Santa Barbara County

Energy Efficiency Strategic Plan Program

Commissioning and

Retro-Commissioning Policy

For County Owned and Operated Facilities

Strategic Plan Task 3.2.4
Commissioning/Retro-Commissioning: Task 2D

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Executive Summary

The County of Santa Barbara is committed to the effective management of our limited resources and is a strong advocate for energy-efficient operations of its facilities.

This Policy is developed under a grant provided by Southern California Edison that was approved by the County Board of Supervisors in 2011. This Policy is the outcome requirement of an existing County ordinance (Ordinance 4452, Chapter 12a) approved by the County Board of Supervisors, year and date, and will ensure the following across all County departments:

1) All new applicable County construction and major renovation projects are commissioned prior to occupancy/operation.
2) All existing buildings are assessed on an ongoing basis for retro- and re-commissioning.
3) The commissioning process becomes an integrated function of the County's building construction and management teams' budgets and regular activities.

This Policy and the commissioning of County owned and operated buildings:

1) Builds on the County's approved Energy Action Plan (25% electricity reduction goal) and Benchmarking Policy.
2) Is consistent with the County's Sustainability Action Plan and Resolution 09-059.
3) Supports the County's role in achieving the State of California's long-term energy strategy.
4) Is consistent with actions taken by peer local governments and municipalities, including: Santa Monica, CA; Santa Clara County, CA; and Pasadena, CA.

Recommended Actions:

That the Board of Supervisors:

1) Accept the Santa Barbara County Commissioning and Retro-Commissioning Policy.
2) Adopt the Santa Barbara County Commissioning and Retro-Commissioning Policy into existing County Ordinance 4452.

Summary Text:

The Commissioning and Retro-Commissioning Policy is intended to work in conjunction with other County energy management strategies and policies; specifically the Benchmarking Policy, the Utility Manager System, and the Energy Action Plan. In tandem, these policies provide a framework and tools for the County to proactively manage the commissioning process of its building assets.

This policy addresses approaches specific to the County of Santa Barbara to maximize its effectiveness and across all County Departments and achieve real impact. As such, the Policy has been developed specifically for Santa Barbara County through assessment of County buildings, solicitation of stakeholder feedback from County departments, and the County's Green Team.

Background:

Commissioning is the process of performing a comprehensive building evaluation to validate and improve building system performance. It is an integrated team approach that can be used as a quality assurance and risk management tool and means to incorporate energy and non-energy benefits into County buildings. It can be applied to all new construction, major renovations, retrofit projects and existing buildings.

The goal of the Commissioning and Retro-Commissioning Policy is to improve the performance of County buildings. As buildings and their systems age their energy and functional performance unavoidably degrades. This results in an increase in energy consumption and loss of original performance. Improvements can be realized through the implementation of cost-effective strategies that improve facility operations and maintenance activities and result in utility cost savings (e.g. gas, electric, and demand), maintenance savings, departmental savings and non-energy benefits that improve building and employee environmental health and lead to increased building and staff performance.

Studies have found that both new construction commissioning and existing building retro-commissioning projects can be cost-effective across a wide range of building types and sizes, with average energy savings of 10% and 15% respectively. Anecdotal evidence suggests that non-energy benefits alone, in some cases, can be significant enough to offset the entire cost of commissioning, increasing the value of commissioning and return-on-investment.

Comprehensive commissioning requirements have until recently been absent from building codes and standards. Today's green and sustainable building standards promote commissioning as a fundamental requirement, with state and local codes (e.g. CAL Green) incorporating more comprehensive compliance documentation. With the adoption and incorporation of relevant ordinances, Title 24, Part 6 2013 forms the basis for the County's minimum requirement for the commissioning of County owned and operated buildings and will be further enhanced by the requirements of this Policy.

Fiscal and Facility Impacts:

The Commissioning and Retro-Commissioning Policy serves as one of several Policy frameworks that will help the County achieve its energy reduction goals, namely 25% electricity energy reduction as identified in the County's Energy Action Plan.

Adoption of the Commissioning Policy will not require specific additional annualized ongoing funding at this time. Funding for future commissioning activities related to new construction and major renovations will be included as a component of individual project budgets. Funding for potential re-commissioning and retro-commissioning activities will be identified as appropriate commissioning projects emerge through the assessment process. These funding sources may include traditional and non-traditional sources, including grants and utility incentives.

As appropriate, significant individual projects and their associated funding will require the approval of the Board of Supervisors. Projects requiring financing will be brought to the County Debt Advisory Committee for review and concurrence prior to being presented to the Board of Supervisors.

Narrative:

The Commissioning and Retro-Commissioning Policy provides County minimum requirements for the commissioning of County owned and operated buildings and provides an implementation plan for County staff that:

1) Demonstrates the County's leadership to the community through leading-by-example.
2) Builds on the County's Energy Action Plan, Benchmarking Policy, and Utility Manager System.
3) Establishes a framework that defines necessary and appropriate criteria that trigger commissioning and retro- and re-commissioning requirements in both new construction and major renovations and existing buildings.
4) Establishes a protocol for prescribing in-house and third party commissioning efforts.
5) Defines County goals and expectations related to the commissioning processes.
6) Defines County's roles and responsibilities throughout the commissioning process.
7) Defines County internal departmental staff roles and responsibilities to support the commissioning and retro-commissioning processes.
8) Establishes a protocol for assessing and identifying opportunities for retro- and re-commissioning activity in existing County buildings.
9) Supports the County's role and responsibility in achieving the States long-term energy strategy.
10) Promotes the communication of commissioning best practices and lessons learned with peers and showcasing of successes.
11) Identifies opportunities for County staff training.

Staffing Impacts: None Anticipated

Attachments:

1) Appendix A – Definitions and Acronyms
2) Appendix B – Santa Barbara County Case Studies
3) Appendix C – Methodology for Selecting and Results from Survey of County Buildings
4) Appendix D – Soliciting and Incorporating Stakeholder Feedback
5) Appendix E – List of Resources and References

1 Introduction

1.1 Commissioning and Retro-Commissioning Policy Purpose, Goals, and Objectives

1.1.1 Goals and Expected Outcomes

The goal of the Commissioning and Retro-Commissioning Policy is to improve the performance of County buildings. Improvements will be realized through the systematic evaluation of facility systems, known as commissioning, and the implementation of cost-effective strategies that improve facility operations and maintenance activities. Adoption and implementation of the Policy is expected to provide the County with:

1) Utility cost savings from energy strategies that reduce gas, electric, and peak demand.
2) Maintenance savings from controlled and proper documented operation of facilities.
3) Departmental savings from avoided "band-aid requisitions" for work to solve problems that could be corrected with a controlled commissioning evaluation.
4) Non-energy benefits that optimize building systems and reduce the County's liability, such as improved Indoor Air Quality (IAQ) and design change order avoidance.

The Commissioning and Retro-Commissioning Policy, herein referred to as the "Policy", is intended to work in conjunction with other County energy management strategies and policies; specifically the Benchmarking Policy, the Utility Manager System, and the Energy Action Plan. In tandem, these policies provide a framework and tools for the County to proactively manage the commissioning process of its building assets. It is paramount that the Policy be clear and actionable across all County occupants and tenants of County owned and General Services maintained buildings, facilities, or structures to the extent possible to maximize effectiveness to the County and achieve real impact. As such, the Policy has been developed specifically for Santa Barbara County and through assessment of County buildings and solicitation of stakeholder feedback from County departments and the County's Green Team.

This Policy is the outcome requirement of an existing County ordinance (Ordinance 4452, Chapter 12a) approved and adopted by the County Board of Supervisors (December, 2001), and will ensure the following across all County departments:

1) All new applicable County construction and major renovation projects are commissioned prior to occupancy/operation.
2) All existing buildings are assessed on an ongoing basis for retro- and re-commissioning.
3) The commissioning process becomes an integrated function of the County's building construction and management teams' budgets and regular activities.

This Policy:

1) Provides a clear and actionable implementation plan for County staff.
2) Demonstrates the County's leadership to the community through leading-by-example.
3) Builds on the County's Energy Action Plan, Benchmarking Policy, and Utility Manager System.
4) Establishes a framework that defines necessary and appropriate criteria that trigger commissioning and retro- and re-commissioning requirements in both new construction and major renovations and existing buildings.
5) Establishes a protocol for prescribing in-house and third party commissioning efforts.
6) Defines County goals and expectations related to the commissioning processes.
7) Defines County's roles and responsibilities throughout the commissioning process.
8) Defines County internal departmental staff roles and responsibilities to support the commissioning and retro-commissioning processes.
9) Establishes a protocol for assessing and identifying opportunities for retro- and re-commissioning activity in existing County buildings.
10) Supports the County's role and responsibility in achieving the States long-term energy strategy.
11) Promotes the communication of commissioning best practices and lessons learned with peers and showcasing of successes.
12) Identifies opportunities for County staff training.

