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Benefit-Cost Analysis of Certain Measures

After some discussion with the Title 24 Stakeholder team, I was advised to submit this concern to the pre-rulemaking docket. This concern addresses the economic analysis of potential energy saving measures being submitted for consideration in the 2028 code cycle. Typically, the economic analysis for all measures use a 30-year time horizon for savings and costs, with the benefit-cost ratio being defined as the ratio of the life-cycle savings and costs, using a discount rate to net the terms to a net present value.

Part of this analysis requires that, in situations where the equipment has an expected useful life less than 30 years, that equipment would be replaced with new equipment of equal efficiency and those replacement costs would be incorporated into the analysis. The cost component also must include maintenance costs over the same 30-year time horizon, such that all costs associated with the operation of the measure, over the 30-year time horizon, are captured. I am told that this is pursuant to CEC guidance. This approach is usually appropriate, as measures which fail at end of life are presumed to have an operational impact which necessitates its replacement, and such replacement would customarily trigger code compliance anew by the jurisdictional authority.

One measure which is being considered for this cycle does not fit neatly into this process. The measure (Boiler Stack Economizer) is proposed to be mandated add-on equipment for any new or replacement steam boiler installed under Title 24. The economizer recovers heat from the boiler's flue stack and uses it to preheat the feedwater being fed into the boiler. While the analysis shows that the feedwater economizer is cost-effective across the spectrum of boiler sizes, the durability of the savings raises issues in the lifetime impacts analysis; the economizer itself has a much shorter operating life than the boiler it is attached to, and a failed economizer may be easily bypassed without impacting boiler functionality or steam production. This issue is exacerbated by the fact that replacement of the economizer itself is not mandated by code, nor would its replacement trigger Title 24; rather, it is the host equipment (the boiler) which triggers code compliance under Title 24.

The difficulty associated with the lifecycle analysis of this type of measure becomes apparent when one notes that the economizer itself only has a useful life of 15 years. Replacement of the economizer is not a trivial matter, as the cost to replace it can exceed $1 million for the largest boiler size (see Table 9 of CASE Report for Stack Economizers). Additionally, the economizers typically require tube replacement after 7 years, at a cost equal to around 20% of the economizer replacement cost. When one considers that the boiler itself can last for 30 years before replacement, and it is the boiler that triggers code compliance, there is no inherent mechanism in the Title 24 code to require the economizer to be repaired and/or replaced at a significant cost over the lifetime of the boiler that it is attached to. Couple that with the fact that, unlike most

Title 24 equipment, whose failure will likely trigger operational impacts that necessitate repair or replacement, the feedwater economizer can fail without any adverse impact to boiler steam output, manufacturing productivity, or building comfort. In fact, my anecdotal observations of manufacturers in Illinois that had previously installed economizers found that a substantial fraction of those economizers had failed and were simply bypassed by the maintenance crew in lieu of repair.

When I raised the issue with the T24 Stakeholders team, they noted that, since both costs and savings would be reduced in the out years, the net bias on the benefit/cost factor would likely be negligible. While that may be true generally, I also noted that replacement costs of the economizer were evaluated with an escalation rate of zero, while energy cost savings assumed an escalating cost of energy over time. These dissimilar cost escalators suggest that a lifecycle savings analysis that reflects non-replacement and non-repair of economizers would yield a lower benefit/cost ratio (owing to the dissimilar escalation rates).

To the extent the lifecycle analysis may be used either for benefit/cost analysis or annual impacts analysis, there is a risk of overstating the benefit of the measure in such scenarios. For example, the CEC Impact Analysis, which is typically conducted during each code cycle, quantifies annual savings versus prior code cycles and it appears that this annual impact analysis assumes that first year savings are maintained throughout the entire time horizon of the analysis. Since the report identifies annual impacts rather than first-year impacts, inclusion of savings degradation over time should be considered, at least for the proposed Stack Economizer measure.

Ideally, CEC guidance for measure impact analyses should include a mechanism for incorporating potential savings degradation for these types of scenarios, where the durability of measure savings would be at risk of decaying over time due to a lack of regulatory mechanisms that ensure measure retention and minimize savings degradation.