State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 10-12

February 25, 2010

Agenda Item No.: 10-2-1

WHEREAS, the Air Resources Board (ARB or Board) 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 2700-266, entitled "Modeling Optimal Transition Pathways to a Low Carbon Economy in California: Impacts of Advanced Vehicles and Fuels on the Energy System," has been submitted by the University of California, Davis (UC Davis);

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee (RSC) has reviewed and recommends for funding:

> Proposal Number 2700-266, entitled "Modeling Optimal Transition Pathways to a Low Carbon Economy in California: Impacts of Advanced Vehicles and Fuels on the Energy System," submitted by UC Davis, for a total amount not to exceed $278,356.

NOW, THEREFORE, BE IT RESOLVED that ARB, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of RSC and approves the following:

> Proposal Number 2700-266, entitled "Modeling Optimal Transition Pathways to a Low Carbon Economy in California: Impacts of Advanced Vehicles and Fuels on the Energy System," submitted by UC Davis, for a total amount not to exceed $278,356.

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 $278,356.

I hereby certify that the above is a true and correct copy of Resolution 10-12, as adopted by the Air Resources Board.

Sandra Bannerman, Clerk of the Board

ATTACHMENT A

Modeling Optimal Transition Pathways to a Low Carbon Economy in California: Impacts of Advanced Vehicles and Fuels on the Energy System

Background

Reducing greenhouse gases (GHG) by 80 percent in 2050 will require a complete transformation of the State's energy economy affecting every sector including electricity production, transportation and fuels, rural and urban land use, industry, and agriculture. One of the challenges of developing strategies and policies to achieve this long-term climate change mitigation target is the difficulty of envisioning what our state might look like when we succeed. Scenario planning is a tool that can be used to help policy-makers define the strategies that will be most effective in achieving our goals. This project can develop a set of plausible and positive scenarios for the future of California that achieves the 2050 GHG reduction targets of 80 percent below 1990 levels. The scenarios would include information on technical, institutional, and political barriers that would need to be addressed to achieve the scenario.

Objective

The aim of the project is to create transparent, flexible, and publicly accessible modeling tools for understanding the future evolution of California's energy system in achieving the future GHG emission reduction goal in 2050. This project will develop an integrated system model, CA-TIMES (i.e., the next generation of MARKAL), that will identify optimized scenarios for meeting 2050 climate policy goals and evaluate the resource and economic impacts to the state of California.

Methods

UC Davis researchers propose to modify, calibrate, and apply two models for 2050 scenario analyses: CA-TIMES and the California Electricity Dispatch (CED) model. The first is the CA-TIMES/MARKAL model, based on an energy-economic-environment modeling tool widely used internationally. The model will characterize California's energy system and future energy technology pathways to meet energy and environmental challenges. UC Davis researchers will also expand the CED model, an electricity system dispatch model, to enable us to better model low carbon grids incorporating renewable energy. The key results extracted from the detailed hourly electricity dispatch model will be integrated into CA-TIMES. They will apply CA-TIMES to specific research questions pertinent to meeting the 2050 GHG reduction targets and explore a number of optimal scenarios for achieving the long-term climate goal.

Expected Results

One of the important deliverables is the technology database by sector in Excel. The CA-TIMES energy system model and the CED model will be built on a transparent and easy-to-access Excel database. Each sector-specific database includes data on technology characteristics (including efficiency, capital costs, operating and maintenance costs, lifetime, discount rate, etc.), energy balance, demand, and commodity flows. Therefore, ARB staff can run numerous policy scenarios in-house, with the state-of-the-art modeling techniques and most complicated California-specific

data. Another deliverable is the reports and presentations describing CA-TIMES and CED model development, technology database and model capabilities. Particularly, UC Davis researchers will deliver the report on the 2020 scenario analysis, including the analyses of introducing electric, biofuel, and hydrogen vehicles using CA-specific energy system models (including the CA-TIMES and CED models) and impact on energy system under various policy and technology assumptions and scenarios.

Significance to the Board
The two models to be developed will allow us to analyze the structure and operation of the future California energy system for various future energy demand scenarios, technology assumptions and carbon policies. The models and datasets can give us a big picture of what California's energy market will look like in 2020 and 2050, on the grounds of the energy and environmental policies and regulations proposed in Assembly Bill 32. Furthermore, using the 2020 results as the new baseline, future policies and technologies for meeting the 2050 climate goal can be examined and designed by running the models with the database.

Contractor:
Institute of Transportation Studies,
University of California, Davis

Contract Period:
24 months

Principal Investigator (PI):
Dr. Sonia Yeh

Contract Amount:
$278,356

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:
Dr. Yeh will serve as the principal investigator coordinating and synthesizing the effort for the overall project. Her 9+ years of experience in energy modeling and strong publication records, especially her expertise in developing the model specific to this project, make her ideal to fulfill this role.

Prior Research Division Funding to UC Davis:

Year	2008	2007	2006
Funding	$1,209,135	$935,020	$1,684,890

BUDGET SUMMARY

Contractor: Institute of Transportation Studies, University of California, Davis

Modeling Optimal Transition Pathways to a Low Carbon Economy in California: Impacts of Advanced Vehicles and Fuels on the Energy System

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 220,975	
2.	Subcontractors	$ 0	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 6,420	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 150	
7.	Mail and Phone	$ 75	
8.	Supplies	$ 200	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 27,753[1]	
	Total Direct Costs		$255,573
INDIRECT COSTS			
1.	Overhead	$ 22,783	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$22,783
TOTAL PROJECT COSTS			**$278,356**

[1] Resident Fees for two Graduate Student Researchers, per year. Graduate researchers already trained with expertise directly related to projects of this kind will contribute significantly to this project.