State of California
AIR RESOURCES BOARD

Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology

RESEARCH PROPOSAL

Resolution 14-22

July 24, 2014

Agenda Item No.: 14-6-1

WHEREAS, the Air Resources Board (ARB) has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2780-279, titled "Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology," has been submitted by the University of California, Davis; and

WHEREAS, the Research Division staff has reviewed Proposal Number 2780-279 and finds that in accordance with Health and Safety Code section 39701, research is needed to provide strategies to maximize the current market penetration of fuel infrastructure that can accommodate alternative fuels in the long-term, which will ease the transition to a zero or near-zero transportation sector in the future;

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2780-279 titled "Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology," submitted by the University of California, Davis, for a total amount not to exceed $250,000.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee and Research Division staff and approves the following:

> Proposal Number 2780-279 titled "Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology," submitted by the University of California, Davis, for a total amount not to exceed $250,000.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed $250,000.

I hereby certify that the above is a true and correct copy of Resolution 14-22 as adopted by the Air Resources Board.

Tracy Jensen

Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology"

Background

The abundance of natural gas, coupled with its low price and multiple applications across all energy use sectors, means that it will continue to play an important role in the United States energy system in the near future. Natural gas is often touted as a 'bridge' to low carbon fuels in the heavy-duty transportation sector, and the number of natural gas-fueled medium-and heavy-duty fleets is growing rapidly. Research is needed to determine whether the natural gas infrastructure that is being deployed to meet this rising demand for fossil-based natural gas fuels could economically and technologically serve as a jump-off point to facilitate a shift to more near-zero alternative fuels in the long-term. The original design of the Low Carbon Fuel Standard (LCFS) provides time for the development of advanced, near-zero technologies. However, having infrastructure already in place to deliver alternative fuels to fleets, once more alternative fuels are in place, will ease the costs and difficulties for the future transition to zero or near-zero transportation technology. ARB's current research is addressing the development of the commercial-scale production of alternative fuels in California. This proposed project will complement ARB's on-going work by exploring optimum paths for developing distribution and fueling infrastructure in the near-term that will accommodate alternative, low carbon fuels once those are being produced at the commercial scale.

Objective

This project will investigate how the near-term development of natural gas infrastructure can be implemented to include technology that can best facilitate the long-term conversion to near-zero technology. The role of policies and/or incentives that encourage the use of infrastructure that can accommodate both natural gas and alternative fuels will be explored.

Methods

This investigation will focus on infrastructure for medium-and heavy-duty fleets with a scope that includes potential synergies with light-duty infrastructure. Alternative fuels that will be considered in this analysis include hydrogen, renewable diesel, renewable natural gas, and dimethyl ether (DME). This analysis will also identify the role of policies and incentives that encourage the use and construction of infrastructure that can accommodate both natural gas and alternative fuels. The project's scope includes a literature review to compile costs and technological and environmental limitations for fuel infrastructure (pipelines, storage tanks, filling stations, delivery trucks, etc.) to accommodate both natural gas and alternative fuels, for all levels of medium and heavy-duty fleet operation (private small fleet operators to large commercial distribution). The researchers will also gather information on potential synergies with light-duty infrastructure. The researchers will use the information gathered in the literature review to define the technological and/or economic barriers to the availability of multi-use infrastructure and develop potential strategies that could be implemented by state agencies to encourage the use of such infrastructure in the near-term. The

researchers will then explore the role of policies and incentives that encourage the use of infrastructure that can accommodate both natural gas and alternative fuels.

Expected Results
ARB's 2011 LCFS Program Review Report indicates that a major barrier to expanded alternative fuel use includes the availability of appropriate fuel infrastructure. Results will provide strategies to maximize the current market penetration of fuel infrastructure that can accommodate alternative fuels in the long-term, which will ease the transition to a zero or near-zero transportation sector in the future. If this research leads to the development of a seamless transition to low carbon fuels, it will smooth implementation of the LCFS and benefit California consumers.

Significance to the Board
Results will provide essential data that will inform future refinements to the State's LCFS program and other climate change and air quality initiatives.

Contractor:
University of California, Davis

Contract Period:
18 months

Principal Investigator (PI):
Amy Jaffe

Contract Amount:
$250,000

Basis for Indirect Cost Rate:
The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:
ARB staff has worked with a number of staff at the University of California, Davis Institute for Transportation Studies (ITS) in the past, and have worked directly with the principal investigator, Amy Jaffe, on a contract funded through last year's Research Plan. Thus far, our experience working with Mrs. Jaffe has been extremely positive. Her quarterly reports have been timely and she had been coordinating with ARB staff on tailoring her research products to fit the needs of the agency. Amy Jaffe is a widely published, leading expert on global energy policy and energy and sustainability. The UCD team will lead the policy analysis and compilation of the final report. A subcontract was established with the University of California Riverside (UCR) to assist with the literature review and assessment of barriers to the installation of infrastructure that can support advanced fuels. The subcontract with the UCR team was essential due to their expertise in the heavy-duty sector.

Prior Research Division Funding to UC Davis:

Year	2013	2012	2011
Funding	$1,131,716	$4,949,363	$1,394,560

BUDGET SUMMARY

University of California, Davis

"Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology"

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 147,817	
2.	Subcontractors	$ 62,500	
3.	Equipment	$ 7,500	
4.	Travel and Subsistence	$ 2,500	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 1,205	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 13,278	
	Total Direct Costs		$ 234,800
INDIRECT COSTS			
1.	Overhead	$ 15,200	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 15,200
TOTAL PROJECT COSTS			**$ 250,000**

ATTACHMENT 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: University of California, Riverside

Description of subcontractor's responsibility: UC Riverside will assist with the literature review and assessment of barriers to the installation of infrastructure that can support advanced fuels, and brings important heavy-duty expertise to the project.

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 48,356	
2.	Subcontractors	$ 0	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 0	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 79	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 10,158	
	Total Direct Costs		$ 58,593
INDIRECT COSTS			
1.	Overhead	$ 3,907	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 3,907
TOTAL PROJECT COSTS			**$ 62,500**