LAO
65 YEARS OF SERVICE

November 17, 2008

Hon. Roger Niello
Assembly Member, Fifth District
Room 6027, State Capitol
Sacramento, California 95814

Dear Assembly Member Niello:

The following is in response to your letter dated August 6, 2008, in which you requested that we report on the draft scoping plan of the Air Resources Board (ARB) for implementation of the Global Warming Solutions Act of 2006 (Chapter 488, Statutes of 2006 [AB 32, Núñez]). Your letter was a follow-up to earlier communication from you and Assembly Member Villines requesting our analysis of the plan. Specifically, you asked our office to:

- Provide a summary of the draft scoping plan to reduce greenhouse gas (GHG) emissions and a discussion of the major measures contained within the plan.
- Identify measures proposed in the draft scoping plan that lack an economic impact analysis that support them.
- Provide, to the extent possible, a critique of the adequacy of the plan's analysis of economic impacts in support of a proposed measure, and the reasonableness of the conclusions drawn from that analysis.
- Provide a discussion of some of the key policy choices warranting legislative evaluation raised by measures proposed in the draft scoping plan, such as so-called "cap-and-trade" mechanisms or a carbon tax or fee.

The remainder of this letter addresses each of your requests in turn. Immediately below, we provide a summary of the bottom-line findings of our analysis.

Summary of LAO's Findings. As a result of our review and analysis of ARB's scoping plan and accompanying documents, we find the following:

- ***The scoping plan's overall emissions reductions and purported net economic benefit are highly reliant on one measure—the Pavley regulations.*** Implementation of the so-called Pavley regulations on light-duty vehicle emission of GHGs (developed in accordance with Chapter 200, Statutes of 2002 [AB 1493, Pavley]) accounts for about 18 percent of the plan's emissions re-

ductions. It also accounts for roughly 70 percent ($11 billion) of the plan's net direct economic savings to businesses and consumers, according to ARB's documentation.

- ***The plan's evaluation of the costs and savings of some recommended measures is inconsistent and incomplete.*** The plan does not reflect the costs and savings of all of the emissions reduction measures that it recommends. This is because, in some cases, ARB has intentionally excluded the costs and savings associated with certain measures, such as the "million solar roofs" program. In other cases, including the proposed cap-and-trade program, ARB has yet to develop the costs and savings associated with its measures. For one measure—the low-carbon fuel standard—ARB acknowledges that the assumptions behind its estimates of costs and savings are weak at present, even though this measure represents a significant portion of the plan's direct costs and savings.
- ***Macroeconomic modeling results show a slight net economic benefit to the plan, but ARB failed to demonstrate the analytical rigor of its findings.*** Despite its findings—slight, eventual overall benefit to the economy—the macroeconomic analysis conducted by ARB provides little insight. The findings are highly dependent upon key assumptions, and ARB has not performed an analysis to determine how sensitive the macroeconomic findings are to changes in the key assumptions.
- ***Economic analysis played a limited role in development of scoping plan.*** It appears that ARB selected measures for inclusion in the scoping plan and then conducted its economic analysis of the plan as a whole after the fact. Selection of particular measures and the mix of measures appear not to have been directly influenced by cost-effectiveness considerations or macroeconomic analysis. In fact, ARB deemed all measures included in the plan "cost-effective" simply because they reduce GHG emissions, whatever the cost.
- ***The plan fails to lay out an "investment pathway."*** Despite its prediction of eventual net economic benefit, the scoping plan fails to lay out an investment pathway to reach its goals for GHG emissions levels in 2020. Such a pathway would describe, year-by-year, the investments required by implementation of the plan and the timing of the economic return on those investments. This information is very important to businesses and households that would be responsible for these investments, especially in the current climate of pronounced economic uncertainty and scarce credit. In addition, because the modeling approach used provides information about how broad economic sectors would be affected, but not individual businesses and households, it cannot identify the types of disruptions certain parties could face under the proposal. For example, it is possible some businesses could lose money or go

out of business. An investment pathway analysis could potentially help to identify such problems.

BACKGROUND

ARB's Scoping Plan Documents

Assembly Bill 32 requires that California limit its emissions of GHGs so that, by 2020, California's emissions of GHGs are equal to what they were in 1990. To that end, AB 32 requires ARB to quantify the state's 1990 GHG emissions and to adopt, no later than January 1, 2009, a "scoping plan" that describes the board's plan for achieving the maximum technologically feasible and cost-effective reductions of GHG emissions reductions by 2020.

Beginning in June of this year, ARB, in keeping with AB 32, began releasing scoping plan documents to the public. Below is a summary of the documents released by ARB and the dates of their release.

- ***Draft Scoping Plan Released on June 26, 2008.*** The draft scoping plan provided an estimate of California's GHG emissions in 1990, outlined the GHG emissions reduction measures under consideration by ARB, and discussed the preliminary estimates of the costs and savings associated with implementation of the plan. The ARB highlighted the findings of its economic analysis of the scoping plan, which predicted the plan's positive effect on the California economy. However, the draft scoping plan did not include several supplements and appendices, including the details of its economic analysis of the scoping plan, that were listed in the plan's table of contents.
- ***Initial Economic Analysis Released on September 17, 2008.*** On this date, ARB released several supplements to the draft scoping plan, including its economic analysis.
- ***Proposed Scoping Plan Released on October 16, 2008.*** This version of the plan modified and replaced the earlier draft scoping plan, including its appendices and supplements, such as the economic analysis. The proposed scoping plan newly included an appendix that evaluated the public health benefits associated with the plan.

The board of ARB will consider and take public testimony on the proposed scoping plan at its next meeting, scheduled for November 20 and 21. The ARB is then expected to vote on adoption of the plan at its meeting scheduled for December 11 and 12.

LAO's Process for Reviewing the Scoping Plan

As requested, we have worked to understand and to analyze ARB's scoping plan—both in its draft and proposed forms. To complete these tasks, LAO staff in our Resources and Economics sections:

- Reviewed, as each version was released, the plan, appendices, supplements, and other related documents.
- Met in person in July and early September with ARB supervisors and program staff, including its economists and other staff responsible for developing (1) the scoping plan measures; (2) estimates of emissions reductions, costs, and savings; and (3) the economic model that ARB applied to the scoping plan.
- Examined, along with ARB staff, the real-time operation and components of the computer-based economic model used by ARB.
- Sent to ARB in early October a series of written follow-up questions based on our earlier meetings with ARB and our ongoing review of the scoping plan materials. We met with ARB supervisors and staff in early October to clarify the questions to help expedite ARB's response.

