State of California
AIR RESOURCES BOARD

Zero-Carbon Buildings in California: A Feasibility Study

RESEARCH PROPOSAL

Resolution 15-29

July 23, 2015

Agenda Item No.: 15-6-2

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 2793-283, titled "Zero-Carbon Buildings in California: A Feasibility Study," has been submitted by the University of California, Berkeley, for an amount not to exceed $430,574;

WHEREAS, the Research Division staff has reviewed Proposal Number 2793-283 and finds that in accordance with Health and Safety Code section 39701, research is needed to explore the technical feasibility of zero or near-zero carbon building for both residential and commercial buildings, which will help keep California on track to achieve long-term climate goals; and

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

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 staff and approves the Research Proposal.

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 Proposal as further described in Attachment A, in an amount not to exceed $430,574.

I hereby certify that the above is a true and correct copy of Resolution 15-29 as adopted by the Air Resources Board.

/s/
Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Zero-Carbon Buildings in California: A Feasibility Study"

Background

The First Update to the Scoping Plan calls for ARB and stakeholder agencies to "establish target dates and pathways toward transitioning to zero net carbon buildings that expand upon and complement zero net energy (ZNE) goals" by 2017. Currently, the state's ZNE goals established by both the California Public Utilities Commission and the California Energy Commission call for all new low-rise residential buildings to be ZNE by 2020 and all new commercial buildings to be ZNE by 2030. In addition, the Governor has made a commitment that all new state buildings beginning design in 2025 shall be ZNE. To build upon these targets, ARB and state agency stakeholders must chart a path for expanding these goals to focus on GHG emissions, and as a result, consider water, waste, and transportation impacts of a building.

Objective

The objective of this research is to assess the technical feasibility of zero or near-zero carbon buildings.

Methods

The research team will begin by conducting an inventory of zero carbon building strategies, spanning transportation, water, and waste, and will identify the building types to be studied in subsequent tasks. They will then establish future building performance baselines for each building type in the study, and perform a wedge analysis to evaluate how each of the zero carbon building strategies can reduce building emissions to achieve zero carbon new construction. They will also identify and discuss the potential for retrofit of existing buildings to the various tiers of zero carbon status. Greenhouse Gas (GHG) abatement strategies will be sorted into three groups: 1) those that can be implemented individually without a major property renovation; 2) those that can only be implemented as part of a major property renovation; 3) strategies with prohibitive installation costs in existing buildings. Finally, the research team will make recommendations to ARB on appropriate targets for zero carbon building for both new construction and retrofit.

Expected Results

This project will inform ARB decision makers about the practicality and appropriate timeframe for development of a zero carbon building State policy or program.

Significance to the Board

This project addresses the research need to explore the technical feasibility of zero or near-zero carbon building for both residential and commercial buildings. It will assess the practicality and appropriate timeframe for a zero or near-zero carbon building State policy or program, which will help keep California on track to achieve long-term climate goals.

Contractor:
University of California, Berkeley

Contract Period:
24 months

Principal Investigator (PI):
Louise Mozingo, M.L.A.

Contract Amount:
$430,574

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:
Research team members are among the most expert in the field, and have direct experience doing high quality work on closely related research and analysis. The team is led by strong researchers from academia but includes a strong private sector policy firm (Fehr and Peers) with additional "real world" experience and context. Professor Louise Mozingo, Principal Investigator, serves as the Director of the Center for Resource Efficient Communities and the Chair of the Department of Landscape Architecture and Environmental Planning. Professor Mozingo and one of the project team researchers (Dr. William Eisenstein) have worked on a related research project to analyze the GHG co benefits of green buildings. The research team is extremely knowledgeable and has strong insight as a result of conducting past research in the areas of waste, water, and transportation."

Prior Research Division Funding to University of California, Berkeley:

Year	2014	2013	2012
Funding	$ 0	$ 1,095,792	$ 1,320,000

BUDGET SUMMARY

Contractor: University of California, Berkeley

Zero-Carbon Buildings in California: A Feasibility Study

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	188,357	
2.	Subcontractors	$	214,865	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	300	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	1,500	
7.	Mail and Phone	$	0	
8.	Supplies	$	1,397	
9.	Analyses	$	0	
10.	Miscellaneous	$	0	
	Total Direct Costs			$ 406,419
INDIRECT COSTS				
1.	Overhead	$	24,155	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 24,155
TOTAL PROJECT COSTS				**$ 430,574**

ATTACHMENT 1

S U B C O N T R A C T O R S' B U D G E T S U M M A R Y

Fehr and Peers:

Description of subcontractor's responsibility: Fehr and Peers Associates will be primarily responsible for the transportation-related components of the project.

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	132,723	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	1,220	
5.	Electronic Data Processing	$	3,500	
6.	Reproduction/Publication	$	700	
7.	Mail and Phone	$	215	
8.	Supplies	$	0	
9.	Analyses	$	0	
10.	Miscellaneous	$	0	
	Total Direct Costs			$ 138,358
INDIRECT COSTS				
1.	Overhead	$	41,507	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 41,507
TOTAL PROJECT COSTS				**$ 179,865**

ATTACHMENT 2

SUBCONTRACTORS' BUDGET SUMMARY

Resource Refocus:

Description of subcontractor's responsibility: Resource Refocus will be primarily responsible for providing the technical guidance related to ZNE buildings, the energy use outputs from the ZNE Scenario Analysis Tool, and other building energy use and PV generation estimates as needed, and will contribute guidance related to ZNE policy issues and the target-setting process for the ZNE goals.

DIRECT COSTS AND BENEFITS					
11.	Labor and Employee Fringe Benefits	$	30,975		
12.	Subcontractors	$	0		
13.	Equipment	$	0		
14.	Travel and Subsistence	$	928		
15.	Electronic Data Processing	$	0		
16.	Reproduction/Publication	$	0		
17.	Mail and Phone	$	0		
18.	Supplies	$	0		
19.	Analyses	$	0		
20.	Miscellaneous	$	0		
	Total Direct Costs			$	31,903
INDIRECT COSTS					
5.	Overhead	$	3,097		
6.	General and Administrative Expenses	$	0		
7.	Other Indirect Costs	$	0		
8.	Fee or Profit	$	0		
	Total Indirect Costs			$	3,097
TOTAL PROJECT COSTS				**$**	**35,000**