CALIFORNIA STATEWIDE
UTILITY CODES AND STANDARDS PROGRAM

*2016 Title 24 Codes & Standards Enhancement (CASE) Proposal*

# Thermally Driven Cooling

CEC Pre-rulemaking Workshop, June 12th, 2014

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# Pre-rulemaking Workshop: Agenda

- Code change overview
- Current code requirements
- Planned data collection & analyses
- Methodology for savings analysis
- Proposed code requirements
- Stakeholder requests

# Code Change Overview

- Systems where cooling effect driven by heat, not compressors
- Heat source could be solar thermal, waste heat or combination
- Waste heat could be process heat, cogeneration or other
- Absorption chillers are most common form

# Code Change Overview

- Desiccant system is another option
  - Used to dehumidify
  - Combine with evaporative or vapor compression
  - Heat to regenerate the desiccant
  - Example: unitary DX with desiccant wheel

# Code Change Overview

- Thermal Cooling Benefits
  - Provides end-users more options to manage and control energy use profile
  - Potential electrical peak demand reduction
  - Potential for customer utility bill savings, especially with TOU rates
  - Opportunities for improved plant efficiency using heat recovery

# Code Change Overview

- Thermal Cooling Challenges
  - Solar or waste heat is coincident with cooling demand
  - Higher equipment costs
  - Higher maintenance costs
  - Added system complexity
  - Possible increased site water use with absorption chillers due to larger cooling towers

# Code Change Overview

- Anticipated type of change:
  - Compliance credit for performance approach (whole building simulation energy trade-off)
  - Not a mandatory requirement
  - Not a prescriptive requirement

# Code Change Overview

- Applicable building types
  - New construction
  - High-rise multifamily
  - Large office
  - Hotels
  - College/university
  - Large retail
  - Etc…

# Current Code Requirements

- Title 24-2013
  - Minimum efficiency requirements for absorption chillers
  - Minimum unloading ratios
  - Cooling efficiency adjustment curves
- ASHRAE 90.1-2013
  - Minimum efficiency requirements for absorption chillers
  - Site-recovered energy shall not be considered to be purchased energy and shall not be included in the design energy cost

# Planned Data Collection & Analysis

- Ensure compliance software is ready
  - Develop algorithms for various systems and heat sources as needed
  - Fraction of heat sources
  - Correctly calculate energy impact
- Product availability
- Current state of market adoption
- No cost effectiveness analysis

# Planned Data Collection & Analysis

- Develop a useful/clear definition of waste heat
- Environmental impacts of potential increase of on-site emissions addressed with CARB
- Potential increase in water consumption addressed with CA DWR
- Estimate energy & demand impacts

# Methodology for Savings Analysis

- EnergyPlus for energy and demand impacts
  - Single effect & double effect absorption chillers
  - Desiccant systems
  - Flat plate solar collectors or waste heat
  - Supplemented by boiler
  - Include electric loads for pumping, heat rejection, etc.

# Proposed Code Requirements

- Proposed Title 24 Requirements
  - Absorption chillers
  - Adsorption chillers
  - Desiccant systems
  - Modify ACM to allow compliance credit
  - Require a minimum fraction of solar or waste heat
  - Solar or waste heat is available & coincident with cooling demand
    - Else: storage, supplemental heat or electric cooling

# Feedback From IOU Stakeholder Meeting

- Stakeholder meeting held May 20, 2014
  - No substantive feedback received during IOU Stakeholder meeting.
  - CASE Team has been conducting targeted outreach to solicit additional input.
  - Notes and presentations from stakeholder meeting available at Title24Stakeholders.com.

# Requests from Stakeholders

- How will a computer simulation credit for absorption chillers or desiccant cooling impact your business?
- How frequently are absorption chillers installed in CA?
- How frequently are desiccant cooling systems installed in CA?
- Please describe typical applications and configurations.
- Can you estimate the approximate market share (%) of thermally driven chillers (using waste heat and/or solar) compared with conventional vapor compression chillers for new installations?
- Do you see this installation rate as stable, increasing, or decreasing in the future?
- What are some of the disadvantages? Why are they not installed more often?

# Requests from Stakeholders

- What tools do you use for simulation or prediction of the performance of absorption chillers?
- What tools do you use for simulation or prediction of the performance of desiccant cooling?
- Have you used EnergyPlus for modelling absorption chillers? What comments do you have on ease of use, ability to model various equipment types, accuracy etc.?
- Have you used EnergyPlus for modelling desiccant cooling? What comments do you have on ease of use, ability to model various equipment types, accuracy etc.?
- Are you aware on any studies that compared measured results with simulations of absorption cooling or desiccant cooling that you think might be useful for evaluating the accuracy of various simulation methods?

# Questions?

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