At the time we prepared this analysis, ARB had not provided written responses to our questions even though it had been provided ample time to do so. Should we ultimately receive ARB's written responses, we will provide you with any necessary updates to the content of this letter.

Finally, we note that ARB has arranged for peer review of its economic analysis of the scoping plan. This peer review is being conducted by an independent panel selected by economists from the University of California (UC), Berkeley. The ARB originally had informed us that the peer review findings would be available for our review by mid-to-late October, but no such findings have been made available to us to date. We also will update your office on the peer review findings when they become available.

HIGHLIGHTS OF THE PROPOSED SCOPING PLAN

You have requested that we provide you with a summary of the draft scoping plan to implement AB 32 and a discussion of its most significant components. We provide this information below.

ARB Concludes That Scoping Plan Leads to Direct Economic Savings

The proposed scoping plan recommends 31 GHG emissions reduction measures to be applied to 8 broad sectors of the economy that together would reduce GHG emissions to 1990 levels by 2020, as required by AB 32. The ARB estimates that, collectively, the measures would reduce California's GHG emissions by roughly 29 percent below what they would otherwise be in 2020 under the "business as usual" scenario. In addition, ARB concludes that implementation of the scoping plan measures would eventually result in nearly $16 billion in net "annualized" savings (a concept we explain below) to California businesses and households as a whole.

This estimate of net annualized cost savings drives the results of ARB's macroeconomic modeling of the effects of the scoping plan on jobs, gross state product, and income, as discussed later in this analysis.

The Concept of Annualized Costs and Savings

The ARB's documents display both the costs and savings from implementation of the plan's recommended measures on an annualized basis. Therefore, it is important to define the annualized concept.

The ARB calculates the annualized costs of a GHG reduction measure by determining the total of associated capital outlay costs, such as the purchase price of equipment and the cost to finance that purchase. The ARB then spreads those costs, along with the costs of operation and maintenance of the capital good, over its projected useful lifetime, with costs occurring in future years discounted at 5 percent annually. The result is that the costs of a measure are distributed evenly in real dollar terms, year by year, over its life. The annualized costs, then, reflect the discounted costs for a single year for which a measure remains in effect.

Similarly, to determine what it terms annualized savings, ARB estimates the dollar value of annual savings expected to result over the life of the measure, such as the yearly savings resulting from increased fuel efficiency, again discounting savings occurring in future years by 5 percent annually. This distributes the discounted savings from a measure evenly, year by year, over its life.

To determine *net* annualized costs/savings of a measure, ARB compares the annualized savings to the annualized costs. Net annualized costs/savings, then, are the theoretical costs/savings that would result in any given year that a measure remains in effect.

For example, consider a hypothetical measure that, similar to the Pavley regulations, reduced GHG emissions from passenger vehicles. As a result of the measure, consumers would purchase vehicles that each cost more than the vehicles they otherwise would have purchased but that each save consumers money as the result of increased fuel efficiency.

The ARB would calculate the annualized cost of compliance with the measure as follows. For each year the measure was in effect, ARB would multiply the number of cars purchased as a result of the measure by the additional costs paid by consumers as a result of the measure. Next ARB would sum the annual cost of compliance to determine the overall cost of compliance, first having discounted future expenses at a discount rate of 5 percent per year. Then, ARB would divide the overall cost of compliance by the number of years during which the vehicles will remain in operation. The resulting dollar amount is the annualized cost of compliance, or, in other words, the cost of compliance with a measure in an average year.

To calculate annualized savings of the measure, ARB would estimate the dollar amount that consumers will save as a result of the measure during each year of the vehicles' useful lives, discounting future savings at a rate of 5 percent per year. The ARB

would then sum those discounted savings to arrive at the overall savings associated with the measure. Finally, ARB would divide the overall savings by the number of years during which the vehicles will be in operation. The resulting dollar amount is the annualized savings associated with the measure, or, in other words, the amount saved in an average year as a result of the measure.

To determine the net annualized costs/savings of the measure, ARB simply subtracts annualized savings from annualized costs.

Components of the Plan

Figure 1 summarizes, by sector, the GHG emissions reductions expressed in MMTCO2E (millions of metric tons of carbon dioxide equivalents) and annualized costs/savings that ARB estimates would relate to a single year from implementation of the scoping plan. Figure 2 shows the measures that the scoping plan proposes for each sector shown in Figure 1, along with the scoping plan's estimates of annualized costs/savings that would be achieved from the measures in a given year.

Figure 1

Scoping Plan's Greenhouse Gas (GHG) Emissions Reductions, by Sector[a]

(GHG emissions in MMTCO2E in 2020)
(Dollars in Millions)

Sector	Business-as-Usual GHG Emissions	Scoping Plan GHG Emissions Reductions	Net Annualized Cost/Savings[b]
Transportation	225.4	62.4	-$14,047
Electricity	139.2	45.3	-1,191
Industry	100.5	1.4	-60
High global warming potential gases	46.9	20.3	129
Commercial and residential	46.7	4.4	-470
Recycling and waste management	7.7	1.0	52
Forests	—	5.0	50
Subtotals	596.2	139.8	-$15,537
Regional cap and trade	—	35.0	—
Totals	**596.2**	**174.8**	**-$15,537**

a Does not include 7.8 millions of metric tons of carbon dioxide equivalents (MMTCO2E) of reductions in water and agricultural sectors, because water reductions are accounted for in business-as-usual scenario and agricultural reductions are voluntary.

b Negative dollar amounts represent net savings.

