan’s absence.** In late 2007, Congress passed and the President signed the EISA. As a result of EISA, many of the cost-saving energy-efficiency improvements identified by CARB in its Scoping Plan analysis will be adopted even in the absence of the Scoping Plan. For example, EISA significantly increased federal Corporate Average Fuel Economy standards, and created new federal appliance and lighting energy efficiency standards. Given the enactment of this Act, CARB’s analysis should focus on the *incremental* impact of the Scoping Plan on top of the energy efficiency improvements that would occur as a result of EISA even in the absence of the Scoping Plan. Properly accounting for EISA’s effects would dramatically reduce the cost savings that should be attributed to the Scoping Plan.

**IV. Other significant flaws and omissions in CARB’s analysis**

**While CARB’s economic analysis is rendered entirely unreliable as a result of the baseline that it has adopted in evaluating the Scoping Plan’s incremental impact (see Section III), its analysis suffers from several additional flaws and omissions that would, on their own, undermine CARB’s analysis.**

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<sup>22</sup> Climate Change Draft Scoping Plan, June 2008 Discussion Draft, Appendix C, p. C-66.

<sup>23</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 7.

**A. CARB does not account for important interactions among the policies that it analyzes, leading it to underestimate the cost of achieving AB 32's 2020 target**

CARB's analysis was not solely conducted in the context of one integrated model. Rather, it involved piecing together numerous discrete analyses of the impacts of various policies in attempting to estimate their combined economic effect.

**While this modeling approach may have been unavoidable given practical considerations, it led CARB to overlook important interactions among policies that diminish their collective effectiveness in reducing emissions and increase their collective costs. While CARB has made efforts to address some of these interactions, important interactions remain unaddressed.** In effect, CARB's analysis double counts certain emission reduction measures and thereby understates the effort and cost associated with achieving AB 32's target. CARB's analysis also fails to consider how the effects of certain policies will increase the cost of implementing others.

**CARB's estimate of emission reductions from low friction engine oils offers an example of how CARB fails to account for some important interactions among policies.** CARB believes low friction oils will achieve a 2% improvement in the fuel efficiency of 85% of light-duty vehicles. It then applies these estimates to its estimate of baseline emissions from those vehicles (160.8 MMTCO<sub>2</sub>-e) to arrive at an emission reduction estimate of 2.8 MMTCO<sub>2</sub>-e (i.e., 0.02 X 0.85 X 160.8).<sup>24</sup> Yet, this calculation fails to recognize that other policies, such as the Pavley standards, will significantly reduce emissions from vehicles and will thereby reduce the incremental emission reductions from low friction oils to less than 2 MMTCO<sub>2</sub>-e. While CARB attempts to account for some of these kinds of interactions, it does not address all of them.

**CARB also fails to rigorously account for the possibility that particular emission reduction measures could simultaneously earn credit toward compliance with multiple policies, leading to double counting of emission reductions. The Pavley standards and the Low Carbon Fuel Standard (LCFS) offer a prominent example of this kind of interaction.** In particular, emission reductions from increased use of plug-in hybrid vehicles and other alternative fuel vehicles will simultaneously count toward compliance with both the Pavley standards and the LCFS. As a result of this potential double counting of emission reductions, it is possible that the two policies will collectively achieve only 31.7 MMTCO<sub>2</sub>-e of reductions – that is, the same reduction as the Pavley standards on their own – rather than the 48.2 MMTCO<sub>2</sub>-e that CARB projects. In its updated analysis of the proposed Scoping Plan, CARB attempts to account for this interaction by arbitrarily reducing its estimate of emission reductions from the LCFS by 10%.<sup>25</sup> However, CARB fails to acknowledge that the effect of this interaction could be far greater, and CARB offers no explanation for why it believes this 10% adjustment represents the best estimate of the effect of this interaction.

**CARB's analysis of the allowance price under the cap-and-trade program (and hence the cap-and-trade program's cost) is rendered unreliable by likely double counting of low-cost emission reductions.** CARB assumes that the various other policies that it has proposed will

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<sup>24</sup> Climate Change Draft Scoping Plan, Measure Documentation Supplement, September 2008, p. 8.