All forms of commissioning share common goals; however, because of inherent differences in the approaches to commissioning new construction and major renovations and retro-commissioning existing buildings, this policy treats each as distinct processes.

1.1.2 Potential Energy Efficiency and Utility Cost Savings Impact

It is the County's expectation that the implementation of this Policy will result in energy consumption reductions, and therefore utility bill reductions.

A building's energy savings potential varies based on the Owner's objectives and the buildings unique characteristics and existing energy consuming features and systems. A study conducted by the Lawrence Berkeley National Laboratory (LBNL) (Mills, Friedman, Tehesia Powell, Claridge, Hassl, & Piette, December 15, 2004) analyzed results from over 160 projects across 7 building types and found that on average commissioning in existing buildings saved 11% of the buildings total electricity consumption with peak power reductions of 7% and total energy savings of 19%. The study found that in existing buildings, there were on average 32 deficiencies identified per project with 20 effective measures implemented, providing an average energy bill savings of 18% or $0.54/sq.ft. (reported in 2003 dollars). The bottom 25% of projects had on average 5 deficiencies, yielding 7% total energy savings; indicating that there is potential for energy savings across all building types and sizes, although, less potential for smaller and less complicated buildings. The range of savings from the study are identified in Table 1 below, and indicate energy savings for existing building retro-commissioning projects that range in size from 5,600 to over 1.0 million square feet.

Table 1: Existing Building Retro-Commissioning Energy Savings Potential

Existing Buildings	Bottom 25%	Median	Average	Top 25%
Total Energy Cost Savings (%)	7%	15%	18%	28%
Normalized Energy Cost ($/sq.ft. 2003)	0.11	0.26	0.54	0.72

Using the average energy savings data obtained from the study, Figure 1 below approximates the County's potential electricity energy savings in all buildings greater than 10,000 gross square feet. It assumes that 20% of the inventory is retro-commissioned then re-commissioned on average every 5 years and a 15% average electrical consumption reduction for buildings greater than or equal to 30,000 sq.ft. and 7% for those less than 30,000 sq.ft. (over 2011 baseline energy consumption)[1]. 10,000 square feet was used as the delineation based on trends in commissioning standards[2] and a conservative approach for estimating savings. New construction commissioning benefits are omitted from this approximation as energy savings is difficult to quantify as there is no baseline.

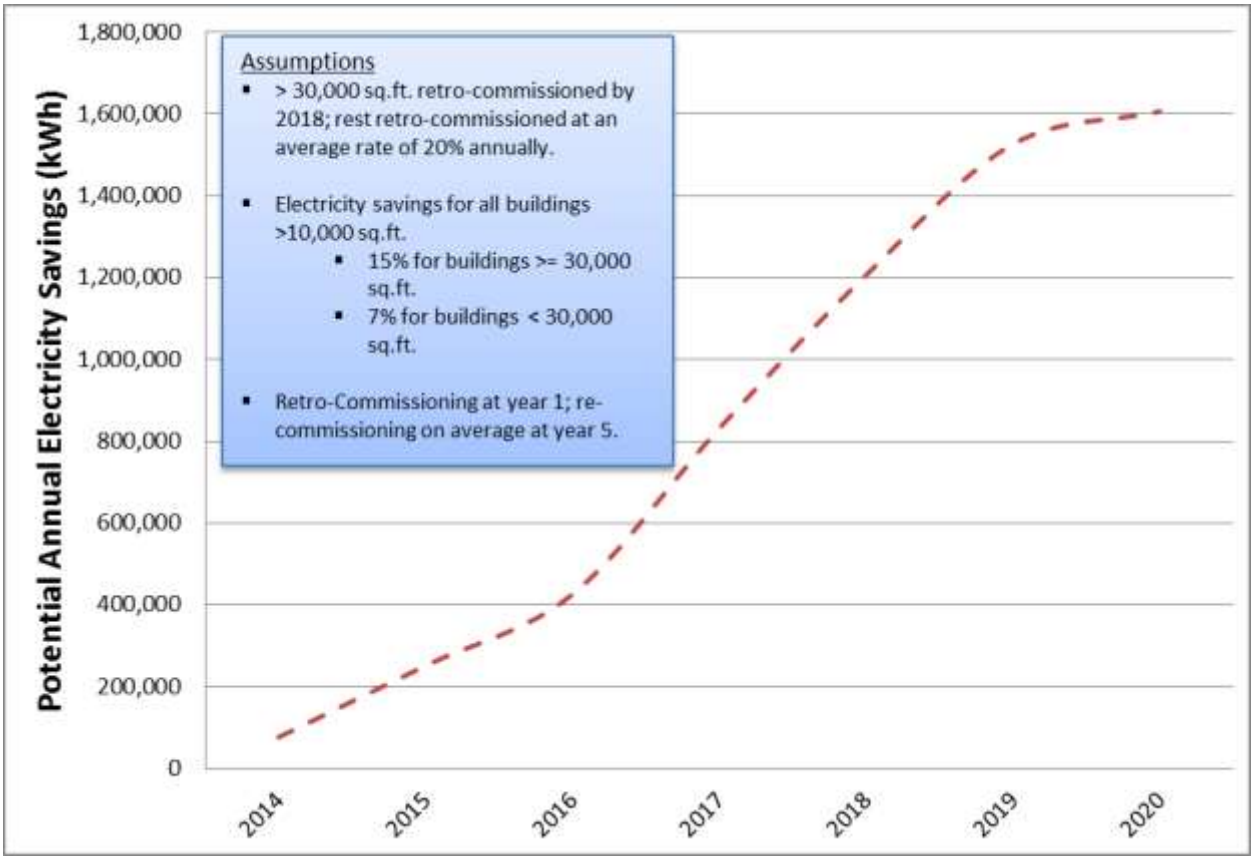

Figure 1: Potential Annual County Electricity Savings, Year 2014 through 2020

Figure 2 below depicts the County's potential for utility bill financial savings through electricity use reduction in all buildings greater than 10,000 gross square feet using average energy

[1] Estimates are conservative given they do not include potential savings from buildings less than 10,000 sq. ft., which make up 85.6% of the County's portfolio, refer to Table 5: County Building Inventory.
[2] Refer to Table 7: Building Industry Relevant Codes and Standards.

savings data used in Figure 1. It is based on a normalized electricity consumption rate of $0.13/kWh[3]. It is worth noting that Figure 1 does not include savings that will occur through natural gas or electricity demand reduction measures. As with the electrical consumption estimates above, savings will be dependent upon existing building conditions, current operation and maintenance practices, coordination with other County' capital energy efficiency projects, changes in utility pricing schedules, and how successful the County is with aggressively implementing the Policy.