Figure 2

Scoping Plan's Greenhouse Gas (GHG) Emissions Reductions Measures

(GHG emissions in MMTCO2E in 2020)
(Dollars in Millions)

Sector	Measure	GHG Emissions Reductions	Annualized Costs	Annualized Savings	Net Annualized Costs/Savings[a]
Transportation		**62.3**	**$16,208**	**$30,255**	**-$14,047**
	Pavley light-duty vehicle emissions regulations	31.7	1,966	13,024	-11,058
	Low-carbon fuel standard	15.0	11,000	11,000	—
	Vehicle miles traveled reductions	5.0	500	2,054	-1,554
	Light-duty vehicle efficiency measures	4.5	1,033	1,863	-830
	Goods movement efficiency measures	3.5	TBD	TBD	TBD
	Support implementation of high-speed rail	1.0	—	—	—
	Heavy-/medium-duty vehicle aerodynamic efficiency	0.9	1,616	2,137	-521
	Heavy-/medium-duty vehicle hybridization	0.5	93	177	-84
	Ship electrification at ports	0.2	—	—	—
Electricity		**45.3**	**$7,436**	**$8,627**	**-$1,191**
	Increase renewable electricity generation to 33 percent	21.3	3,672	1,889	1,783
	Energy efficiency and conservation—electricity	15.2	3,402	5,065	-1,663
	Increase combined heat and power use	6.7	362	1,673	-1,311
	Million solar roofs	2.1	—	—	—
High Global Warming Potential Gases		**20.3**	**$159**	**$30**	**$129**
	Reductions from stationary sources	10.9	32	30	2
	Mitigation fee	5.0	100	—	100
	Reductions from mobile sources	3.4	21	TBD	TBD
	Sulfur hexafluoride limits in non-utility and non-semiconductor applications	0.3	<0.1	<0.1	<0.1
	Limit use in consumer products	0.3	<0.1	—	<0.1
	Reduce refrigerant loss from nonprofessional servicing of motor vehicle air conditioning	0.3	3	—	3
	Reduction in semiconductor industry	0.2	3	—	3
Forestry		**5.0**	**$50**	**—**	**$50**
	Sustainable forest target	5.0	50	—	50
Commercial and Residential		**4.4**	**$963**	**$1,433**	**-$470**
	Energy efficiency and conservation—natural gas	4.3	963	1,433	-470
	Solar water heating	0.1	—	—	—
Industry		**1.4**	**$11**	**$71**	**-$60**
	Energy efficiency and cobenefits audits for large industrial sources	TBD	TBD	TBD	TBD
	Leak reduction from oil and gas transmission	0.9	$1	$18	-$18
	Refinery flare recovery process improvements	0.3	7	46	-39
	Oil and gas extraction emissions reductions	0.2	<0.1	4	-4
	Removal of methane exemption from existing refinery regulations	<0.1	3	3	1

Continued

Sector	Measure	GHG Emissions Reductions	Annualized Costs	Annualized Savings	Net Annualized Costs/Savings[a]
Recycling and Waste Management		**1.0**	**$52**	**—**	**$52**
	Landfill methane control	1.0	52	—	52
Subtotals		139.8	—	—	—
	Cap and trade system	35.0	—	—	—
Totals		**174.8**	**$24,879**	**$40,416**	**-$15,537**

MMTCO2E = millions of metric tons of carbon dioxide equivalents, TBD = to be determined.

[a] Negative dollar amounts represent net savings.

As Figures 1 and 2 show, over two-thirds of the 175 millions of MMTCO2E in GHG emissions reductions projected from the scoping plan come from 5 of 31 measures recommended by the proposed scoping plan:

- Cap-and-trade program—35 MMTCO2E. (We discuss this proposed market-based policy approach in more detail in the last part of our analysis.)
- The Pavley light-duty vehicle emissions regulations—32 MMTCO2E.
- Increase in electricity from renewable energy to 33 percent by 2020—21 MMTCO2E.
- Energy efficiency and conservation in the electricity sector—15 MMTCO2E.
- Low-carbon fuel standard—15 MMTCO2E.

The preceding figures also show that ARB projects, as a result of implementation of the proposed scoping plan, the following direct economic effects for businesses and households:

- $25 billion in annualized costs.
- $40 billion in annualized savings.
- About $16 billion in net annualized savings.

Plan Requires Sectors to Reduce Emissions Roughly in Proportion to Their Emissions

The ARB's scoping plan calls for GHG emissions reductions from sectors that are roughly proportional to the emissions from those sectors. For example, the transportation sector is estimated to be responsible for roughly 38 percent of GHG emissions absent the implementation of measures to reduce GHG emissions. (As noted earlier, the scenario in which California's emissions of GHGs are not reduced in 2020 is referred to in the ARB plan as business as usual, or BAU.) The scoping plan accordingly calls on the transportation sector to contribute nearly 36 percent of the plan's overall emissions reductions. Similarly, the plan seeks 26 percent of its reductions from the electricity sector, which contributes about 23 percent of BAU emissions.

One seeming exception to this proportionality is the industrial sector. The scoping plan calls on the industrial sector to reduce its emissions by less than 1 percent through direct emissions reduction measures, even though that sector contributes about 17 percent of BAU emissions. However, ARB assumes that a large proportion of the emissions reductions resulting from the proposed cap-and-trade program will come from the industrial sector. Were all cap-and-trade emissions reductions to come from the industrial sector, that sector's contribution to the plan's overall GHG emissions reductions would total just over 20 percent.

Costs and Savings Concentrated in Transportation Sector

As noted above, the ARB plan would reduce GHG emissions in the transportation sector roughly in keeping with its share of GHG emissions (about 36 percent). However, as shown in Figure 3, the transportation sector would represent a much larger share of the plan's costs and savings.

Figure 3

Costs and Savings Concentrated in Transportation Sector

(Dollars in Millions)

Sector	Percentage BAU GHG Emissions	Annualized Costs	Percent Annualized Costs	Annualized Savings	Percent Annualized Savings	Net Annualized Costs/Savings[a]
Transportation	37.8 %	$16,208	65.1%	$30,255	74.9%	-$14,047
Electricity	23.3	7,436	29.9	8,627	21.3	-1,191
Industry	16.9	11	<1.0	71	<1.0	-60
HGWP gases	7.9	159	<1.0	30	<1.0	108
Commercial and residential	7.8	963	3.9	1,433	3.5	-470
Agriculture	5.0	156	<1.0	—	—	156
Recycling and waste management	1.3	52	<1.0	—	—	52
Forestry	—	50	<1.0	—	—	50

[a] Negative dollar amounts represent net savings.

BAU = business as usual, GHG = greenhouse gas, HGWP = high global warming potential.

Plan Assumes Net Savings Heavily Concentrated in One Measure—The Pavley Regulations

Figure 4 shows those recommended measures that account for the most significant proportions of annualized costs, annualized savings, or net annualized costs/savings.

