ORAL ARGUMENT NOT YET SCHEDULED

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 09-1237

CHAMBER OF COMMERCE OF THE UNITED STATES OF AMERICA, et al.,

Petitioners,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, et al.,

Respondents.

On Petition For Review of Final Action of the
United States Environmental Protection Agency

BRIEF FOR RESPONDENTS UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, et al.

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November 10, 2010

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CHAMBER OF COMMERCE OF THE UNITED STATES, et al., Petitioners, v. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, et al., Respondents.	)	Docket No. 09-1237

RESPONDENTS' CERTIFICATE OF COUNSEL

Pursuant to Circuit Rule 27(a)(4), counsel for respondent United States Environmental Protection Agency ("EPA") submits this certificate as to parties, rulings, and related cases.

(A) Parties and Amici

(i) Parties, Intervenors, and Amici Who Appeared in the District Court

This case is a petition for review of final agency action, not an appeal from the ruling of a district court.

(ii) Parties to These Cases

1. Petitioners: Chamber of Commerce of the United States of America and National Automobile Dealers Association.

2. Respondents: United States Environmental Protection Agency ("EPA") and Lisa P. Jackson, EPA Administrator.

3. Intervenors:

a. The State of California;

b. South Coast Air Quality Management District;

c. The States of New York, Arizona, Connecticut, Delaware, Illinois, Iowa, Maine, Maryland, Minnesota, New Jersey, New Mexico, Oregon, Rhode Island, Vermont, and Washington, the Commonwealth of Massachusetts, the State of Florida Department of Environmental Protection, and the Commonwealth of Pennsylvania Department of Environmental Protection; and

d. Environmental Defense Fund, Natural Resources Defense Council, the Sierra Club, and Environment California.

4. Amici:

a. Pacific Legal Foundation;

b. William K. Reilly and Russell E. Train;

c. Charles E. Frank and Adam D. Lee;

d. Inez Fung, James Hansen, Mark Z. Jacobsen, Michael Kleeman, Benjamin Santer, Stephen H. Schneider, and James C. Zachos;

e. PG&E Corporation and Sempra Energy.

(B) Rulings Under Review

Petitioners seek review of the EPA action published at 74 Fed. Reg. 32,744 (July 8, 2009) granting a request by the State of California for a waiver of preemption of new motor vehicle emission standards pursuant to section 209(b) of the Clean Air Act, 42 U.S.C. § 7543(b).

(C) Related Cases

The case on review has not been previously before this Court or any other Court. EPA's prior action denying the same requested waiver was the subject of California v. EPA, No. 08-1178 and consolidated cases (D.C. Cir.). That action was dismissed September 3, 2009.

Respectfully submitted,

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GLOSSARY

CAA	Clean Air Act, 42 U.S.C. §§ 7401-7671q
CARB	California Air Resources Board
Chamber	Petitioner Chamber of Commerce of the United States of America
CO	Carbon monoxide
EPA	United States Environmental Protection Agency
EPCA	Energy Policy and Conservation Act, Pub. L. No. 94-163, 89 Stat. 871 (1975)
NADA	Petitioner National Automobile Dealers Association
NOx	Oxides of nitrogen

JURISDICTION

The Court has jurisdiction pursuant to 42 U.S.C. § 7607(b)(1).

STATUTES AND REGULATIONS

The pertinent statutory provision is quoted herein.

STATEMENT OF ISSUES

1. Whether Petitioners have standing.

2. Whether the Environmental Protection Agency ("EPA") reasonably determined that the issue of whether California needed its own standards for control of motor vehicle emissions should be based on a consideration of California's program as a whole.

3. In the alternative, if California's need for its greenhouse gas standards must be considered in isolation from other aspects of its motor vehicle program, whether EPA reasonably determined that the opponents of the waiver had failed to demonstrate that California did not need the greenhouse gas standards to meet compelling and extraordinary conditions.

4. Whether EPA took any action regarding preemption under the Energy Policy and Conservation Act.

STATEMENT OF THE CASE

I. STATUTORY BACKGROUND

The Clean Air Act ("CAA"), 42 U.S.C. §§ 7401-7671q, establishes a comprehensive program for controlling and improving the nation's air quality. The Act generally preserves considerable flexibility for States to meet their goals. However, with regard to new motor vehicles, EPA promulgates nationally applicable emission standards, and States are generally preempted from adopting their own standards. 42 U.S.C. § 7543(a). The Act contains a provision allowing the State of California to petition EPA for a waiver of that preemption. Id. § 7543(b).

Specifically, the Act provides:

> The Administrator shall, after notice and opportunity for public hearing, waive application of this section to [California] if the State determines that the State standards will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards. No such waiver shall be granted if the Administrator finds that –
>
> (A) the determination of the State is arbitrary and capricious,
>
> (B) such State does not need such State standards to meet compelling and extraordinary conditions, or
>
> (C) such State standards and accompanying enforcement procedures are not consistent with section 7521(a) of this title.

Id. § 7543(b)(1). In keeping with the broad discretion that Congress intended to give California, EPA is required to grant the waiver unless it affirmatively makes at least one of these findings. Motor & Equip. Mfrs. Ass'n, Inc. v. EPA, 627 F.2d 1095, 1120-23 (D.C. Cir. 1979) ("MEMA"). Furthermore, "the burden of proof lies with the parties favoring denial of the waiver." Id. at 1121. Similarly, EPA is not required to affirmatively find that none of the conditions that would warrant denial affirmatively exist. Id. at 1120. Rather, the Administrator must examine the evidence submitted by those opposed to the waiver to determine if it is sufficient to overcome the presumption that the waiver should be granted. Id. at 1122. If EPA grants a waiver, other States may adopt the same standards if specified conditions are met. 42 U.S.C. § 7507.

Both the preemption provision in section 7543(a) and the waiver provision in 7543(b) were enacted in 1967. As the Senate Committee that developed these provisions stated: "Senator Murphy convinced the committee that California's unique problems and pioneering efforts justified a waiver of the preemption section to the State of California." S. Rep. No. 90-403 at 33 (1967). See MEMA, 627 F.2d at 1109. As explained by this Court:

> According to the Committee, the advantages of the California exception included the benefits for the Nation to be derived from permitting California to continue its experiments in the field of emissions control – benefits the Committee recognized might

> "require new control systems and design." [S. Rep. No. 90-403 at 33 (1967)] – and the benefits for the people of California to be derived from letting that State improve on "its already excellent *program*" of emission control, id. (emphasis added).

MEMA, 627 F.2d at 1109-10. Thus, as this Court has recognized, in enacting the waiver provision, Congress clearly expected that manufacturers would have to produce two fleets of vehicles: one for California and one for the rest of the nation.

The waiver provision was amended in 1977 to allow California to consider the protectiveness of its standards in the aggregate, rather than requiring that each such standard be at least as stringent as its federal counterpart. See MEMA, 627 F.2d at 1110-11. At the same time, Congress enacted section 7507, the previously-mentioned provision that allows other States to adopt California's standards. As this Court explained, "Congress had an opportunity to restrict the waiver provision in making the 1977 amendments, and it instead elected to expand California's flexibility to adopt a complete program of motor vehicle emissions control." MEMA, 627 F.2d at 1110. The Committee Report of the House committee in which the amendment originated states:

> The Committee amendment is intended to ratify and strengthen the California waiver provision and to affirm the underlying intent of the provision, i.e., to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare.

H.R. Rep. No. 95-294 at 301-02 (1977), reprinted in 1977 U.S.C.C.A.N. 1077, 1380-81 ("1977 Comm. Rpt."). This Court has summarized Congress' intent in section 7543(b) by stating:

> Since the inception of the federal government's emissions control program it has drawn heavily on the California experience to fashion and to improve the national efforts at emissions control. The history of congressional consideration of the California waiver provision from its original enactment up through 1977, indicates that Congress intended the State to continue and expand its pioneering efforts at adopting and enforcing motor vehicle emission standards different from and in large measure more advanced than the corresponding federal program; in short, to act as a kind of laboratory for innovation.

MEMA, 627 F.2d at 1110-11 (footnote omitted).

II. FACTUAL BACKGROUND

The petition for review challenges EPA's grant of a waiver of Clean Air Act preemption for California regulations concerning emissions of greenhouse gases, including carbon dioxide, methane, nitrous oxides, and hydrofluorocarbons, from new motor vehicles. California submitted its initial request for a waiver to EPA by letter dated December 21, 2005. On April 30, 2007, EPA published a notice announcing an opportunity for hearing and comment on California's waiver request. 72 Fed. Reg. 21,260 (Apr. 30, 2007). Public hearings were held May 22 and May 30, 2007, and the public comment period closed on June 15, 2007.

EPA originally denied California's request in a Federal Register notice dated March 6, 2008. 73 Fed. Reg. 12,156. In reaching that decision, the then-Administrator departed significantly from the Agency's past practice of considering whether California needed its own motor vehicle program *as a whole* to address compelling and extraordinary conditions, and instead considered whether California needed its greenhouse gas regulations considered *by themselves*. Id. at 12,159-61.[1] Based on that new approach, the Administrator stated that the greenhouse gas standards were designed to address a global air pollution problem and determined that California did not need its standards to meet compelling and extraordinary conditions, as required by section 7543(b)(1)(B). 73 Fed. Reg. at 12,159/1.

Petitions for review of that decision were filed in this Court and consolidated as California v. EPA, No. 08-1178. The parties filed their initial briefs in the case. The brief that was submitted on behalf of EPA argued that the Administrator's decision was a reasonable interpretation of the ambiguous

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[1] This decision resulted in a bifurcated interpretation of the statute, where this new interpretation was applied to emissions standards for greenhouse gases, while the traditional interpretation continued to be applied to all other emissions standards. 74 Fed. Reg. 32,744, 32,759/3 (July 8, 2009). See 73 Fed. Reg. 12,156, 12,161 (March 6, 2008) ("EPA continues to believe that it is appropriate to apply its historical practice to air pollution problems that are local or regional in nature, and is not suggesting the need to change such interpretation.").

provisions of section 7543(b). The case was dismissed by Order dated September 3, 2009 on the basis of the parties' joint motion to dismiss.

On January 21, 2009, the California Air Resources Board ("CARB") submitted a request that EPA reconsider the waiver denial. See 74 Fed. Reg. at 32,747. On February 12, 2009, EPA published a notice in the Federal Register announcing that EPA would fully review and reconsider its March 6, 2008 Denial. 74 Fed. Reg. 7040 (Feb. 12, 2009). In that notice EPA sought comment on: any new or additional information regarding the three section 7543(b) waiver criteria; whether EPA's interpretation and application of section 7543(b)(1)(B) in the denial decision was appropriate; and the effect of the waiver denial on whether CARB's greenhouse gas standards were consistent with section 7521(a), including that section's lead time requirements. Id. EPA held a public hearing on the reconsideration on March 5, 2009.

EPA's decision on reconsideration granting California's waiver request was published in the Federal Register on July 8, 2009. 74 Fed. Reg. 32,744. The decision was based on the Administrator's finding that "the March 6, 2008 Denial was based on an inappropriate interpretation of the waiver provision." Id. at 32,746/1. Specifically, the Administrator rejected the interpretation of section 7521(b)(1)(B) relied on in the March 6, 2008 denial and returned to the Agency's

traditional interpretation of section 7543(b)(1)(B) – that this criterion is to be determined on the basis of its program *as a whole*, by considering whether California needs it own motor vehicle program to address extraordinary and compelling circumstances, rather than standard-by-standard. The Administrator stated:

> If California needs a separate motor vehicle program to address the kinds of compelling and extraordinary conditions discussed in the traditional interpretation, then Congress intended that California could have such a program. Congress also intentionally provided California the broadest possible discretion in adopting the kind of standards in its motor vehicle program that California determines are appropriate to address air pollution problems that exist in California, whether or not those problems are local or regional in nature, and to protect the health and welfare of its citizens. The better interpretation of the text and legislative history of this provision is that Congress did not intend this criterion to limit California's discretion to a certain category of air pollution problems, to the exclusion of others.

Id. at 32,762/1-2.

The Administrator further recognized that there is no sharp line between local and broader air pollution problems. Id. at 32,762/2 ("air pollution problems, including local or regional air pollution problems, do not occur in isolation"). For example, ozone and particulate matter air pollution, which have long been the target of California's motor vehicle standards, have both local, regional and long-range components. Id. The Administrator concluded:

> This context for air pollution problems supports the view that Congress did not draw such a line between the types of air pollution problems under this criterion, and that EPA should not implement this criterion in a narrow way restricting how California determines it should develop its motor vehicle program to protect the health and welfare of its citizens.

Id.

Considering California's motor vehicle program as a whole, the Administrator determined that she was "unable to identify any change in circumstances or any evidence to suggest that the conditions that Congress identified as giving rise to serious air quality problems in California no longer exist." Id. at 32,763/1. Accordingly, the Administrator concluded that there was no basis to deny the requested waiver. Id. The Administrator determined that "whether or not local conditions are the primary cause of elevated concentrations of greenhouse gases," this approach is consistent with the clear deference that Congress intended to provide California on the mechanisms it chooses to address its air pollution problems. Id. at 32,763/2.

The Administrator also considered, in the alternative, whether the waiver should be granted even if the tests utilized in the waiver denial were applied. Id. at 32,763-67. To that end she considered whether the evidence in the record showed that California did not need its motor vehicle greenhouse gas standards if those standards were looked at separately, and concluded that the waiver could not

be denied based on such a finding. Id. The first alternative test from the denial decision considered by the Administrator was whether California's greenhouse gas standards, considered in isolation, were designed at least in part to address an air pollution problem that is local or regional in nature. Id. at 32,763. The Administrator rejected as "overly narrow" the approach taken in the waiver denial, which focused solely on the global effects of greenhouse gases. Id. Instead, the Administrator considered both the logical link between local ozone concentrations and climate change and the considerable discretion that Congress has given California in addressing its air pollution problems. Id. Applying this approach, the Administrator found that California had made the case that its ozone problems would be made worse by rising temperatures, which the greenhouse gas regulations are intended to ameliorate, and thus that California's greenhouse gas standards were intended at least in part to address a local or regional problem.

The Administrator also considered whether the waiver should be granted if the second alternative test from the denial was applied, i.e., she considered whether the impacts of global climate change on California were significant enough and different enough from the effects on the rest of the country to support the conclusion that California needs its greenhouse gas regulations to meet compelling and extraordinary circumstances. She determined, based on the

evidence in the record, that there would also be no basis to deny the waiver if that test were applied. Id. at 32,763-67. The Administrator found that California had identified a wide variety of impacts from climate change within California and that the opponents of the waiver had not demonstrated that any other State, group of States or area within the United States would face a similar or wider range of vulnerabilities and risks. Id. at 32,765/2. Thus, the waiver could not be denied even under the alternative tests.

The petition for review was filed September 8, 2009. EPA moved to dismiss the petition for lack of standing. By Order dated February 25, 2010, the Court referred the motion to dismiss to the merits panel and ordered the parties to address the issues raised in the motion in their briefs.

STANDARD OF REVIEW

The Court's review of EPA's decision to deny California's request for a waiver is governed by section 706 of the Administrative Procedure Act, 5 U.S.C. § 706. Motor & Equip. Mfrs. Ass'n, Inc. v. EPA, 627 F.2d at 1105. Thus, the Agency's decision must be upheld unless it is "arbitrary, capricious, . . . or otherwise not in accordance with law," or if it fails to meet statutory, procedural, or constitutional requirements. 5 U.S.C. § 706(2). See also American Trucking Ass'ns, Inc. v. EPA, 600 F.3d 624, 627 (D.C. Cir. 2010).

The "arbitrary or capricious" standard presumes the validity of agency actions, and a reviewing court is to uphold an agency action if it satisfies minimum standards of rationality. Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 519-21 (D.C. Cir. 1983); Ethyl Corp. v. EPA, 541 F.2d 1, 34 (D.C. Cir. 1976) (en banc). Where EPA has considered the relevant factors and articulated a rational connection between the facts found and the choices made, its regulatory choices must be upheld. Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983). The Court must "presume that the Administrator acted lawfully and so conclude unless [the Court's] thorough inspection of the record yields no discernible rational basis for his action." MEMA, 627 F.2d at 1105. Furthermore, the same standard applies to judicial review of an agency's decision, whether review is of the agency's initial decision on a matter or is of the agency's revision or reversal of a previous decision. F.C.C. v. Fox Television Stations, Inc., 129 S. Ct. 1800, 1810-11 (2009). In either case, the Agency is required only to provide a "reasoned explanation" for its decision. Id.

With regard to questions of statutory interpretation, as the agency to which Congress expressly delegated implementation authority, EPA's interpretation of the Clean Air Act "governs if it is a reasonable interpretation of the statute – not necessarily the only possible interpretation, nor even the interpretation deemed

most reasonable by the courts." Entergy Corp. v. Riverkeeper, Inc., 129 S.Ct. 1498, 1505 (2009) (emphasis in original) (citing Chevron U.S.A., Inc. v. NRDC, 467 U.S. 837, 843-44 (1984)). It is not necessary that the reviewing court first and independently consider the Chevron step 1 question of "'whether Congress has directly spoken to the precise question at issue' . . . [because] surely if Congress has directly spoken to an issue then any agency interpretation contradicting what Congress has said would be unreasonable." Riverkeeper, 129 S. Ct. at 1505 n.4 (internal citations omitted).

SUMMARY OF THE ARGUMENT

Petitioners lack standing, and the petition must therefore be dismissed. The Chamber of Commerce of the United States ("Chamber") has failed to identify a single individual member that it asserts has suffered harm as a result of the waiver decision, and thus has not even made the minimum threshold showing necessary to demonstrate standing. While the National Automobile Dealers Association ("NADA") has presented declarations identifying specific members, those declarations do not establish that NADA's members will suffer any concrete harm as a result of the grant of the waiver. While the declarants assert *without support* that they will lose sales as a result of the waiver, evidence in the record demonstrates the opposite – that the availability of more fuel-efficient vehicles as

a result of the waiver decision will actually *increase* sales. Furthermore, declarants' claims that they will lose sales to dealers in other States has been mooted by the recent adoption of federal standards for model years 2012 to 2016 that are essentially equivalent to the California standard for which the waiver was granted.

Even if Petitioners had standing, the petition should be denied because EPA reasonably concluded that California's need for its own emission standards should be determined based on consideration of California's need for its program *as a whole*. EPA reasonably interprets the criterion set forth in section 7543(b)(1)(B) – whether California needs "*such* State standards" to meet compelling and extraordinary conditions – as referring back to the introductory language of section 7543(b)(1), which requires California to determine whether *its standards "in the aggregate"* are at least as protective as applicable Federal standards, which refers to California's program as a whole. Furthermore, Congress' 1977 amendment of the statute to allow the protectiveness determination to be made "in the aggregate" supports EPA's reading of the statute because it would be anomalous for Congress to permit California to have a program in which some standards were less stringent than federal standards, so long as the whole is more protective, and yet simultaneously require California to justify its need for those standards individually.

EPA's reading of the statute is also consistent with congressional purpose. Once EPA grants California a waiver with regard to any of its regulations, manufacturers will need to meet two different sets of regulations for the nation without regard to the exact nature of California's program; thus, EPA's reading of the statute as allowing California's need for its own standards to be assessed based on the California program as a whole does not implicate Congress' desire to avoid a "patchwork" of regulation. Furthermore, one of the central purposes of Congress' decision allowing California to obtain waivers of preemption was to allow that State to continue to act as a laboratory for innovation in developing new pollution control technologies and techniques. To that end, Congress intended to grant the State the "broadest possible discretion." MEMA, 627 F.2d at 1110-11; Ford Motor Co. v. EPA, 606 F.2d 1293, 1296-97 (D.C. Cir. 1979). Considering California's need for its program as a whole is consistent with this congressional intent to allow California the broadest possible discretion to innovate, whereas requiring considering each element of the program in isolation is not.

