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On Title 24 Proposal

Additional submitted attachment is included below.

July 07 2017

Re: **Comments on the Title 24 Proposal for a Substantial Increase in Minimum Efficiency for Axial Fan, Open Circuit Cooling Towers; April 2017 CASE Study**

Mark Alatorre, P.E.
California Energy Commission
Efficiency Division

Dear Mark:

Thank you for the opportunity to respond to the proposal for Prescriptive Efficiency Requirements for Cooling Towers. ASHRAE TC8.6 (The Technical Committee for Cooling Towers and Evaporative Condensers) fully supports the increased usage of energy-efficient equipment and systems. However, we would like address several concerns with the current cooling tower proposal, starting with the drastic increase in minimum efficiency from 42.1 gpm/hp to 80 gpm/hp for axial fan, open circuit cooling towers (hereafter referred to as "cooling towers").

1. **The Cost Premium is Underestimated, Significant, and Will Increase Both the Cost-of-Living and the Cost-of-Doing Business in California**
    a. Per comments during the stakeholder meeting, **a 90% increase in the minimum efficiency requirement can increase first costs to owners and contractors by more than 25% on galvanized units.** Although the proposal's estimates indicate only a 15% cost increase, alternate thermal conditions, particularly for some larger towers, can result in much more significant premiums in both percentage and dollar terms. For businesses with plants and offices in California, there is sensitivity to the cost of doing business. This will further discourage the location of new facilities in California as a change of this magnitude will ultimately increase both the cost-of-living and the cost of doing business in California. And while cooling tower manufacturers will be pleased to sell larger, more efficient equipment, selling fewer cooling towers is also likely, with owners and contractors switching to less efficient, but alternate lower first cost cooling systems. Has the potential impact of a market shift been accounted for in your analysis? While the current air cooled limitation over 300 tons provides some protection from such shifts, there are workarounds and exceptions as well as lower cost, less energy efficient alternative systems not covered by the current limitation that can be used to circumvent the intent of the Code. Does the CEC have data on how often these exceptions are used to circumvent the limitation?

Can you provide a copy (or internet link) of the list of "high efficiency" air cooled chillers that can be used in the third exception to the air cooled chiller limitation?

b. The proposal reviewed the premium for galvanized units. However, much of the equipment purchased in California has at least some portion, if not the entire unit, constructed of stainless steel in order to increase the longevity of the equipment, especially in corrosive coastal environments, in areas of lower water quality, or on systems using alternative sources of water such as reclaimed water or air conditioning condensate. **Since the stainless steel cost premium in dollar terms will be much higher per ton (estimated at 50% to 75% more than galvanized steel, depending on the grade of stainless and the content), this will add significant costs in dollar terms.**

c. Additional installation cost premiums will also include additional structural steel for support and higher enclosure walls, both of which can be significant for most installations. **This real cost was regretfully neglected in the analysis.** Furthermore, there will be cases where the area available for the cooling towers is not sufficient to properly accommodate the larger units required under the current proposal. Keep in mind that the required space not only includes the cooling tower itself but also sufficient space for proper airflow into the cooling tower. Reducing this air inlet and discharge space to accommodate the larger cooling towers would lower the actual thermal performance of the units, negating much of the expected energy savings. Furthermore, on installations where a taller cooling tower is used to meet the proposed efficiency requirements, the additional pump head and cost of the larger condenser pump must be taken into account in any analysis as the additional pumping energy will detract from the expected savings.

d. Virtually all cooling towers are equipped with variable speed drives (VSD), which significantly reduce the fan energy. As the typical HVAC system operates the majority of the time at part load, the associated fan energy is a fraction of the full load fan energy. For instance, a cooling tower operating at half speed will draw only 12% of the full load power. **The prevalent use of VSDs reduce the expected savings significantly.**

e. **Additional maintenance costs** which were not included in the analysis may include maintaining additional drive components (e.g. more motors, belts, gearboxes, etc.), cleaning more fill, and cleaning additional basins, all of which are not accounted for in the analysis.

f. **Additional water treatment chemicals**, another cost that was overlooked, will also be required for the larger basins and / or the additional cells that will result under this proposal. Water treatment chemical cost is calculated and priced based on system water volume, so these costs will increase for the same cooling capacity.

