SUPPORT FOR ADVANCED CLEAN CARS

I. OBJECTIVE

Implementation of the recently approved Advanced Clean Cars program will result in various technologies emerging in the new vehicle market to meet the tighter requirements. Ongoing evaluation of these technologies and requirements from multiple perspectives is necessary to assess the progress towards meeting the program's goals. ARB seeks innovative approaches to understanding issues related to consumer acceptance, technological progress, as well as consumer, societal or economic impacts of the regulatory programs. Research findings will be used to inform future policy actions to facilitate compliance with the program or any amendments to light-duty vehicle emissions standards.

II. BACKGROUND

The Advanced Clean Cars program is comprised of a suite of performance-based regulations intended to achieve significant criteria and greenhouse gas emissions reductions from new light-duty vehicles. By 2025 when the program is fully implemented, new automobiles will emit 34 percent fewer global warming gases and 75 percent fewer smog-forming emissions. Additionally, in coordination with Governor Brown's Executive Order B-16-2012, the Advanced Clean Cars program will result in more than 1.4 million zero-emission and plug-in hybrid vehicles on the road in California.

Auto manufacturers will continue to have flexibility in the types of conventional and advanced technologies they utilize while consumers will likewise have a diverse array of new vehicle offerings from which to choose. As compliance with the emissions standards is based on a manufacturer's fleet average of new vehicles, it will be important to monitor and understand the trends in the new car market. Trends of particular interest include the types, costs, and effectiveness of pure- or near-zero emissions technologies that emerge in the marketplace as well as consumers' willingness and ability to purchase these technologies. The resultant broader economic and societal impacts of these market trends will also require continued evaluation for direct and indirect effects. Lastly, the targets established for zero-emission vehicles are intended as a minimum volume. ARB and partner agencies will continue to foster development of this emerging vehicle market, which would be aided by additional research on incentives and market transformation.

III. RESEARCH AREAS

Research proposals are requested to address any of the following research questions. Prospective investigators are encouraged to contact ARB staff for any clarification on these topics. Note that ARB will fund projects for only a few of these questions based on the quality of proposals received; proposals ARB is unable to fund may be shared with other organizations for potential funding.

- New car market trends. Beyond basic descriptive statistics on vehicle sales mix and technology penetration rates, researchers are asked for innovative or novel approaches, methods, etc. to characterize changes in the new vehicle fleet over time and how the Advanced Clean Car program affects those trends. These approaches, methods, etc. should allow for ongoing characterization of the existing new vehicle fleet as well as some ability to extrapolate, forecast, or project future trends.

- Advances in vehicle technology. Engineers, scientists, and inventors in the public and private sectors continue to explore new technologies or improve existing ones. Synthesizing research is needed that identifies exotic technologies, such as new or substitute materials, chemistries, or processes, and evaluates and compares their potential for contributing to compliance with the standards.
- Technology impacts on consumer welfare. Given the array of vehicle technologies that may be employed to comply with more stringent standards, a method and estimation are needed on the consumer response to vehicle technology changes resulting from the regulations. Do consumers like the new technologies with their associated fuel savings, or are the new vehicles undesirable? Is it possible to identify effects of the program on vehicle sales or consumers' choices among vehicles? Is there evidence of hidden costs of the new technologies? In addition to consumer satisfaction with these technologies, changes in consumer welfare may also occur from rebound effects -- that is, changes in miles driven due to vehicle technologies with lower operating costs -- independent of fuel price effects.
- Affordability of new vehicles. Projected increases in new vehicle prices may be offset by expected fuel savings. However, from the perspective of a new car buyer, an increase in upfront costs may pose a barrier to entering the new car market. A method is needed for quantifying or indexing new vehicle affordability and estimating the extent to which higher upfront costs limit market entry into various vehicle segments/types and the ways in which traditional or alternative leasing/purchasing mechanisms may evolve to address the combination of those higher upfront costs and reduced fuel expenditures. Further research is also needed to understand how affordability influences the dynamics between the new and used vehicle markets.
- Economic Impacts. California could become the center of the emerging ZEV industry, on both the vehicle or infrastructure sides. Research is needed that examines the structure of the ZEV industry within California and beyond to identify the highest value elements in the supply chain and to distinguish the current and future impacts of policies directly affecting regulated parties or affiliated businesses from indirect impacts to other sectors of the economy. Continued research is also needed on the current and future regional and national impacts of the regulatory program on overall economic output and employment.
- Impacts on vehicle manufacturing. OEMs and suppliers will be seeking improvements in manufacturing techniques to reduce cost and shorten product cycle times, while zero-emission technologies may create new supply chains or manufacturing processes. Research is requested to track manufacturing trends in response to the Advanced Clean Car Program. Of particular interest is the relationship between product lifecycles and manufacturing costs for vehicles, engines, transmissions, etc. as well as changes in and differences between manufacturing processes (and costs) for conventional and advanced technologies.
- Valuation of co-benefits. ZEVs and other advanced vehicle technologies may offer consumers with benefits that do not necessarily have a market price. Research proposals are requested that develop and estimate the co-benefits related to greater ZEV adoption, such as home charging convenience, avoided oil spillage and water quality impacts, reduced military expenditures, improved grid reliability through vehicle-to-grid connectivity, or greater motivation for residential energy conservation.

- Incentives based on behavioral economics. Ongoing developments in the field of behavioral economics suggest that incentives could be structured in an alternate manner to be more effective at persuading consumers to adopt new vehicle technologies or behaviors. Research proposals are requested that rigorously evaluate possible incentives for purchasing near or pure zero-emission vehicles based on principles of behavioral economics.
- Innovative approaches to transform the new vehicle market. A sustainable market cannot rely indefinitely on publicly-funded incentives. Research proposals are requested evaluating innovative approaches to increase consumer awareness and demand for zero-emission vehicles beyond conventional strategies such as financial incentives or vehicle perks (free parking, HOV access). Approaches may include, but are not limited to, the use of social media, alternative vehicle ownership or financing structures, or demonstration projects.

IV. DELIVERABLES

- Quarterly progress reports
- Final report
- Additional deliverables to be determined in consultation with ARB staff.

V. TIMELINE

It is anticipated that projects will be completed in 36 months from the start date. Note that this allows 30 months for completion of all work through delivery of a draft final report; the last 6 months are for ARB and RSC review of the draft final report and delivery of a revised final report and data files to the ARB.