Even if California's need for the greenhouse gas regulations is considered in isolation from other aspects of California's regulatory program, EPA's determination that there was no basis to deny the waiver is reasonable and supported by evidence in the record, including evidence submitted during the

reconsideration process. First, California's greenhouse gas regulations are part of California's program to address the local and regional problem of air pollution. California has considerable discretion in fashioning its program of vehicle standards. Because California indisputably may promulgate its own program to address its long-recognized and undisputed ozone problem, it has discretion to include the greenhouse gas standards for purposes of that program, and there was no basis to deny the waiver. Second, EPA reasonably determined that the waiver should be granted because opponents of a waiver had not demonstrated that the effects of climate change on California do not constitute compelling and extraordinary conditions.

Finally, EPA made no determination as to whether enforcement of California's greenhouse gas regulations would be preempted by the Energy Policy and Conservation Act. Rather, EPA simply granted a waiver from the prohibition in section 7543(a) on adoption or enforcement of motor vehicle standards by a State. Thus, that issue is not before this Court.

ARGUMENT

I. PETITIONERS LACK STANDING

Petitioners do not claim standing based on an injury to themselves, but rather associational standing based on alleged injuries to their members. Pet'r Br.

at 22. To establish associational standing, Petitioners must demonstrate that: (1) at least one identified member would have standing to sue in its own right; (2) the interests they seek to protect are germane to the organizations' purpose; and (3) neither the claim asserted nor the relief requested requires the participation of individual members. American Chemistry Council v. Dep't of Transp., 468 F.3d 810, 815 (D.C. Cir. 2006).

To establish that an identified member would have standing, the Petitioners must demonstrate that (1) the member has suffered an injury-in-fact that is both concrete and particularized and actual or imminent rather than conjectural or hypothetical; (2) there is a causal connection between the claimed injury and the challenged action and that the injury is not the result of the independent action of some third party; and (3) it is likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision. Id.

The California regulations for which the waiver was granted directly regulate only vehicle manufacturers,[2] who have not challenged the grant of the waiver. "[W]hen the plaintiff is not himself the object of the government action or inaction he challenges, standing is not precluded, but it is ordinarily 'substantially

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[2] See Cal. Code Regs. tit. 13 § 1961.1 (2010) (compliance with California's greenhouse gas emission standards are based on manufacturer compliance with fleet average requirements).

more difficult' to establish." Lujan v. Defenders of Wildlife, 504 U.S. 555, 562 (1992) (citation omitted); Sierra Club v. EPA, 292 F.3d 895, 899-900 (D.C. Cir. 2002). Because Petitioners are not themselves the subject of the agency action being challenged, they must come forward with specific facts to demonstrate that they have an identifiable member who has suffered a redressable injury from the waiver grant.

The Chamber has not identified a single specific member that it alleges has been injured, and thus has not even made the threshold showing necessary to establish standing. While the Chamber asserts that it has members who are automobile dealers or other entities who are affected by the grant of the waiver, it has not identified them, and thus cannot establish the particularized injury necessary for standing. Summers v. Earth Island Inst., 129 S. Ct. 1142, 1150-51 (2009) (to have standing organization must identify specific member with a specific concrete injury).

While NADA has identified specific members, it has not established that those members will suffer a concrete injury. The sole evidence of injury presented by NADA are declarations by two dealers who speculate that they may be harmed if they are unable to obtain certain vehicle models allegedly desired by

customers or are forced to accept more fuel-efficient vehicles that are allegedly less popular with consumers. Pet'r Stand. Add. at 8-14.

The evidence in the record, however, shows that automobile sales are predicted to *increase* in California as a result of its greenhouse gas standards because of growing consumer preference for high-mileage vehicles. Analysis by CARB demonstrates that implementation of the California standards will result in an overall increase in vehicle sales, at least through the 2013 model year, because of the increased availability of fuel-efficient vehicles. CARB, Addendum to Initial Statement of Reasons, EPA-HQ-OAR-2006-0173-0010.132, at 34 Table 12.1-7; see also id. at 38 Table 12.6-4 (showing no jobs lost at automobile dealers as a consequence of implementation of the California standards) (JA 828, 832). This conclusion is supported by other analyses as well as the recent experience of at least one automobile manufacturer. Testimony of Dr. Walter McManus, University of Michigan Transportation Research Institute, EPA-HQ-OAR-2006-0173-7176, at 175-82 (JA 3154-61); Citigroup Global Market Reports, October 13, 2009 (Attachment 1); Ford Motor Company news release November 3, 2009 (Attachment 2) ("Consumer demand for our new high-quality, fuel-efficient products is driving Ford's market share gains.").

Furthermore, federal greenhouse gas standards have been promulgated for model years 2012 to 2016, and California has taken action to accept compliance with the federal standards as an alternative means of compliance with the State's standards.[3] As a result of EPA's promulgation of these federal standards, automobile manufacturers selling vehicles in States neighboring California will now be subject to the same greenhouse standards as manufacturers selling vehicles in California and manufacturers will be able to deliver the same fleet for sale in each State. Therefore, there will be no incentive for consumers to leave the State to purchase vehicles, eliminating one of the major alleged sources of harm identified by NADA's declarants. While the vehicle manufacturers will have to comply with the California standards for the 2009-2011 model years, there is no evidence whatsoever that compliance with the standards for those years will impose actual or imminent injury on dealers or other third parties. The combined car and truck federal fuel economy standards for the 2009-2010 model years are comparable to California's standards for those model years. See Environmental Analysis, Inc., "Auto-Manufacturers' Ability to Comply with California GAG

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[3] As Petitioners note, the federal regulations were not final at the time the petition was filed, and standing is determined as of the date of filing. Pet'r Br. at 25. However, if the Court were to find that there was injury at the time of filing that has been eliminated by the subsequent promulgation of federal regulations, the petition would still have to be dismissed because it would be moot.

Standards through 2012," EPA Docket No. EPA-HQ-OAR-2006-0173-9019.15[1] (JA 3324). Furthermore, manufacturers can utilize credits generated by exceeding the applicable standards in 2009 or 2010 to assist in compliance with the 2011 standards. Evidence presented to EPA during the reconsideration process indicates that vehicle manufacturers will be able to comply with the 2009-2011 California requirements with little or no change to their intended model lines. 74 Fed. Reg. at 32,770-76. Specifically, that evidence demonstrates that the manufacturers complied with the 2009 standards with the generation of credits, that manufacturers will comply with the 2010 standards, and that manufacturers will be able to comply with the 2011 standards with, in some cases, the use of credits from previous years. Id.

Furthermore, any alleged injury to dealers or other third parties, whether in the 2009-11 model years or beyond, is entirely speculative because it is dependent on the voluntary actions of third parties, specifically the vehicle manufacturers. Simon v. E. Ky. Welfare Rights Org., 426 U.S. 26, 41-42 (1976) (no standing where claimed injury "results from the independent action of some third party not before the court."); Gettman v. Drug Enforcement Admin., 290 F.3d 430, 435 (D.C. Cir. 2002) ("speculative claims dependent upon the actions of third parties do not create standing"). Manufacturers have a range of options for complying

with the California requirements, and any alleged harm would have to be based on speculation that manufacturers would choose a particular option. For the same reason, any claim by Petitioners that their alleged injury can be redressed by the Court would also be based on speculation. For example, manufacturers could *choose* to manufacture fleets compliant with the California standards regardless whether the Court upholds or vacates the waiver decision.

Because Petitioners have not met their burden to establish standing, the petition should be dismissed.

II. EPA REASONABLY ASSESSED WHETHER CALIFORNIA NEEDS ITS PROGRAM TO MEET COMPELLING AND EXTRAORDINARY CONDITIONS BY CONSIDERING THE PROGRAM AS A WHOLE

CAA section 209(b)(1)(B) states that EPA may not grant California a waiver of preemption if the Administrator finds that California "does not need such State standards to meet compelling and extraordinary conditions." 42 U.S.C. § 7543(b)(1)(B). In granting the waiver for California's greenhouse gas regulations, EPA considered whether California needed its automobile emission standards as a whole, a practice that has been followed in every decision it has made under this section for over 40 years, except for the initial March 6, 2008 denial of this waiver petition. EPA's current interpretation is consistent with the

statutory language, congressional intent as demonstrated by the legislative history, and prior decisions by this Court.

Nothing in section 7543(b) requires that EPA consider whether California has a need for any *particular* aspect of its automotive standards program, rather than assessing whether California has a need for its program *as a whole*. The statute provides in relevant part:

> The Administrator shall, after notice and opportunity for public hearing, waive application of this section to [California] . . . if the State determines that *the State standards will be, in the aggregate*, at least as protective of public health and welfare as applicable Federal standards. No such waiver shall be granted if the Administrator finds that . . . (B) such State does not need *such State standards* to meet compelling and extraordinary conditions . . . .

42 U.S.C. § 7543(b)(1) (emphasis added). The most natural reading of the statutory language is that the italicized phrase "such State standards" in subsection (b)(1)(B) refers back to the italicized word "standards" in section 7543(b)(1) – that is, the "State standards" that the State has determined will be, "in the aggregate," as protective as federal standards. In other words, that it refers to California's program as a whole. Thus, even if the statutory language does not compel the reading EPA gives to section 7543(b)(1), EPA's interpretation is a reasonable one that must be upheld.

Furthermore, EPA's interpretation is clearly reasonable in light of the purpose of the statute and its legislative history. As this Court has recognized, the waiver provision in section 7543 was a compromise between allowing any State to independently regulate automobile emissions and complete preemption in favor of a single federal standard. MEMA, 627 F.2d at 1109. Under the provision as enacted, and as amended in 1977, manufacturers desiring to sell cars in California would potentially have to produce two variations of each model sold – one complying with national standards and one complying with California's standards. EPA's interpretation of the statute, to consider California's need for a separate motor vehicle program as a whole, is consistent with this congressional compromise. Regardless of the individual elements of California's program, there are still only two required variations – one for California (and States that adopt California's program) and one for the rest of the nation.

Furthermore, the congressional rationale for adopting the statutory provision allowing California to adopt its own standards was not only that California has unique air pollution problems, but also that the provision would allow California to continue to be a leader in experimenting with techniques for control of air pollution from automobiles. The report of the Senate committee that created the waiver provision stated, "Senator Murphy convinced the committee

that California's unique problems *and pioneering efforts* justified a waiver of the preemption section to the State of California." S. Rep. No. 90-403 at 33 (1967) (emphasis added). This Court has summarized the compromise reached by the Committee in this manner:

> According to the Committee, the advantages of the California exception included the benefits for the Nation to be derived from permitting California to continue its experiments in the field of emissions control – benefits the Committee recognized might "require new control systems and design." [S. Rep. No. 90-403 at 33 (1967)] – and the benefits for the people of California to be derived from letting that State improve on "its already excellent *program*" of emission control, id. (emphasis added). There is no intimation in the Senate Committee report that the waiver provision was designed to permit California to adopt only a portion of such a program.

MEMA, 627 F.2d at 1109-10.

Considering California's program as a whole is consistent with Congress' intent that California be allowed to continue its role to experiment with new methods for emissions control and to spur the development of new pollution control technologies and techniques. The current waiver is a good example of the benefits of this approach. California developed and implemented standards for the control of greenhouse gases when there was no regulation of these pollutants at

the federal level, and California's innovative efforts ultimately facilitated the development of federal standards to address the same problem.[4]

The conclusion that Congress intended to give California broad flexibility in determining for itself the scope of its emissions control program is reinforced by the 1977 amendment to the waiver provision, in which Congress provided that California could receive a waiver if it determined that its program "in the aggregate" is at least as protective as the federal program, rather than requiring that each component of the program be at least as protective as the corresponding federal requirement. As this Court explained, "Congress had an opportunity to restrict the waiver provision in making the 1977 amendments, and it instead elected to expand California's flexibility to adopt a complete program of motor vehicle emissions control." MEMA, 627 F.2d at 1110. The Committee Report of the House committee where the amendment originated says:

> The Committee amendment is intended to ratify and strengthen the California waiver provision and to affirm the underlying intent of that

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[4] It is worth noting that the Alliance of Automobile Manufacturers, a trade association of 11 car and light truck manufacturers including BMW Group, Chrysler Group LLC, Ford Motor Company, General Motors Company, Jaguar Land Rover, Mazda, Mercedes-Benz USA, Mitsubishi Motors, Porsche, Toyota and Volkswagen Group of America, has moved to intervene *in support* of EPA's federal greenhouse gas standards for new light duty motor vehicles in Southeastern Legal Found. v. EPA (D.C. Cir.), No. 10-1094, which involves direct challenges to those federal standards.

> provision, i.e., to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare.

1977 Comm. Rpt. at 1380.

Interpreting section 7543(b) to allow California to determine the exact nature of its air quality problem and to subsequently design the parameters of its overall program for control of automobile emissions, once the threshold determination is made that California needs its own program, is clearly consistent with the congressional intent that California be provided "the broadest possible discretion" to adopt a "complete program" to protect the health and welfare of its citizens. Nothing in the statute indicates that Congress intended this broad discretion to apply to some air pollution problems but not to others.

California has determined that control of greenhouse gases is a desirable part of its program for control of emissions from vehicles. Because California undisputably has a need for its own program of emission controls to address its serious air pollution problems, such as ozone, the addition of greenhouse gas controls to its program does not increase the number of different vehicles that manufacturers must create nationwide, and thus does not implicate the multiple-fleet concerns that caused Congress to enact the section 7543 preemption provisions in the first place. Accordingly, EPA's determination that it need only

consider California's need for its program as a whole in finding that the State is entitled to a waiver for its program including the greenhouse gas controls, is consistent with the statutory language, purpose, and existing case law. EPA's reading of the statute thus must be upheld as a reasonable interpretation of the statute under the precepts of Riverkeeper and Chevron. See American Trucking Ass'ns, Inc. v. EPA, 600 F.3d at 627 (holding that similar language in CAA section 209(e)(2)(A)(ii), 42 U.S.C. § 7543(e)(2)(A)(ii), "gives California (and in turn EPA) a good deal of flexibility in assessing California's regulatory needs.")[5/]

Petitioners' claims to the contrary are without merit. Petitioners' textual argument, Pet'r Br. 31-32, 39-42, simply assumes that the word "standards" in section 7543(b)(1)(B) refers to the particular standards that California wants to add to its program or modify at a given time, rather than to the program as a whole. However, there is nothing in the statutory text that specifies that EPA must consider *only* California's need for the *particular* changes being made at one

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[5/] In the waiver decision at issue in the American Trucking case, EPA interpreted the similar language in Clean Air Act section 209(e), 42 U.S.C. § 7543(e), concerning "compelling and extraordinary circumstances" as requiring a review of California's need for the program as a whole. Although the issue was not explicitly addressed by the Court in its opinion, petitioners did challenge EPA's interpretation of this statutory language. See American Trucking Ass'ns, Inc. v. EPA, No. 09-1090 (D.C. Cir.), Brief of Respondent United States Environmental Protection Agency (August 31, 2009) at 23-30.

time. As discussed above, the introductory text of section 7543(b)(1) uses the word "standards" to refer to California's program as a whole because it permits California to obtain a waiver if the State determines that its "*standards* will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards." 42 U.S.C. § 7543(b)(1) (emphasis added). It is clearly a reasonable interpretation of the statute that the later reference to "such standards" in subsection B of the same section *also* refers to California's program as a whole.

Petitioners' argument that the fact that Congress did not include the phrase "in the aggregate" in section 7543(b)(1)(B) means that Congress did not intend for the protectiveness determination to be made with regard to the program as a whole, Pet'r Br. at 44-46, is meritless. First, the language "such standards" in section 7543(b)(1)(B) refers back to the "State standards" for which the protectiveness determination is made "in the aggregate," thus indicating the program as a whole. Second, the "in the aggregate" language was added to the statute to address a specific issue that arose in the context of the protectiveness determination, i.e., the problem of control measures for one pollutant potentially exacerbating emissions of another (in particular, the possibility that control measures for oxides of nitrogen ("NOx") would increase emissions of carbon monoxide ("CO")). Congress amended the statute to give California the

discretion to determine whether the benefits of increased NOx control (to address the problem of ozone pollution) outweigh the increased emissions of CO.

It would be bizarre for Congress to give California such substantial discretion in determining the overall makeup of its emissions control program, while at the same time requiring the State to justify its need for each element of the program. For example, it is difficult to envision how California could possibly justify its need for a CO standard that is less stringent than federal standards if the CO standard had to be considered on its own. The interpretation of the statute most consistent with Congress' grant of "the broadest possible discretion" to California to develop its own program is that if California needs its own emissions control program in some respect, it is allowed to fashion whatever set of controls it deems appropriate, as long as it finds that the controls in the aggregate are at least as protective as the federal program and as long as the program is consistent with Clean Air Act section 7521(a). The alternative interpretation espoused by Petitioners would effectively undermine what Congress intended to achieve through the 1977 Amendments by requiring California to make a protectiveness determination for each element of its program under the guise of demonstrating the State's need for that element.

Petitioners' claim that the use of the phrase "such standards" in section 7543(b)(1)(C) is inconsistent with EPA's interpretation, Pet'r Br. at 43-44, is similarly meritless. California's *entire* program must be consistent with section 7521(a), including the requirement of adequate lead time. As a practical matter, when California seeks to add or modify a portion of its program, the only issue before the Agency will generally be whether the new or modified portion of the regulations meets the consistency requirement because EPA will have already made that determination with regard to the pre-existing elements of the program.[6] Because vehicles sold in California must meet *all* the applicable California requirements, the program would not meet the 7543(b)(1)(C) requirement if such vehicles could not be constructed in compliance with the lead time requirements. Petitioners' assertion that EPA took a different view in this waiver decision is simply erroneous.

There is similarly no basis to Petitioners' assertion that EPA's interpretation of the statute renders section 7543(b)(1)(B) a nullity, Pet'r Br. at 46-49. California still must be denied a waiver if it does not need its own program to

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[6] One circumstance in which EPA might have to consider California's program as a whole to determine if a modification of the program meets the requirement of section 7543(b)(1)(C) would be if an opponent of the waiver alleges that the new standard, while feasible by itself, is infeasible to meet in combination with other aspects of California's standards.

control vehicle emissions to meet compelling and extraordinary conditions.[7/] Thus, section 7543(b)(1)(B) continues to establish a substantive criterion that requires denial of a waiver if it is met. However, once that substantive requirement has been met, Congress and this Court have made clear that California is to be given the broadest possible discretion in designing that program. MEMA, 627 F.2d at 1110. Petitioners do not contest that California still needs its own program for controlling vehicle emissions to address its problems with ozone and other pollutants. Given that California still needs its own program, section 7543(b)(1)(B) provides no basis for EPA to deny the waiver.