<sup>25</sup> Climate Change Proposed Scoping Plan, I- 7.

achieve 134 of the 169 MMTCO<sub>2</sub>-e of emission reductions thought to be necessary to meet California's emissions target. Consequently, CARB assumes that the incentives created by the cap-and-trade program's allowance price only need to reduce emissions by an additional 35 MMTCO<sub>2</sub>-e to meet that target. To calculate the allowance price necessary to bring about these additional reductions, CARB apparently used available estimates of how households and firms reduce their emissions in response to increased allowance prices in order to determine how high allowance prices must rise to reduce emissions by the remaining 35 MMTCO<sub>2</sub>-e. However, in conducting this exercise, CARB did not account for the fact that many of the actual emission reduction measures that consumers and firms would adopt in response to increasing allowance prices would likely already be implemented in response to CARB's various other policies. As a result, fewer low-cost emission reduction options would remain available to reduce emissions in response to rising allowance prices, making CARB's estimates of household and firm responsiveness to rising allowance prices unreliable. Therefore, CARB has likely significantly underestimated how high allowance prices must rise to elicit an *incremental* 35 MMTCO<sub>2</sub>-e of emission reductions that *have not already been targeted by other policies*.

**The above double counting problem highlights a fundamental and insurmountable problem associated with CARB's approach to modeling a cap-and-trade program alongside other emission reduction policies outside the framework of a single integrated model.** Assessments of emission reductions from a cap-and-trade program ultimately depend on estimates of how responsive household and firm emissions are to changes in emission allowance prices. These estimates inform how much allowance prices must rise to reduce emissions enough to achieve the cap. However, some of the emission reduction measures that underlie those estimates of the responsiveness of household and firm emissions are undoubtedly the very same measures that are already being targeted by CARB's various other policies. For example, existing estimates of the responsiveness of household and firm emissions to increasing allowance prices likely reflect, at least in part, the fact that households and firms will adopt energy-efficiency measures in response to increasing allowance prices. But those very same measures may already be targeted by other CARB policies, reducing the incremental emission reduction opportunities that households and firms have at their disposal when responding to rising allowance prices. Without analyzing both the cap-and-trade program and the various other proposed policies in a single integrated model, CARB cannot avoid the possibility that much, most, or perhaps even all of the emission reductions that it attributes to the cap-and-trade program simply reflect double counting of low-cost reductions that would occur as a result of its other proposed policies. Consequently, it cannot produce reliable estimates of the allowance price under a cap-and-trade program using its current approach.

#### **B. CARB does not acknowledge substantial uncertainty in its estimates**

**The costs of policies to reduce GHGs are inherently uncertain, and any economic analysis of a GHG reduction program should take these uncertainties into account.** Uncertainty is an unavoidable characteristic of any environmental policy, and it is a particularly important consideration in evaluating climate policy. Indeed, examinations of federal climate policies demonstrate the degree of uncertainty associated with estimating the cost and feasibility of GHG reduction programs. For example, the U.S. EPA estimates that the 2020 allowance price under a

federal cap-and-trade program could range from \$15 to \$98 per ton.<sup>26</sup> In another indication of the uncertainty that surrounds the implementation of climate policy, the latest U.S. Energy Information Administration (EIA) annual energy forecast questions whether the federal renewable fuel standard will be achievable in 2020.<sup>27</sup> Any economic analysis should acknowledge and take these types of uncertainties into account.

**Despite the inherent uncertainties in the costs of GHG reduction efforts, CARB does not discuss uncertainties in its cost estimates, and it does not discuss the implications of these uncertainties for its conclusions about the Scoping Plan's economic impact.** The Scoping Plan's economic impact depends critically upon future energy prices and technological advancement, as well as the way in which various emission reduction policies interact with each other from now through 2020. Even a small change in one of these factors could substantially alter the cost of individual GHG reduction policies. Yet, strikingly, CARB does not address the uncertainty associated with its estimates either quantitatively or qualitatively. In fact, the word "uncertainty" appears only once in the Economic Analysis Supplement, where CARB notes that "[a]spects of the BAU [baseline] case are subject to uncertainty."<sup>28</sup> As we described in Section II, CARB cannot possibly provide a sound assessment of the relative merits of alternative emission reduction policies without considering this uncertainty and its implications for the cost of alternative policy approaches.

