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Development of Advanced Low-Energy, Innovative HVAC System Solutions for Comfortable and Healthy Buildings

See attached document

Additional submitted attachment is included below.

Title: Development of Advanced Low-Energy, Innovative HVAC System Solutions for Comfortable and Healthy Buildings

CEC PIER and EPIC have previously sponsored research projects related to Improvements in high-efficiency HVAC systems. For example, the first EPIC solicitation was entitled "Developing a Portfolio of Advanced Efficiency Solutions: Technologies and Approaches for More Affordable and Comfortable Buildings." The current draft 2018-2020 EPIC Triennial Investment Plan includes Topic 1.3: Drive Technical- and Cost-Performance Improvements in Heating, Ventilation and Air-Conditioning Systems. All of the initiatives currently listed under Topic 1.3 relate to specific HVAC components and equipment: 1.3.1) electric cold-climate heat pumps, 1.3.2) electrochemical compression system, and 1.3.3) heat exchangers. Improvements in the efficiency of HVAC components and equipment will certainly support energy savings and reduced operating costs in buildings, but a broader system-based approach will also be needed.

Ultimately, to achieve the ambitious energy efficiency goals for the State of California, the development of new design tools, optimized controls, and updated guidelines, standards, and codes related to complete integrated building systems will be required. In the past, CEC, PIER, and EPIC have funded large scale projects that have addressed some of these advanced and promising building systems, including radiant cooling and heating, underfloor air distribution, and personal comfort systems.

It is critical that EPIC supports proposals that address such overall system solutions. Other funding agencies do not support applied research on this scale within our field. For a funding program of this scope to be successful in assisting California to meet its challenging sustainability goals, it is often necessary to cover a range of simultaneous tasks. Depending on the status of the technology and the goals of the proposal, these tasks may include theoretical and laboratory research; measurement of energy, comfort, and cost performance in a population of real buildings; and finally updating standards and codes and producing publicly available design guides and tools. The building industry is interested, but poorly positioned to assimilate results and lessons learned from completed projects on advanced/innovative systems and approaches, as these projects are done by individual companies, and rarely are details of the design methods and control strategies made available to others.

Description

We propose that CEC include another initiative under Topic 1.3 (or create a separate topic), with a title similar to the following: "Development of Advanced Low-Energy, Innovative HVAC System Solutions for Comfortable and Healthy Buildings." There are several advanced low-energy HVAC systems that could be candidates for additional focused research. These include: personal comfort systems, natural ventilation and mixed mode, radiant cooling and heating, chilled beams, underfloor air distribution, and displacement ventilation, systems. Proposals would be aimed at improving our fundamental understanding, using this knowledge to develop new and practical design tools, provide guidance for efficient operation and control that maintains a high indoor environmental quality, and updating of relevant standards and codes.

Impact if Successful

This initiative is aimed at addressing needed enhancements to promising advanced/innovative HVAC technology solutions that, while often representing a commercialized technology, are still predominantly unfamiliar to the building design and operation industry at large. An overall goal of any successful project under this initiative would be to develop previously unavailable information based on

current state-of-the-art, combined with targeted and carefully performed research addressing gaps in knowledge and/or needed guidance. This would support the wider application of these advanced building technologies to help achieve aggressive energy reduction while improving indoor environmental quality.

Primary Users and/or Beneficiaries

Building owners, building occupants, engineers and architects, construction industry, manufacturers, innovators/entrepreneurs, technology investors, research community.

Metrics and/or Performance Indicators

Potential metrics include energy and cost savings, occupant satisfaction and wellbeing surveys, and growth of advanced technology after conclusion of the project.