Petitioners' assertion that EPA's interpretation is inconsistent with the statutory purpose is similarly erroneous. While Petitioners focus on Congress' intent in passing the preemption provision of section 7543(*a*) to avoid a nationwide "patchwork" of regulations, Petitioners ignore the fact that in section 7543(*b*) Congress expressly allowed *California* to seek a waiver of preemption, thus practically guaranteeing that manufacturers would have to produce two fleets

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[7/] California must also meet the other requirements of section 7543(b), including demonstrating that its standards in the aggregate are at least as protective as federal standards and are technically feasible. Thus, EPA's interpretation does not give California "unlimited discretion," as asserted by Petitioners. Pet'r Br. at 42. It does, however, give California the "broadest possible discretion," as intended by Congress.

if they intended to sell into the California market. Congress thereafter expanded the applicability of California's regulatory program by amending the statute in 1977 expressly to allow other States to adopt them. Changing the specific parameters of California's program does not alter the fact that there are still two, and only two, fleets and thus does not implicate the congressional concern of avoiding a "patchwork" of regulation.[8]

Petitioners' argument ignores the fact that an equally important reason for inclusion of the waiver provision in the statute was to allow California to continue to drive the development of new techniques and technologies for emissions control. Petitioners similarly ignore the clear legislative history showing that Congress intended to give California the "broadest possible discretion" to determine the parameters of its program. EPA's interpretation of the statute is consistent with this congressional intent, while Petitioners' more narrow interpretation requiring EPA to consider each part of California's program in isolation is not.

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[8] Petitioners' assertion that the adoption of the California standards by other States will create a "patchwork" of regulations because of state-specific enforcement, Pet'r Br. at 17-18, has no relevance to whether *California* needs its standards to address compelling and extraordinary circumstances. Any claims that a particular State's adoption of the California standards is inconsistent with Clean Air Act requirements can be addressed through a challenge to that State's standards. See, e.g., Motor Vehicles Mfrs. Ass'n of the United States, Inc. v. N.Y. State Dep't of Envtl. Conservation, 17 F.3d 521 (2d Cir. 1994).

III. EVEN IF THE GREENHOUSE GAS STANDARDS ARE CONSIDERED IN ISOLATION, THE WAIVER WAS PROPERLY GRANTED

As discussed above, EPA believes that interpreting section 7543(b)(1)(B) to require analysis of whether California needs its own program as a whole is more consistent with the statutory language and congressional intent than Petitioners's interpretation that EPA is required to analyze each element of the program in isolation. However, EPA also examined whether the waiver must be denied if California's greenhouse gas standards are examined on their own. EPA determined that those opposing the waiver had not met their burden, and this decision is fully supported by the record.

EPA evaluated this question under two alternative approaches, i.e., EPA considered: (1) whether California's greenhouse gas standards address an air pollution problem that is local or regional in nature; and (2) whether the impacts of climate change in California constituted compelling and extraordinary circumstances. 74 Fed. Reg. at 32,763-67. EPA determined that under either of these alternative analyses those opposing the waiver had not met their burden to prove that the waiver should not be granted. This determination is fully supported by the record.

A. The Greenhouse Gas Standards Are Part Of California's Program To Address Ozone Pollution, A Local Or Regional Problem.

With regard to the first approach, EPA determined that California's greenhouse gas regulations were intended in part to address California's chronic problems with ozone pollution, an undisputable local problem. California contains the only region in the United States classified as an "extreme" ozone nonattainment area, and California's climate, geography, and number of vehicles have made the problem of achieving the ozone standard particularly intractable in California. The production of ozone in the atmosphere, and thus ambient concentrations, is dependent on temperature. Lower temperatures result in lower ambient ozone concentrations; higher temperatures, conversely, lead to higher ozone concentrations. California's greenhouse gas regulations are intended to help slow the current rise in temperatures, which exacerbates California's ozone problem. 74 Fed. Reg. at 32,763 & n.112. California also noted that its greenhouse gas standards will lead to some limited local reductions in the traditional pollutants that cause ozone. 74 Fed. Reg. at 32,763 & n.114; CARB 2009 Comments, EPA-HQ-OAR-2006-0173-9006.1, at 10 (JA 3439) Thus, whether or not local conditions are the primary cause of elevated concentrations of greenhouse gases, California's greenhouse gas regulations are designed to

address, inter alia, a local or regional problem relating to the formation of ozone within the State. 74 Fed. Reg. at 32,763.

Petitioners do not dispute that California needs its own vehicle emissions program to address its ozone problem. As discussed above, Congress has given California broad discretion in deciding how to structure its program to address the identified needs. Because the greenhouse gas regulations are a part of California's program to address its persistent ozone pollution problem, a program that California indisputably needs, there is no basis for EPA to deny the requested waiver pursuant to section 7543(b)(1)(B). 74 Fed. Reg. at 32,763.

Petitioners' first argument in response to this alternative approach is to assert that the projected decrease in temperature from implementation of the greenhouse gas regulations is too small for EPA to conclude that California needs the greenhouse gas regulations to address its ozone problem. Pet'r Br. at 49-50; Br. of Amicus Curiae Pacific Legal Foundation. This Court rejected a similar argument in MEMA. The petitioners there argued that California did not need the challenged regulations because the State had not demonstrated that the regulations would enhance air quality. 627 F.2d at 1124-25. Although the Court acknowledged that "the CARB staff conceded that it could not precisely identify

the emissions-related benefits to be derived from the regulations alone," id., the Court upheld the Administrator's grant of the waiver. Id. at 1125.

The Supreme Court also rejected a similar argument in Massachusetts v. EPA, 549 U.S. 497 (2007). Specifically, the Court rejected the argument that because the motor vehicle regulations sought by Massachusetts and other petitioners would not completely address the injuries caused by global climate change, they lacked standing. Id. at 523-26. The Court held that EPA's failure to take an interim step that could slow or reduce the effects of climate change was a sufficient cause of petitioners' injuries to give them standing. Id. at 525-26. Similarly here, that California's greenhouse gas standards will make only an incremental contribution to resolving California's ozone and climate change problems does not satisfy Petitioners' burden to establish that California does not need the standards.

Petitioners do not contest that California's greenhouse gas standards will result in some reduction in greenhouse gas emissions or that a reduction in greenhouse gas emissions will result in reduction in global temperatures. See Comments of Chamber of Commerce of the United States, EPA-HQ-OAR-2006-0173-8995.1, at 14-15 (JA 3389-90). Such a reduction will have an effect on temperatures in California, and lower temperatures will result in

less ozone formation.[9] 74 Fed. Reg. at 32,763 & n.112; CARB 2009 comments, EPA-HQ-OAR-2006-0173-9006.1, at 7-10 (JA 3436-39); CARB Hearing Presentation, EPA-HQ-OAR-2006-0173-7177, at 8-12 (JA 3281-85); Jacobson Testimony, EPA-HQ-OAR-2006-0173-7177.1 (JA 3300-23); Environmental Defense Comments (June 15, 2007), EPA-HQ-OAR-2006-0173-1459, at 1-2 (JA 2917-18); Comments of Jacobson, et al., EPA-HQ-OAR-2006-0173-8993.1, at 6-8 (JA 3337-39); May 30, 2007 Public Hearing Tr., EPA-HQ-OAR-2006-0173-0421, at 71 (testimony of Andrew Clubock, Alliance of Automobile Manufacturers) (JA 2680).

Petitioners argue that the waiver is inappropriate because the impacts of climate change on California ozone levels are not entirely the result of local emissions of greenhouse gases. Pet'r Br. at 36-37, 50-51. Petitioners' argument ignores the substantial deference that Congress intended to provide California on the mechanisms it chooses to use to address its air pollution problems. The greenhouse gas program is part of a set of standards that California needs to

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[9] Petitioners' attempt to distinguish the "logical link" EPA found between climate change and California's standards and causality, Pet'r Br. at 49-50, is specious. At a minimum, California's standards will reduce global concentrations of greenhouse gases, which will reduce global temperatures, including temperatures in California. Thus, there is a causal link between California's greenhouse gas standards and temperatures in California.

address the local or regional problem of ozone pollution. While the greenhouse gas regulations may make only a small contribution to solving that problem, Congress specifically left to California the determination of whether that contribution is worth the cost of the controls. As this Court has explained, "Congress consciously chose to permit California to blaze its own trail with a minimum of federal oversight." Ford Motor Co. v. EPA, 606 F.2d at 1297. "Congress has decided to grant California the broadest possible discretion in adopting and enforcing standards for the control of emissions from new motor vehicles." MEMA, 627 F.2d at 1128; see also Massachusetts v. EPA, 549 U.S. at 525-26.

Moreover, California can reasonably expect greater reductions in greenhouse gas emissions from its regulations than simply those resulting from application of the regulations in California. First, under section 7507, other States may adopt California's standards, multiplying their effect. In fact, 13 States and the District of Columbia, representing (with California) over half of the new motor vehicle market in the United States, have adopted California's greenhouse gas standards. California could also expect that the technologies developed in response to its regulations (which reduce fuel consumption as well as reducing the amount of greenhouse gases emitted) would be more widely adopted. This has

also proven to be the case, as demonstrated by the adoption of similar federal standards.[10] The comments of the Chamber of Commerce and of the Alliance of Motor Vehicle Manufacturers demonstrate that a small but measurable decrease in temperature would result from nationwide adoption of the California standards. JA 3389-90, 2680.

Finally, evidence presented during the reconsideration proceeding confirms the strong correlation between climate change and ozone levels in California. 74 Fed. Reg. at 32,763 & n.112; CARB 2009 comments, EPA-HQ-OAR-2006-0173-9006.1, at 7-10 (JA 3436-39); CARB Hearing Presentation, EPA-HQ-OAR-2006-0173-7177, at 8-12 (JA 3281-85); Jacobson Testimony, EPA-HQ-OAR-2006-0173-7177.1, (JA 3300-23). The record also contains evidence that local emissions of greenhouse gases can contribute to localized higher temperatures, and thus increased levels of ozone, and that the greenhouse gas emission standards will reduce total emissions of pollutants that

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[10] Petitioners' claim that California was inappropriately attempting to influence federal standards, Pet'r Br. at 50, is misplaced. First, one of the very purposes of the statutory waiver, expressly acknowledged by Congress, is to allow California to be a laboratory for innovation, i.e., to develop measures that may ultimately be adopted as federal standards. Thus the progression from California to federal standards is specifically intended by the statute. Second, California submitted its petition for a waiver in 2005, well before development of the federal standards.

are ozone precursors. See 74 Fed. Reg. at 32,763; 2009 CARB Comments, EPA-HQ-OAR-2006-0173-9006.1, at 7-10 (JA 3436-39).

Accordingly, even if EPA were required to determine whether California's greenhouse gas standards are needed to address a local or regional problem, the waiver should still be granted because opponents of the waiver have not met their burden of proof to demonstrate that the greenhouse gas regulations are not part of a program of standards designed by California to address California's ozone problem.

B. The Effects Of Climate Change In California Constitute Compelling And Extraordinary Conditions.

EPA also determined that, if it were necessary to consider whether California needs its greenhouse gas standards to address extraordinary and compelling conditions caused by climate change, there would again be no basis to deny the waiver. 74 Fed. Reg. at 32,763-67. This determination is based both on a re-analysis of the evidence in the record from the original waiver proceeding, as well as new evidence presented during the reconsideration proceeding.

EPA found that, while other States will suffer many of the same impacts from climate change as California, "[o]pponents have not demonstrated that any other state, group of states, or area within the United States would face a similar or

wider range of vulnerabilities and risks." Id. at 32,765. Among the impacts identified in California are:

> exacerbation of tropospheric ozone, heat waves, sea level rise and salt water intrusion, an intensification of wildfires, disruption of water resources by, among other things, decreased snowpack levels, harm to high value agricultural production, harm to livestock production, and additional stresses to sensitive and endangered species and ecosytems.

Id.

Factors that make these problems particularly acute for California include:

- California has the largest agricultural based economy of any State;
- California agriculture is heavily dependent on irrigation;
- California has the largest state coastal population, representing 25 percent of the United States oceanic coastal population;
- California has a recalcitrant ozone problem, which higher temperatures will exacerbate;
- California's water supply is already stressed and over-allocated;
- California has the greatest variety of ecosystems in the United States and the most threatened and endangered animal species.

Id. at 32,764. That global climate change will have effects on these concerns in California is supported by numerous documents in the record. 74 Fed. Reg. at

32,764-65; CARB 2007 Comments, EPA-HQ-OAR-2006-0173-1686, at 7-9 (JA 2888-90).

Petitioners' claim that these circumstances do not constitute extraordinary and compelling conditions, Pet'r Br. at 53-55, is without merit. Petitioners' assertion that EPA may only consider whether the *causes* of pollution constitute extraordinary and compelling conditions has no basis in the statute. Section 7543(b)(1)(B) does not specify how EPA is to determine what constitutes extraordinary and compelling conditions, and thus leaves to EPA's discretion whether to consider causes, effects, or both. Furthermore, the legislative history makes clear that one of the rationales for the waiver provision was concern over the effects of pollution in California, such as California's particularly severe ozone problems. S. Rep. No. 90-403 at 33 (1967) (citing "California's unique problems" as one basis for the waiver provision). Thus, even assuming it were necessary to consider California's greenhouse gas standards by themselves, examining whether California needs separate emission standards because the effects of the air pollution in California are extraordinary and compelling is a reasonable interpretation of the statute entitled to deference under Chevron, U.S.A., Inc. v. NRDC, 467 U.S. 837 (1984).

Petitioners' assertion that EPA has not sufficiently explained why its current conclusion differs from the one it reached in denying the waiver in 2008, Pet'r Br. at 56, is also without merit. First, Petitioners erroneously assert that the decisions are based on the same factual record. However, additional information was presented during the reconsideration process that demonstrates that the impact of climate change on California is more severe than in other States. See, e.g., 74 Fed. Reg. at 32,764 n.117.

Second, the determination of whether the impact of climate change on California compared to other States rises to the level of "compelling and extraordinary conditions" is a matter of judgement, rather than a purely factual determination. Contrary to Petitioners' assertions, Pet'r Br. at 56, the Supreme Court has made clear that there is no higher standard an agency must meet in changing a previous policy than that which applies when the agency develops a policy as an initial matter. F.C.C. v. Fox, 129 S. Ct. at 1810-11. If the agency's change in position is based on changed facts, the agency must address them, but there is no higher standard of review for its new policy. Id.

In this case, EPA adequately explained why it reached a different conclusion on reconsideration than it reached initially. To the extent the decision relies on new facts, those facts were presented to EPA during the reconsideration

process and show that the impacts of climate change on California are more severe than believed during the initial proceedings. 74 Fed. Reg. at 32,764 n.117. In the notice granting the waiver on reconsideration, the Administrator acknowledged the prior contrary determination, and explained why she has concluded that the prior determination was in error. Id. at 32,765. California has demonstrated that it will suffer from a lengthy series of consequences as a result of global climate change. Id. The opponents of the waiver have the burden of proof to demonstrate that California does not need its own standards, and the Administrator found that they have not presented any evidence to demonstrate that the range of effects from climate change expected in California are matched by other States or regions of the United States. Id. Accordingly, the Administrator concluded that the opponents of the waiver have not carried their burden of proof, and there is no basis to deny the requested waiver.

C. The Federal Standards Provide No Basis For Denying The Waiver

Petitioners' claim that California does not need its greenhouse gas standards because of regulations subsequently issued by EPA and the National Highway Traffic Safety Administration, Pet'r Br. at 56-58, is meritless. First, section 7543(b) specifically provides that California can have its own standards if they are "*at least* as protective of public health and welfare as applicable Federal

standards." 42 U.S.C. § 7543(b)(1) (emphasis added).[11] Thus, the statute clearly contemplates that California may have standards that are separate from EPA regulations but equally effective. Thus, the existence of federal standards with similar aims does not establish that California does not need its own standards.

Second, California's standards are not identical to the EPA regulations. The most obvious difference is that the California standards apply to model years 2009 through 2011, which are not addressed at all in the EPA standards. Thus, the EPA standards cannot obviate California's need for its greenhouse gas standards to cover those model years.

Third, at the time EPA made its waiver decision the federal regulations had not even been proposed, let alone promulgated. *Potential* regulations provide no basis for EPA to have found that the federal regulations obviated California's need for its own greenhouse gas regulations.[12]

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[11] EPA has interpreted the term "Federal standards" in section 7543(b) to refer only to standards promulgated by EPA. 74 Fed. Reg. at 32,750-54. Petitioners have not challenged that interpretation.

[12] Furthermore, Petitioners (among other parties) have sought review in this Court of the federal regulations and of the endangerment finding that is a prerequisite to EPA's greenhouse gas regulations. Coalition for Responsible Regulation v. EPA, No. 09-1322 and consolidated cases (endangerment finding); Coalition for Responsible Regulation v. EPA, No. 10-1092 and consolidated cases (federal motor vehicle greenhouse gas standards). Thus Petitioners are seeking to have reversed the federal rules that Petitioners assert undermine California's need for its own standards.

Thus, the federal regulations promulgated subsequent to EPA's waiver decision have no bearing on the validity of that decision.

IV. EPA HAS NOT ADDRESSED THE QUESTION OF WHETHER CALIFORNIA'S GREENHOUSE GAS STANDARDS ARE PREEMPTED BY THE ENERGY POLICY AND CONSERVATION ACT

The last argument in Petitioners' Brief, Pet'r Br. at 58-62, is meritless because it posits a determination that EPA has not made. Petitioners assert that by stating that California may enforce its greenhouse gas regulations, EPA has made a determination that those regulations are not preempted by the Energy Policy and Conservation Act ("EPCA"), Pub. L. No. 94-163, 89 Stat. 871 (1975). However, as Petitioners themselves note, EPA has not addressed that issue. Pet'r Br. at 61.

Rather, in the challenged statement EPA was simply stating the effect of its waiver decision. Section 7543(a) states that "[n]o State or any political subdivision thereof shall adopt *or attempt to enforce* any standard relating to the control of emissions from new motor vehicles . . . ." 42 U.S.C. § 7543(a) (emphasis added). Section 7543(b) allows EPA to waive "application of this section" to California. Waiving application of section 7543(a) includes waiving

the Clean Air Act's prohibition on adoption and *enforcement* of standards. Thus, when EPA grants California a waiver of preemption, California is authorized, at least under the Clean Air Act, to adopt and enforce its own standards.

Whether California's enforcement of its standards is limited by some other provision of law, such as EPCA, is outside the scope of EPA's waiver decision and thus outside the scope of this case. In Massachusetts, the Court rejected an argument that EPA cannot regulate greenhouse gases for motor vehicles because the establishment of fuel economy standards was delegated to the Department of Transportation under EPCA. 549 U.S. at 531-32. The Court held: "EPA has been charged with protecting the public's 'health' and 'welfare,' 42 U.S.C. § 7521(a)(1), a statutory obligation wholly independent of DOT's mandate to promote energy efficiency." Id. at 532. Consistent with that holding, EPA's analysis of California's request for a waiver is limited to the factors specified in the Clean Air Act and specifically does not include any consideration of EPCA. 74 Fed. Reg. at 32,783. Because EPA's statement that California may enforce its greenhouse gas standards simply states that the prohibition on enforcement in section 7543(a) is waived, there is nothing in that statement for the Court to review.

CONCLUSION

As demonstrated above, the petition for review should be dismissed for lack of standing or denied for lack of merit. Petitioners have failed to establish a concrete, specific injury to their members and thus lack standing. Even if Petitioners had standing, EPA properly determined that California's need for its own motor vehicle emission standards should be determined on the basis of the program as a whole. Because it is undisputed that California still requires its own motor vehicle standards to meet its unique pollution problems, there is no basis to deny the requested waiver. Even if EPA is required to consider California's greenhouse gas standards in isolation, the record fully supports EPA's determination that opponents of the waiver have not met their burden of showing that California does not need its own greenhouse gas standards to meet compelling and extraordinary conditions.

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CERTIFICATE OF COMPLIANCE WITH WORD LIMITATION

Pursuant to Federal Rule of Appellate Procedure 32(a)(7)(C), I hereby certify that the foregoing Brief of Respondent EPA contains 10,996 words as counted by the Word Perfect 12 word processing system.