### **C. CARB does not discuss the Scoping Plan's substantial upfront costs**

**Even if CARB is correct that the Scoping Plan will yield cost savings in the long run, CARB's analysis does not address the substantial upfront costs of implementing many of its GHG reduction policies.** Many of the GHG reduction policies in the Scoping Plan will require dramatic investments in the short term. In some cases, the Scoping Plan's policies will require new investments that firms and households would otherwise not have to make. In other cases, while firms and households may make the affected investments anyway, the Plan will increase the cost of those investments. These investments will span a range of energy-consuming durable goods (such as vehicles and appliances) and energy-producing capital equipment (such as renewable energy generation technologies and more energy efficient industrial boilers). CARB has not adequately addressed questions about the near-term magnitude of these investments, and the demand that such investments will place on capital markets, businesses, and households. Compounding the issue, the current financial crisis has made it more difficult and expensive for households and businesses to finance investments. If the effects of this crisis persist into the future, the costs of implementing many of the GHG reduction policies may be higher than CARB projects. Also, the investments required by AB 32 may crowd out other important investments that Californian businesses and households might otherwise make.

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<sup>26</sup> U.S. Environmental Protection Agency, "EPA Analysis of the Lieberman-Warner Climate Security Act of 2008: S.2191, in 110<sup>th</sup> Congress," March 14, 2008, p. 27.

<sup>27</sup> U.S. Energy Information Administration, "Annual Energy Outlook 2008," June 2008, p. 81.

<sup>28</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 10.

#### **D. CARB's analysis of impacts on competitiveness is simplistic and flawed**

**CARB's analysis mischaracterizes the impacts of AB 32's implementation on the competitiveness of Californian businesses.** Importantly, CARB recognizes that the Scoping Plan will increase electricity prices (by 11%) and natural gas prices (by 8%).<sup>29</sup> All else equal, these increases in energy prices will unequivocally adversely affect the competitiveness of Californian businesses relative to out-of-state competitors. Yet, surprisingly, CARB finds that the Scoping Plan "will dramatically improve California business competitive position in the nation."<sup>30</sup> CARB reaches this conclusion based on its estimate that the forecasted increase in electricity and natural gas prices will be outweighed by the average statewide reduction in electricity and natural gas use that it forecasts, leading to a net reduction in energy expenditures.

**While all businesses will experience increased energy prices as a result of AB 32's implementation, the forecasted energy-efficiency improvements will be unevenly distributed and may occur even without AB 32's implementation. As a result, some businesses will inevitably experience a net increase in their energy costs and a reduction in their competitiveness as a result of AB 32.** Because AB 32's implementation will affect the market price of natural gas and electricity, all businesses will experience this increase in their energy costs. Given the forecasted price increases, CARB's claim that AB 32's implementation will reduce energy expenditures of Californian businesses and thereby improve their competitive position depends on the assumption that *every* business will experience a reduction in their electricity and natural gas use of no less than 10% and 7%, respectively, as a direct result of AB 32's implementation. Any business whose energy use is not reduced by at least that much as a direct result of AB 32's implementation will face a net increase in its energy costs and a reduction in its competitiveness. Given the varied circumstances and opportunities for energy-efficiency improvements faced by Californian businesses, it is highly unlikely that every business will experience such significant reductions in their energy use as a result of AB 32's implementation. Moreover, it is particularly difficult to imagine that significant opportunities for cost-saving energy-efficiency improvements exist in those industries that are the most energy intensive, and hence the most prone to adverse competitiveness impacts associated with AB 32's implementation. Because they are so energy intensive, these businesses must constantly focus on finding ways to reduce their energy use in order to remain competitive, suggesting that few cost-saving opportunities would remain to be tapped by policies implemented under AB 32. Thus, the most energy intensive businesses may also be the most likely to experience adverse competitiveness impacts associated with AB 32's implementation. By making a blanket claim about the average change in Californian businesses' competitive position, CARB fails to acknowledge that the competitive position of certain businesses and industries will be adversely affected by AB 32's implementation.