Figure 4

Greenhouse Gas Reduction Costs and Savings Concentrated in a Few Measures

(Dollars in Millions)

Measure	Reductions (MMTCO2E)	Annualized Costs	Percent	Annualized Savings	Percent	Net Annualized Costs/Savings[a]
Pavley light-duty vehicle emissions regulations	31.7	$1,966	8.0%	$13,024	32.2%	-$11,058
Increase renewable electricity generation to 33 percent	21.3	3,672	14.9	1,889	4.7	1,783
Energy efficiency and conservation—electricity	15.2	3,402	13.8	5,065	12.5	-1,663
Low-carbon fuel standard	15.0	11,000	44.5	11,000	27.2	—
Heavy-/medium-duty vehicle aerodynamic efficiency	0.9	1,616	6.5	2,137	5.3	-521

MMTCO2E = millions of metric tons of carbon dioxide equivalents.

[a] Negative dollar amounts represent net annualized savings.

As the figure shows, the net annualized savings identified by the scoping plan are concentrated in one measure. Of the roughly $16 billion in net annualized savings identified by the plan, approximately $11 billion comes from implementation of the Pavley light-duty vehicle GHG emissions regulations.

LAO CRITIQUE OF ECONOMIC ANALYSIS

You have requested that we provide you with a critique of the adequacy and reasonableness of the analysis of economic impacts conducted by ARB in its review of its draft scoping plan. Our review found that the ARB's economic analysis raises a number of questions relating to (1) how implementation of AB 32 was compared to doing BAU, (2) the incompleteness of the ARB analysis, (3) how specific GHG reduction measures are deemed to be cost-effective, (4) weak assumptions relating to the low-carbon fuel standard, (5) a lack of analytical rigor in the macroeconomic modeling, (6) the failure of the plan to lay out an investment pathway, and (7) the failure by ARB to use economic analysis to shape the choice of and reliance on GHG reduction measures. We discuss these concerns in more detail below.

Scoping Plan's Treatment of BAU Scenario of Major Significance

The ARB projects that California will emit 596 MMTCO2E of GHG emissions in 2020. This projection is based on the assumption that no actions are taken explicitly to reduce California emissions of GHGs between now and 2020, such as implementation of the Pavley regulations, regardless of the requirements of AB 32 or any other statute or policy. As noted earlier, this scenario is described by ARB as BAU. How the economic analysis categorizes the economic impacts of the BAU case has major significance.

Scoping Plan Presents Alternative to BAU. The scoping plan presents an alternative scenario to BAU. Under this alternative scenario, implementation of measures recom-

mended in the proposed scoping plan brings about an estimated 29 percent (175 MMTCO2E) decrease in California's emissions of GHGs by 2020, compared to the BAU case. Although some of the measures recommended in the scoping plan, such as implementation of the Pavley regulations, are required by statute or administrative action other than AB 32 ("non-AB 32 measures"), ARB nonetheless does not consider the GHG *emissions reductions* resulting from these non-AB 32 measures as BAU. Rather, it always attributes the GHG emissions reductions from these non-AB 32 measures to the AB 32 scoping plan. In other words, by assuming that no actions are taken to reduce GHG emissions by 2020, ARB overstates the problem that it then credits the scoping plan with addressing. Together, non-AB 32 measures account for at least 34 MMTCO2E (about 20 percent) of the 175 MMTCO2E of the scoping plan's GHG emissions reductions.

ARB Varies in Attribution of Costs and Savings of Measures to BAU. The scoping plan varies in the way it reflects the *costs/savings* associated with the non-AB 32 measures it recommends. In some cases, ARB attributes the costs and savings of non-AB 32 measures to BAU. In such instances, the costs and savings are not reflected in the costs and savings associated with the scoping plan. In other instances, however, ARB does attribute the costs and savings associated with non-AB 32 measures to the scoping plan, and those costs and savings are reflected in ARB's calculation of the costs and savings of the scoping plan.

The ARB's explanation for its seemingly inconsistent treatment of the costs and savings of recommended non-AB 32 measures is shown in Figure 5.

Figure 5

Scoping Plan Rationale for Differing Treatment of Costs and Savings of Non-AB 32 Measures

If…	. . .Then
The measure is not required by preexisting statute, regulation, or policy…	. . .The ARB attributes costs/savings to the scoping plan.
The measure is required by preexisting statute, regulation, or policy in order to reduce GHG emissions…	. . . The ARB attributes costs/savings to the scoping plan.
The measure is required by preexisting statute, regulation, or policy but is not explicitly for purposes of reducing GHG emissions…	. . . The ARB does not attribute costs/savings to the scoping plan.

For example, consider two non-AB 32 measures recommended by the scoping plan—the Pavley light-duty vehicle emissions regulations and the installation of 3,000 megawatts of rooftop solar by 2017. Each measure is required by a statute other than AB 32—the Pavley bill in the case of the vehicle regulations and Chapter 132, Statutes of 2006 (SB 1, Murray), in the case of rooftop solar (a so-called "million solar roofs initiative"). Because the explicit purpose of the Pavley regulations is to reduce GHG emissions, ARB attributed to the scoping plan the costs and savings associated with this

measure. Conversely, because the explicit goal of the million solar roofs initiative is increased renewable energy generation, not GHG emissions reductions per se, the plan does not consider the costs/savings associated with the measure as part of the state's efforts to reduce GHG emissions and, therefore, does not attribute costs/savings associated with the measure to the scoping plan. Figure 6 below summarizes the measures that were excluded from ARB's calculations of costs and savings.

Figure 6

Scoping Plan Includes Emissions Reductions, But Intentionally Excludes Costs or Savings Associated With Four Measures

(Greenhouse gas reductions in MMTCO2E)

Measure	Emissions Reductions
Million solar roofs	2.1
Support implementation of high-speed rail	1.0
Ship electrification at ports	0.2
Solar water heating	0.1
Total	**3.4**

MMTCO2E = millions of metric tons of carbon dioxide equivalents.

Relevance to Economic Analysis. The ARB's differing treatment of costs and savings associated with non-AB 32 measures substantially affects the ARB's bottom-line economic projections for the plan. This is primarily, though not solely, because one non-AB 32 measure for which ARB attributed savings to the scoping plan—the Pavley regulations—accounts for such a large proportion of the plan's projected net annualized savings—$11 billion out of the plan's purported roughly $16 billion in net annualized savings. Were costs and savings of the Pavley regulations to be treated like those of the other non-AB 32 measures, for which ARB attributed no cost or savings, the net annualized savings that ARB attributes to the plan itself would be diminished considerably.