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Industry

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CAFE and the U.S. Auto Industry Revisited

Equity

A Growing Auto Investor Issue, 2011-2016

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- **What's New?** — In partnership with Ceres and the Investor Network on Climate Risk, we, along with the Planning Edge, University of Michigan Transportation Research Institute, Meszler Engineering Services, and the Natural Resources Defense Council, evaluated the impact that changes to the U.S. Corporate Average Fuel Economy (CAFE) program may have on the industry in 2016. We have issued this report as a follow-up to Citi's October 22, 2007 report "CAFE and the U.S. Auto Industry – A Growing Auto Investor Issue, 2012-2020" in which we examined the impact of proposed fuel economy regulation on the U.S. auto industry.

- **New CAFE and GHG Standards** — On May 19, 2009, President Obama announced the adoption of one national program ("National Program") for model years 2012-2016 that will set higher fuel economy standards and new greenhouse gas (GHG) emissions standards. The GHG standards are intended to be equivalent to applying California's GHG vehicle emissions standard to the national sales fleet. In model year 2016, the car and light truck GHG standards will be set to an equivalency of 250 grams of CO2 per mile average over the entire fleet, about equal to 35.5 mpg, representing approximately a 40% increase in fuel economy. With this approach, the Administration addressed both auto companies' concern regarding multiple regulatory schemes, and the desire of California and several other states to enforce stricter regulations. California has agreed to defer to the National Program through model year 2016, clearing the way for a uniform national standard through that time period.

- **Key Takeaways** — The analysis demonstrates that the proposed National Program is likely to benefit both domestic automakers (the Detroit 3) and the Japan 3 by boosting variable profits, based on the relative value consumers put on fuel costs compared to vehicle price, the future price of fuel, and the level of direct costs to improve fuel economy. Additionally, our research indicates the Detroit 3 would be able to mitigate market share erosion by producing more competitive fuel-efficient fleets in the coming years.

- **Suppliers of Key Technologies Will Benefit, Maintain Buy on BWA** — The U.S. auto industry is still in the early stages of adopting fuel saving technologies to meet rising regulatory standards. Key beneficiaries of relevant technology include Buy-rated BorgWarner (BWA) and Hold-rated Johnson Controls (JCI). BorgWarner appears best positioned to benefit as the company derives most of its sales from fuel savings technologies such as turbochargers and dual-clutch transmissions.

See Appendix A-1 for Analyst Certification and important disclosures.

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U.S. Auto Industry: New CAFE/GHG Standards

I. Overview of Findings

This past May, the Obama Administration announced a new approach to vehicle regulation; a single National Program that will coordinate both fuel economy and greenhouse gas (GHG) emissions standards. The GHG national standard is intended to be equivalent to California's formerly stricter GHG vehicle emissions standard for the U.S. sales fleet. In model year 2016, the car and light truck GHG standards will be set to an equivalency of 250 grams of CO2 per mile average over the entire fleet, about equal to 35.5 mpg (depending on how the automakers choose to comply with the GHG standards), representing approximately a 40% increase in fuel economy.[1] This report looks at the impacts of more stringent regulation, including overall technology impacts and costs, financial impacts, and strategies of individual auto manufacturers to compete under this new regulatory environment.

In this analysis, we sought to understand how a CAFE standard of 35 miles per gallon by 2020 – the minimum industry-wide target established by Congress in the Energy Independence and Security Act of 2007 (EISA)– as well as a national version of the California Pavley standard would affect profitability within the industry. Our national Pavley scenario assumes an industry-wide fuel economy level of 35 miles per gallon in 2016, compared to the nominal 35.5 miles per gallon target set for the National Program (in 2016). The National Program is expected to allow automakers more flexibility than the existing CAFE program, so the 0.5 miles per gallon difference in our scenario and the National Program is not material. In particular, it is expected that the automakers will make use of GHG credits for reducing air conditioning refrigerant emissions which could easily allow account for this difference. Because we lack a sufficiently detailed sales forecast for model year 2016, we simply adopt the model year 2015 forecast sales mix.

Our analysis reveals that meeting the requirements of the National Program by 2016 will be not only be economically and technically feasible, but also will likely raise variable profits for both the Detroit 3 and the Japan 3 automakers. Under the National Program, Detroit's gross profits are likely to increase by roughly $3 billion per year, compared to a $0.8 billion increase for the Japanese 3, and sales are expected to increase by the equivalent of two large assembly plants for the Detroit 3. These factors include the relative value consumers put on fuel costs compared to vehicle price, the future price of fuel, and the level of direct costs to improve fuel economy. While these three factors could result in losses rather than gains in profits, the potential losses are relatively small, and all three factors are more likely to result in gains. In fact, in our central analysis, the only potential loss suffered by the Detroit 3 occurs when the Detroit 3 stay at their current mpg and meet neither the National Program nor the EISA requirement. Most importantly, complying with the National Program renders the vehicles in the majority of segments more cost effective for consumers; the present value of the fuel saved will be greater than the increase in purchase price associated with the new fuel saving technology.

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Figure 1. Summary of Changes in Variable Profit

Gain or (Loss) $Billions Detroit 3 / Japan 3	National Pavley	Current CAFE
Consumers Value 100%	$3.4 / $0.8	$4.1 / $0.8
Consumers Value 70%	$0.9 / $0.6	$1.7 / $0.6
Consumers Value 70% *Detroit stays at current mpg*	($0.2) / $0.6	($0.7) / $1.0

Source: UMTRI

II. Fuel Economy and Climate Change

An Update on Current Regulations

On May 19th, 2009, President Obama announced that his Administration plans to establish a National Program governing both fuel economy and GHG emissions from vehicles. The proposed rulemaking for the National Program was announced on September 15, 2009.[2] The National Program represents the culmination of years of litigation and debate regarding new standards for the auto industry. The new GHG emissions standard should be roughly equivalent to the GHG emissions standard that California, thirteen other states and the District of Columbia have adopted. The Administration's approach is intended to harmonize federal and state regulation so that automakers are in effect subject to the single National Program. Three agencies exist with independent authority to regulate vehicle emissions (or emissions influencing parameters): the California Air Resources Board (CARB), authorized to regulate California vehicles for GHGs now that it has recently received a waiver from EPA, the Environmental Protection Agency (EPA), authorized to regulate vehicle GHG emissions based on a Supreme Court ruling from 2008, and the National Highway Traffic Safety Administration (NHTSA), responsible for CAFE standards since 1975. For the first time, all three agencies will work together to produce a final uniform rule.

California's Greenhouse Gas Pollution Standards

In 2004, California adopted the Pavley regulation (Pavley 1) that will require about a 30% reduction in carbon emissions from new passenger vehicles sold in the state by model year 2016 (approximately 35.5 mpg). Under the Clean Air Act, California was given leeway to adopt its own, more stringent, vehicle emission standards, pending an EPA waiver approval. Other states would then be free to implement California's standards once California received its waiver. Amid initial pushback from the EPA to grant California's proposal, President Obama directed the agency to revisit the waiver request, which was ultimately granted in June 2009.[3]

Pavley 1's impact alone on national fuel economy would have been significant. Beyond California, thirteen additional states and the District of Columbia adopted the Pavley 1 regulation, representing about 37% of U.S. new passenger vehicle sales. Four more states (corresponding to an additional 10% of vehicle sales) were in the administrative process of adopting California's standards when President Obama made his May announcement. At

that time, California agreed to harmonize its regulations for model years (MYs) 2012-2016 with the federal standards, and announced that compliance with its standards for MYs 2009-2011 could be demonstrated based on the fleet of vehicles sold in California and in the states that adopted California's standards (thereby expanding the averaging pool). In return, auto manufacturers agreed to dismiss pending litigation associated with California's and other states GHG standards, and not to renew such litigation for MYs 2009-2016.

The California Air Resources Board (CARB) has announced its plan to adopt a second phase of its carbon emission regulation (Pavley 2) that would reduce CO2 emissions from new cars by about 50% by model year 2020 (roughly equivalent to 39.2 mpg assuming the national mix of gasoline cars and light trucks). California has also agreed to work with federal agencies and other stakeholders to develop a national standard for the model years after 2016, but it retains authority to have its own vehicle emissions program.

EPA's Authority to Regulate GHG Emissions

In April 2007, the Supreme Court in the Mass. vs. EPA decision found that greenhouse gases are air pollutants under the Clean Air Act. The decision thus provided EPA with the authority to regulate greenhouse gases from motor vehicles once the agency made an "endangerment" finding (a finding that greenhouse gas emissions are adversely affecting human health and welfare). On April 17, 2009, the EPA issued a proposed rule finding that CO2 endangers human health and welfare and that vehicle GHG emissions cause or contribute to that endangerment. It is widely expected that EPA will make a positive endangerment finding, and indeed, President Obama's May 2009 announcement anticipates such a finding.

NHTSA's Authority to Regulate Fuel Economy

Shortly after the release of our previous CAFE report, Congress passed the EISA 2007, which President Bush signed into law on December 18, 2007. The Act contained a provision to raise the Corporate Average Fuel Economy (CAFE) standard to a fleetwide average (combining cars and light trucks) of at least 35 mpg by 2020, an approximate 40% improvement over today's levels.

On May 2, 2008, as required by EISA 2007, the National Highway Traffic Safety Administration (NHTSA) of the DOT issued proposed standards for model years 2011 to 2015 (the Notice of Proposed Rulemaking (NPRM)).[4] It then released a draft final rule in November of 2008, but held off finalizing the proposal. At the direction of President Obama, NHTSA published a final rule for MY2011 in March 2009 with a combined fleet average fuel economy estimated at 27.3 mpg.

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The new national standard will change the old CAFE system of a single fleetwide average for all manufacturers to an attribute-based standard based on vehicle size (that is, the footprint, or wheelbase times track width, of the vehicle). A CAFE standard will be established for each automaker's car and truck fleets based on the size and number of vehicles produced, and the overall fuel economy the manufacturer achieves at the end of the model year must meet that standard. As a result, it is likely that all automakers will be required to improve the fuel economy of their vehicle fleets (as opposed to requiring improvements from only some automakers as under the old system). The new guidelines will also reduce incentives to "game" the system by shifting mix; shifting production from larger, less fuel-efficient vehicles to smaller, more fuel-efficient vehicles would increase the company's average fuel economy, but it would also raise the company's production-weighted fuel economy target. Thus, the size-based system for cars will greatly mitigate the law's impact on companies' sales mix, although volatile fuel prices will likely also exert pressure to increase the proportion of lighter, more fuel-efficient vehicles. Accordingly, some automakers will provide fuel economy standards that go beyond the regulatory requirements, and will change vehicle mix independently in response to consumer demand.

New Federal Climate Change Legislation

The Waxman-Markey bill, named the American Clean Energy and Security Act (ACES), passed the House in July 2009, with Senate resolution forthcoming. In its current form, ACES would impact the auto industry in several key ways. First, the bill would bring in immediate and long-term investments in electric vehicles and other advanced automobile technology and deployment. Starting in 2012, automakers would receive 3% of the federal government's revenue from carbon emissions permits through 2017 and 1% from 2018 through 2025, to be used exclusively for such investments.[5] Second, the bill would authorize the federal government to provide financial assistance for regional deployment and integration of grid-connected vehicles. Through the bill's "Large-Scale Vehicle Electrification Program," automakers would be eligible to receive federal funds to help offset the cost of purchasing new plug-in electric drive vehicles, deploy electric charging stations or battery exchange locations, or facilitate the integration of smart grid equipment with plug-in electric drive vehicles. The bill would double a $25 billion Energy Department loan program designed to help automakers produce more fuel-efficient cars and trucks. The bill would also require utilities to develop plans to support electric vehicle infrastructure and establish protocols for integration with smart grid systems. Finally, the bill directs EPA to establish national transportation GHG reduction goals in consultation with the Secretary of Transportation.

On September 30, 2009, Senators John Kerry and Barbara Boxer introduced the Clean Energy Jobs and American Power Act. The Senate bill amends the Clean Air Act to require EPA to establish GHG emission standards for new heavy-duty road and non-road vehicles and engines. In addition, the bill establishes a Clean Vehicle Technology Fund to boost plug-in electric vehicle usage. The Fund would be stocked by the proceeds of the GHG allowances auction. Eighty percent of the Fund would be available to the Secretary of Energy to support the development and demonstration of a national transportation low-emissions energy plan and the use of medium- and heavy-duty plug-in electric vehicles. From that 80%, not more than 5% would be used to develop the low-emissions plan, which must: project the near- and long-term need for electric vehicle refueling infrastructure at strategic locations across all major transportation corridors; identify infrastructure and

standardization needs for electricity providers, infrastructure providers, vehicle manufacturers, and electricity purchasers; establish a goal for achieving strategic deployment of electric vehicle infrastructure by 2020; involve relevant stakeholders; and develop smart card billing and port systems. The remaining 20% of the Fund would be available to EPA to provide grants for reducing diesel engine emissions through the State Clean Diesel Grant Program created by the Energy Policy Act of 2005. The Senate bill would further require the Secretary to establish pilot projects to demonstrate electric vehicles and infrastructure, at least one of which must be carried out in a rural region and another one of which must focus on freight issues.

International Fuel Economy Standards and Incentives

Countries across the world are stepping up regulation of vehicle fuel economy and greenhouse gas emissions. In many cases, these international regulations are much more aggressive than those of the United States. In fact, in late May 2009, China announced that it would require automakers to improve fuel economy by an additional 18% by 2015; raising fuel economy to approximately 42 mpg. (This may disproportionately affect multinationals because increases in fuel economy requirements are greater for segments where multinationals are stronger, namely midsize and compact cars.) China has already increased taxes on large engine vehicles (over four liters) to 40%, increased taxes on vehicles with engines between three and four liters to 25%, and decreased the tax on small engine vehicles (1-1.5 liters) to 1%. In April 2009, European Union lawmakers adopted regulations requiring a reduction of CO2 from new passenger cars from an average level of 159g/km (in 2006) to a maximum of 130g/km by 2015, corresponding to a fuel economy of roughly 48.9 mpg. The EU requirement includes much more significant penalties for noncompliance than the United States, and also sets a target for 2020 emissions at 95 g/km (subject to review prior to becoming a standard). Japan's fuel economy target is 48 mpg by 2010. Australia's fuel economy standards will increase to 34.4 mpg by 2010. In addition, most of the countries in the EU currently vary the tax on cars based on their carbon emissions, and those EU members that do not currently do so have committed to adopting carbon based emissions taxes.

III. Technology Impacts and Costs

Although energy efficiency has continued to advance through the evolution of the automobile, significant inefficiencies remain in the conversion of fuel energy to motive energy. Moreover, much of the potential reduction in fuel consumed per mile of travel resulting from more efficient drivetrain development has been offset by inefficiencies resulting from enhanced vehicle performance (i.e. increased horsepower per unit engine displacement). Figure 2 presents a generalized energy consumption distribution for a vehicle driven in an urban environment, illustrating both how total fuel energy is consumed and where room lies for efficiency improvement.

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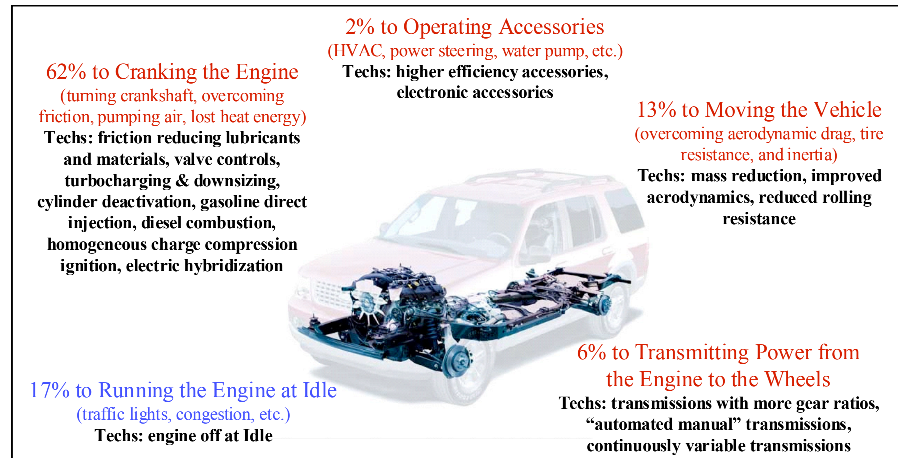
Figure 2. Urban Fuel Energy Breakdown



Source: Meszler Engineering Services

As one would expect, the largest energy losses are associated with converting fuel energy to mechanical energy in the engine. Such losses take place as heat escapes through the radiator, engine block, and exhaust system. Since engines must be designed to operate over a wide range of speed and load conditions – from crawling along in city traffic to zipping along on faster highways, both with and without significant cargo weight – engines are designed for "worst case" operating conditions and seldom operate under conditions of maximum efficiency. A typical gasoline engine is only about 25% efficient on average – meaning that 75% of fuel energy is simply "lost" as heat. Thermodynamics places a practical limit on the potential improvement of this energy conversion process, but substantial improvements – into the 40% average efficiency range – are possible.

The technologies automakers can employ to promote increased engine efficiency are generally designed to reduce mechanical friction, improve "breathing" (facilitating airflow through the engine), improve fuel control, or adjust the effective engine load to maximize high efficiency operations. Such technologies include the use of improved lubricants and low friction materials (to reduce mechanical resistance), improved valvetrain controls (to allow for finer air and combustion control), the increased use of turbocharging (to allow for greater performance from smaller engines), cylinder deactivation (to effectively change the "size" of an engine with operating conditions), gasoline direct injection (to allow for finer fuel control), dieselization (since the diesel cycle has inherent efficiency advantages relative to gasoline), homogeneous charge compression ignition (HCCI, which brings gasoline combustion efficiency closer to diesel, while retaining important gasoline emissions advantages), and hybridization (to supplement heat energy with higher efficiency electrical energy).

Energy losses also occur as energy moves from the engine to the wheels or due to non-motive engine loads. In urban driving, 17% or more of energy is consumed while the vehicle is not moving and the engine is simply idling – consuming fuel but producing no motive work. Recouping this energy through technology that allows the engine to be shut off at idle can provide for significant improvements in effective driving cycle efficiency. About 2% of fuel energy is expended on vehicle accessories such as power steering pumps and air conditioning systems. Accessories that demand less energy to operate or accessories that are operated electrically can reduce this energy consumption.

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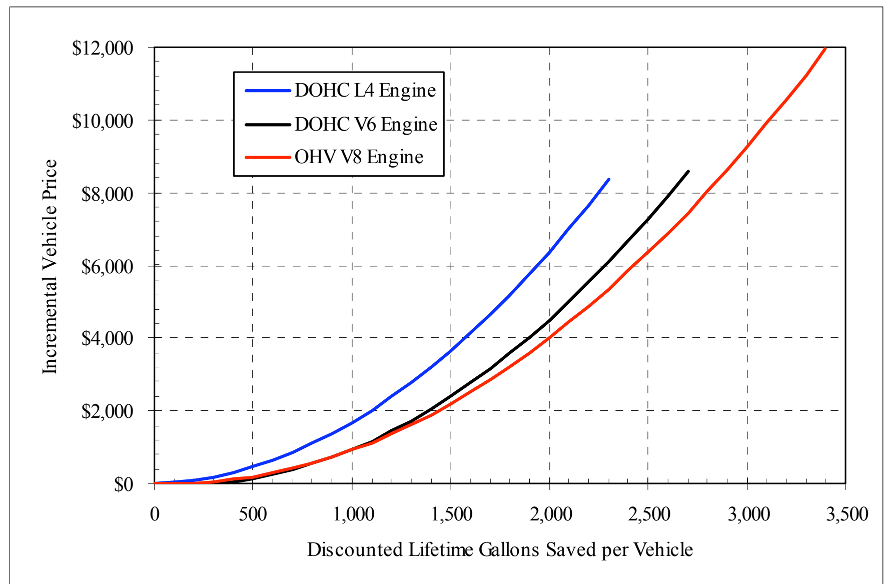
About 6% of energy is lost in moving energy from the engine to the vehicle wheels through transmission and axle systems. More efficient transmission technology can both reduce these losses and contribute to improved engine efficiency by allowing the engine to operate under high efficiency conditions more often. Since the load placed on an engine varies with road speed, transmissions with more gear ratios allow engine speed to adjust more frequently to road conditions and thereby maximize efficiency. The idealization of this is the continuously variable transmission that could potentially allow for infinite engine speed adjustment.