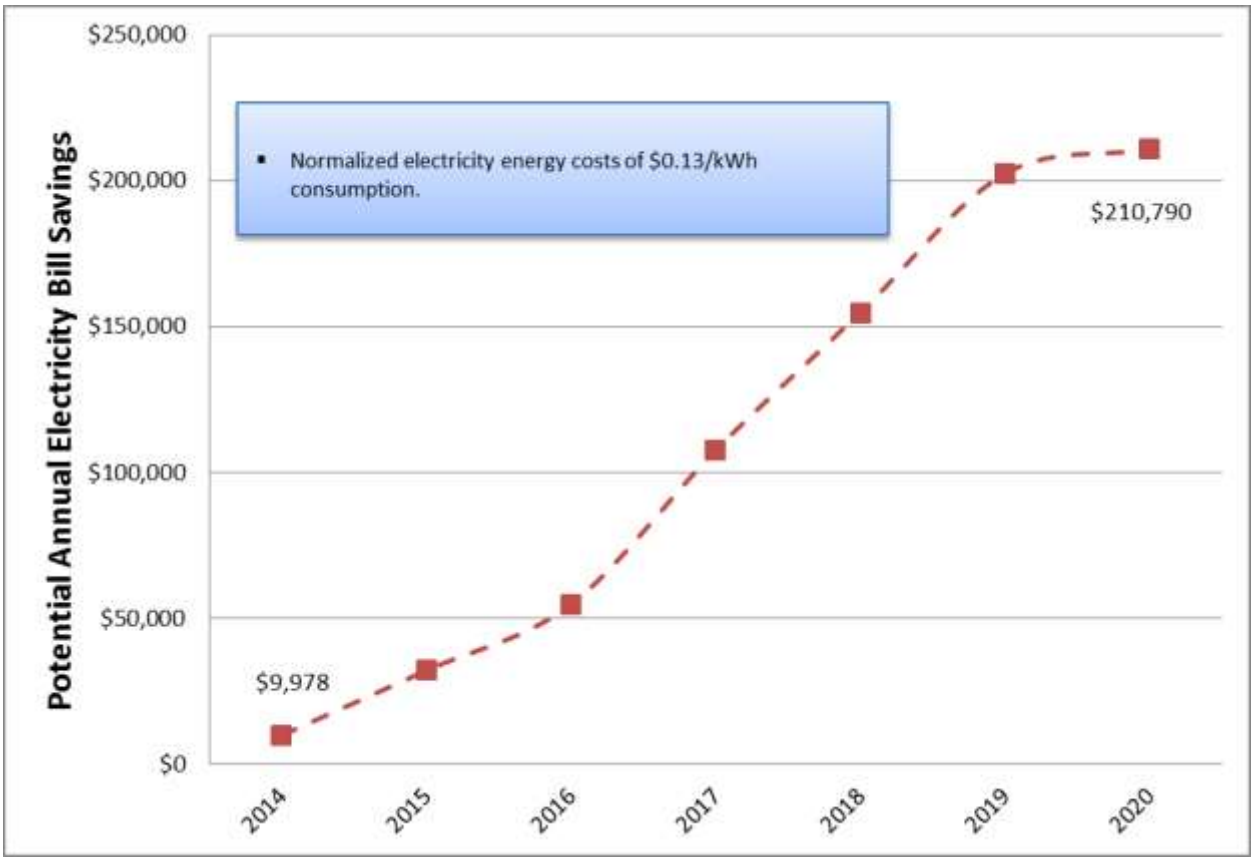

Figure 2: Potential Annual County Electricity Bill Financial Savings, Year 2014 through 2020

1.2 Introduction to Commissioning, Retro-Commissioning, and Re-Commissioning

Commissioning is the process of performing a comprehensive building evaluation to validate and improve building system performance. It applies to all new construction and major renovations and existing buildings and is applied to previously commissioned buildings to maintain performance.

Commissioning is an integrated team approach used in new construction as a quality assurance and risk management tool and means to incorporate additional non-energy benefits into the project. In existing buildings, commissioning is employed as a means to improve a buildings energy performance from a baseline. On small simple projects the County can save money with

[3] As identified in the County's Energy Action Plan.

capital projects or County staff acting as the commissioning authority – on larger complex projects a third-party consultant should manage the process.

1.2.1 New Construction and Major Renovation Commissioning

In new construction projects "commissioning" refers to a comprehensive building evaluation process to ensure the facility functions as the owner intended and the design documents require. It includes projects such as:

1) New construction;
2) Major Renovations of existing buildings;
3) System retrofit and modernization projects (i.e. replacement of equipment and systems in existing buildings);
4) Minor Renovations and tenant improvement projects which modify systems or equipment.

Commissioning minimizes design and construction project risk for the County. Commissioning ensures the building's systems are integrated for optimum performance and are designed, installed, and operated in accordance with the owner's functional project requirements as documented by the County during the project's pre-design/conceptual phase. Commissioning is thus a means through which the building owners' requirements are proactively articulated, documented, and validated.

Commissioning for new construction and major renovations typically includes four-phases: *pre-design/conceptual*, *design*, *construction*, and *occupancy/operations/warranty period*. Commissioning begins at the project's inception and continues through construction and into the performance warranty period, typically one-year after substantial completion, and may include seasonal/deferred testing. The validation of systems begins at the end of substantial construction, when functional performance testing is performed to validate equipment performance and system level interactions. Commissioning issues are documented and tracked to contractor completion by the commissioning authority.

1.2.2 Existing Building Retro-Commissioning

The term "retro-commissioning" refers to commissioning activity when applied to existing buildings that have never been commissioned. Similar to commissioning, retro-commissioning is a comprehensive process to improve a buildings performance through evaluation of the building and its systems in an integrated approach. It uses a similar four-step process; *planning*, *investigation*, *implementation*, and *hand-off/verification* that are tailored to the evaluation.

Retro-commissioning traditionally focuses on the identification and implementation of low/no-cost energy improvement opportunities first and returning the building to its optimal use, or current facility requirement. Additional opportunities for savings are then defined and evaluated for feasibility. Non-energy benefits such as increased occupant comfort and productivity make the cost of retro-commissioning more attractive, but can be difficult to quantify.

1.2.3 Existing Building Re-Commissioning

The term "re-commissioning" refers to commissioning activity when applied to buildings that have been previously commissioned with documented results. It is recommended that re-commissioning be performed every 3-5 years to address shifts in building performance,

changes in building use and tenancy, and to maintain building energy savings persistence. Re-commissioning follows the same process as retro-commissioning but can cost significantly less when documents generated as part of the commissioning and retro-commissioning processes are current, available, and can be utilized as a baseline.

1.2.4 Drivers Influencing the Need for Commissioning / Retro-Commissioning

The U.S. DOE estimates that municipal buildings consume approximately 25% more energy than their private sector counterparts (SEEAction, May 2012). There is quantitative and qualitative evidence that commissioning can lead to improved building performance and reduce utility energy costs. Retro-commissioning is one of the most cost-effective means for improving energy efficiency in the existing building stock (Mills, Friedman, Tehesia Powell, Claridge, Hassl, & Piette, December 15, 2004)[4].

This policy recognizes that independent requisitions created by individual County departments to add equipment or systems to alleviate operational problems is not a cost-effective or long-term solution and likely will result in increased energy usage. A controlled evaluation and recommendation (commissioning) is mandatory for true successful results of financial expenditure. As buildings and their systems age their energy and functional performance unavoidably degrades. This results in an increase in energy consumption and loss of original performance. When facilities staff or occupants override building controls to quickly address tenant complaints the long-term condition and energy (and therefore cost) expenditure can be exacerbated further.

The emergence of new and energy efficiency technologies, controls, and building codes have increased the complexity of building systems. They cannot be treated as discrete components but rather an integrated system, and as such should be commissioned as such to optimize performance where existing older approaches to this resolution will not provide the outcomes the County deserves.

1.2.5 The Costs and Benefits of New Construction Commissioning / Existing Building Retro-Commissioning

It is the County's expectation that the implementation of this Policy will result in energy consumption reductions which will directly correlate with utility bill reductions and additional building and employee environmental health benefits that lead to increased building and staff performance. This section details these benefits and how they can best be realized through adoption of this framework.

All forms of commissioning share common goals and similar processes, however there are distinct differences in their requirements; likewise, building owners have different motives for implementing the commissioning processes, creating a spectrum of energy and non-energy benefits. Commissioning projects tend to balance energy and non-energy benefits, whereas retro-commissioning projects tend to emphasize energy efficiency and operational improvements overall. Table 2 is a summary of common benefits obtained through the new construction commissioning and existing building retro-commissioning processes.

Table 2: Common Benefits Obtained through New Construction and Major Renovation Commissioning (Cx) and Existing Building Retro-Commissioning (RCx)[5]

Benefits of Commissioning	Process		Benefit		Benefiting Stakeholder		
	Cx	RCx	Energy	Non Energy	A/E and Trades	County Staff	Policy Makers
Direct Benefits							
Document system operation, update building documents	X	X		X		X	
Identify and resolve building system operation, control, and maintenance issues		X	X	X		X	
Improved building energy and cost performance	X	X	X			X	X
Risk management, reduced liability and insurance claims	X			X	X	X	X
Early detection of problems	X			X	X	X	
Mitigate or eliminate occupant complaints		X		X		X	
Improved productivity and reduced absenteeism	X	X		X		X	X
Improved Indoor Air Quality (IAQ) and thermal comfort	X	X		X		X	
Enhancing occupant safety	X	X		X		X	
Equipment downsizing	X		X	X		X	
Increased Net Operating Income and building asset value and financing leverage		X	X	X		X	X
Quicker lease-up and longer term leases	X	X		X		X	
Reduced construction costs, time, change orders , and call backs	X			X	X	X	X
Achieve USGBC LEED or other ANSI rating/certification or ENERGY STAR rating	X	X		X		X	X
Builds in-house capacity through operator training	X	X		X		X	
Improved Operations and Maintenance	X	X		X		X	
Preventative maintenance and extended equipment life		X	X	X		X	
Reduce maintenance costs		X		X		X	X
Ensure energy savings persistence	X	X	X			X	X
Achieving energy targets and program success		X	X			X	X
Indirect Benefits							
Job Creation	X	X		X	X		X

[5] Table 2 lists the range of potential benefits associated with the commissioning processes. Potential benefits are project specific and will vary based on a buildings use, complexity, and energy, operations, and maintenance performance.

Benefits of Commissioning	Process		Benefit		Benefiting Stakeholder		
	Cx	RCx	Energy	Non Energy	A/E and Trades	County Staff	Policy Makers
Local building engineering and construction activity	X	X		X	X		X
Direct and indirect taxes resulting from increased construction and consulting activity.	X	X		X		X	X

The energy efficiency opportunities in existing building retro-commissioning are well documented while the lack of a baseline condition in new construction makes quantifying the benefits of new construction commissioning more challenging. Studies have found that both new construction commissioning and existing building retro-commissioning projects, are cost-effective across a wide range of building types and sizes, when implemented with discretion.