Notably, it is unclear what effect including the costs and savings of the non-AB 32 measures listed in Figure 6 would have had on the bottom-line costs and savings of the plan. These measures reflect roughly 2 percent of the emissions reductions from the measures recommended in the plan. However, the scoping plan does not provide any information on the costs and savings associated with these measures. Thus, in summary, the scoping plan includes an inconsistent and incomplete evaluation of costs and savings associated with its recommended measures.

Some Costs, Savings, or Emissions Reductions Undetermined for Certain Measures

For most measures included in the scoping plan, ARB has estimated anticipated emissions reductions, costs, and savings. However, this is not always the case. As

shown in Figure 7, ARB has yet to identify either the emissions reductions or resulting annualized costs/savings associated with the following measures.

Figure 7

Some Reductions, Costs, or Savings Yet to Be Determined

(Dollars in Millions)

Measure	GHG Emissions Reductions (MMTCO2E)	Annualized Costs	Annualized Savings
HGWP gas reductions from mobile sources	3.4	$21	TBD
Energy efficiency and cobenefits audits for large industrial sources	TBD	TBD	TBD
Goods movement efficiency measures	3.5	TBD	TBD

HGWP = high global warming potential, GHG = greenhouse gases, MMTCO2E = millions of metric tons of carbon dioxide equivalents.

As can be seen in Figure 7 (see amounts marked "TBD"), these measures account for slightly more than 4 percent (about 7 MMTCO2E) of the scoping plan's GHG emissions reductions. As is the case with the ARB's exclusion of costs and savings for certain non-AB 32 measures discussed above, this lack of data for certain measures is another example of the incompleteness of ARB's economic analysis of the scoping plan.

We appreciate that development of the scoping plan continues and that the plan is not a final document. While it is not unreasonable that the plan includes some measures which ARB has yet to fully analyze, we would expect that full analysis would accompany regulatory development of the measures. In the interim, we are unable to estimate the extent to which inclusion of the missing data would affect the bottom-line net annualized costs/savings associated with the scoping plan because ARB did not provide us preliminary estimates of such data.

Weak Basis for Low-Carbon Fuel Standard Assumptions

The $25 billion in annualized costs that ARB attributes to the scoping plan are concentrated in one measure—the low-carbon fuel standard. That measure alone accounts for $11 billion (44 percent) of the scoping plan's annualized costs, although it provides just less than 9 percent of the plan's emissions reductions. However, the ARB further claims that these $11 billion in annualized costs would be offset by equivalent savings on petroleum products (mainly gasoline) that would no longer be purchased for transportation purposes. Therefore, according to ARB, the net annualized cost of this measure is zero.

The ARB acknowledges that these estimates of costs and savings associated with this measure are weak at present. The scoping plan is based on the uncertain assumption that fuel producers can produce ethanol and biodiesel at costs similar to the current and projected high price of gasoline and diesel. However, ARB did not provide us a basis to justify this major assumption. We see the lack of development of the costs and savings estimates for the low-carbon fuel standard as a significant weakness in ARB's economic analysis of its scoping plan. As a consequence, the bottom-line calculation of net annualized costs/savings could change substantially, depending on the development of more refined estimates for the fuel standard.

ARB's Macroeconomic Modeling Lacks Analytical Rigor

Our analysis indicates that the macroeconomic analysis conducted by ARB provides little insight. The findings are highly dependent upon key assumptions, some of which are based on incomplete data as discussed above. However, in spite of the weakness of the data, the ARB has not determined how sensitive the macroeconomic findings are to changes in these key assumptions. Therefore, the modeling lacks analytical rigor. We discuss ARB's modeling of its economic analysis, and our concerns about it, in more detail below.

General Equilibrium Model. To determine the economic effects of the proposed scoping plan on the larger California economy, ARB relied upon a well-known type of model called a computable general equilibrium (CGE) macroeconomic model. Such models divide the overall economy into a large number of different individual sectors that interact with one another, and can trace through the effects of a change in one sector on the other sectors and, ultimately, the economy as a whole. A CGE model assumes as its starting point that each of its sectors is in equilibrium—that is, the supply and demand for the goods and services it produces are in balance. It then allows one to change the supply and demand in an individual economic sector by reallocating money from that sector to another, and then permits prices and wage rates in all sectors to adjust until equilibrium is restored in each one and their supply and demand are again in balance.

The factors that cause prices to change are as a result of inputs to the model. The inputs could represent changes in tax policy or the effects of regulation but, in any case, are expressed in the model as increased or decreased dollar amounts allocated to one or more economic sectors. In effect, the model is designed to reflect the interrelationship of sectors of the economy, in which direct economic changes to one sector manifest themselves indirectly as subsequent economic changes in other sectors of the economy.

The ARB applied a particular CGE model to the scoping plan—a modification of the Dynamic Revenue Assessment Model (DRAM). The DRAM was originally developed by Peter Berck, Professor in the Department of Agriculture and Resources Economics and Policy at UC Berkeley, for use by the Department of Finance to model the effects of proposed tax law changes. The ARB, working with Professor Berck, modified the

DRAM model to allow consideration of the effects of environmental regulations, dubbing the modified model Environmental DRAM (or E-DRAM).

Results of Economic Modeling Show Slight, Positive Effect. Based on the inputs provided by ARB (these are discussed further below), E-DRAM modeled the macroeconomic effects of the proposed scoping plan. Most notable among E-DRAM's "outputs":

- There would be an overall, though slight, positive effect on the state economy as of the year 2020, with increased total state output of 0.9 percent ($33 billion) and gross state product of 0.3 percent ($7 billion).
- The strongest, overall positive economic effects would occur in the agriculture, forestry, and fishing sector—a 3.9 percent ($4 billion) increase in economic output, and a 3.5 percent (15,000 job) increase in employment.
- Overall economic loss would be contained to the utilities sector—a 16.7 percent ($12 billion) decrease in economic output, and a 14.7 percent (10,000 job) decrease in employment.

Results of Economic Modeling Depend Heavily Upon Several Key Assumptions. Like all models, E-DRAM necessarily relies upon assumptions, such as the definition of major economic sectors and the interrelations between those sectors. We asked ARB to identify the most significant assumptions used in its economic modeling of the scoping plan—in other words, to list those assumptions that, were any one of them to change, would substantially alter the E-DRAM findings. At the time this analysis was prepared, ARB had not responded to our request. However, our analysis of the information available to us indicates that the most significant assumptions made by ARB are the direct economic costs and savings that it assumes result from each GHG reduction measure. These inputs drive the model's finding of net economic benefit from the scoping plan measures. We do not find it particularly insightful or surprising that E-DRAM predicts a positive economic effect for the scoping plan based on an input of $16 billion in assumed annual net savings. Therefore, the appropriate focus of any review of ARB's economic analysis is not the E-DRAM model itself or its findings, but on ARB's inputs to the model.