About 13% of fuel energy is actually used to move the vehicle. This energy is used to overcome a vehicle's inertial resistance, which is a function of vehicle mass, air resistance, and the rolling resistance of vehicle tires. Thus, technologies such as high strength, low mass materials, more streamlined vehicle designs, and lower rolling resistance tires can increase vehicle fuel efficiency.

Meszler Engineering Services (MES) undertook a limited meta analysis to estimate the fuel economy and cost impacts of various vehicle efficiency technologies. Details regarding the analysis can be found in Appendix C on page 24. Figure 3 shows the fuel economy technology cost curves for the three base engine types evaluated. As expected, costs increase more rapidly with each successive gallon of fuel saved.[6] However, it might be less intuitively obvious to recognize that the cost to obtain a specific reduction in fuel volume is higher for 4 cylinder engines due to the fact that such engines are already more fuel efficient. In effect, 6 and 8 cylinder engines use more fuel and therefore have more potential to eliminate existing inefficiencies.

Figure 3. Fuel Economy Technology Cost Curves



Source: Meszler Engineering Services

Figure 4 represents these same data in terms of marginal cost (expressed on a retail price increase basis) per discounted gallon of fuel saved versus specific levels of CAFE fuel economy. By expressing the data in terms of the marginal cost per gallon of fuel saved, one can roughly estimate the cost effective level

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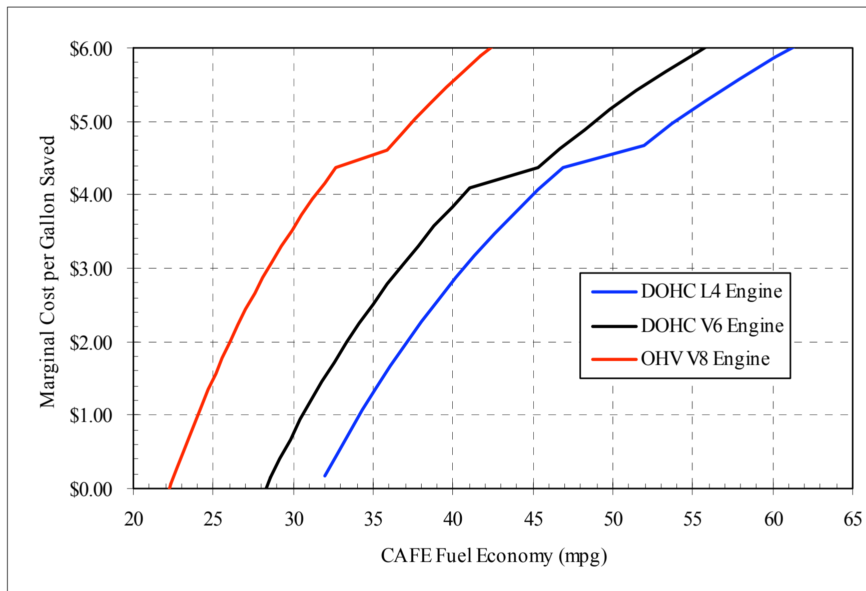
of CAFE by simply equating the marginal cost with an expected fuel price. Thus, for example, for a fuel price of $3.50 per gallon, CAFE standards of about 43 mpg, 39 mpg, and 30 mpg would be cost effective for DOHC L4, DOHC V6, and OHV V8 base engine technology respectively.[7] It is perhaps worth noting that the V6 curve can be taken as an approximate indicator of the cost effective CAFE level for the overall U.S. fleet since roughly 30% of engines are 4 cylinder, 47% 6 cylinder, and 23% 8 cylinder.

Figure 4. Marginal Fuel Economy Cost by CAFE Increase



Source: Meszler Engineering Services

It is also notable that Figure 4 illustrates that a 35 mpg CAFE standard, as required by under EISA 2007, is cost effective at a fuel price of about $2.50 a gallon. A CAFE standard of 32.5 mpg is cost effective at a fuel price of $2.00 per gallon, and CAFE standards above 40 mpg become cost effective at $4.00 per gallon.

In considering this data, it is also important to recognize that the estimated cost of fuel savings does not assume any ancillary benefits for reduced fuel consumption such as the economic savings of reduced foreign energy dependence or the direct savings of reduced military expenditures necessary to protect that dependence. Inclusion of such benefits would further reduce the effective cost of CAFE. Additionally, no assumptions regarding future reductions in technology cost are made. To the extent that more efficient means of achieving fuel savings are developed, these advances will also reduce the cost of CAFE. Perhaps most importantly, the data clearly demonstrate that cost effective fuel economy improvements can be made to engines of all sizes. Increased CAFE does not need to signal the demise of the 8-cylinder engine or the advent of the small car era. Both U.S. and foreign manufacturers can significantly improve fuel economy while simultaneously maintaining consumer choice by implementing available and cost effective vehicle efficiency technology.

IV. Specific Impacts on Individual Automakers

Below is a detailed analysis of individual companies' respective strategies to meet the National Program requirements.[8]

Our analysis has focused on the impact of the National Program scenario on the various automakers in terms of sales volume, miles per gallon, revenue and profit in 2015. Overall, the market size would be expected to remain constant.

General Motors

Even as General Motors faced a turbulent 2009, fuel efficiency improvements remained a key priority at the company, and will likely become a critical component of the turnaround at "New GM".

GM is expected to continue to utilize its own international sources for vehicles and powertrains (even if it has less of an ownership stake in Opel), enabling it to increase its volume of small cars and diesel engines, among other products. For example, the Chevrolet Spark (provided by Daewoo in Korea) will be sold in the U.S. In addition, the Chevy Cruze, another vehicle based on a global platform, will reportedly be built in the U.S. and serve as a more fuel efficient replacement to the Cobalt.

Changing the distribution of its products is another key strategy, with production of cars and car-like trucks (generally front wheel drive trucks based on car platforms) increasing at the expense of larger rear wheel drive trucks. These larger vehicles, due to their weight and larger displacement engines, generate lower gas mileage.

GM also has the highest car share of its Detroit 3 competitors. This gives it some advantages as it seeks to increase its fuel economy although it is currently behind the curve on car-based crossovers, a shortcoming it is trying to remedy with products of varying sizes and styles.

While GM has gained generally positive exposure for its forthcoming EV Chevy Volt (which uses hybrid technology in the form of plug in lithium ion batteries), its projected share of hybrid vehicles represents only 3.6% of the industry's total volume in the baseline and 8.8% in the CAFE scenario under our assumptions. The Two Mode Hybrid, another fuel economy-themed offering by GM, will focus on drivers who primarily drive on highways. Diesel penetration increases from 4.6% in the baseline to 7.0% in the CAFE scenario. In order to meet the CAFE requirements by 2015, just over 50% of vehicles not powered by diesels or hybrids will need to be improved. This means that about one-third of GM's fleet will not undergo major improvements in fuel economy. The share of vehicles in this category varies by segment, with lower cost vehicles generally less likely than higher priced vehicles to receive fuel economy improvements (which more cost conscious customers may reject).

As is true with most of its rivals, the most significant gain in mileage will be in internal combustion engines, where a variety of technologies will be utilized. The cost, and return in terms of fuel economy improvement, of these technologies is less than that of the diesel and hybrid vehicles, but given the share of sales with these engines, they are a critical part of the fuel economy improvement equation. GM's share of four cylinder engines in its fleet has increased from 18% in 2007 to 26% in 2008 to over 30% by 2011, with further gains expected in the future.

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Ford

Since CEO Alan Mulally's arrival at Ford, the company has championed a "One Ford" approach designed to commonize the product line globally. One impact of that approach has been to significantly expand the small car market in the U.S. and to make diesel technology more available in the U.S. Changes in the auto market have only quickened that plan. The cost of this change in product offerings is immense, but Ford has leveraged its international manufacturing footprint in order to reduce costs. We expect to see average mileage increases of 14% for cars and 17% for trucks.

While Ford is working on a number of fronts and has received attention for its hybrid Escape (one of the first sport utility vehicles with hybrid technology), the Escape is only projected to comprise 5.1% of all hybrid vehicles sold in 2015 and 9.5% in the CAFÉ scenario. Additional vehicles will be incorporating hybrid powertrains soon, including the Fusion and the Edge. Diesel penetration increases from 8.9% in the baseline to 11.3% in the CAFE scenario, although there have been short term delays in adding diesel engines to the F-150 and Expedition. In order to meet the CAFE requirements by 2015, almost 55% of vehicles not powered by diesels or hybrids will be improved. This leaves about one-fourth of Ford's fleet without major improvements in fuel economy. In 2007, 17% of Ford's fleet was powered by four cylinder engines, but we expect Ford to double that share by 2014. Meanwhile, the company's share of V8 offerings should shrink by half in that timeframe.

Ford has recently introduced or upgraded a number of new products in underserved segments. Such products include the Ford Fusion, Edge, Flex, and Lincoln MKS. Ford's new and heightened focus on small cars such as the Ford Fiesta, the updated Ford Focus, and smaller crossovers such as the Ford Transit Connect and EcoSport should continue to improve the position of the company, and reduce its dependence on larger sport utility vehicles and pickup trucks. The EcoBoost engine is another key component of Ford's fuel improvement program, as a smaller engine delivers better fuel economy without sacrificing performance.

The cost and availability of investment funds is a significant issue in the necessary transition process, and the general economic environment in which Ford and the auto industry operate over the next several years will determine how the company does in the medium term.

Chrysler

The last year has been particularly unkind to Chrysler, with its truck-heavy lineup stifling retail sales. Although vehicles like the new crossover Dodge Journey may help tilt the balance away from an industry high truck mix, Chrysler continues to significantly trail the competition in small cars and crossovers. Chrysler will benefit from the soon-to-be-launched V6 Phoenix engine program and its existing I4 engine family. While these new products will help, they are not sufficient to meet the increased CAFE requirements.

The company's recent Chapter 11 filing necessitated a strategic alliance with Fiat, which should provide needed access to fresh vehicle and powertrain products. In fact, without Fiat, Chrysler would stand little chance of complying with tighter fuel economy standards given its truck-centric, fuel-inefficient suite of vehicle offerings. The Fiat link provides potential flexibility in Chrysler's product line, as small cars derived from Fiat's vehicle platforms could be developed. Examples of current Fiat vehicles that could be modified to form the basis of new products include the Fiat 500 (a minicar), Grande Punto (a small hatchback), and Panda Cross (a small crossover).

While Chrysler has used Cummins technology in its pickups for many years, it is behind the curve in the use of alternative powertrain technologies. Before the link with Fiat, its share of volume in hybrid vehicles in 2015 was expected to be only 0.8% of total volume in the baseline and 5.8% in the CAFE scenario. Diesel penetration was to increase from 12.7% in the baseline to 25.1% in the CAFE scenario. And again, in the absence of Fiat, over 40% of vehicles not powered by diesels or hybrids were to be improved. This would have left about one-quarter of Chrysler's fleet where major improvements in fuel economy were not planned. The introduction of Fiat's products and powertrains would dramatically change the nature of Chrysler's product line.

Chrysler recently announced its intention to sell an electric vehicle (either a plug in hybrid or a fully electric vehicle) by 2010. It is important to note that the vehicles shown as prototypes use lithium ion batteries, although that technology is still not ready for regular production. Chrysler's goal is twofold: to have the technology available for consumers and to improve its standing with the public and the financial community. The lack of such technology has hurt its reputation, especially in comparison to its competitors, many of whom are moving forward on a variety of alternative powertrain technologies.

Honda

Honda has been one of the best performers in this current difficult environment. It has benefited from development decisions that have produced vehicles that consumers want to drive backed by a reputation consumers want to own. Additionally, Honda is a market leader in fuel economy in part on its corporate focus on engine technology, which goes beyond vehicles to a variety of products including lawn mowers, power tools, and airplanes. While it has looked into expanding its product line and powertrain options to cover a greater portion of the market, Honda has benefited from not offering products in segments that have recently been poor performers. Average mileage increases by 18% for cars and 17% for trucks.

Honda benefits from a cost perspective because most of its products are based on two platforms, the Civic and the Accord. Each of these provides the base technology for a wide variety of vehicles including sedans, hatchbacks, crossovers, and utility vehicles, as well as vehicles marketed under the Acura brand.

Honda's projected share of volume in hybrid vehicles in 2015 is a relatively high 6.4% of total volume in the baseline (based on a significant increase in these products between now and 2015) and almost 17% in the CAFE scenario. The company recently relaunched the Insight and will likely add a smaller hybrid. Embracing a strategy that values affordability, Honda's hybrids are less expensive than Toyota's, although they deliver somewhat less improvement in fuel economy.

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Although a diesel engine for the U.S. has been delayed, our vehicle forecast expects diesel penetration by 2015 to increase from 6.8% (again based on a significant increase in these products between now and 2015) in the baseline to almost 14% in the CAFE scenario. In order to meet the CAFE requirements by 2015, just over 35% of vehicles not powered by diesels or hybrids will be improved. This leaves about one-third of Honda's fleet where major improvements in fuel economy will not be made. We expect that Honda's four cylinder share of its total product line will grow from an already high 56% in 2007 to 68% in 2010 and even more thereafter.

Nissan

Although many of Nissan's products have been updated in the last few years, the company has experienced significant volume declines amid an overall weak U.S. market. Nissan has been known as a design leader, and the Nissan Altima and 370Z are examples of particularly stylish recent launches. Their engines are also highly regarded, particularly in terms of performance, and have average to above average performance with regards to fuel economy.

However, trucks are a different story. Nissan's truck offerings have performed very poorly as of late, and the company expects to eschew these products in favor of more fuel efficient, car-like trucks with front wheel drive transmissions.

Nissan is the leading provider of continuously variable transmissions (CVT), based on product provided by JATCO, a supplier in which it holds a large ownership stake. CVTs generally provide a 5% improvement in fuel economy, compared to standard automatic transmissions. Average mileage increases by 19% for cars and 20% for trucks.

Nissan's share of volume in hybrid vehicles in 2015 is only 0.5% of total volume in the baseline and 9% in the CAFE scenario. Diesel penetration increases from 2.9% in the baseline to 11.0% in the CAFE scenario. In order to meet the CAFE requirements by 2015, just over 50% of vehicles not powered by diesels or hybrids will be improved. This leaves about 30% of Nissan's fleet without planned fuel economy improvements.

While company CEO Carlos Ghosn seemed somewhat skeptical about the value of hybrid and diesel technologies in the past, the company is now working to improve its position with the use of these technologies. The company is also making significant changes in the distribution of its internal combustion engines, from 65% in 2007 to 80% of total sales in 2011, with V8 engines almost non-existent.

Toyota

Toyota has not escaped the current difficulties of the automotive marketplace. While the company's recent struggles have taken many observers by surprise (Toyota should report a loss for FY2009), its growth into a full-line manufacturer, as well as its expanded geographical and manufacturing footprint, has resulted in significant volume and profit declines. Toyota's truck products have performed poorly of late and, as a result, we expect more emphasis on cars and crossovers. The decline in truck production explains, in part, an increased share of I4 engines (52% in 2007 to 63% in 2011) and declines in V8 share from 15% in 2007 to 7% in 2011.

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Over they years, Toyota's retail and marketing prowess, especially with regard to fuel economy, has set a high standard for the industry and pushed competitors to improve. The company benefits from a strong capital position and has used this advantage to research and develop a variety of fuel efficient products across its product line. Hybrids are a key pillar of Toyota's fuel economy strategy, and the company expects to offer hybrid versions of all its high-volume products. It currently offers the Prius, Camry Hybrid, Highlander Hybrid, and RX400h and is expected to offer a hybrid Yaris, in part to compete with the Honda Insight.

Due to continuing improvements across automakers, Toyota should lose some of its currently held market advantage. Average mileage increases by 21% for both cars and light trucks. More importantly, the company is looking to reduce the cost of hybrid technology, which should mitigate lost variable profit. To the extent that Toyota is successful, it will not only improve its profit position, but also its market share.

V. Financial Implications of Tougher Regulation

In our analysis, we take into account the altered nature of the marketplace in the last few years, the financial position of the automotive industry, the existing CAFE target, and the alternative national Pavley target (functionally equivalent to the National Program for analytical purposes). We have analyzed the changes compared to the baseline in sales and profits in the U.S. market under two regulatory scenarios: 1) CAFE 2020 – imposing the existing CAFE target of 35 miles per gallon in 2020; and 2) national Pavley – imposing a national Pavley target of 35 miles per gallon in 2016 (again, essentially equivalent to the National Program).

It can be argued that in the past, the Detroit 3 tended to underestimate U.S. consumers' willingness to pay for higher fuel economy or environmental benefits, so a mandated increase in fuel economy is likely to increase retail prices by more than it would increase variable costs. While this point is frequently debated, its tendency is evidenced in the following:

- Consumer references to poor selection ("I can't find the vehicle I want with the fuel economy I need") increased during the 1970s, peaked in 1980, and did not return to pre-oil shock levels until 2002. These complaints started rising again in 2003 and exceeded the 1980 peak in 2008.[9]
- In recent years, as the real price of gasoline increased, the unit sales of fuel-inefficient SUVs and large cars, which ought to have fallen at the same rate, did not seem to be affected until prices soared to over $4 per gallon. This was because automakers substantially offset the increase in the resulting present value of fuel costs by reducing prices of fuel-inefficient vehicles. Estimates of the responsiveness of vehicle sales to fuel prices that ignore these vehicle price reductions understate consumer preferences for fuel economy.[10]
- Continuing loss of market share by Detroit 3 to competitors with more fuel efficient vehicles.

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While the above points indicate that automakers have historically underestimated the value of fuel economy to consumers, we also examined how sensitive our findings are to alternative beliefs about the value consumers put on fuel economy. We estimate the lifetime fuel cost of operating a vehicle as the present discounted value of the expected annual fuel expenses. Our estimates assume a 15-year vehicle life, annual miles of driving that start at 15,000 and decline at 5.2% per year, a 7% real consumer discount rate, and a constant real price of $3 per gallon of gasoline. In the market demand model, the quantity demanded for each market entry is a function of the effective full prices of all vehicles in the market. The effective price is defined as:

Purchase Price + ϕ(Expected Lifetime Fuel Costs)

The parameter ϕ measures the relative consumer responsiveness to operating costs compared to capital costs in the purchase decision. A "rational" consumer would have $\phi = 1.0$. Some analysts assume $\phi < 1.0$ based on consumers' inadequate understanding of risks.[11] Recent empirical estimates have found that significant heterogeneity in the parameter exists between consumers: the median $\phi = 1.4$, $\phi > 1$ for 63% of consumers, and $\phi > 5.0$ for 30% of consumers. In the sensitivity analysis we compare our findings under two alternative values of ϕ: 0.70 and 1.0.[12]

The Baseline case reflects automakers' expected product plan for 2015 without specific efforts to comply with fuel economy requirements. It does include existing plans for alternative powertrains and a change in product mix due to the recent shift in market demand away from trucks and toward cars. However, these plans would neither meet the CAFE 2020 target of 35 miles per gallon as set forth in the EISA, nor the national Pavley standard we assumed (35 mpg in 2016). Thus, the utilization of a variety of additional fuel saving technologies and changes in product mix would be necessary to meet future fuel economy standards.