Non-energy benefits are often excluded from cost-effectiveness analysis due to the difficulty in quantifying them; even so there is evidence that non-energy benefits can be significant enough to offset the entire cost of commissioning (such as increased worker productivity, decreased sick days, etc.).

Complicating the issue is the fact that there is no standard definition on what constitutes the cost of commissioning. Studies have found that on average new construction commissioning costs 0.9% of total construction costs or $1.64/sq.ft. of commissioned area. (Mills, Friedman, Tehesia Powell, Claridge, Hassl, & Piette, December 15, 2004) The same study found the average costs are $0.41/sq.ft, or approximately one-fourth, for existing buildings retro-commissioning as indicated in Table 3, while the average energy savings benefit (excluding non-energy benefits) is 50% larger, as indicated in Table 4, which can make them highly cost effective when applied conservatively and to good candidate buildings. This policy provides a framework for targeting this opportunity.

Table 3: Approximate Historical New Construction Commissioning and Existing Building Retro-Commissioning Costs[6]

Commissioning Process	Bottom 25%	Median	Average	Top 25%
New Construction Commissioning ($/sq.ft.)	0.49	1.00	1.64	1.66
New Construction Commissioning (% construction)	0.30%	0.60%	0.90%	1.10%
Existing Building Retro-Commissioning ($/sq.ft.)	0.13	0.27	0.41	0.45

[6] The values in this table were taken from available literature and represent costs associated with the buildings under the purview of that study. The values in this table should not be used by County or Department staff for budgeting purposes. For preliminary budgeting, Departments shall use Table 17: Initial Commissioning Budget Assumption Matrix

Table 4: Approximate Historical New Construction Commissioning and Existing Building Retro-Commissioning Benefits[7]

Commissioning Process	Average Total Building Energy Savings
New Construction Commissioning	10%
Existing Building Retro-Commissioning	15%

1.3 Assessment of Santa Barbara County Building Inventory

1.3.1 Santa Barbara County Building Inventory

Santa Barbara County's portfolio consists of a diverse make-up of buildings that vary in age, use, and size across its 3,789 square miles, 3 climate zones, and 8 incorporated cities. The County has more than 400[8] facilities and structures that make up approximately 2.4 million square feet of space managed by General Services and occupied by the County's 25 departments[9].

The County's owned and operated and leased buildings are served by 232 electric and 88 natural gas meters and four utilities; Southern California Edison, Southern California Gas, Lompoc City, and Pacific Gas & Electric in New Cuyama. These buildings account for approximately 91% of the County's total electrical metered energy consumption and 49% (Hapeman & Foster, April 2013) of the County's baseline greenhouse-gas emissions.

[7] Excludes savings from non-energy benefits.

[8] The County's owned and operated facility inventory includes buildings, facilities, and structures that range in size from small unoccupied buildings to large conventional office buildings that house hundreds of County employees. They include but are not limited to the following: restrooms at park and storage buildings, office buildings, fire stations, small sheds, clinic facilities, warehouses, jails and detention facilities, park and recreation facilities, libraries, maintenance shops, semi-permanent trailers, car ports, swimming pools, and mission critical facilities such as the Emergency Operations Center and 911 Call Center.

[9] County departments are occupants and tenants of the County owned and General Services maintained buildings, structures and facilities.

The diversity in the makeup of owned and operated buildings in the County portfolio can be attributed to the following:

1) The median age of all County buildings is 36 years and consequently nearly half of the County's building stock was constructed before Title 24 was enacted in 1978 (Hapeman & Foster, April 2013).
2) Many of the buildings continue to utilize originally installed aging systems and equipment.
3) Due to the local climate, many of the County's buildings are not fully conditioned.
4) The County has over 40 building types[10] each of which have different operational functions and occupant uses.
5) The County has 3 distinct Climate Zones[11] within its boundaries.
6) Coastal located facilities experience further accelerated aging and corrosion issues due to the coastal climate.

This policy must address non-traditional approaches to the commissioning process in addition to conventionally accepted practices because typically, commissioning of buildings of less than 10,000 square feet in size is not cost-effective, except where the right implementation strategy is applied to the worst performing buildings. Table 5 below is a breakdown of the County's building[12] inventory by floor area. Over three-quarters of County buildings are less than 10,000 square feet (85.6% as indicated in the highlighted cell) and more than two-thirds by gross area are less than 30,000 square feet (67.8%).

[10] The County's owned and operated facility inventory includes buildings, facilities, and structures that range in size from small unoccupied buildings to large conventional office buildings that house hundreds of County employees. They include but are not limited to the following: restrooms at park and storage buildings, office buildings, fire stations, small sheds, clinic facilities, warehouses, jails and detention facilities, park and recreation facilities, libraries, maintenance shops, semi-permanent trailers, car ports, swimming pools, and mission critical facilities such as the Emergency Operations Center and 911 Call Center.

[11] The County's distinct climate zones include: Zone 4 – central coastal valley; Zone 5 – central coastal; Zone 6 – south coastal.

[12] Includes County owned and maintained structures only

Table 5: County Building Inventory[13]

Building Inventory Summary				
Size	Building Quantity	% Building Quantity	Estimated Gross Building Area (sq.ft.)	% SF Portfolio
sq.ft. <=10,000	343	85.6%	504,120	21.3%
10,001> sq.ft. <=20,000	32	8.0%	555,724	23.5%
20,001> sq.ft. <=30,000	17	4.2%	543,847	23.0%
30,001> sq.ft.<=60,000	4	1.0%	264,838	11.2%
60,001> sq.ft. <=90,000	2	0.5%	246,487	10.4%
sq.ft. >90,001	3	0.7%	252,805	10.6%
Totals	401	100%	2,367,821	100%

Table 6 below is a summary of building energy consumption by floor area (similar to Table 5) and illustrates the disproportionate amount of energy consumption in buildings less than or equal to 10,000 square feet (as indicated in the highlighted cell). The County's energy consumption is spread evenly through the bins, save the 30,000 - 60,000 square feet bin. Buildings in the 30,001 - 60,000 gross square feet range may represent a transition from smaller, temporary or seasonally occupied buildings with limited or no building heating, cooling, and ventilation system infrastructure, as indicated by the lower Median Energy Use Index, (EUI) to larger occupied buildings with traditional infrastructure.

[13] Building quantity data taken directly from County of Santa Barbara Energy Action Plan, April 2013. Gross building area is estimated from data within the Energy Action Plan.

Table 6: County Owned and Operated Building Electricity Consumption[14]

Building Electricity Consumption Summary				
Size	Estimated Annual Consumption (kWh)	% Consumption	Median Gross Area (sq.ft.)	Median EUI (kBtu/sq.ft./yr)
sq.ft. <=10,000	4,509,173	21%	1,152	30.52
10,001> sq.ft. <=20,000	4,066,503	19%	13,612	24.97
20,001> sq.ft. <=30,000	4,012,077	18%	25,075	25.17
30,001> sq.ft.<=60,000	2,046,764	9%	51,896	26.37
60,001> sq.ft. <=90,000	3,529,112	16%	64,400	48.85
sq.ft. >90,001	3,686,840	17%	99,076	49.76
Total	21,850,469	100%		
Average				31.49

1.3.1.1 Preliminary Assessment for Existing Building Retro-Commissioning Opportunities

In contrast to the County's Energy Action Plan, this Policy is applicable to and directed at all existing County building stock, as a means to increase operational and maintenance performance, and all new construction, major renovation, and retrofit projects. This broad inclusion will improve the County's construction product and establish long term performance. Although not explicitly stated in the Energy Action Plan, many of the proposed building energy improvement measures can be likened to the retro-commissioning process, making commissioning a key strategy within the Energy Action Plan to meet the County's goal of 25% electricity energy reduction.

Many of the County buildings are located on campuses and consist of multiple utility accounts consolidated together at meters making it difficult to reconcile the energy performance for any single building and apply that data to assess building energy performance and commissioning opportunities either within that building or as a benchmark against other similar buildings in the County's portfolio. One way to enable this is through the installation of sub-metering equipment to separate the data from the different buildings. (Several sub-meters will be install on the Calle Real Campus in 2014 by a grant from Southern California Edison.)

Benchmarking building performance is the first-step in the energy assessment process. It provides building level energy data that can be used to verify and track energy performance, create baseline conditions, and prioritize buildings for commissioning. A lack of benchmarking, utility bill data, or other means to establish a buildings energy performance, creates headwind for commissioning because buildings cannot be properly assessed for performance and energy saving strategies cannot be accurately verified.

[14] Energy consumption is estimated from 2008 baseline energy data taken from the County of Santa Barbara Energy Action Plan, April 2013. Average building EUI is calculated as the product of Estimated Annual Consumption (taken from Table 5) divided by the Estimated Gross Building Area (taken from Table 6).