Despite Reliance on Key Assumptions, Plan Provides No Sensitivity Analysis. Sensitivity analysis determines how dependent the findings of an economic model are to changes in individual variables used in the model. The ARB indicates that, though it has not conducted a sensitivity analysis of the scoping plan, it hopes to do so in the future.

We see the lack of sensitivity analysis as particularly problematic, given that the findings of ARB's economic analysis rely so heavily on a small number of key assumptions. For example, the analysis assumes significant net economic effects from some measures which seem well-developed, such as the Pavley regulations, and other measures which are not well-developed, such as the low-carbon fuel standard. Similarly, the ARB necessarily made key assumptions about the public and private actions that would lead to the BAU scenario. It is impossible for our office, or decision makers, to fully

evaluate the scoping plan and its economic effect without an awareness of the degree of uncertainty connected with these assumptions and the risk associated with that uncertainty.

Plan Fails to Lay Out an Investment Pathway

ARB Analysis Fails to Explicitly Identify Timing of Needed Investments and Resulting Savings. The ARB estimates net annualized costs/savings for the scoping plan, as described above. However, the ARB has failed to plot an investment pathway required to implement the scoping plan. Such a pathway would depict the *timing* of the $25 billion in annual investments that the scoping plan seeks to require of businesses and households, as well as the timing of the $40 billion in annual savings predicted by the scoping plan. Such information is critical to businesses and households, and the decision makers who represent them, in trying to determine whether and how to finance capital improvements. The current environment of significant economic uncertainty and credit scarcity only make such information more critical. We see ARB's failure to lay out such an investment pathway as a major shortcoming of its economic analysis of the plan. This is especially so given that certain individual parties could be harmed by the plan, depending on those parties' individual circumstances, even if broad economic sectors will benefit.

Economic Analysis Not Used to Inform Plan Development

As acknowledged by ARB, its selection of measures for inclusion in the scoping plan preceded its economic analysis. Based on our review of the scoping plan materials, as well as our conversations with ARB staff, it appears that ARB developed the scoping plan by first selecting a collection of measures that conceivably could achieve the GHG emissions reductions called for by AB 32. Once it had compiled and developed that collection of measures, ARB estimated the associated direct costs and savings of those measures and input those dollar amounts into the E-DRAM economic model.

The modeling provided new macroeconomic findings related to the scoping plan. However, according to ARB, it did not use these findings in its selection of measures to include in the scoping plan or in its development of the individual measures. In this sense, ARB's economic modeling was after the fact. We would think that the modeling results would have provided useful data for ARB to have used in its development of the scoping plan.

It is unclear whether any findings about cost-effectiveness influenced either the mix of measures included in the scoping plan or the relative importance of each of those measures to achieve emissions reductions. For some individual measures, such as the Pavley regulations, ARB appears to have conducted reasonably thorough economic analyses, including cost-effectiveness considerations. However, the board indicates that it did not eliminate measures from the scoping plan that fell below a cost-effectiveness threshold. Nor, according to ARB, did it apply any findings about cost-effectiveness to

alter its designation of the number of tons of emissions reductions that it determined should be applied to each specific measure in the scoping plan.

MARKET-BASED MECHANISMS RAISE POLICY CHOICES

You have requested that we provide a discussion of some of the key policy choices in the draft scoping plan that warrant evaluation by the Legislature. As referenced earlier, the proposed scoping plan relies on a cap-and-trade program to provide about 20 percent of the plan's GHG emissions reductions. A cap-and-trade program is one of two major types of market-based compliance mechanisms. Another involves taxation related to carbon emissions. In the section that follows, we discuss:

- The economic theory behind market-based mechanisms.
- The tradeoffs involved in choosing one type of market-based mechanism over the other.
- The ARB's specific proposal for a cap-and-trade program.
- The important policy choices raised by the ARB's proposal that warrant legislative consideration.

The Theory of Market-Based Compliance Mechanisms

Traditionally, California has relied upon direct regulatory measures to regulate air emissions. Such regulations, sometimes referred to as "command-and-control" measures, specify certain performance standards applicable to emissions sources and, oftentimes, require specific actions on the part of those sources. Direct regulatory measures can be distinguished from market-based compliance mechanisms, which provide economic incentives to achieve emissions reductions, usually without specifying how emissions sources are to achieve those reductions.

The rationale in economic theory behind use of market-based mechanisms is that, when compared to command-and-control measures, they can achieve the same quantity of emissions reductions, but at a potentially lower cost. This is because the focus of market-based mechanisms is the amount of emissions placed into the atmosphere from all sources combined, not the amount of emissions attributable to any individual emissions source. Sources facing high costs to reduce emissions can choose not to do so. At the same time, sources that can reduce emissions cheaply can do so by an amount that compensates for the emissions reductions foregone by other emissions sources.

Broadly speaking, there are two types of market-based compliance mechanisms that could be used to achieve the GHG emissions reductions called for by AB 32—emissions taxes and trading programs. We discuss each of these mechanisms in turn and highlight the tradeoffs involved in choosing one mechanism over the other.

Emissions Taxes

The first type of market-based compliance mechanisms is emissions taxes. Tax mechanisms, such as imposing a set tax on each ton of carbon dioxide emitted, place a cost on GHG emissions where none previously existed. Under an emissions tax program, the regulator does not limit the amount of emissions that any individual source may emit. Rather, the regulator would set the tax at a dollar amount per ton of emissions so that, overall, the resulting amount of emissions will not exceed regulatory targets. This is because at least some emissions sources are assumed to reduce their emissions in order to avoid the tax.

An individual firm will experience greater cost, as a result of the tax, the more emissions it produces. The choice for any given emissions source, then, is whether the cost of reducing a ton of emissions exceeds the cost of the emissions tax. Presumably, those firms that can reduce a ton of emissions for less than the cost of the emissions tax will do so. Conversely, those firms that can only reduce a ton of emissions at a cost that exceeds the emissions tax will continue to produce emissions and pay the resulting emissions tax. In theory, if the amount of the tax is set appropriately, the decisions of emissions sources facing the emissions tax will result in a collective reduction in overall emissions. This collective emissions reduction is achieved, even as individual emissions sources maintain the flexibility to reduce, or not to reduce, emissions, based on each of their economic situations. And those emissions reductions are achieved, in theory, at the least cost possible.