The increase in fuel economy we simulated was the same in both the CAFE 2020 and the national Pavley scenarios. The difference is in the timing, with the national Pavley scenario achieving the CAFE 2020 target in 2016.

Figure 5 below shows the change in average fuel economy by automaker and vehicle type:

Figure 5. Estimated Average Fuel Economy Savings By Automaker and Vehicle Type

	Cars			Light Trucks			Industry		
	BASE	SCENARIO	CHANGE	BASE	SCENARIO	CHANGE	BASE	SCENARIO	CHANGE
	32.0	40.8	27%	23.1	30.4	32%	26.9	35.0	30%
Chrysler	28.7	38.7	35%	24.1	31.1	29%	25.2	32.8	30%
Ford	30.3	40.3	33%	21.9	29.9	37%	24.3	32.9	36%
GM	30.0	40.0	33%	21.4	29.5	38%	24.4	33.2	36%
Honda	35.2	40.2	14%	25.5	31.5	24%	31.4	37.0	18%
Nissan	32.1	42.1	31%	24.7	31.7	28%	28.7	37.3	30%
Toyota	37.0	42.0	14%	25.6	30.6	20%	31.7	36.8	16%
Others	29.8	40.8	37%	23.2	31.2	34%	27.2	37.0	36%

Source: UMTRI

We simulated the scenarios using a market demand model developed by UMTRI, with a baseline established by The Planning Edge, and cost curves from Meszler Engineering Services.

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In addition to the two regulatory scenarios, we analyzed two alternative assumptions about how consumer value of fuel costs compared to vehicle prices and whether the Detroit 3 comply with the standard. An efficient consumer would value expected fuel costs exactly the same as vehicle price: a $100 increase in expected fuel costs would have the same impact on vehicle demand as a $100 increase in vehicle price, making the value of $\phi = 1.00$. The alternative assumption is that consumers are less responsive to fuel cost changes ($\phi = 0.70$): a $100 increase in expected fuel costs would have the impact on vehicle demand as only a $70 increase in vehicle price.
Under a scenario with a National Pavley standard in which consumers fully value fuel savings, variable profit for the Detroit 3 increases by $3.4 billion, or 9% (as compared to a 3% increase for the Japan 3); and unit sales for the Detroit 3 increase by 8% (as compared to a 2% increase for the Japan 3).

Figure 6. National Pavley (Short Term Multiplier)

Scenario Assumptions:
100% The share of computed fuel savings that consumers perceive.
145% Indirect Cost Multiplier (ICM) multiplier to cover indirect costs.
6% Pure price margin to cover profit.
30% The overall improvement in MPG.

	unit sales (000)					variable profit (billions)			
	base	scenario	Change (000)	Change %		base	scenario	Change bn	Change %
Chrysler LLC	1,592	1,740	148	9%	Chrysler LLC	$8.1	$8.9	$0.8	10%
Ford Motor Co.	2,339	2,528	189	8%	Ford Motor Co.	$12.1	$13.2	$1.1	9%
General Motors	3,345	3,574	229	7%	General Motors	$19.3	$20.7	$1.5	8%
Honda	1,559	1,602	43	3%	Honda	$8.1	$8.4	$0.3	4%
Nissan	1,089	1,131	42	4%	Nissan	$5.3	$5.7	$0.3	6%
Toyota	2,634	2,656	21	1%	Toyota	$13.6	$13.8	$0.1	1%
Others	2,646	2,790	144	5%	Others	$18.8	$19.8	$1.0	5%
Market Total	**15,204**	**16,020**	**816**	**5%**	**Market Total**	**$85.3**	**$90.5**	**$5.2**	**6%**
Detroit 3	**7,276**	**7,842**	**566**	**8%**	**Detroit 3**	**$39.5**	**$42.8**	**$3.4**	**9%**
Japan 3	**5,282**	**5,388**	**106**	**2%**	**Japan 3**	**$27.1**	**$27.9**	**$0.8**	**3%**
Others	**2,646**	**2,790**	**144**	**5%**	**Others**	**$18.8**	**$19.8**	**$1.0**	**5%**

Source: UMTRI

Under a scenario with a National Pavley standard in which consumers only value 70% of fuel savings, the Detroit 3 still realize a gain in variable profit of $0.9 billion, while vehicle sales decrease by only 2,000, equal to a 0.02% change in unit sales.

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Figure 7. National Pavley (Short Run Multiplier) and Lower Consumer Value of Fuel Economy

Scenario Assumptions:
70% The share of computed fuel savings that consumers perceive.
145% Indirect Cost Multiplier (ICM) multiplier to cover indirect costs.
6% Pure price margin to cover profit.
30% The overall improvement in MPG.

unit sales (000)				
	base	scenario	Change (000)	Change %
Chrysler LLC	1,592	1,620	28	2%
Ford Motor Co.	2,339	2,323	(16)	-1%
General Motors	3,345	3,330	(14)	0%
Honda	1,559	1,595	37	2%
Nissan	1,089	1,056	(33)	-3%
Toyota	2,634	2,667	32	1%
Others	2,646	2,609	(37)	-1%
Market Total	**15,204**	**15,201**	**(3)**	**0%**
Detroit 3	**7,276**	**7,274**	**(2)**	**0%**
Japan 3	**5,282**	**5,318**	**36**	**1%**
Others	**2,646**	**2,609**	**(37)**	**-1%**

variable profit (billions)				
	base	scenario	Change bn	Change %
Chrysler LLC	$8.1	$8.4	$0.3	3%
Ford Motor Co.	$12.1	$12.3	$0.2	2%
General Motors	$19.3	$19.7	$0.4	2%
Honda	$8.1	$8.4	$0.3	4%
Nissan	$5.3	$5.4	$0.1	1%
Toyota	$13.6	$13.9	$0.3	2%
Others	$18.8	$19.1	$0.3	2%
Market Total	**$85.3**	**$87.1**	**$1.8**	**2%**
Detroit 3	**$39.5**	**$40.3**	**$0.9**	**2%**
Japan 3	**$27.1**	**$27.7**	**$0.6**	**2%**
Others	**$18.8**	**$19.1**	**$0.3**	**2%**

Source: UMTRI

VI. Appendices

Appendix A. Forecasting CAFE/National Pavley Impacts

A Brief Overview of Corporate Average Fuel Economy (CAFE)

U.S. CAFE standards are defined in terms of the harmonic average fuel economy of vehicles sold by a manufacturer in a given model year, and manufacturers are required to meet the standards for cars and light trucks (with domestic and imported fleets measured separately). Penalties are assessed for fleets that do not meet the standards. Since CAFE's inception in the 1970s, the Detroit 3 have always met CAFE standards, the Japanese 3 have always exceeded CAFE standards, and the European automakers have either met standards or failed to do so (due to their production of high-performance, luxury vehicles). Fines are assessed at a rate of $5.50 per tenth of a mpg that the manufacturer attained below the CAFE standard, multiplied by the number of vehicles in the affected fleet in a given year. While the CAFE program has some recognized weaknesses – among them the lack of automatic review and adjustment, and the CAFE credit given to producers of "dual-fuel" vehicles whether or not those vehicles actually use the alternative fuel in question (which will be phased out between 2016 and 2020) – it has nonetheless proven to be a viable option for reducing oil consumption in the United States, a topic of increasing priority for a country reliant on oil imports from several politically volatile countries. According to a 2002 National Academy of Science report, CAFE contributed to saving 2.8 million barrels of fuel a day, the equivalent of 14% of consumption in that year, and noted that increases to CAFE standards would contribute to future oil savings – and that the necessary improvements to fuel efficiency could be achieved without large increases in vehicle costs.[13] Preliminary analysis indicates that the National Program will result in cumulative greenhouse gas reductions of approximately 900 million metric tons (CO_2 equivalent) and fuel savings of approximately 1.8 billion barrels of oil.[14]

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As reformed by NHTSA, both car and light truck CAFE fleets are assigned a target fuel economy level for each vehicle based on a measure of size (footprint, or wheelbase multiplied by track width) and sets a CAFE standard for each automaker based on the weighted (harmonic) average fuel economy targets of its vehicles. A size-based CAFE standard has a number of advantages over the un-reformed system it is replacing. In contrast to the former CAFE system that required improvements only from some automakers, under the proposed standards, all automakers would be required to improve the fuel economy of their vehicle fleets. The size-based system is less biased than legacy CAFE, which penalized full-line manufacturers and rewarded niche (i.e., small vehicle) manufacturers. Under the size-based system, "gaming" CAFE by shifting mix or making vehicles smaller (just to game CAFE) is reduced because changing mix and vehicle size will result in a change in the CAFE standard in the same model year. (It is the function that the automaker faces, not a single number.) An automaker can choose to meet the CAFE standard in a given fleet (cars or trucks) through two avenues: 1) shift its mix to more fuel-efficient vehicles for the same size, and/or 2) apply technologies to improve the fuel economy of specific vehicles.

Methodology and Assumptions

In our quantitative analysis of sales and variable profits we compared two regulatory scenarios: the existing CAFE target in 2020 of 35 miles per gallon and a national Pavley program target in 2016 of 35 miles per gallon. Each alternative standard was applied in a market simulation model developed by UMTRI. The Planning Edge developed the baseline for sales and vehicle attributes by automaker and segment. All the changes we consider in this report were with respect to this baseline. The scenario represents The Planning Edge's mid-range outlook for the U.S. market in the near future. Cost curves for increasing fuel economy were developed by Meszler Engineering Services. Variable profits increase relative to the base in both scenarios, but the increase is larger for the existing CAFE target in 2020 scenario. The difference is due to our assumption that it costs more to increase fuel economy at a faster pace.

Regulatory standards exert substantial influence on product portfolios and the attributes of products. Our analysis tests this conclusion by addressing the question, "Would *tightening* the standards and/or *speeding* their implementation result in higher or lower profits for the Detroit 3?"

We used a future market simulation to estimate the impacts of higher industry wide fuel economy requirements. Both supply and demand were modeled. We used a baseline "middle" market scenario and examined two fuel economy improvement scenarios: (CAFE 2020 or national Pavley 2016) and its impact on consumer demand and supplier costs and profits. We then conducted an extensive sensitivity analysis to the key parameters in our model.

We began our analysis with a scenario that represents a mid-range outlook for the U.S. market in the near future.

We defined cost and demand at the automaker by segment level. In the analysis, a market entry (the lowest level we modeled) is defined as an aggregate of an automaker's products in a segment. For example, GM has several Luxury Car products that we aggregated into a composite "GM Luxury Car" market entry. The attributes of the GM Luxury Car market entry are the sales-weighted averages of the products that comprise the market entry (fuel economy is the sales-weighted harmonic average).

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The aggregation to automaker by segment market entries is consistent with our market demand and automaker cost information. We are using a price-elasticity demand model that is defined at the automaker by segment level. The own- and cross-price elasticities were originally derived from a segment level elasticity model from General Motors. We estimated the automaker by segment elasticities using a method developed by the Congressional Budget Office. The costs of improving fuel economy, which were provided by Meszler Engineering Services, are defined at the segment level. We applied these segment-level costs to each automaker within the appropriate segment.

Consumer demand is modeled as a set of 75 demand equations – one for each market entry. There are 7 automakers: the Detroit 3, the Japan 3, and an aggregate of all others. With the 15 segments in our model, there are 105 (=15x7) possible market entries, but since an automaker may not offer products in all segments there are 75 actual market entries.

The quantity of entry, m, demanded by consumers is a function of the "effective consumer prices" of all 75 market entries. (The elasticity matrix is 75 x 75.) The effective consumer price for an entry, n, is the retail price of that entry plus the adjusted expected future fuel costs for that entry. The adjustment in expected fuel costs consists is multiplied by ϕ, a measure of the relative consumer response to fuel cost (an operating cost) vs. retail price (a capital cost).

We estimate the expected fuel costs as the discounted present value over the life of the vehicle of the annual future expected fuel costs of operating the vehicle. Along with the fuel economy of entry n, several consumer preference factors determine expected fuel costs. Vehicle Lifetime is the consumer time horizon for the present value calculation. First Year Fuel Price and First Year Miles Driven establish the level of annual fuel costs.

The future fuel costs are brought into present value by applying the Overall Discount Rate, which is defined by consumer behavior and expectations about the Expected Fuel Price Growth, the Rate of Change in Miles per Year, and the (real) Consumer Discount Rate. Expected annual vehicle miles generally fall as a vehicle ages based on two considerations. Not all vehicles survive from one year to the next, and a declining fraction of vehicles of a given vintage remain in use as they age. There is also evidence from the National Household Travel Survey that older vehicles are driven fewer miles.

We developed a model of product cost to estimate the impact of improving vehicle fuel economy on OEM and Dealership cost and retail price. Our estimates of the impact of a given industry-wide percentage increase in fuel economy on product cost and profit assume that each market entry is improved by the same percentage. This significantly eases the model's computational burden, and does not materially influence our directional findings. Our analysis focuses on the impact of alternative scenarios on the gross profits of the Detroit 3. If they can meet an industry-wide increase in fuel economy by applying different rates of improvement by segment, then they would be able to increase profits (reduce losses) above what results from the assumed uniform improvement rate. Thus our (gross) profit impacts are understated.

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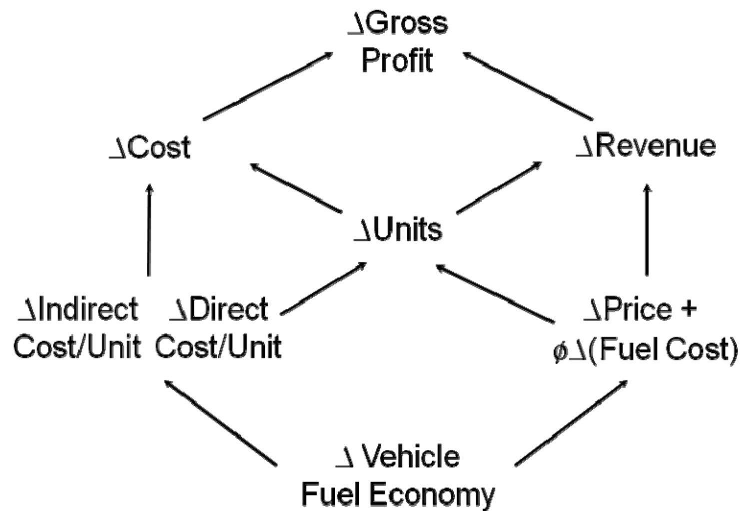
The OEM Product Cost model distinguishes between Direct and Indirect Costs. We received estimates of the direct cost of improving fuel economy from Meszler Engineering Services. Direct cost = Direct Labor + Direct Materials. We assumed that an improvement in fuel economy also increases some Indirect Cost items including, Warranty & Freight, Factory Overhead (mainly Engineering in Indirect Labor and Depreciation, Maintenance, and Other). We measured the Indirect Cost increase by multiplying Direct cost by an Indirect Cost Ratio (assumed to be identical for all automakers).

The Dealership New Vehicle Cost model also distinguishes between Direct and Indirect Costs. From the vertical perspective of the enterprise (the OEM and its dealerships), dealership costs are all indirect. We incorporate dealership costs that change when technologies are used to improve fuel economy into our measure of Enterprise Indirect Cost. These may include Direct Cost Dealership-Installed Options, Dealership Overhead, and Other Indirect Costs.

Figure 8. Matrix of Operating Impacts on OEM and Dealership Business Models from Fuel Economy



Source: UMTRI

We combined each automaker and its dealerships for an enterprise view of costs, sales, revenue, and profits. An industry-wide increase in fuel economy increases the cost per vehicle. Direct Costs changes include OEM direct labor and materials costs of new components that raise the cost of manufacturing. Indirect Cost changes include other changes in OEM costs that vary with output (warranty and freight, if affected by new technologies); and some OEM costs that do not vary with production, but cover the costs of changing the vehicle or the manufacturing process: OEM engineering expense and OEM factory overhead. Indirect costs also include dealership costs that are changed to deal with selling and servicing new technologies.

Vertical View of Enterprise (Automaker and Its Dealerships)
Change in Cost = (1 + Indirect Cost Multiplier) x (change in Direct Cost)
Change in Price = (1 + ICM + Gross Profit Rate) x (change in Direct Cost)

Consumers

Change in Full Price = Change in Price + ϕ (Change in Fuel Cost)

The prices and full prices of all market entries are changed by the industry-wide improvement in fuel economy. The impact on sales on vehicles by automaker and segment is predicted by applying the elasticity matrix to the changes in full prices.

Change in Gross Profit = Change in Revenue - Change in Variable Cost

Our estimates of the impact on Direct Cost of a percentage increase in fuel economy were computed using information provided by Meszler Engineering Services. We defined cost curves for each segment that predict the change in Direct Cost as a quadratic function of the percentage change in fuel economy.

$$\Delta DC = A(\Delta E/E) + B((\Delta E/E)^2)$$

In the sensitivity analysis, we treat uncertainty in the change in cost through an uncertain multiplicative factor that scales the change in direct costs to be higher or lower than the prediction from the curves.

Using the True WTP (assuming consumers respond the same to fuel cost as to retail price) the net gain to consumers is the area A. Automakers can raise prices and increase Gross Profits.

Industry average fuel economy is 26.9 mpg in the baseline mid-level future-market scenario. Gross profits are estimated for the automakers and their dealerships combined at $85.3 billion for the industry. Vehicle unit sales are 15.204 million, reflecting The Planning Edge's expectation of a recovery from current sales that are running below 10 million on an annual basis.

Appendix B. Calculating the Economic Impact to OEMs (A Representative Example of Appendix A)

An increase in vehicle fuel economy has impacts on product costs, on product prices, and on consumers' willingness to pay for vehicles—leading to changes in profits. The diagram in Figure 9 is a schematic of the model we used to estimate profit impacts. We use two symbols that need to be defined. Delta, Δ, is used to indicate the change in the variable to which it is applied (for example, ΔCost is the change in a vehicle's cost associated with an increase in its fuel economy). Phi, ϕ, measures the relative responsiveness of consumers to operating costs compared to capita costs. For a given change in fuel economy, the consumer response would be larger with a higher ϕ that it would be with a lower ϕ.

The following example is for the aggregate GM luxury car, and traces the impacts of a 33% increase in fuel economy through the paths shown in Figure 9. The dollar terms shown are per vehicle, so we do not show the change in units.

