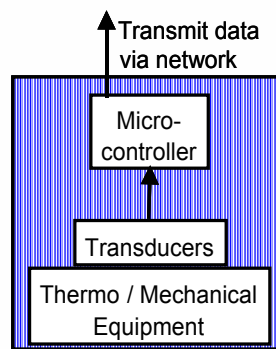


# Automated Diagnostics for Cooling Equipment

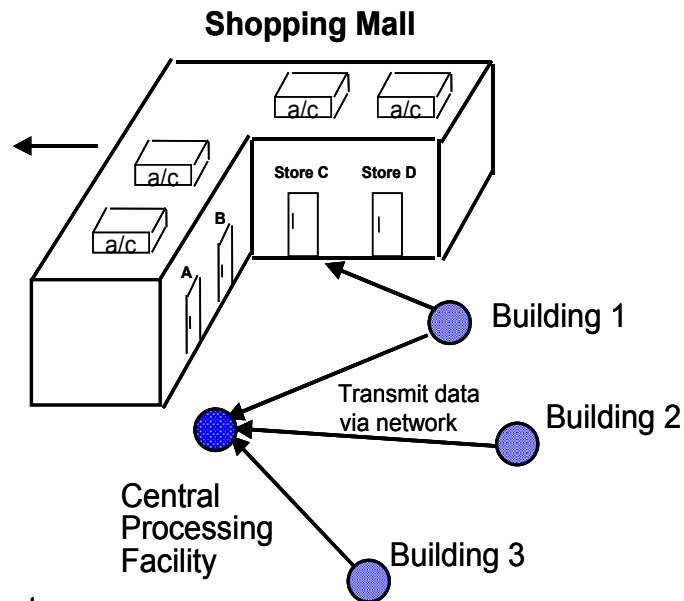
*Principal Investigator: Prof. Jim Braun*

*Recent Sponsors: California Energy Commission, Department of Energy, Honeywell*

## Vision



**A/C Unit**



### **Benefits**

- improved comfort
- lower energy costs
- lower maintenance costs

## Goals

- Early detection & diagnosis of faults for chillers and air conditioners
- Impact evaluation for faults
- Optimal maintenance scheduling
- Low-cost sensors

## Results

- Methodology based on low-cost temperature & pressure measurements
- Laboratory prototype
- Field demos/evaluations