**CARB's competitiveness analysis focuses on the Scoping Plan's impacts on various sectors that are least likely to face competitiveness concerns, while providing no discussion of potential impacts on those sectors that are most likely to face competitiveness concerns.** In analyzing impacts on business competitiveness, CARB attempts to estimate how climate policy

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<sup>29</sup> In fact, the various flaws in CARB's analysis suggest that these estimates may understate the Scoping Plan's impact on electricity and natural gas prices.

<sup>30</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. V-9.

may affect businesses such as coin-operated laundries, trailer parks, and barber shops.<sup>31</sup> Because customers of these businesses cannot readily switch to out-of-state suppliers, there are minimal competitiveness concerns associated with the impacts of state climate policy on these businesses. By contrast, there are significant and justifiable concerns about the impacts of state climate policy on various energy-intensive industries that face national and international competition, such as the paper, chemical, cement, and refining industries, to name a few. Yet, CARB provides no analysis of potential competitiveness impacts for these industries.

## **V. Recommendations for future analyses**

There should be no doubt that the economic stakes associated with implementing AB 32 are enormous. Different approaches to implementing AB 32 could easily alter the annual costs borne by Californians by billions of dollars. If appropriately designed and carefully implemented, economic analysis can provide invaluable insight as California begins to implement AB 32. This section provides a few recommendations for how CARB can refine its economic analyses to support the implementation of AB 32.

### **A. Evaluating the relative cost of alternative policy approaches**

**CARB should place higher priority on evaluating the *relative* cost of alternative approaches to achieving AB 32's target, rather than improving its evaluation of the *absolute* cost of the Scoping Plan.** Only through such analyses can CARB evaluate whether it is adopting the most cost-effective approach or understand the magnitude of the costs associated with alternative policy design decisions.

**In particular, given the balance that CARB's Scoping plan strikes between a cap-and-trade program and other regulatory approaches, CARB should carefully analyze whether the cost of AB 32 can be reduced through greater reliance on a cap-and-trade program.** CARB states that "limitations of the available modeling tools ... prevent a comparison between market-based approaches and alternative strategies, such as one that relies only on direct regulation."<sup>32</sup> This is only true in the narrow sense that it may not be possible to develop definitive quantitative estimates of the relative cost of the two approaches.<sup>33</sup> However, it is unequivocally possible to provide insightful and detailed economic analysis of the relative economic merits of each approach. Given that the choice between the two approaches could alter the cost of implementing AB 32 by billions of dollars per year, it behooves CARB to undertake such analyses.

**To the extent that CARB seeks to implement additional policies targeting emissions from sources that would also be covered by a cap-and-trade program, CARB's analyses should examine if (and, if so, why) such policies would reduce the cost of meeting AB 32's target, given the alternative of simply allowing the cap-and-trade program to elicit the most cost-**

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<sup>31</sup> For example, see Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, Table V-4, p. V-7.

<sup>32</sup> Climate Change Draft Scoping Plan, Economic Analysis Supplement, September 2008, p. 7.

<sup>33</sup> Even this distinction is of relatively little significance given the substantial uncertainty associated with any such estimates.

**effective reductions from those sources.** Such analyses would need to examine the nature and magnitude of any “market failures” that may prevent a cap-and-trade program from bringing about some cost-effective emission reductions from those sources. To the extent that some additional policies are justified by the presence of such market failures, it is important to understand those failures in order to design those additional policies in the most effective way.