The County has implemented a Benchmarking Policy that uses the U.S. EPA's ENERGY STAR Portfolio Manager framework. Although the County has not inventoried the entire building stock, it is the County's most complete current database of building energy performance data; and represents 48 County owned and operated buildings and more than 1.1 million square feet of floor area within the County's building assets. As the Benchmarking Policy is implemented at the department level, the addition of building population data will increase its usefulness and the County's ability to track energy consumption and evaluate building performance.

Currently, energy performance data is available for 22 buildings though the County's ENERGY STAR Portfolio Manager Account. Although these buildings make up only 5.5% of the County's owned and operated building stock, they account for 696,408 square feet (29.5%) of floor area and an annual energy consumption of 17,080,642 kWh (78%). This suggests that the County's biggest energy consumers are found in a small set of larger sized buildings while the bulk of the County's buildings are smaller and consume a disproportionately smaller amount of energy.

Figure 3 and Figure 4 below represent buildings in the County's ENERGY STAR Portfolio Manager Account and confirm the County's building portfolio is made up of a small quantity of large sized and higher energy consuming buildings paired alongside a higher quantity of small, low energy intensity buildings. Buildings within the shaded area are those that may be good first candidates for retro-commissioning based on energy performance (high energy consumption and high energy intensity) alone. Other criteria, as discussed in Section 3.2 below, should be evaluated in parallel with energy performance to select candidate buildings. Likewise, the smaller lower energy consuming buildings may be excellent candidates for retro-commissioning when evaluated against peer buildings (benchmarked) and other criteria are considered.

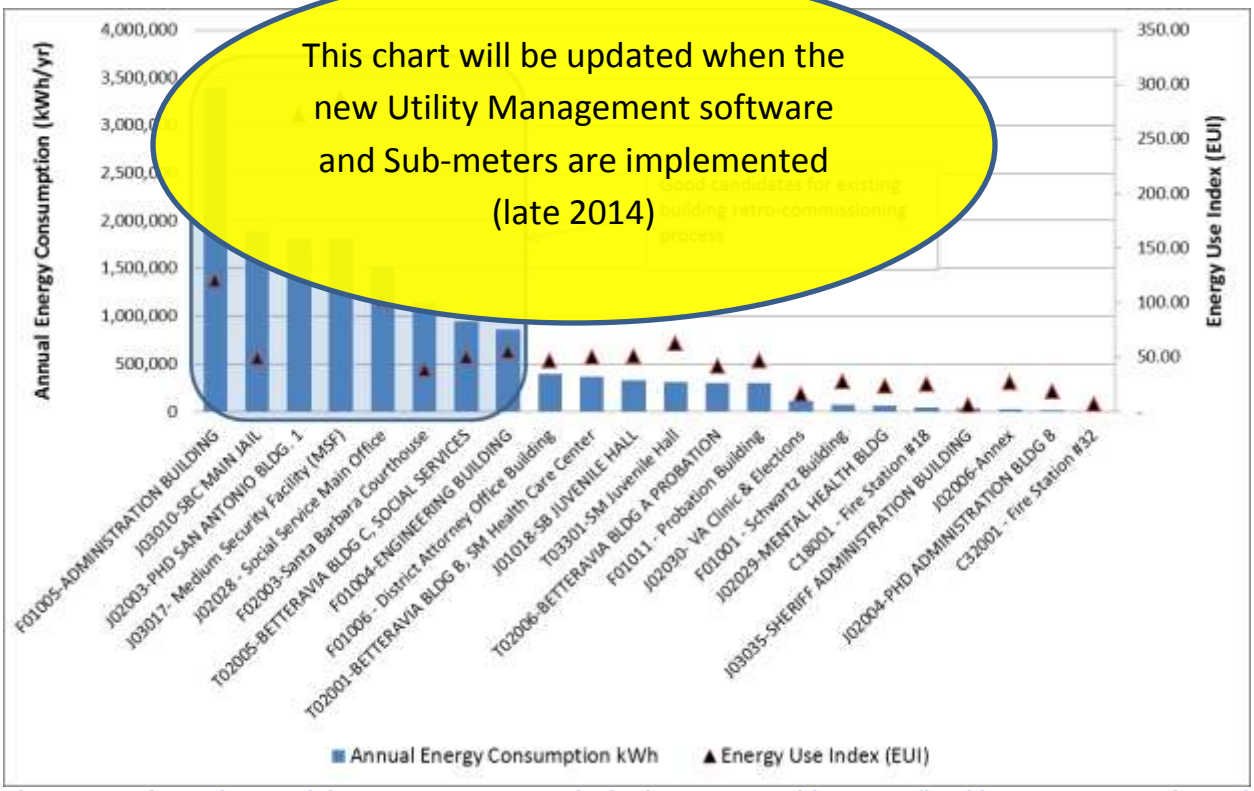

Figure 3: Estimated Potential County Retro-Commissioning Opportunities as Defined by Energy Intensity and Consumption[15]

[15] Data in Figure 3 is taken from the U.S. ENERGY STAR Portfolio Manager Account and includes ratio estimates for facilities that are on combined meters.

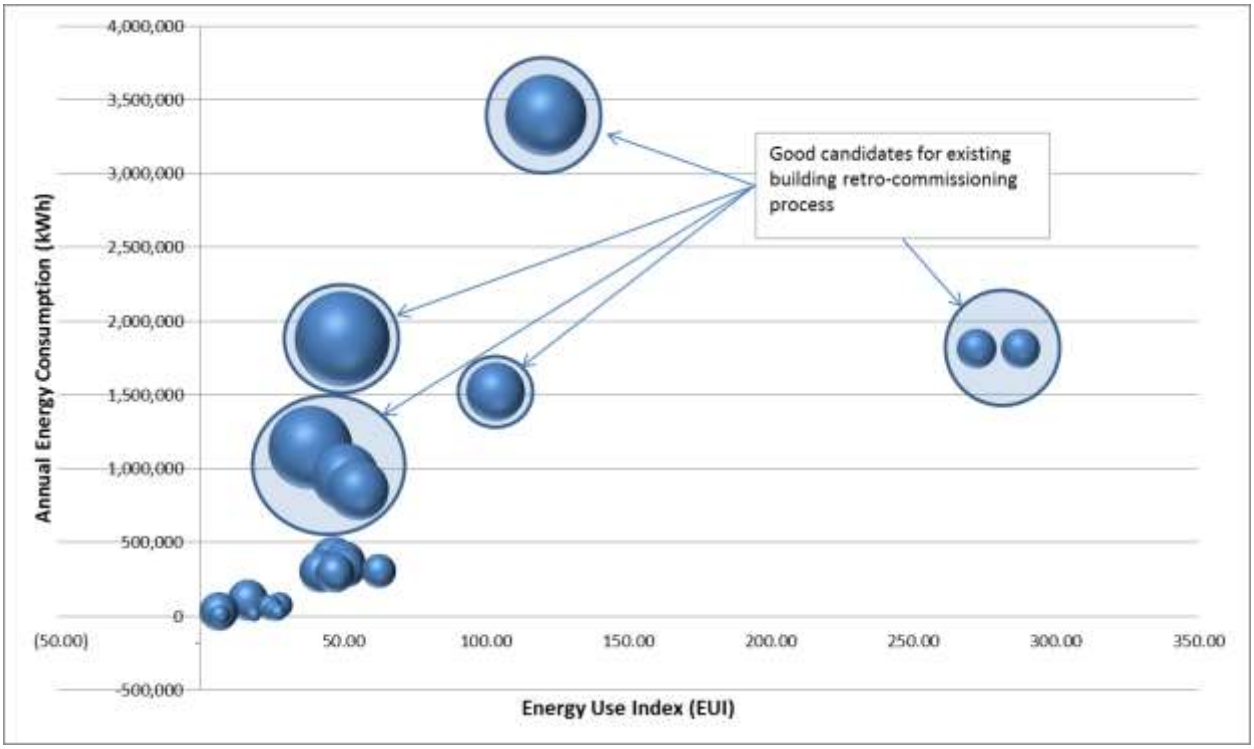

Figure 4: Potential County Retro-Commissioning Opportunities as Defined by Energy Intensity and Consumption[16]

1.4 Background

Despite the inherent complexity of buildings and their systems, comprehensive commissioning requirements have until recently been absent from building codes. ASHRAE Standard 90.1, the national baseline non-residential energy code, mandates commissioning be performed for heating, ventilation, and air conditioning system controls for projects larger than 50,000 square feet but forgoes requirements for the commissioning of all other systems and smaller projects. More recently, green building model codes and ANSI accredited green building certifications have incorporating comprehensive commissioning requirements as indicated Table 7. Several of these standards are voluntary, while California's Statewide code "Title 24" and green building code "CAL Green" both exceed the federally minimum state energy codes.