Trading Programs

The second common type of market-based mechanism is trading programs, often referred to as cap-and-trade programs. As with emissions taxes, a cap-and-trade program does not directly require an individual emissions source to reduce its emissions. However, under a cap-and-trade program, the regulator issues allowances for each ton of emissions permissible within the regulated area. A regulated source must possess an allowance for each ton of the regulated emission it produces or face penalties established by the regulator. Because the amount of allowances issued is less than the amount of emissions that would otherwise be produced, the effect of the allowance system is assumed to be lower overall emissions.

A cap-and-trade program differs from a tax program in that the cost to emit regulated emissions is not decided by a regulator who sets a tax. Rather, the cost is determined, in effect, by the emissions sources themselves through trading of scarce emissions allowances. (An emissions allowance is essentially a permit to emit a particular quantity of emissions.) In this way, a trading market determines the price of an emissions allowance.

As is the case under an emissions tax program, regulated firms in the trading program must decide whether the cost to emit a ton of emissions is economically rational. Firms that can reduce their emissions at a cost below the trading price of emissions al-

lowances will do so, thereby allowing them to sell their excess allowances to those sources for which the cost of emissions reductions exceeds the trading price of allowances. In this way, a cap-and-trade program achieves, in theory, emissions reductions at the least cost possible.

Relative Economic Effects of Emissions Tax and Cap-and-Trade Programs

While an emissions tax and a cap-and-trade program differ in their administration, their theoretical economic effects (all other factors being equal) are identical. This is because both mechanisms ordinarily use the price per ton of emissions to limit emissions at the desired level. The difference between the two mechanisms is how the price per ton of emissions is established.

Under an emissions tax program, the regulator sets the per-ton price of emissions by setting the amount of the emissions tax. In contrast, under a cap-and-trade program, the regulator determines the number of emissions allowances to issue to regulated sources and leaves it to the trading of allowances to determine the price of a ton of emissions. The end result is theoretically the same—a cost per ton of emissions that causes emissions sources to reduce their emissions to the level desired by regulators.

Emissions Taxes Provide More Certainty Regarding the Costs of Compliance. The main difference between an emissions tax and a cap-and-trade program is the level of certainty provided by each to the parties subject to such regulation. An emissions tax provides relative certainty about the price per ton of emissions reductions and, therefore, the cost of compliance. This is because the per-ton price is, by definition, the dollar amount of the per-ton emissions tax. Emissions sources subject to the tax are free to emit whatever quantity of emissions they choose, so long as they are willing to pay the emissions tax. Should regulators set the emissions tax too low, emissions may exceed regulatory targets. Should regulators set the emissions tax too high, then regulated sources may reduce emissions beyond what is economically optimal. Therefore, under an emissions tax program, the cost of compliance to a regulated source is known, although the overall effect of this regulatory approach on the quantity of GHGs emitted is less certain.

Cap-and-Trade Programs Provide More Certainty Regarding the Level of Compliance. In contrast to an emissions tax, a cap-and-trade program provides relative certainty about the reduction in GHG emissions that will be achieved. This is because, by definition, the amount of overall emissions will equal the amount of emissions allowances issued by the regulator. However, because the price of an allowance is determined by the market, not regulators, the cost of compliance with a cap-and-trade program is more uncertain.

Scoping Plan Relies on Both Command-and-Control and Market-Based Measures

Consistent with AB 32, the scoping plan includes both direct regulatory measures and market-based compliance mechanisms to achieve GHG emissions reductions. The

plan relies heavily on the types of direct regulatory requirements that have typified California's regulation of environmental quality, such as efficiency and emissions standards. In fact, as can be seen from Figures 1 and 2, such direct regulatory measures account for over three-quarters of the GHG emissions reductions recommended by the plan.

The remainder of the plan's GHG emissions reductions would result from market-based compliance mechanisms. Specifically, the scoping plan recommends a cap-and-trade program to achieve roughly 33 MMTCO2E—or about 20 percent—of the scoping plan's 175 MMTCO2E of GHG emissions reductions. The scoping plan also includes very limited use of fees applied to specific emissions sources to achieve relatively minor reductions of GHG emissions. (See, for example, the mitigation fee on high global warming potential gases.) The plan does not propose the use of a broad-based carbon tax to reduce GHG emissions.

Cap-and-Trade Proposed for Economic Sectors With the Largest Emissions. The particular cap-and-trade program recommended by the scoping plan would apply to four economic sectors which, collectively account for more than 80 percent of the state's BAU GHG emissions. Those four sectors are transportation, electricity, commercial and residential, and industry. The GHG emissions from these sectors would be "capped" so that, collectively, they could emit no more than 365 MMTCO2E of GHGs in 2020. Figure 8 shows the four economic sectors that would be covered by the proposed cap-and-trade program.

Figure 8

Economic Sectors Covered by the Proposed Cap-and-Trade Program

(Greenhouse gas [GHG] emissions in MMTCO2E)

Sector	Business-as-Usual GHG Emissions	Scoping Plan Direct Reduction Measures	GHG Emissions After Direct Reduction Measures
Transportation	225.4	62.4	163.0
Electricity	139.2	45.3	93.9
Industry	100.5	1.4	99.1
Commercial and residential	46.7	4.4	42.3
Subtotals	511.8	113.5	398.3
GHG emissions limit for capped sectors			365.0
Emissions to be achieved through cap-and-trade program			33.3[a]

MMTCO2E = millions of metric tons of carbon dioxide equivalents.

[a] Air Resources Board rounded this amount to 35 MMTCO2E in Figures 1 and 2.

As Figure 8 illustrates, each of the four economic sectors must reduce its GHG emissions through the direct regulatory measures recommended by the program. However, after accounting for GHG emissions reductions resulting from the plan's direct regulatory measures, the four sectors must together achieve additional reductions of approximately another 33 MMTCO2E through the cap-and-trade program.