2. **Proposed Efficiency Rating for Cooling Towers Will Reduce System Efficiency**
    a. **The proposal represents a 90% increase in the minimum energy efficiency ratings, to a level nearly double that of ASHRAE 90.1, which would disallow over 50% of currently offered models (per the case report), which some may consider a restraint of trade.** For some product lines, the model disallowance is even greater, restricting the ability of the Industry to supply the market. Many of the largest models will be removed from consideration – these models are often used by Designers to increase the efficiency of the cooling system and pack as much heat rejection into the allowable space for a given project. The Industry's selection flexibility allows engineers to optimize energy usage for the entire system, including the chiller and pumps. By focusing on cooling towers only, the proposal does not consider chiller energy usage, which accounts for the vast majority of cooling system energy usage (typically a factor of 10 or more times the cooling tower fan energy). This proposal will encourage the use of larger, more expensive towers with relatively small energy savings when compared to the energy usage of the overall cooling system. What will keep a system designer from using a lower cost, less efficient chiller to help offset the added cost of the cooling tower installation? Therefore, **we recommend a more moderate incremental increase in the minimum efficiency on the order of 5% to 10% instead of 90%.** This will enable a more rational adoption of the concept by the market over time while avoiding the risk of unintended market shifts to lower efficiency systems.
3. **Premium will Place an Undue Burden on HVAC systems with Cooling Towers; Energy Efficiency Increase Must be Applied to Competing Technologies**
    a. Although a building energy model can be generated to circumvent the prescriptive requirement, this is a **costly and time consuming process** that not all building owners and designers will be able to follow if the higher efficiency cooling towers are too large and / or costly to implement on a given project.
    b. Evaporative water cooled systems are already the most efficient cooling solution on the market. **Why require such a large efficiency increase on an already efficient design, especially when other much less energy efficient, though widely used classes of HVACR equipment are not being similarly challenged?** If these regulations are imposed on evaporative cooling systems, should not similar increases be required on all technologies to ensure that Title 24 does not arbitrarily favor less efficient technologies? One solution, which is being proposed for other classes of HVACR equipment, is to parallel the cooling tower requirements in Standard 90.1 2016. Note that TC 8.6 is evaluating a proposal for a reasonable increase in the minimum efficiency of axial fan, open circuit cooling towers for the 2019 Edition of Standard 90.1. TC 8.6, along with the Cooling Technology Institute, has taken a leading role in helping to move the Industry forward in the areas of energy efficiency and sustainability.

c. **Strengthening the limitation on air cooled chillers by eliminating loopholes and enforcement issues would help to negate some of the issues the Industry has with any increase in minimum efficiency for cooling towers.** Consideration of adding other less efficient competing technologies to the limitation would also help to mitigate any market shift from higher efficiency, but higher cost water cooled systems to lower cost, less energy efficient cooling systems. For instance, the limitation could be expanded to limit the use of all water cooled systems as well as remove the exceptions for poor water quality (the Industry offers a wide variety of corrosion resistant materials to withstand virtually all water qualities) and "high efficiency" air cooled systems.

4. **The proposal shown on pages 5 and 25 of the Case Study should be corrected to "Newly installed <u>axial fan,</u> open circuit cooling towers serving …**". This proposal only addresses and applies to axial fan, open circuit cooling towers. The use of centrifugal fan cooling towers is already limited in Title 24 (as in Standard 90.1). There are applications where strict sound criteria must be considered and installations where units must be installed indoors using ductwork (such as for high security installations), both of which are allowed under the exceptions to the open circuit centrifugal cooling tower limitation (140.4 [h] 4). Adding the term "axial fan" will add clarity to the new requirement.

Again, ASHRAE TC8.6 is highly supportive of California's energy-efficiency initiatives as demonstrated in past Stakeholder reviews. However, we believe that mandating this change for cooling towers will make California a less competitive state in which to live, work, and do business. Therefore, we propose a more reasonable and incremental efficiency increase on axial fan, open circuit cooling towers should the state chooses to deviate from the ASHRAE Standard 90.1 minimum efficiency requirements (which is being followed for virtually all other HVACR equipment in Title 24 2019). We continue to believe that allowing System Designers the greatest flexibility in the design and selection of cooling towers will result in the highest system efficiency possible. The TC does acknowledge and appreciate the efforts of the CEC Team to limit the potential negative consequences of such a large increase, such as limiting the change to new construction. However, we still believe a more measured, incremental approach is called for.

Finally, note that most cooling tower companies have sales offices throughout the State of California to serve the market. Additionally, two of the three largest firms have large manufacturing facilities in California (in Madera) to serve not only California but markets in the Western United States, Canada, and Asia.

The Committee also plans to submit comments on the waterside economizer proposal under separate cover in the very near future. We look forward to working with you and the Title 24 Team to advance energy efficiency in California.

Sincerely,

ASHRAE TC8.6 Subcommittee on Codes and Standards

Submitted by Frank Morrison, Subcommittee Chair