[16] Data in Figure 3Figure 4 is taken from the U.S. ENERGY STAR Portfolio Manager Account and includes ratio estimates for facilities that are on combined meters.

Table 7: Building Industry Relevant Codes and Standards

Code/Standard	Mandatory Requirement	Comprehensive Requirement	New Construction	Existing Buildings	Requirement
ASHRAE 90.1 - 2010[17]	X		X		HVAC for projects > 50,000 sq.ft
Title 24, Part 6 - 2013	X	X	X		Comprehensive requirement for buildings > 10,000 sq.ft.
USGBC LEED NC/EB[18]	X	X	X	X	Re-commission ~ 5-years
ASHRAE 189.1 - 2011[19]	X	X	X		buildings > 5,000 sq.ft
IgCC - 2012[20]	X	X	X		HVAC in buildings > 5,000 sq.ft

1.4.1 The State of California and the California Public Utilities Commission

CAL Green 2010 (California Code of Regulations Title 24, Part 11), the State of California's Green Building Code, requires comprehensive commissioning for all new construction and major renovations greater than 10,000 square feet in size serves as the State's minimum mandated commissioning requirement. The code has been in effect since January 2011 and is updated on a continuous maintenance cycle. Title 24, Part 6 2013 will become effective January 1, 2014[21] with mandates that increase building commissioning requirements and link building design and operational performance. When adopted with relevant ordinances, it will serve as the County's minimum mandated commissioning requirement and is thus the bare minimum requirement for commissioning for all projects under purview of this Policy.

California's Executive Order (EO) B-18-12[22] , signed into law by Governor Brown (April 25, 2012) established a requirement for State agencies, departments, and other entities to commission new and existing buildings to improve building performance. Although this EO is not mandated at the County level, it demonstrates the States commitment to the commissioning processes.

[17] American Society of Heating Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE), ANSI/ASHRAE/IESNA Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings
[18] U.S. Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED)New Construction and Major Renovations (NC), Existing Building Operations and Maintenance (EB)
[19] American Society of Heating Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE), ANSI/ASHRAE/USGBC/IES Standard 189.1-2011 Standard for the Design of High-Performance Green Buildings, Except Low-Rise Residential Buildings
[20] International Code Council, International Green Construction Code (IgCC)
[21] http://www.bsc.ca.gov/
[22] http://gov.ca.gov/news.php?id=17508

1.4.2 The County of Santa Barbara's Energy Action Plan

In April of 2013 the County Board of Supervisors approved the County of Santa Barbara's Energy Action Plan. The plan provides qualitative guidance on the County's objectives to achieve a 25% electricity reduction by 2020, when compared to a 2008 baseline. This plan works in tandem with the County's Benchmarking Policy (Approved April 2, 2013) to provide framework and tools that strengthen and legitimize the County's commitment to achieving stated energy reduction goals. Executive Order B-18-12 represents the State's commitment, and this Policy represents the County's commitment.

2 Policy Statement

The County of Santa Barbara includes new construction and major renovation commissioning and existing building retro- and re-commissioning processes in a manner that promotes energy efficiency and long-term sustained building performance.

01) This Policy establishes a Commissioning Oversight Committee (refer to Section 3.1) that will be chaired by the County Energy Manager with representatives from the County's Capital Projects, Facilities Group, County Architect, and respective building departments as required. The Commissioning Oversight Committee is the expert and authority in recommending County commissioning projects and communicating matters with County Departments and the Board of Supervisors.

02) Departments must plan for commissioning and are encouraged to include budgeting allowances for commissioning processes in their annual budget planning in accordance with Section 3.1 and Section 3.5.2 of this Policy.

03) This Policy establishes minimum acceptable criteria for the commissioning of County buildings. Where differences exist between County adopted codes and relevant ordinances and this Policy, the more stringent requirement shall apply. This Policy requires that for all applicable projects, commissioning be performed in accordance with all adopted codes and relevant ordinances.

04) This Policy requires that all County owned and operated buildings report energy generation and utility consumption[23] through the County's Utility Manger System.

2.1 New Construction and Major Renovation Commissioning

The County will commission all new construction and major renovations in occupied and unoccupied buildings and facilities in accordance with the following criteria:

01) All new construction and major renovation projects will be commissioned.

02) All new construction and major renovations that are equal to or exceed 50,000 square feet or involve complex mechanical systems[24] shall be commissioned by an independent certified third-party commissioning agent. Project scope shall comply with the requirements of all County adopted codes and ordinances in addition to the requirements of this Policy as set forth by the County's Commissioning Oversight Committee.

03) All new construction and major renovations less than 50,000 square feet may be commissioned by either an independent certified third-party commissioning agent or in-house County staff, at the discretion of the Commissioning Oversight Committee. In either case the minimum outcome is documented functionality verification and document review by a Commissioning Oversight Committee representative.

[23] This includes utilities consumed by the County but paid for by others as in a County leased and tenanted building and facilities (e.g. under a full-service lease agreement.) This includes all utilities consumed by all County Departments (structures, facilities, equipment, etc.) at the meter level.
[24] As defined by the 2013 Building Energy Efficiency Standards, Title 24, Part 6.

04) Projects seeking an ANSI or other green building certification (e.g. USGBCs LEED certification) shall be commissioned by an independent certified third-party commissioning agent or as required by that standard.

05) All system and equipment retrofit projects that replace major capital equipment or materially impact sequences of operation, and qualifying tenant improvement projects shall be commissioned end-to-end including front-end computer integration[25]. Commissioning may be performed by either an independent certified third-party commissioning agent or in-house County staff at the discretion of the Commissioning Oversight Committee.

2.2 Existing Building Retro-Commissioning

The County will assess all existing buildings on an on-going basis for applicability of the retro-commissioning process. Buildings that meet the following conditions shall be considered priority candidates for commissioning and review for determination by the County's Commissioning Oversight Committee:

01) Buildings greater than or equal to 10,000 square feet.

02) Buildings with U.S. EPA ENERGY STAR rating less than 75[26], as generated by ENERGY STAR's Portfolio Manager.

03) Buildings with inefficient systems or controls[27].

04) Buildings identified by Commissioning Oversight Committee during the annual selection process.

05) All County buildings and facilities that operate 24 hours per day.

The County will implement all retro-commissioning measures identified in the retro-commissioning *List of Findings* that have payback periods of less than 12-months, as determined through an economic analysis approved by the Commissioning Oversight Committee.

[25] Front-end computer integration means all applicable or connected building and County energy management or building management control systems and the County's Maintenance Connection – Service Request software.
[26] Buildings with ENERGY STAR ratings greater than 75 are in the top 25 percentile for energy performance when compared to similar type buildings.
[27] Refer to Appendix A for definition of inefficient systems and controls.

2.3 Existing Building Re-Commissioning

The County will assess all existing previously commissioned buildings on an on-going basis for applicability of the re-commissioning process. Buildings will be re-commissioned when the following conditions apply, or as determined by the Commissioning Oversight Committee, to maintain the integrity of the buildings energy consuming systems and energy savings persistence[28]:

01) More than 50% of the building is renovated as part of a minor renovation or tenant improvement.

02) Upon a change in building use or material impact to building function or energy consuming systems as determined by the County Energy Manager.

03) Major energy consuming systems or controls are replaced or retrofitted.

04) Increase in building tenant complaints due to improper building systems and controls.

05) Increasing trend in building energy consumption over 12 month period by more than 10% when normalized for weather and occupancy conditions (indicating a possible issue).

06) As required to certify, maintain, or recertify a building for an ANSI or other green building certification (e.g. USGBC's LEED Existing Buildings Operation and Maintenance certification).

07) As required to maintain rating with U.S. EPA ENERGY STAR Label for Commercial Buildings program.

2.4 Requirements for Major vs. Minor Renovations

A major renovation is a project which materially modifies the buildings envelope, mechanical, electrical, or plumbing systems. It may be a building infrastructure or tenant improvement project. These projects usually involve the moving of walls, ceilings, and seating arrangements or making material changes to the building or tenant infrastructure systems.

A minor renovation is a project where only finishes or furniture are modified and there are no substantial changes to seating arrangements and no changes to walls, ceilings, or system zones. Minor renovations will not require commissioning as "new construction" but will still be taken under consideration for retro- or re-commissioning at the discretion of the Commissioning Oversight Committee. Where minor renovation projects are identified for the commissioning process, they shall conform to the full scope of this Policy.

2.5 Basic Owner Project Requirements

Every County project must have a documented Owner's Project Requirements (OPR) which outlines minimum established requirements for all new construction and major renovation commissioning and existing building retro- and re-commissioning projects. This guarantees a

[28] Approximated at a 5 year re-commissioning cycle.

minimum standard of care is performed for all commissioned projects and the County requires end-to-end functionality that includes: performance testing, demonstration, witnessing, and documentation of building systems and equipment. End-to-end means that all systems are tested and verified to meet the OPR and are fully integrated into all required building systems; including but not limited to automatic temperature controls, fire alarm, fire suppression, security systems, and those regulated by County adopted codes and relevant ordnances and other applicable standards.