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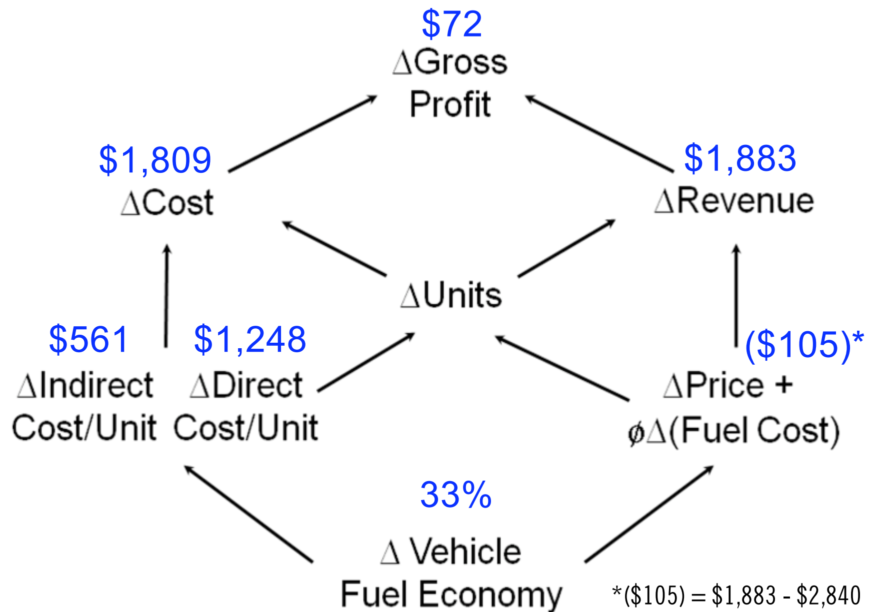
Figure 9. CAFE Economic Impacts -- GM Luxury Car Unit (An Example of the Calculation)



Source: UMTRI

- A 33% increase in the fuel economy of GM luxury cars would add $1,248 in direct costs per vehicle.
- Indirect costs would add $561 (45 percent of direct costs).
- The change in total cost would be $1,809 (= $561 + $1,248).
- A 33% increase in fuel economy would save consumers $4,057 (present value over the life of the vehicle), but in this example ϕ = 0.7, so the perceived savings are $2,840.
- We assume a 6% margin on the incremental costs, which would increase the price to consumers by $1,883.
- The change in full price (capital plus fuel operating cost to the consumer) would fall $105.
- Average revenue per vehicle is the same as the price to the consumer, $1,883.
- Profit of $74 per vehicle is the difference between $1,883 and $1,809.

Appendix C. Costs and Fuel Economy Impacts of Various Fuel Efficiency Technologies

As stated above, Meszler Engineering Services (MES) undertook a limited meta analysis to estimate the fuel economy and cost impacts of various vehicle efficiency technologies. While MES undertook this analysis for both individual technologies and selected packages of technologies, only the technology package estimates were used to evaluate industry impacts. This technology package approach was employed in recognition of the fact that many technologies target the same inefficiencies, so their combined application results in a lesser efficiency improvement than would be expected were their individual impacts simply summed. The evaluated technology packages were selected to cover a broad range of fuel economy impacts, basically ranging from modest (~10%) improvements due to conventional engine technology advances to large (>100%) improvements due to advanced technologies such as diesel hybrid electric vehicle technology, with associated reductions in vehicle mass and drag.

Specific studies or information sources included in the meta analysis include the National Highway Traffic Safety Administration's 2008 CAFE (Corporate Average Fuel Economy) proposal and related support documents,[15] a 2004 report on greenhouse gas reduction technology from the Northeast States Center for a Clean Air Future,[16] the 2008 version of the Energy Information Administration's NEMS (National Energy Modeling System) Transportation Demand Module (which is used to support their Annual Energy Outlook forecast series)[17], the National Academy of Science's 2002 CAFE review[18], and numerous articles in automotive trade publications such as Automotive News and Automotive Engineering International. By definition, the impact estimates reflect a compendium of work performed by others, but it is important to recognize that the references utilized are generally considered to be "middle of the road" sources, reflecting neither inordinate optimism nor inordinate pessimism.

Generally, the technology packages included in the analysis were intended to reflect the lowest cost technologies available to support a broad range of fuel economy improvements. Moreover, these packages generally reflect technologies that are or will be market ready within the next few vehicle model years. Technologies such as fuel cells and hydrogen internal combustion engines that either require further development or supporting (e.g., refueling) infrastructure establishment before being viable on a high volume basis are not considered, as the driver of this study is technology that can support CAFE compliance through the 2016 timeframe. Due to differences in costs (and, in some cases, cost savings) for engines of different sizes, the data were analyzed in terms of 4, 6, and 8 cylinder engines individually.

The specific technologies considered include:

Variable valve timing (or cam phasing)

Valves are used to allow air and exhaust gases to respectively enter (intake valves) and exit (exhaust valves) the combustion chambers (cylinders) of the internal combustion engines that currently power the vehicle fleet. Traditional valve opening and closing is controlled by fixed cams located on one or more camshafts that are driven by the rotation of the engine crankshaft, limiting the ability to tailor either intake or exhaust performance to specific engine operating conditions. Variable valve timing technology allows the timing of intake and/or exhaust valve openings to vary in accordance with engine speed and load. This allows for improved breathing (intake air and exhaust gas movement) and more efficient combustion.

Variable valve lift

Variable valve lift is an adjunct to variable valve timing technology, which allows valve opening height (and duration) to also vary with engine speed and load. This further improves breathing and combustion efficiency.

Camless valve actuation

Camless valve actuation allows for valve functionality that is fully independent of crankshaft and/or cam operation. Electromechanical actuators allow valve operation to be continuously varied in accordance with engine speed and load, so that breathing and combustion efficiency can be optimized. In addition, the elimination of mechanical camshafts and actuators reduces engine load and friction. Camless valve actuation is not included in the technology packages evaluated for this analysis due to current costs that outweigh the additional efficiency potential relative to less expensive variable valve timing and lift systems.

Cylinder deactivation

Cylinder deactivation technology effectively “shuts off” engine cylinders under operating conditions where their output is not necessary for performance purposes. This essentially creates a smaller displacement engine that operates closer to its optimum efficiency speed and load conditions. When the smaller displacement configuration is not adequate for demanded performance, the deactivated cylinders are “turned back on” and the performance capacity of the larger displacement engine is restored. For this analysis, it is assumed that cylinder deactivation technology can be effectively applied to engines of 6 or more cylinders, but that 4 cylinder engines are not viable technology candidates.

Turbocharging

Turbocharger technology utilizes some of the energy that leaves engine cylinders in the form of exhaust heat to drive a compressor in the engine air intake manifold. This compressor increases the quantity of air delivered to the combustion chambers, and this increased change density allows for greater engine power (than would be delivered by the same size non turbocharged, or naturally aspirated, engine). This higher specific power allows for a smaller (and more efficient) engine to be used for a given level of performance. For certain engines (DOHC V6 and V8 engines), the cost savings associated with engine downsizing can offset the incremental cost of the turbocharger. However, the savings are reduced if 2 valves per cylinder OHV engines are simultaneously converted to 4 valves per cylinder DOHC configurations. For this analysis, it is assumed that there is no significant cost savings associated with downsizing a 4 cylinder engine (as the downsized engine will retain all cylinders, valves, camshafts, etc.).

Gasoline direct injection

“Conventional” gasoline engine fueling is accomplished through relatively low pressure fuel injection outside (at the air intake ports) of the engine cylinders. This currently conventional multiport fuel injection technology allows for significantly enhanced fueling (and efficiency gains) relative to the predecessor carburetion technology, but even greater advantages can be attained through higher pressure fuel injection directly into the engine cylinders. This so called gasoline direct injection (GDI) technology allows for much more precise fuel

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control, higher compression, increased EGR, and stratified lean burn (more air/less fuel per unit of power than conventional non stratified combustion) under certain operating conditions. For this analysis, it is assumed that stratified operations would occur at relatively light load operation and that additional exhaust gas aftertreatment costs would be incurred to adequately control altered emissions characteristics (relative to non stratified systems).

Direct injection diesel engines

Direct injection diesel engine technology is well established and offers considerable efficiency benefits relative to current gasoline engines, primarily through high compression throttle less lean burn combustion characteristics. About one half of all vehicles currently sold in the EU are diesel powered, but more stringent emissions requirements as well as continuing stigmas of noise, soot, etc. and a higher fuel price must be overcome in the U.S. market. The cost impacts assumed in this analysis include both downsizing credits for 6 and 8 cylinder engines and additional exhaust aftertreatment costs for all diesel applications.

Transmission technology

Increasing the number of steps between the lowest and highest transmission gear ratios allows the engine to operate in the region of greatest efficiency more often. For this reason, significant movement from four speed toward five and six speed automatic transmissions is already underway, and seven and eight speed automatic transmissions have entered the market. Continuously variable transmission (CVT) technology, which provides an essentially “infinite” range of gear ratios, allows the engine to operate in the region of greatest efficiency most often. Historically, torque limitations have hindered the widespread application of CVT technology, but improved technology has extended potential application to most light duty vehicles.

12 volt idle off technology

Considerable fuel energy is used during engine idle operations in typical urban driving environments. Turning the engine off during these operations would improve the overall driving cycle average fuel efficiency of the vehicle. A 12 volt belt driven alternator/starter (BAS) system can offer a relatively simply solution, allowing automatic engine shutdown and automatic, fast, and reliable restart (upon brake release). For this analysis, it is assumed that BAS systems are not sufficiently able to control larger 6 and 8 cylinder engines, but are reliably able to control engine off at idle operations for 4 cylinder engines.

42 volt integrated starter/generator (ISG)

A step up from the 12 volt BAS, the 42 volt ISG is a small, high performance electric motor that is either integrated into the driveline of a vehicle (generally referred to as a flywheel alternator/starter or FAS) or belt driven like the 12 volt BAS. Like the 12 volt BAS, the technology allows the vehicle engine to be turned off at idle and instantaneously restarted (both automatically) and accessories to be powered electrically during the engine off period. However, the higher system voltage also allows for regenerative braking (where braking energy is captured and stored for later use) and a modest level of launch assist (where electrical energy is used to supplement internal combustion engine performance). Sometimes termed a “mild hybrid” as a result of these features, the 42 volt ISG system is capable of controlling all light duty engines. The

costs estimated for this analysis include an associated electrical system upgrade.

Improved aerodynamics

In urban driving, 20 30% of motive energy is expended in overcoming air resistance, 50 65% at highway speeds. More streamlined designs that allow for less turbulent airflow reduces fuel use.

Reduced rolling resistance

30 40% of motive force is expended overcoming the resistive torque of tires. Improved tire designs (and reduced vehicle weight) can reduce this force, but tradeoffs in traction, etc. are limiting.

Reduced vehicle weight

Vehicle weight affects both the force required to overcome rolling resistance and the force required to induce a given motion. Generally, each 10% weight reduction reduces fuel use by about 8%. The efficiency advantages of weight reduction must, however, be considered in conjunction with possible safety concerns.

Advanced power steering

Electric and electrohydraulic power steering systems offer improved efficiency over conventional hydraulic systems. Conventional hydraulic power steering systems rely on a pump that is connected to the engine via a belt, and this pump places a continuous load on the engine. Conversely, the electric and electrohydraulic power steering systems are operated electronically on an as needed basis, resulting in improved engine efficiency through the elimination of the continuous load otherwise placed on the engine by a conventional power steering pump.

Electric hybrid powertrains

Three hybrid electric designs were evaluated as part of the technology packages included in this analysis. Since hybridization facilitates several complementary technologies, simple hybridization of the engine was not evaluated in isolation. Instead, three hybrid package designs were included: a Honda like parallel hybrid package, a Toyota like dual mode (series/parallel) hybrid package, and a diesel version of the Toyota like package. Each package includes the basic engine hybridization, which allows for the recapture of braking energy (regenerative braking), engine off at idle capability, and electric launch assist (thereby allowing the combustion engine to be downsized). The Toyota like design also offers limited electric only drive capability. In addition to this basic hybridization, the packages also include other features typically associated with the Honda and Toyota designs. The Honda like package assumes a 2.5% mass reduction, a 22% drag improvement, VVTL, a CVT transmission, electric accessories, and electric power steering. The Toyota like packages assume Atkinson cycle combustion (in the gasoline version), a 15% mass reduction, a 7% drag improvement, VVT, an electronic CVT transmission, electric accessories, and electric power steering. More advanced hybrid designs (e.g., plug in hybrids), electric only designs, or fuel cell vehicles were not evaluated in this analysis due to the focus on 2016 CAFE compliance.

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Figure 10 presents a list of the individual technologies evaluated, along with their respective fuel economy and cost impacts, while Figure 11 presents similar impacts for the selected technology packages.

Figure 10. Vehicle Technologies with Associated Fuel Savings and Cost Impacts

Fuel Economy Technology	Change in mpg	Cost Basis	Cost to Vehicle Manufacturer for:		
			DOHC L4	DOHC V6	OHV V8
VVT (variable valve timing, cam phasing)	3%	Dual coupled, with EGR credit	$25	$90	$90
VVL (variable valve lift)	2%	Discrete lift technology	$75	$115	$150
VVT+VVL	5%		$100	$205	$240
CVA (camless valve actuation)	8%		$340	$565	$720
		Independent system	n/a	$115	$150
Cylinder Deactivation (1/2 of cylinders deactivate)	5%	If combined with VVL	n/a	$200	$260
		Turbocharger system cost	$400	$400	$400
		Downsizing credit, V8 to DOHC	$0	($700)	$100
Turbocharging (with downsizing)	10%	Net cost	$400	($300)	$500
		Engine cost	$135	$185	$210
		Aftertreatment cost	$215	$275	$330
Gasoline Direct Injection (stratified at light loads)	10%	Net cost	$350	$460	$540
		Engine cost (V6 to L4, V8 to L6)	$1,000	$300	$950
		Aftertreatment cost	$500	$600	$1,000
Diesel Direct Injection (relative to MPFI gasoline)	35%	Net cost	$1,500	$900	$1,950
12V Idle Off	8%		$200	n/a	n/a
		Technology cost	$300	$300	$350
		Electrical system upgrade	$100	$100	$100
42V ISG - Idle Off/Regen Braking/Launch Assist	10%	Net cost	$400	$400	$450
Mass Reduction (per % reduction in mass)	0.80%	Per pound reduced	$1	$1	$1
Drag Reduction (per % change in drag)	0.20%	Per percent change in drag	$5	$5	$5
Lower Rolling Resistance (per % change in RR)	0.20%	Per percent change in RR	$4	$4	$4
Electric Power Steering	1%		$20	$40	$40
Transmission Transition from:					
4 Speed Automatic to 6 Speed Automatic	5%		$50	$75	$80
4 Speed Automatic to 7 Speed Automatic	6.50%		$75	$110	$120
4 Speed Automatic to 8 Speed Automatic	8%		$110	$160	$170
5 Speed Automatic to 6 Speed Automatic	3%		$20	$25	$20
5 Speed Automatic to 7 Speed Automatic	4.50%		$45	$60	$60
5 Speed Automatic to 8 Speed Automatic	6%		$80	$110	$110
6 Speed Automatic to 7 Speed Automatic	1.50%		$25	$35	$40
6 Speed Automatic to 8 Speed Automatic	3%		$60	$85	$90
4 Speed Automatic to CVT	10%		$150	$175	$200
5 Speed Automatic to CVT	8%		$120	$125	$140
6 Speed Automatic to CVT	5%		$100	$100	$120

mpg = miles per gallon, DOHC = dual overhead cam engine, OHV = overhead valve engine, EGR = exhaust gas recirculation
MPFI = multiport fuel injection, ISG = integrated starter/generator, Regen = regenerative, RR = rolling resistance
CVT = continuously variable transmission

Source: Meszler Engineering Services

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Figure 11. Fuel Economy Impact and Cost of Technology Packages

Technology Package	Change in mpg	Cost to Vehicle Manufacturer for:		
		DOHC L4	DOHC V6	OHV V8
		With a Base Weight of:		
		2800 lbs	3500 lbs	4800 lbs
VVTL + A4-to-A6 + EPS	9%	$170	$320	$360
with 5% Mass Reduction	13%	$310	$495	$600
VVTL + Cylinder Deactivation + A4-to-A6 + EPS	14%	n/a	$405	$470
with 5% Mass Reduction	19%	n/a	$580	$710
VVT + Turbocharging + A4-to-A6 + EPS	15%	$495	$60	$60
with 5% Mass Reduction	20%	$635	$235	$300
VVT + Turbocharging + GDI + A4-to-A6 + EPS	27%	$845	$365	$1,250
with 5% Mass Reduction	32%	$985	$540	$1,490
VVT + Turbocharging + GDI + ISG + A4-to-A6 + EPS	39%	$1,045	$765	$1,700
with 5% Mass Reduction	45%	$1,185	$940	$1,940
VVTL + Cylinder Deactivation + ISG + A4-to-A6 + EPS	25%	n/a	$805	$920
with 5% Mass Reduction	30%	n/a	$980	$1,160
VVTL + Cylinder Deactivation + GDI + ISG + A4-to-A6 + EPS	34%	n/a	$1,265	$1,460
with 5% Mass Reduction	39%	n/a	$1,440	$1,700
Diesel Direct Injection	35%	$1,500	$900	$1,950
with 5% Mass Reduction	40%	$1,640	$1,075	$2,190
Moderate (Honda-Style) Gasoline Hybrid Package				
Package includes engine hybridization plus 2.5% mass reduction, 22% drag improvement, VVTL, CVT, electric accessories, and EPS.	50%	$2,000	$2,000	$2,500
Advanced (Toyota-Style) Gasoline Hybrid Package				
Package includes hybridization, Atkinson cycle combustion, 15% mass reduction, 7% drag improvement, VVT, e-CVT, electric accessories, & EPS.	80%	$4,000	$4,000	$5,300
Advanced Diesel Hybrid Package				
Package includes engine hybridization, 15% mass reduction, 7% drag improvement, VVT, e?CVT, electric accessories, and EPS.	125%	$5,400	$5,400	$7,500

All impacts are relative to a gasoline multiport fuel injected, 4 speed automatic transmission base technolog

mpg = miles per gallon, DOHC = dual overhead cam engine, OHV = overhead valve engine, VVTL = variable valve timing and lift
VVT = variable valve timing, A4 = 4 speed automatic transmission, A6 = 6 speed automatic transmission, EPS = electric power steering
GDI = gasoline direct injection, ISG = integrated starter/generator, MPFI = multiport fuel injection
CVT = continuously variable transmission, e CVT = electronic CVT

Source: Meszler Engineering Services

As indicated in Figure 11, the evaluated technology packages are estimated to be capable of increasing CAFE fuel economy by as much as 125%.

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Notes

1. Since regulations implementing the National Program have not yet been developed, it is not possible to state with certainty exactly what the program will entail. While public statements reflect the standards cited herein, actual standards are expected to be established independently for passenger cars and light trucks so that effective fleet average standards are dependent on the proper design of these component standards for a given fleet mix.

2. See 74 Fed. Reg. 186, 49454.

3. Published on Mar. 6, 2008, in the Federal Register.

4. See 73 Fed. Reg. 24,352.

5. These allowances are estimated to be worth $12-$17 billion. "UAW Endorses House Democrats climate Change bill," May 18, 2009, Detroit News.

6. Note that the discontinuity in each of the CAFE cost curves results from the differential relationship between CAFE and in use fuel economy for non hybrid and hybrid vehicles. The curves would be continuous if graphed in terms of in use fuel economy. In effect, the discontinuities reflect the point at which significant hybrid penetration becomes necessary for CAFE compliance.

