



Title of Proposed Initiative Energy Efficiency in Buildings for High Tech Industries Buildings

Investment Areas:

- X Applied Research and Development
- X Technology Demonstration and Deployment
- X Market Facilitation

Electricity System Value Chain:

- Grid operations/market design
- Generation
- Transmission
- X Distribution
- X Demand-side management

California Energy Commission

DOCKETED

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Issues and Barriers:

Cleanrooms, laboratories, and data centers are crucial to California's High-tech industries and other institutions. These buildings are 10 to 100 times as energy intensive as typical commercial buildings. The building types are cross-cutting among many types of industries and institutions. Prior research and demonstrations illustrate that large energy savings are possible (typically 25-40%). These building types house energy intensive processes that drive the buildings' energy use, however most resources are focused on reliably delivering the "product" with very little focus on energy efficiency or demand response opportunities. There are no limited publically available energy benchmarks for systems in these facilities yet prior PIER research provided some insight into the current state. There is generally a lack of unbiased information documenting current best practices, and no little non-proprietary energy efficiency research. Within public interest programs there is often a void where these building types are not included in commercial buildings programs or industrial efficiency programs. Under the PIER program, there was a conscious decision by the Commission to include them in the industrial program.

Initiative Description and Purpose:

The initiative outlined here builds upon prior research and combines a number of research areas into a comprehensive research program. There are a variety of topics that could be included in such an initiative. The goal of this activity will be to provide an integrated research, development, and demonstration program to investigate various high value technologies and strategies. This includes providing updates to research "roadmaps" to capture technology advancements and provide a path for continual improvement. Activities will include research in the specialized HVAC systems used in high tech buildings, power distribution and storage options, consolidation and utilization strategies, ties to renewable energy sources, and demand response opportunities; among other areas. The end goal for this program would be to seek to optimize performance of buildings for high tech industries and establish a framework for continuous improvement. This includes researching new solutions, demonstrating new and emerging technologies, developing best practice information resources, energy analysis tools, and training.

A recommended budget of \$500K 1M - \$1.5M/yr should be established to address these building types.

Stakeholders:

Stakeholders include designers, owners, operators, commissioning agents, utilities, manufacturers, and industry associations dealing with these building types

Background and the State-of-the-Art:

- Research roadmaps were developed addressing the specialized research needs for cleanrooms and data centers under the PIER program.
(http://hightech.lbl.gov/documents/DataCenters_Roadmap_Final.pdf;
http://hightech.lbl.gov/documents/datacenters_roadmap_final.pdf)
Some of the activities identified in the roadmaps were subsequently undertaken, however many opportunities were not researched. Since the industries utilizing these building types undergo rapid evolution, the roadmaps should be updated, with new research priorities assigned.
- Benchmarking of a limited number of facilities was undertaken for these building types. Additional current benchmarking should be undertaken
- A number of demonstrations of best practices have been performed by various organizations, including work by industry groups such as the Silicon Valley Leadership Group and their member companies. Additional demonstrations should be undertaken and the results independently verified and reported.
- The PIER high tech buildings projects have significantly raised awareness of the efficiency opportunities in CA, nationally, and internationally.
- Some technologies such as the use of DC power or use of liquid cooling in data centers have great potential, yet there are barriers that only public interest activities can overcome. The industries alone will not depart from tried and true conventional solutions if there are perceived risks, or if the vendors entrenched in the industry do not want to see it change.
- Demonstrations are effective in showing stakeholders that new technologies can be safely implemented.
- There have been modest efforts to improve laboratory and data center energy efficiency from DOE, NYSERDA, CA public utilities, DoD, and others. International Sematech has implemented some cleanroom energy efficiency strategies.

**Justification:**

Energy use in High-tech buildings accounts for 3-5% of California's electrical energy use. Studies have shown that typical savings of 25-40% are possible in most of this building stock. Performing efficiency improvements will create highly skilled jobs, but it will also help to retain high-tech industries in California. Public interest research is necessary because the companies and institutions operating such buildings focus on their products and services rather than energy use. Energy use, while high, is not a high enough operating cost to cause concern trigger internally funded R&D. There is also a general lack of knowledge concerning efficiency opportunities that can be achieved.

Ratepayer Benefits (Check one or more):

- Promote greater reliability
- Potential energy and cost savings
- Increased safety
- Societal benefits
- Environmental benefits - specify
- GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost
- Low emission vehicles/transportation
- Waste reduction
- Economic development

Describe specific benefits (qualitative and quantitative) of the proposed initiative

Public Utilities Code Sections 740.1 and 8360:

This activity focuses on demand reduction of energy intensive buildings.