# Intelligent Controls in Commercial Buildings

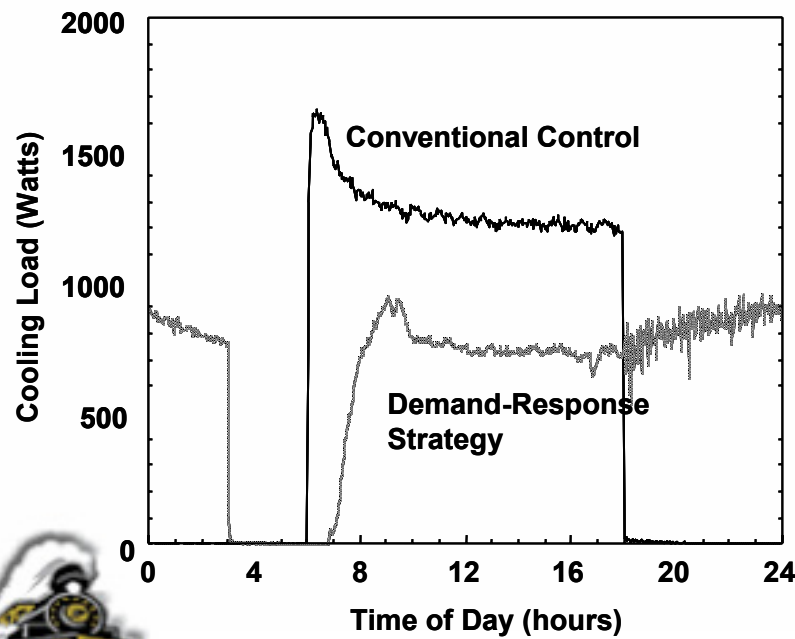
Principal Investigator: Prof. Jim Braun

Recent Sponsors: California Energy Commission, Honeywell, ASHRAE

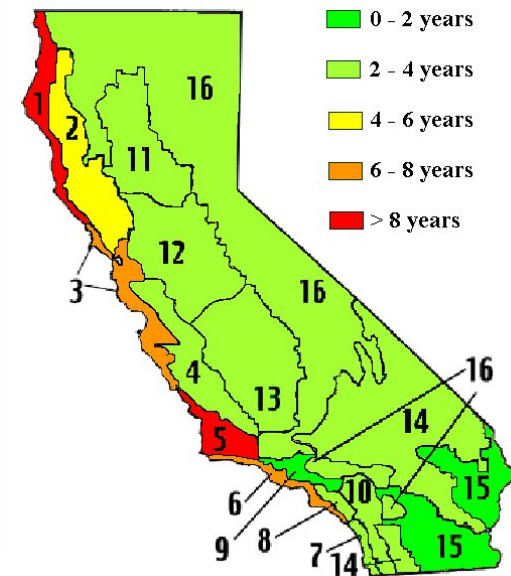
## Goals

Develop/evaluate controls that a) respond to peak electrical shortages (reduce peaks) and/or b) improve energy efficiency

### Control of Building Thermostats



### Economic Paybacks for CO<sub>2</sub>-Based Ventilation



# Environmentally-Friendly Cooling Equipment

Principal Investigators: Prof. Eckhard Groll, Jim Braun, and Luc Mongeau

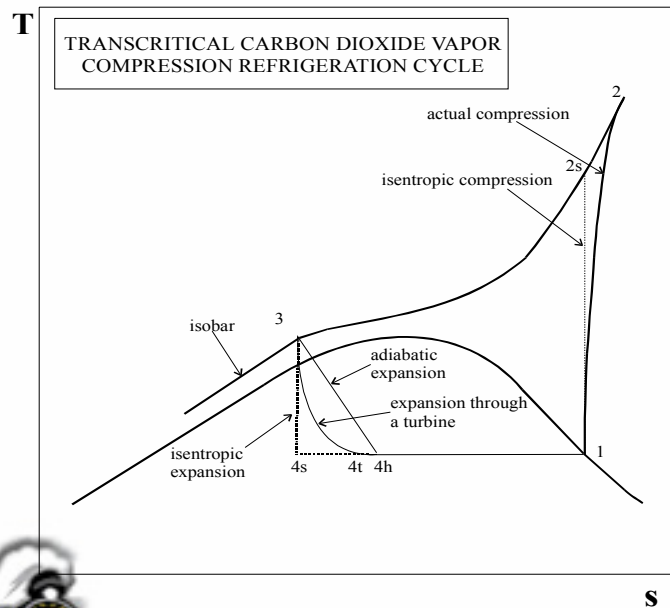
Recent Sponsors: Army, ARTI, Tecumseh Compressors, ...

## Goals

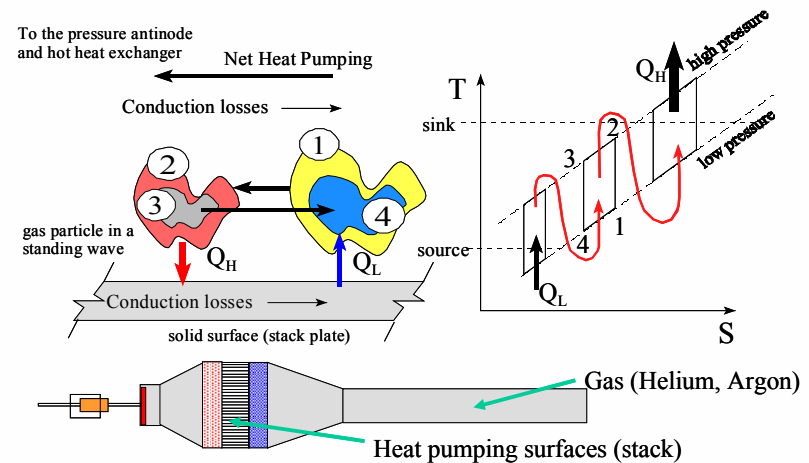
Develop/evaluate technologies that: a) utilize environmentally friendly working fluids and/or b) have improved energy efficiency

1) transcritical carbon-dioxide cycles, 2) Ericsson cycles, 3) thermoacoustics

## Transcritical CO<sub>2</sub> Cycles



## Thermoacoustic Cooling



# Modeling of Cooling Systems, Equipment, and Components

*Principal Investigators: Prof. Jim Braun and Eckhard Groll*

*Recent Sponsors: ARTI, ASHRAE, Trane, Parker Hannifin, LG Electronics, ...*

## Goals

Develop improved models that are useful for design, energy analysis, and control evaluations for components, equipment, and complete systems

## Recent Applications

- CFD modeling of refrigerant flow distributors
- Modeling of scroll compressors
- Improved models for predicting the impact of refrigerant charge
- Transient modeling of cooling coils
- Transient modeling of chillers
- .....

## Refrigerant Flow Distribution