Cap-and-Trade Program Still Under Development, But Many Important Policy Choices Already Made

The ARB is still developing its cap-and-trade proposal and indicates that details of the program will be finalized later as part of the regulatory process. Still, the scoping plan provides some details of the program that ARB envisions. Though preliminary, those details allow insight into ARB's leanings on some important policy choices related to the program's design.

Program to Be Linked to the Western Climate Initiative. The scoping plan indicates ARB's intent to link California's cap-and-trade program to that of the Western Climate Initiative (WCI)—a collaboration of the governors of several western states and premiers of several Canadian provinces to collectively reduce GHG emissions. The ARB indicates that participation in a region-wide trading program will increase the diversity of emissions sources covered by the program and that such diversity will allow more opportunities to realize GHG emissions reductions at the lowest possible cost. However, we note that there are some tradeoffs with such a regional approach. For example, a program that operates beyond the state's borders raises challenging enforcement issues from the state's perspective.

Like ARB's cap-and-trade proposal, the WCI's program is still under development. Nonetheless, WCI has begun to adopt minimum standards for member jurisdictions that would choose to participate in the proposed regional cap-and-trade program. The ARB indicates that many of the policy choices described below were made in order to accommodate the emerging framework of the WCI's regional approach.

Program to Be Phased In. The scoping plan describes a two-phase implementation approach, in which capped sectors are brought in to the cap-and-trade program over time. The first phase would begin in 2012 and the second in 2015. Figure 9 illustrates the two phases and the sectors that would be incorporated under each.

Allocation of Allowances. One of the most contentious policy choices regarding the design of a cap-and-trade system concerns the initial allocation of emissions allowances, including the pricing of such allowances. Generally speaking, regulators could allocate the allowances in one of four ways:

- Give them away for free.
- Sell them for set prices.
- Auction them.
- Do some combination of the three.

The method of initial allocation is so controversial because the emissions allowances, once traded in a market, will have economic value. Thus, in distributing allowances, regulators are distributing a valuable commodity. In addition, because some of the allo-

cation methods generate revenue, decisions concerning the use of that revenue are highly relevant.

Figure 9

Cap-and-Trade Program Would Have Two Phases

Sectors Covered

Phase I—Beginning 2012

- Electricity generation, including imports.
- Large industrial sources with emissions above 25,000 metric tons of CO2 equivalents, including high global warming potential gases used in the industrial process.

Phase II—Beginning 2015

- All sectors covered in Phase I.
- Industrial fuel combustion at facilities with emissions at or below 25,000 metric tons ("upstream"[a]).
- All commercial and residential fuel combustion (upstream[a]).
- Transportation fuels (upstream[a]).

[a] "Upstream" refers to points earlier in the product cycle, such as extraction and refinement of raw materials, rather than later, "downstream" points in that cycle, such as retail sales of products.

The ARB has indicated that, in keeping with WCI guidelines, it will likely auction a portion (at least 10 percent) of the allowances. Another portion of the remaining allowances may be distributed based on performance standards (an approach often termed "benchmarking") or regulated sources' historical emissions of GHG (so-called "grandfathering"). In addition, ARB may withhold some allowances and later award them to firms and sectors that are struggling to adjust to a carbon-constrained economy.

Use of "Offsets." Offsets refer to projects that reduce emissions of GHGs that are undertaken by emissions sources not subject to the cap-and-trade program's GHG emissions cap. These projects are in lieu of emissions reductions by an emissions source subject to the cap. For example, a regulated power plant may pay an industrial emissions source not subject to GHG regulation to reduce its emission of GHGs. The power plant would do this because it would cost the industrial source less to reduce its emissions of GHGs than it would cost the power plant to reduce its emissions by the same amount. Under an offset program, the regulator would credit the power plant for the GHG emissions reductions realized by the industrial source. The result is a reduction in overall GHGs, but at a cost that is lower than if the regulated power plant were to realize those reductions itself.

Use of offsets is controversial, however. This is because it can be difficult to verify that offsets represent a "real" reduction in GHG emissions by nonregulated sources. Similarly, it can also be difficult to verify that the emissions reductions by the nonregulated source are truly "additional"—in other words, that they would not have occurred anyway absent the payment made by the regulated emission source.

These difficulties become more pronounced as the eligible geographic location of potential offset projects is broadened. For example, it would likely be more challenging for California regulators to verify whether an offset project undertaken in northern Canada reflects real, additional GHG emissions reductions than it is for them to verify an offset project undertaken in Northern California.

The ARB indicates in the scoping plan its intention to allow use of offsets as part of its cap-and-trade program. The ARB notes the potential of offsets to reduce emissions reduction costs by incorporating low-cost emissions reductions from nonregulated emissions sources into the cap-and-trade program. The ARB also notes, for similar reasons, the desirability of recognizing offsets from as wide a geographic area as possible.

In keeping with WCI guidelines, ARB states that no more than 49 percent of the cap-and-trade program emissions reductions will be allowed from offsets, with the remainder coming from regulated emissions sources. In addition, ARB indicates that, in keeping with the public health and economic development goals of AB 32, much of California's reduction of GHGs will need to come from California emissions sources. The ARB indicates that it will continue to work with WCI to develop its cap-and-trade proposal, which eventually will be considered for regulatory adoption by the ARB.

Economic Impact of Cap-and-Trade Program Unclear

The effect of the cap-and-trade program on the scoping plan's economic bottom line is unclear. The scoping plan documents, including the figures that illustrate the emissions reductions, costs, and savings associated with the scoping plan measures, include no cost or savings data for the program. This is yet another weakness in the economic analysis accompanying the proposed scoping plan.

Market Mechanisms Raise Policy Choices; Legislative Oversight Needed

As can be seen from the above discussion, the use and design of market mechanisms are very complex and involve many key policy choices. While successful examples of the use of market mechanisms to control air emissions exist, such as the federal acid rain program, there is little experience with the use of these mechanisms to control GHG emissions. As ARB continues to develop its proposed cap-and-trade program, it will be important for the Legislature to oversee and provide policy direction on these issues.

CONCLUSION

In summary, we think that it will be important for the Legislature to exercise oversight as ARB continues to develop the scoping plan's measures up to and through regulatory development. This will be necessary to ensure that AB 32 is implemented cost-effectively and efficiently and that the weaknesses in the economic analysis that we have identified are addressed.

If you have any questions regarding this letter, please contact Jay Dickenson of my staff at 319-8354 or Mark Newton at 319-8323.

Sincerely,

Mac Taylor
Legislative Analyst

cc: Hon. Michael Villines