**CARB’s analyses should also account for how the economic merits of particular policies — relative to the alternative of greater reliance on a cap-and-trade program — are influenced by uncertainty and by variation in emission reduction costs across regulated sources.** In particular, those analyses should account for the fact that, given the flexibility that it permits, a cap-and-trade program is better suited to minimize emission reduction costs in the face of significant variability in costs across regulated sources and significant uncertainty about what those costs will be in the future.

**Practically, such analyses may require far more detailed assessments of individual policies than CARB has envisioned at this point in the implementation of AB 32. However, at this stage, CARB could at least more fully describe the factors that influence the relative economic merits of these alternative regulatory approaches, and describe how it plans to consider and weigh these factors as it proceeds in implementing AB 32.**

**At the same time, CARB could also improve the policy relevance of its analysis by reducing the number of policies that it analyzes to those that it believes are necessary because of market failures and those that represent the greatest emissions reductions and costs.** In its analysis, CARB examines the economic impacts of 34 policies in the Scoping Plan, 18 additional policies under evaluation, and the cap-and-trade program. But not all of these policies are equally important to understanding the overall costs of the program and the ways in which policymakers can reduce those costs. First, given its recommendation to implement the cap-and-trade program, CARB could reduce the number of additional policies on which it focuses by identifying which additional policies are truly necessary to pursue because of the presence of market failures. Absent such market failures, CARB can reasonably presume that any cost-effective emission reduction measures will be pursued in response to a cap-and-trade program without the need for additional specific policies. For example, while there might be an argument for some additional policies targeting residential energy-efficiency improvements given the possibility that market failures may impede the adoption of those improvements, it is difficult to imagine that market failures would prevent the adoption of any cost-effective energy-efficiency improvements at refineries, which would face a strong incentive to adopt any cost-effective emission reductions under a cap-and-trade program. Second, CARB could further prioritize the policies on which it focuses by identifying those policies that disproportionately contribute to the Scoping Plan’s overall emissions reductions and costs. CARB could then assess those policies in much greater detail to understand better the uncertainties affecting them, the interactions among them, and the implications of instead relying to a greater extent on the cap-and-trade program. By prioritizing what it studies in greater depth, CARB could provide analyses that are more helpful to policymakers as they face the most consequential decisions in implementing AB 32.

**Another step that CARB could take to better inform its policymaking decisions going forward is to analyze the *marginal cost* of emission reductions achieved by the various policies that it examines.** Appendix I of CARB’s Economic Analysis Supplement presents the



average cost per ton of emissions reduced by each of the individual policies that CARB examined. These averages offer some insights about adjustments to CARB's Scoping Plan that can reduce its cost. For example, as we described above, CARB's own analysis suggests that a 33% RPS should not be a part of a cost-effective portfolio of emission reduction policies. However, CARB's assessment of the cost-effectiveness of its policies could be far better informed if it estimated the *marginal cost* of the emission reductions achieved by each policy. In many cases, policies can be made either more or less stringent. That is, they are not all-or-nothing propositions. Yet, one can only determine the wisdom of making such adjustments by considering the marginal cost of emission reductions from that policy: the incremental cost of the last, most costly ton of emission reductions achieved by the policy. If the marginal cost of one policy is higher than that of another, this would imply that CARB can reduce the Scoping Plan's economic impact while still achieving California's emissions target by relaxing the stringency of the former policy while making the latter policy more stringent. It is only possible to determine whether CARB has adopted a cost-effective strategy in implementing AB 32 if estimates of the marginal cost of each of its proposed policies are known.

#### **B. Developing more rigorous and informative assessments of competitiveness impacts**

**CARB should refocus its assessment of competitiveness impacts by performing in-depth assessments of impacts on those industries most likely to be adversely affected by AB 32's implementation.** By increasing energy prices, AB 32's implementation has the potential to adversely affect many energy-intensive businesses that compete in national and international markets. Assessing these potential impacts is important not only from the standpoint of avoiding undue burden on particular industries but also because any such impacts can lead to emissions leakage, undermining the achievement of AB 32's emission reduction goals. Because businesses differ with respect to their energy use and opportunities to reduce that use, assessments of competitiveness impacts necessarily require industry-specific research. Assessments of statewide average effects will not address whether those industries most subject to out-of-state competition will be competitively disadvantaged by AB 32. At the same time, while having to dig deeper to provide useful analysis, CARB can appropriately narrow the focus of its investigation to those industries that are most susceptible to out-of-state competition. These industries can be identified by considering both the extent of interstate and international trade in a particular industry, and by comparing the industry's energy expenditures to its other production costs as well as to other economic indicators such as its profit margins.