7. It is important to note that the figures and estimates presented in this section are independent of the larger industry analysis discussed in this report. The cost estimates provided for the larger industry analysis are expressed in terms of incremental costs to the vehicle manufacturer (as stated in Tables Q1 and Q2), and all associated manufacturer markups are introduced as a component of the larger industry analysis. For the limited estimates presented in this section, a simple markup factor of 1.5 has been employed to estimate retail pricing impacts. This value is consistent with the value employed by NHTSA in recent CAFE rulemakings. Additional economic assumptions employed in the limited analysis presented in this section are as follows: vehicle lifetime = 12 years/150,000 miles, annual mileage declination = 4.5 percent, annual discount factor = 8 percent (for 12 years of fuel savings, this equates to a lifetime economic discount multiplier of 0.707), composite in use fuel economy (relative to CAFE) = 0.75 for non hybrids and 0.70 for hybrids (based on average data from a 2007 fuel economy database prepared by the U.S. Department of Energy and a U.S. Environmental Protection Agency in support of fuel economy labeling revisions), and fuel economy improvements of 50 percent or more require hybrid technology. Furthermore, the economic analysis assumes a societal viewpoint, in that fuel savings are valued over the full lifetime of the vehicle (albeit on a discounted basis).

8. Please note that this section regarding specific impacts on automakers only examines the impact of the CAFE scenario on the domestic performance of the various manufacturers. Their overall performance is, of course, based on their global results, which, depending on the automaker, will have a varying impact on their overall results. It should also be understood that our analysis focuses on the impact of

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CAFE on company revenue and earnings and does not include the change in product mix that is already underway due to non-CAFE influences. Changes in response to CAFE will include a further change in product mix (which is included in our model used to generate the results in this report) as well as changes in powertrain technology and mix that are necessary to meet the requirements.

Our baseline forecast already includes significant changes in product mix and powertrain technology, but the CAFE requirements require further steps (particularly with respect to powertrain changes). This report only focuses on the direct impact of the CAFE regulations and does not include other factors such as quality, marketing, corporate reputation, and other characteristics of the companies' product lines which also affect market share. Finally, these results only consider the effects of fuel economy requirements through MY2016. Additional improvements will be necessary through 2020 to meet the more stringent fuel economy requirements through the period 2017-2020.

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15. U.S. Department of Transportation, National Highway Traffic Safety Administration, "Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011–2015," Notice of Proposed Rulemaking, Federal Register, Volume 73, Number 86, Page 24352, May 2, 2008.

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18. National Academy of Sciences, National Research Council, "Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards," National Academy Press, Washington, D.C., 2002.

BorgWarner Inc.

(BWA.N; US$32.29; 1H)

Valuation

Our $36 target price for BorgWarner shares is based on the average of our sum of the parts EV-to-EBITDA valuation, P/E analysis, and discounted cash flow model, consistent with our central point of tendency methodology (i.e. averaging) for the supplier group.

Our sum of parts analysis individually values BorgWarner's higher margin Engine Group and the smaller Drivetrain segment. Our blended EV-to-EBITDA multiple came out at 7x, in line with the company's median multiple over the past five years. (The company's EV-to-EBITDA multiple ranged from 4x to 10x and averaged 7x over the last five years.) In our debt calculation, we utilized 2010E net debt and included the underfunded pension. Our sum of parts analysis drives a total company (i.e. including Beru) EV-to-EBITDA multiple of 7x. Our sum of parts analysis yielded a value of $35.

We apply a P/E multiple of 16x to our 2010 EPS estimate to arrive at a price of $32. We view our P/E multiple as appropriate, as it is in line with that of investment grade peers including JCI. (The company's P/E multiple ranged from 8x to 24x and averaged 14x over the past five years.)

Our adjusted discounted cash flow (DCF) model yields a value of $40. Within the framework of our DCF model, we assume revenue growth of 5% slightly below BorgWarner's implied three-year backlog growth rate of 10%+. Our operating margin expectation of 8.5% falls in line with the company's historic margins. We discount unleveraged free cash flow at an industry cost of capital of 8% and the company's weighted average cost of capital of 8.2%. We value BorgWarner's unleveraged free cash flow at an industry cost of capital to determine the value of the unlevered asset, as well as the weighted average cost of capital to estimate the value of the firm. Consistent with our treatment for auto suppliers with exposure to long-term penetration of non-conventional propulsion systems (i.e. hydrogen fuel cells, electric, and other technologies), we assume a negative 2% growth rate in our terminal value calculation.

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Risks

We rate BorgWarner shares High Risk based on the company's market capitalization, earnings history, price volatility, and customer concentration. The primary driver of our risk rating is the potential for a bankruptcy at one or more of the company's Detroit 3 customers and the impact this may have on the company, potentially including precipitous production declines from lost volume at bankrupt customers and disruptions within the distressed supply chain resulting in cash outflows, impairment of customer receivables, and the need to financially support sub suppliers. We note that the company only has 12% revenue exposure to the Detroit 3 in North America and near 20% globally, and thus we place a High Risk rating instead of Speculative one. Other risks to the stock achieving our target price include execution risk of launching new business, production cyclicality, raw materials prices, and labor relations.

Johnson Controls Inc

(JCI.N; US$27.13; 2H)

Valuation

Our $24 target price for JCI is based on the average of our sum-of-the-parts EV-to-EBITDA valuation, P/E analysis, and discounted cash flow model.

We apply an EV-to-EBITDA multiple of 6x to our F2011 EBITDA estimate to arrive at a target price of $24. We derive our multiple through sum-of-the-parts EV-to-EBITDA analysis. We use a multiple in line with covered suppliers for the Automotive Experience segment, who are competitors to Johnson Controls' Automotive Experience business with comparable size and operating performance. We asses a 30% premium to the automotive aftermarket group (including ATAC, AZO, GPC, and SMP) to value the Power Solutions segment due to the segment's superior margins. We use EMR, HON, and UTX as comparables for the Building Efficiency business, as they compete in similar business lines with comparable financial profiles. (The company's EV-to-EBITDA multiple ranged from 5x to 12x and averaged 8x over the last five years.)

We apply a P/E multiple of 11x to our F2011E EPS to derive a target of $24. We view our P/E multiple of 11x as appropriate, as we use sum of parts analysis similar to our EV-to-EBITDA analysis (including comparables) for deriving our P/E target. (JCI's five-year P/E multiple ranged from 9x to 21x and averaged 15x.)

Our adjusted DCF model yields a value of $23. Within the framework of our DCF model, we assume revenue growth of 5%. Our operating margin expectation of 5.5% falls in line with our F2011 expectations for the company. We discount free cash flow at a weighted average cost of capital of 10%. We value JCI's unleveraged free cash flow at an industry cost of capital to determine the value of the unlevered asset, as well as the weighted average cost of capital to estimate the value of the firm. We use no-growth in calculating terminal value for the shares, consistent with our methodology for automotive suppliers.

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Risks

We rate Johnson Controls High Risk based on the company's market capitalization, earnings history, price volatility, and customer concentration. The primary driver of our risk rating is the potential for a bankruptcy at one or more of the company's Detroit 3 customers and the impact this may have on the company, potentially including precipitous production declines from lost volume at bankrupt customers and disruptions within the distressed supply chain resulting in cash outflows, impairment of customer receivables, and the need to financially support sub suppliers. Other risks to the shares exceeding or falling below our target price include a volatile production environment, execution risk of launching new programs, restructuring execution, raw material prices, and labor relations.

Appendix A-1

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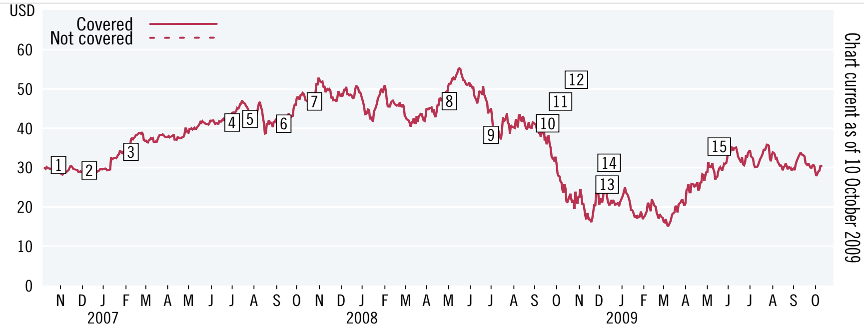
Ratings and Target Price History
Fundamental Research

Analyst: Itay Michaeli
Covered since September 14 2007



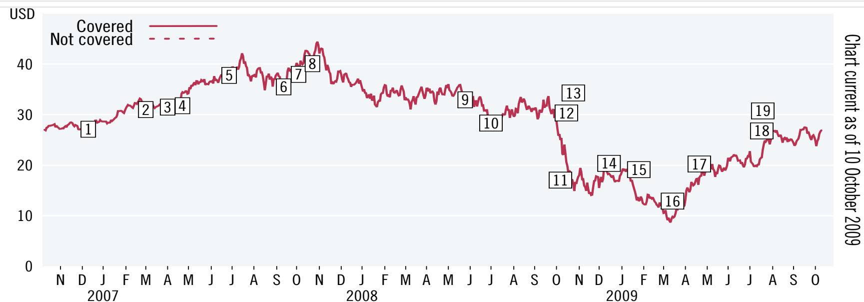
	Date	Rating	Target Price	Closing Price
1	29-Oct-06	1M	*34.50	29.13
2	12-Dec-06	1M	*35.50	28.82
3	8-Feb-07	1M	*43.50	37.20
4	1-Jul-07	1M	*49.50	43.02
5	26-Jul-07	1M	*50.00	43.10
6	12-Sep-07	1M	*48.50	41.60
7	25-Oct-07	1M	*54.50	47.33
8	2-May-08	1M	*58.00	51.48
9	1-Jul-08	1M	*57.00	45.09
10	18-Sep-08	1M	*49.00	36.79
11	7-Oct-08	1M	*46.00	26.50
12	29-Oct-08	1M	*32.00	22.26
13	11-Dec-08	1M	*27.50	22.38
14	15-Dec-08	*1H	*27.00	20.56
15	19-May-09	1H	*36.00	29.82

* Indicates change
Rating/target price changes above reflect Eastern Standard Time

Johnson Controls Inc (JCI)

Ratings and Target Price History
Fundamental Research

Analyst: Itay Michaeli
Covered since September 14 2007



	Date	Rating	Target Price	Closing Price
1	11-Dec-06	1M	*32.33	28.04
2	1-Mar-07	1M	*36.33	31.56
3	2-Apr-07	1M	*36.67	31.77
4	22-Apr-07	1M	*38.67	34.12
5	27-Jun-07	1M	*43.67	38.63
6	12-Sep-07	*2M	*38.67	35.78
7	3-Oct-07	2M	*39.00	39.24
8	23-Oct-07	2M	*40.00	40.24
9	26-May-08	2M	*36.00	33.20
10	1-Jul-08	2M	*32.00	29.18
11	7-Oct-08	2M	*28.00	24.99
12	15-Oct-08	2M	*24.00	20.60
13	24-Oct-08	2M	*18.00	16.31
14	15-Dec-08	*2H	18.00	18.32
15	26-Jan-09	2H	*16.00	12.92
16	13-Mar-09	2H	*10.00	9.81
17	21-Apr-09	2H	*16.00	17.52
18	17-Jul-09	2H	*21.00	21.52
19	20-Jul-09	2H	*24.00	23.08

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% of companies in each rating category that are investment banking clients	47%	45%	36%

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NEWS

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IMMEDIATE RELEASE

NEW PRODUCTS DRIVE FORD'S OCTOBER SALES, SHARE GAINS

- Ford, Lincoln and Mercury October U.S. sales totaled 132,483, up 3 percent versus a year ago and 21 percent higher than September
- October marks the third time in the last four months Ford sales have increased
- October retail share was up for the 12th time in 13 months
- All-new Taurus accelerates in October; Ford dealers report Taurus retail sales nearly tripled year-ago levels
- Ford, Lincoln and Mercury cars and crossovers post sales increases; overall car sales were up 11 percent versus a year ago, and crossovers were up 23 percent
- Ford's new F-150 continues to achieve share gains, followed being named the coveted "Truck of Texas" by the Texas Auto Writer's Association

DEARBORN, Mich., Nov. 3, 2009 – Ford, Lincoln and Mercury October U.S. sales totaled 132,483, up 3 percent versus a year ago and 21 percent higher than September. This marks the third time in the last four months Ford sales have increased.

"Consumer demand for our new high-quality, fuel-efficient products is driving Ford's market share gains," said Ken Czubay, Ford vice president, U.S. Marketing Sales and Service. "Ford vehicles are among the 'freshest' available by any automaker – with more than 80 percent of our sales in October coming from our new 2010 models."

Ford estimates its total market share in October was more than 15 percent – higher than a year ago and higher than its share in the first nine months of 2009. Ford's October retail share was up for the 12th time in 13 months.

"The Ford plan is working, led by the strength of our product lineup and customer demand for our new cars, utilities and trucks," said Czubay. "Consumers increasingly are noticing that the Ford difference is our great products, our strong business and our leadership in quality, fuel efficiency, safety, smart technologies and value."

October Sales Highlights

- All-new Ford Taurus sales totaled 6,076, up 141 percent versus a year ago. Dealers reported retail sales nearly tripled year-ago levels.
- Other new Ford, Lincoln and Mercury cars posting increases included the Ford Fusion (up 24 percent), Ford Mustang (up 2 percent) and Lincoln MKZ (up 27 percent).
- Crossover utilities posted strong sales increases: Ford Escape was up 26 percent; Ford Edge up 38 percent; Ford Flex up 8 percent; Mercury Mariner up 36 percent; Lincoln MKX up 15 percent. In addition, sales of the all-new Lincoln MKT crossover were up 36 percent from September.
- Ford's F-Series truck achieved sales of 39,496 and a year-to-year share increase in the full-size pickup category. In addition, the all-new Ford F-150 SVT Raptor captured the coveted "Truck of Texas" award from the Texas Auto Writer's Association. Ford's F-Series has been the No. 1-selling truck in America for 32 years straight.
- Ford's new EcoBoost engine technology is winning customers, too. In October, sales of EcoBoost-equipped models were twice as high as September. EcoBoost provides customers up to 20 percent improvement in fuel economy and a 15 percent reduction in emissions versus larger-displacement engines. EcoBoost is standard on the Taurus SHO and available on the Ford Flex, Lincoln MKS and Lincoln MKT.

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Note: The sales data included in this release and the accompanying tables are based largely on data reported by dealers representing their sales to retail and fleet customers.

About Ford Motor Company
Ford Motor Company, a global automotive industry leader based in Dearborn, Mich., manufactures or distributes automobiles across six continents. With about 200,000 employees and about 90 plants worldwide, the company's automotive brands include Ford, Lincoln, Mercury and Volvo. The company provides financial services through Ford Motor Credit Company. For more information regarding Ford's products, please visit www.ford.com.

FORD MOTOR COMPANY OCTOBER 2009 U.S. SALES

	October		%	Year-To-Date		%
	2009	2008	Change	2009	2008	Change
Sales By Brand						
Ford	119,072	114,969	3.6	1,181,440	1,468,488	-19.5
Lincoln	6,735	7,399	-9.0	65,971	90,223	-26.9
Mercury	6,676	6,753	-1.1	75,924	103,631	-26.7
Total Ford, Lincoln and Mercury	132,483	129,121	2.6	1,323,335	1,662,342	-20.4
Volvo	4,437	3,717	19.4	51,166	63,745	-19.7
Total Ford Motor Company	136,920	132,838	3.1	1,374,501	1,726,087	-20.4
Ford, Lincoln and Mercury Sales By Type						
Cars	45,225	40,854	10.7	491,997	591,606	-16.8
Crossover Utility Vehicles	27,771	22,552	23.1	292,340	318,455	-8.2
Sport Utility Vehicles	8,572	9,102	-5.8	74,140	137,498	-46.1
Trucks and Vans	50,915	56,613	-10.1	464,858	614,783	-24.4
Total Trucks	87,258	88,267	-1.1	831,338	1,070,736	-22.4
Total Vehicles	132,483	129,121	2.6	1,323,335	1,662,342	-20.4

FORD BRAND OCTOBER 2009 U.S. SALES

	October		%	Year-To-Date		%
	2009	2008	Change	2009	2008	Change
Crown Victoria	3,380	3,299	2.5	28,458	42,616	-33.2
Taurus	6,076	2,517	141.4	33,692	46,167	-27.0
Fusion	13,445	10,836	24.1	148,045	128,381	15.3
Focus	10,119	10,576	-4.3	136,032	175,958	-22.7
Mustang	4,789	4,686	2.2	56,469	83,557	-32.4
Ford Cars	37,809	31,914	18.5	402,696	476,679	-15.5
Flex	2,182	2,017	8.2	32,058	9,569	235.0
Edge	8,185	5,951	37.5	72,624	99,781	-27.2
Escape	12,471	9,886	26.1	138,739	135,558	2.3
Taurus X	37	1,329	-97.2	6,027	20,907	-71.2
Ford Crossover Utility Vehicles	22,875	19,183	19.2	249,448	265,815	-6.2
Expedition	2,878	3,647	-21.1	23,445	46,919	-50.0
Explorer	4,596	3,991	15.2	41,138	68,330	-39.8
Ford Sport Utility Vehicles	7,474	7,638	-2.1	64,583	115,249	-44.0
F-Series	39,496	43,324	-8.8	334,922	436,022	-23.2
Ranger	3,910	3,891	0.5	47,826	58,706	-18.5
Econoline/Club Wagon	5,658	8,429	-32.9	72,474	109,848	-34.0
Transit Connect	1,513	0	NA	5,677	0	NA
Low Cab Forward	11	30	-63.3	209	775	-73.0
Heavy Trucks	326	560	-41.8	3,605	5,394	-33.2
Ford Trucks and Vans	50,914	56,234	-9.5	464,713	610,745	-23.9
Ford Brand	119,072	114,969	3.6	1,181,440	1,468,488	-19.5

LINCOLN BRAND OCTOBER 2009 U.S. SALES

	October		%	Year-To-Date		%
	2009	2008	Change	2009	2008	Change
MKS	1,609	2,072	-22.3	13,961	8,924	56.4
MKZ	1,661	1,309	26.9	18,158	26,223	-30.8
Town Car	360	1,146	-68.6	9,055	12,831	-29.4
MKX	1,675	1,459	14.8	18,063	25,436	-29.0
MKT	619	0	NA	1,074	0	NA
Navigator	810	1,034	-21.7	5,515	12,771	-56.8
Mark LT	1	379	-99.7	145	4,038	-96.4
Lincoln Brand	6,735	7,399	-9.0	65,971	90,223	-26.9

MERCURY BRAND OCTOBER 2009 U.S. SALES

	October		%	Year-To-Date		%
	2009	2008	Change	2009	2008	Change
Grand Marquis	2,176	1,967	10.6	19,185	25,058	-23.4
Sable	63	645	-90.2	6,154	14,356	-57.1
Milan	1,547	1,801	-14.1	22,788	27,535	-17.2
Mariner	2,602	1,910	36.2	23,755	27,204	-12.7
Mountaineer	288	430	-33.0	4,042	9,478	-57.4
Mercury Brand	6,676	6,753	-1.1	75,924	103,631	-26.7

VOLVO BRAND OCTOBER 2009 U.S. SALES

	October		%	Year-To-Date		%
	2009	2008	Change	2009	2008	Change
S40	811	501	61.9	6,711	8,638	-22.3
V50	229	187	22.5	1,858	1,557	19.3
S60	26	612	-95.8	5,835	8,269	-29.4
S80	541	424	27.6	6,999	9,235	-24.2
V70	121	140	-13.6	1,542	2,812	-45.2
XC60	900	0	NA	6,784	0	NA
XC70	296	469	-36.9	4,873	8,204	-40.6
XC90	982	901	9.0	8,224	16,193	-49.2
C70	214	244	-12.3	4,625	5,142	-10.1
C30	317	239	32.6	3,715	3,695	0.5
Volvo Brand	4,437	3,717	19.4	51,166	63,745	-19.7