MEMORANDUM

March 26, 2020

TO: Cory Downs, Conservation Specialist, City of Chula Vista

FROM: Eric Engelman, Principal, Energy Policy Consulting

SUBJECT: Cost-Effectiveness of Proposed Building Performance Ordinance

---

This memo assesses the cost effectiveness of the City's draft Multifamily and Commercial Benchmarking and Conservation Ordinance (v1.5). It particular, it examines three requirements in particular:

1. The ASHRAE 0.5 Retro-commissioning requirement
2. The ASHRAE Level 1 Audit requirement
3. The minimum improvement requirement

The ordinance's prescriptive multifamily requirements are not discussed in this memo as they are supported by the statewide 2019 Existing Residential Cost-effectiveness Study.

Cost-effectiveness for the ordinance's audit and retro-commissioning requirements is supported by commonly cited cost and savings figures from the literature. Both were found to be cost-effective. Calculations and Methodology are described below.

1.0 Cost and Savings from Retro-commissioning

The largest study found to date of retro-commissioning costs and savings found that average costs come to 30 cents per square foot, and simple payback time for existing buildings averages 1.1 year.[1] This implies that average annual savings are 27.3 cents per square foot per year.

Some reports suggest that the savings from retrocommissioning tends to decline over time as buildings revert from optimal to suboptimal tuning. The most comprehensive study on the durability of savings, using a sample of 36 buildings found that savings increased from year one to year two by about 20% and then reverted to roughly half of year 1 savings in year 3.[2] To project the savings for years 2-4, a savings profile matching

[1] Mills, E. Energy Efficiency (2011) 4: 145. https://doi.org/10.1007/s12053-011-9116-8
[2] Mills, E. Energy Efficiency (2011) 4: 145. https://doi.org/10.1007/s12053-011-9116-8

this pattern was used (see Figure 1). Evidence indicates some savings persistes long after year 4,[3] however no savings was assumed beyond year 4 for this analysis.

Cost of an Ashrae Level II Audit

Average audit costs were found to range from 12 cents to 50 cents per square foot.[4] In discussions with local audit provider

Measuring Cost Effectiveness

A general measure of cost-effectiveness is the lifecycle savings divided by the initial cost. A value over one is considered cost effective. For this analysis, savings were discounted at an annual rate of 7%.

FIGURE 1: Cost-effectiveness Calculations

Average Retro-commissioning Cost (per square foot)	$0.30
Median ASHRAE II Audit Cost (per square foot)	$0.31
Average Annual Savings (per square foot)	$0.27

Year	Total	1	2	3	4	5
Saving Persistence (%)	--	100%	120%	50%	70%	0
Savings (per square foot)	$0.927	$0.273	$0.327	$0.136	$0.191	$0.000
Discounted Lifecycle Savings (per square foot)	$0.798	$0.255	$0.286	$0.111	$0.146	$0.000

Retro-commisioning Benefit-to-Cost Ratio	2.66
Audit and Retro-commisioning Benefit-to-Cost Ratio	1.31

Findings

[3] Freidman, H., Claridge, D., Toole, C., Frank, M., Heinemeier, K., Crossman, K., Crowe, E., Choiniere, D. (2010). "Annex 47: Report 3: Commissioning cost-benefit and persistence of savings." International Energy Agency, Energy Conservation in Buildings and Community Systems Programme, 289pp.
http://www.iea-annex47.org/fichier/82050/Annex47-report3-Final.pdf.

[4] Baechler, M., Strecker, C., Shafer, J. (2011). "A Guide to Energy Audits." DOE, Building Technologies Program. 3pp.
https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20956.pdf

Retro-commissioning was found to be cost effective with a benefit-to-cost ratio of 2.66. Adding in the cost of an audit, and assuming no further savings as a result, the combination was also found to be cost-effective with a benefit-to-cost ratio of 1.31.