#### **C. Developing better estimates of the Scoping Plan's aggregate economic impact**

**While we believe CARB should give more attention to evaluating the relative cost of alternative means of reducing GHG emissions than to evaluating the absolute cost of implementing AB 32, CARB can take several steps to improve its estimates of the Scoping Plan's overall economic impact.**

**First, CARB should adopt an internally consistent baseline scenario that reflects its best forecast of how the economy will evolve in the absence of the Scoping Plan, but with all existing state and federal policies in place.** In particular, to be consistent with its treatment of the RPS and Million Solar Roofs, CARB should also include in the baseline the Pavley I

standards, the federal Energy Independence and Security Act of 2007, and any other state or federal policies that have already been decided upon. Likewise, CARB should ensure that its baseline scenario is internally consistent with its assumptions about future energy prices. At the very least, CARB should not make significant adjustments to its prior forecasts of energy prices without making corresponding adjustments to its prior forecast of the baseline scenario. Finally, CARB should only assume that cost-saving energy-efficiency measures would not be adopted in the baseline if it has compelling evidence that existing market failures are of sufficient magnitude to prevent their adoption. Otherwise, the results of its analysis will ultimately be driven by arbitrary assumptions about just how inefficient California's use of energy would be in 2020 in the absence of the Scoping Plan.

**Second, if CARB cannot employ a single integrated model to evaluate the impact of its Scoping Plan, it should consider and do its best to account for all possible interactions among the policies that it evaluates, as well as all possible instances of double counting that its modeling approach may bring about.** As we demonstrated above, while CARB has accounted for some of these interactions and potential double counting, its current approach fails to address other important interactions and double counting.

**CARB's modeling of the cap-and-trade program must account for this potential double counting.** In particular, given the possibility of double counting, the allowance price necessary to achieve the last 35 MMTCO<sub>2</sub>-e of emission reductions under the cap-and-trade program could fall within a wide range of possible values. The level of the allowance price would depend on the extent to which CARB's other policies already target those emission reductions that would otherwise be among the least costly that firms and households would rely on in complying with a cap-and-trade program. CARB's analysis and its resulting allowance price estimate appear to assume that none of the low-cost emission reductions that households and firms would rely on in response to a cap-and-trade program would already be exhausted by CARB's other policies. However, at the other extreme, if CARB's other policies would already exhaust the least costly 134 MMTCO<sub>2</sub>-e of emission reductions available to households and firms, then CARB's modeling of the cap-and-trade program should account for the fact that the allowance price must be high enough to elicit an additional 35 MMTCO<sub>2</sub>-e on top of that base of the 134 MMTCO<sub>2</sub>-e less costly reductions. Because these additional 35 MMTCO<sub>2</sub>-e of reductions would be on top of an existing base of 134 MMTCO<sub>2</sub>-e of less costly reductions, the allowance price necessary to elicit them would be the same as the allowance price necessary to achieve 169 MMTCO<sub>2</sub>-e of reductions (i.e., 134 plus 35) if the cap-and-trade program were implemented on its own without any other policies. To reflect uncertainty about this potential double counting of emission reductions and its implication for allowance prices, CARB should present a range of possible allowance prices from one end of the spectrum to the other.

**Third, CARB should recognize and discuss the substantial uncertainty inherent in its estimates.** Compared with analyses performed by the U.S. EPA and EIA, there is surprisingly little discussion of uncertainty in CARB's analysis of its Scoping Plan.

**Finally, CARB should analyze other dimensions of the Scoping Plan's economic impact, including the near-term investment demands that it will place on households and firms.**