These criteria are irrespective of project scope and apply to all third-party and in-house commissioned projects:

01) Owner Project Requirements shall be clearly established for end-to-end functionality (e.g. control, monitoring, alarming, and performance) of all systems and equipment under all modes of operation (e.g. occupied, unoccupied, standby, emergency operation, etc.).

02) Commissioning Oversight Committee representative (i.e. Facility Group or Capital Projects staff) shall witness select vendor and contractor equipment start-up tests.

03) Commissioning Oversight Committee representative shall be provided copies of selected vendor and equipment start-up reports and documentation a minimum of 7-days prior to functional performance testing, for review and approval.

04) The commissioning authority shall demonstrate to the Commissioning Oversight Committee representative and a building occupant representative through functional performance testing that all systems and equipment satisfactorily meet the OPR under all modes of operation.

05) Commissioning Oversight Committee representative and a building occupant representative shall witness and approve all functional performance testing.

06) The Commissioning Oversight Committee representative shall document in writing to the Department Building Coordinator and County Energy Manager that all systems and equipment have been tested and demonstrated to comply with the OPR and witnessed by County staff. At a minimum, 1) the system and equipment that was demonstrated, 2) who was present, and 3) when the demonstration occurred should be documented.

2.6 Operational and Maintenance Retrofits Requirements

2.6.1 Emergency Replacement Systems

The emergency replacement of existing building equipment and systems are exempt from the commissioning requirements of this Policy, to the extent that systems shall be replaced with no-delay and the requirement for building assessments and determination by the Commissioning Oversight Committee and the “standard” commissioning protocols established within this Policy are relaxed.

All standard County operating protocols for responding to emergency operations and maintenance replacements shall be adhered to and shall take precedence over this Policy so

much as they affect the life-safety and welfare of the building's occupants and community residents. Compliance with this Policy for emergency repairs still requires:

01) The witness of functional performance testing of all emergency replacement equipment by County staff.

02) The Capital Projects Project Manager will provide the Commissioning Oversight Committee a copy of the maintenance ticket and document in writing to the Department Building Coordinator and County Energy Manager that all systems and equipment have been tested and demonstrated to comply with the Owner Requirements and witnessed by County staff. At a minimum, 1) the system and equipment that was demonstrated, 2) who was present, and 3) when the demonstration occurred should be documented.

2.6.2 Unplanned Replacement of Systems and Equipment

The replacement of all unplanned equipment and systems are subject to the commissioning process; either new construction or major renovation commissioning or existing building retro- or re-commissioning process if proper triggers are identified. Upon determination of failed equipment, the following protocol shall be followed:

01) The County Facilities Manager shall assess the system or equipment condition and communicate the replacement requirement to the Commissioning Oversight Committee via a group email..

02) The Commissioning Oversight Committee has 10-business days to respond to the County Facilities Manager with requirements for system and equipment commissioning.

3 Implementation Plan

3.1 Establishment of the Commissioning Oversight Committee

To ensure commissioning is leveraged as an energy management resource cost-effectively across the County departments in all planning and construction activity, the Policy establishes a Commissioning Oversight Committee. The role of the Commissioning Oversight Committee is to identify, assess, and select new construction and retrofit projects and existing buildings and/or their systems for commissioning activity for the upcoming fiscal year. The Commissioning Oversight Committee shall be comprised of the following County of Santa Barbara staff, which represent different constituents within the County and participate in the project selection and review cycle shown in Figure 5:

1) County Energy Manager.
2) County Facilities Manager.
3) County Architect.
4) Facilities Group Capital Project Manager.
5) Capital Projects Group Project Managers.
6) Department-Specific Building Coordinators (as requested).
7) Capital Projects Manager (as requested).

The Commissioning Oversight Committee will convene twice each year, during the last week of October and the first week of December, prior to commencement of the upcoming year's budget planning period. The purpose is to select candidates for commissioning projects, define their scope, and obtain departmental buy-in and understanding to facilitate resource planning and budgeting for the upcoming fiscal year and approval from the County Board of Supervisors.

The Commissioning Oversight Committee scope includes selection of commissioning projects based on the following:

1) Determination of building applicability factors (refer to Section 3.2).
2) Building maintenance and performance factors.
3) Available project construction budget and County resources.

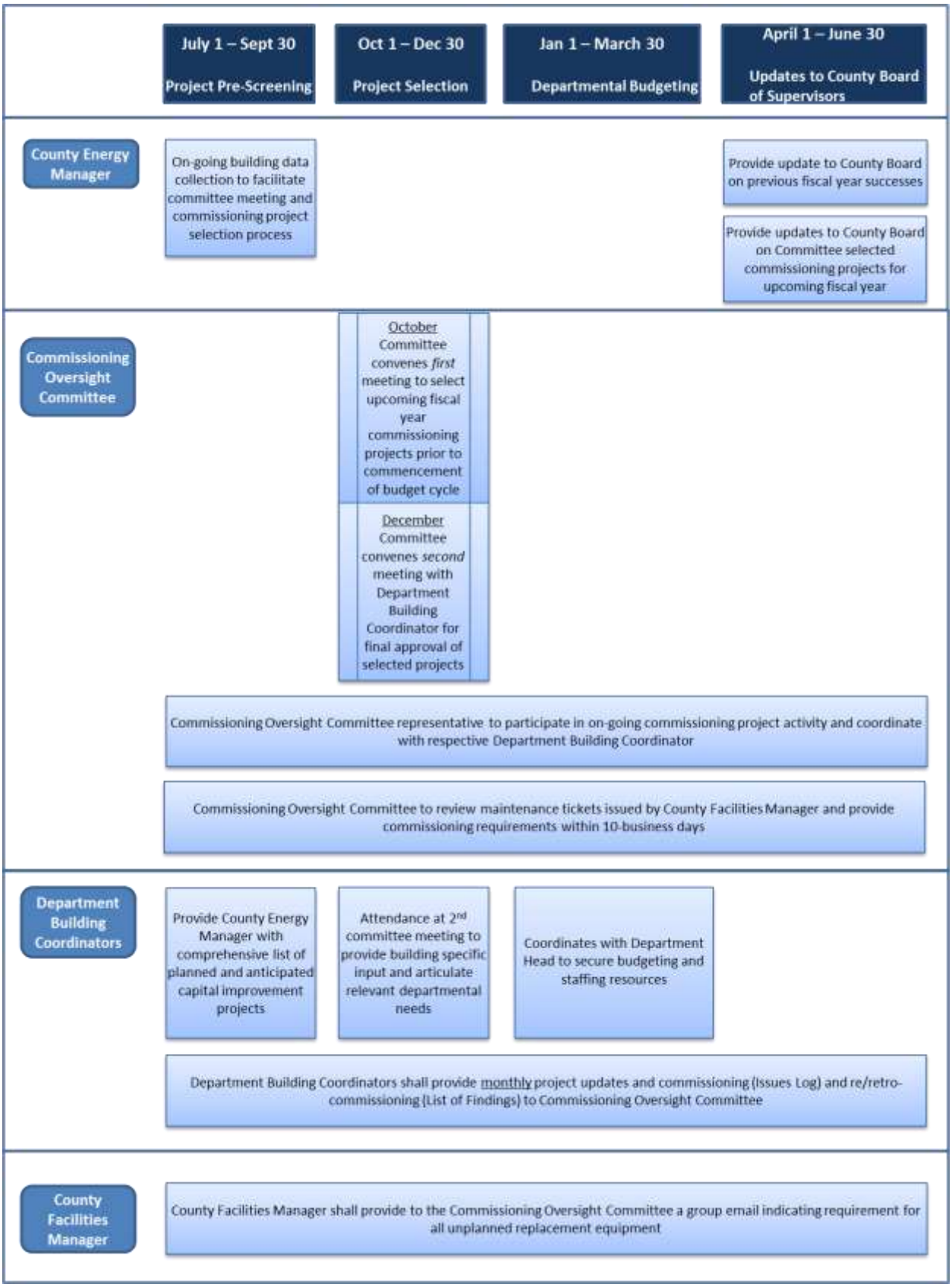

Figure 5: Commissioning Oversight Committee Project Selection and Review Cycle

Project Pre-Screening – *July 1 through September 30*

The pre-screening phase will be conducted by the County's Energy Manager. It will include quantitative assessment of building energy performance and qualitative assessment of building operational and maintenance performance through anecdotal input from County departments, Facilities Group, Capital Projects staff, and the County's Maintenance Connection software. The pre-screening phase will include an on-going gap assessment on building inventory performance and County operation and maintenance practices in relation to County objectives.

During this phase, Department Building Coordinators and Capital Projects group shall provide the County Energy Manager a comprehensive list of all planned and anticipated construction projects for the upcoming year. This should include all building construction related activity including operating and maintenance procedures that are considered beyond standard care.

The result of the project pre-screening process will be a short-list of planned or proposed commissioning projects that address current County operational and maintenance needs that will be presented to the Commissioning Oversight Committee during the project selection phase.

Project Selection – *October 1 through December 31*

Attendance at the first meeting will include all Commissioning Oversight Committee members except for the Department Building Coordinators. The Commissioning Oversight Committee will review the proposed short-list of commissioning projects identified by the County Energy Manager during the project *pre-screening phase*. Projects will be filtered using the decision tree criteria outlined in Figure 7 and Figure 8 below of this policy with input from the Commissioning Oversight Committee members to select the proposed projects (and define their scope of work, refer to Table 8).

The result of the project selection process will be a list of County targeted commissioning projects for the upcoming fiscal year and communication to the respective County Department Building Coordinators.

Table 8: Commissioning Oversight Committee Criteria Selection Matrix[29]

Commissioning Process	Commissioning Authority[30]	Commissioning Scope of Work[31]	Tracking Building Performance
● New Building and Major Renovation Commissioning	● Third Party Commissioning	● Heating, Ventilation, Air Conditioning, and Refrigeration Systems and associated controls	● ENERGY STAR Portfolio Manager ● Utility Manager System ● County Maintenance Connection software
● Minor Renovation Commissioning	● In-House Commissioning	● Indoor and outdoor lighting and controls	● Utility Bill Analysis
● Existing Building Retro-Commissioning		● Domestic hot-water systems	● IPMVP v1[32]
● Existing Building Re-Commissioning		● Landscape irrigation systems ● Water reuse systems ● Electrical Systems ● Life Safety Systems ● Security ● Egress Systems ● Kitchen / Food Service ● Audio/Visual and Communication Systems	

Attendance at the second meeting will include all first meeting attendees and respective Department Building Coordinators of pre-selected projects. The County Energy Manager will provide an overview of the project selection process and solicit input from respective Department Building Coordinators. The purpose is to identify any material building operations, known at the department level; that may influence final project selection. The result of the meeting is departmental acceptance for the planning, budgeting assumptions, and

[29] The Commissioning Oversight Committee is the expert final arbiter for all commissioning requirements, indicated in this table or otherwise, for all projects approved by the County Board of Supervisors.
[30] Where applicable, requirement shall comply with County adopted codes and relevant ordinances (e.g. Title 24 / CAL Green)
[31] Commissioning requirements indicated are minimum system types. Commissioned systems and equipment shall be in full compliance with County adopted codes and relevant ordinances (e.g. 2013 Building Energy Efficiency Standards, Title 24, Part 6 sections 120.8, 110.0, 120.0, 130.0, and 140.0).
[32] International Performance Measurement & Verification Protocol (IPMVP), Concepts and Options for Determining Energy and Water Savings, Volume 1

implementation timeline of commissioning activity in accordance with this Policy, County codes and relevant ordinances, and project requirements established by the Commissioning Oversight Committee.

Departmental Budgeting – *January 1 through March 30*

Departments are encouraged to include commissioning for projects identified by the Commissioning Oversight Committee, as a line-item in their annual operating budget, refer to Section 3.5.2 for discussion on possible funding sources.

Board of Supervisors Approval – *April 1 through June 30*

The County Energy Manager will provide an annual update to the County Board of Supervisors on previous and upcoming year commissioning activities. The update will include reporting the success of commissioning efforts throughout the County and planned activity for the following fiscal year. These annual updates will serve the County by communicating the quantitative benefits achieved through implementation of the Policy to the County Board of Supervisors, department staff, and the community, while showing commitment to the on-going betterment and performance of the County's building stock and fulfilling the County's promise to bring results forward and show progress.

3.2 Project Selection

3.2.1 Determination of Existing Building Retro- and Re-Commissioning Applicability

Studies have shown that large and energy intensive buildings exhibit the greatest potential for retro-commissioning and yield the most cost-effective results. Commissioning in smaller buildings is not as cost-effective due to the less complex heating, ventilation, and air conditioning and control systems prevalent in these buildings. Notwithstanding, this Policy is applied to new construction and major renovation commissioning and existing building retro-commissioning processes broadly across the County's owned and operated buildings to maximize impact and improve the performance of County buildings.

The County has a diverse portfolio of buildings in size, function, and energy use. Many of these buildings are potential candidates for retro-commissioning, but first must be identified through benchmarking (i.e. the County's ENERGY STAR Portfolio Manager Account) or utility bill analysis, then screened by the Commissioning Oversight Committee to identify their potential so that County resources are strategically assigned.

A building's potential for improvement through the commissioning process is specific to each building; and its energy, operating, maintenance, and performance characteristics. Building identifiers have been anecdotally observed to loosely correlate known building attributes with a building's retro-commissioning potential. These criteria, indicated in Table 9 below, can be used as a screen to identify buildings where commissioning may be deployed cost-effectively.

Table 9: Building Opportunity Identifiers for Cost-Effective Retro-Commissioning

Identifier	Greater Potential	Less Potential
Building size	> 10,000 sq.ft.	<=10,000 sq.ft.
HVAC system age and condition	<=12 years	>12 years
HVAC system complexity	central plant systems	unitary systems
Building energy intensity	higher, varies by building type	lower, varies by building type
Building energy consumption	higher	
Building metering scheme	building level meter	no metering
Knowledge of building operational or performance problems	prevalent	few
Knowledge of planned major renovations	no major renovations are planned	major renovations are imminent, can be used to document building conditions and Owners Requirements prior to major renovation
Available current building documentation	available and current	not available and/or not current
Building control system technology	direct digital controls (DDC)	pneumatic controls
Building control system monitoring and trending capability	existing	not present

3.2.2 Project Prioritization

Project prioritization will be determined by the Commissioning Oversight Committee during its annual project selection meetings. It is in the intent of this Policy that all new construction and major and retrofit project be commissioned while existing buildings will be continuously evaluated and screened for retro- and re-commissioning opportunities as indicated in Figure 6 below.

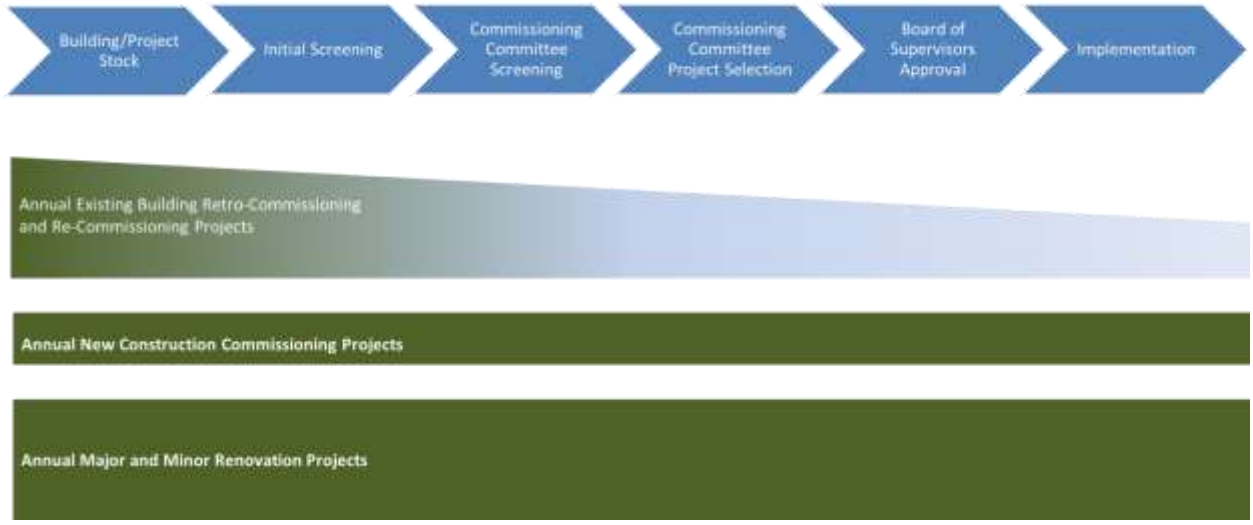

Figure 6: Commissiong Project Selection and Screening for One Year Cycle

The process for selecting commissioning projects is defined in Figure 7 and Figure 8 below. The existing building retro- and re-commissioning process is framed around building performance and operating characteristics, rather than planned construction activity. The hierarchy of questions is designed to support the flow of information in a round table environment, such as the Commissioning Oversight Committee meeting, where the decision tree will be leveraged to identify target buildings for commissioning. Buildings are first screened at a high level using quantifiable metrics such as building energy performance, and are only then filtered using more specific, then anecdotal criteria.

New construction and major renovation commissioning projects represent projects that are known explicitly within the departments but have not always been documented or communicated to General Services.

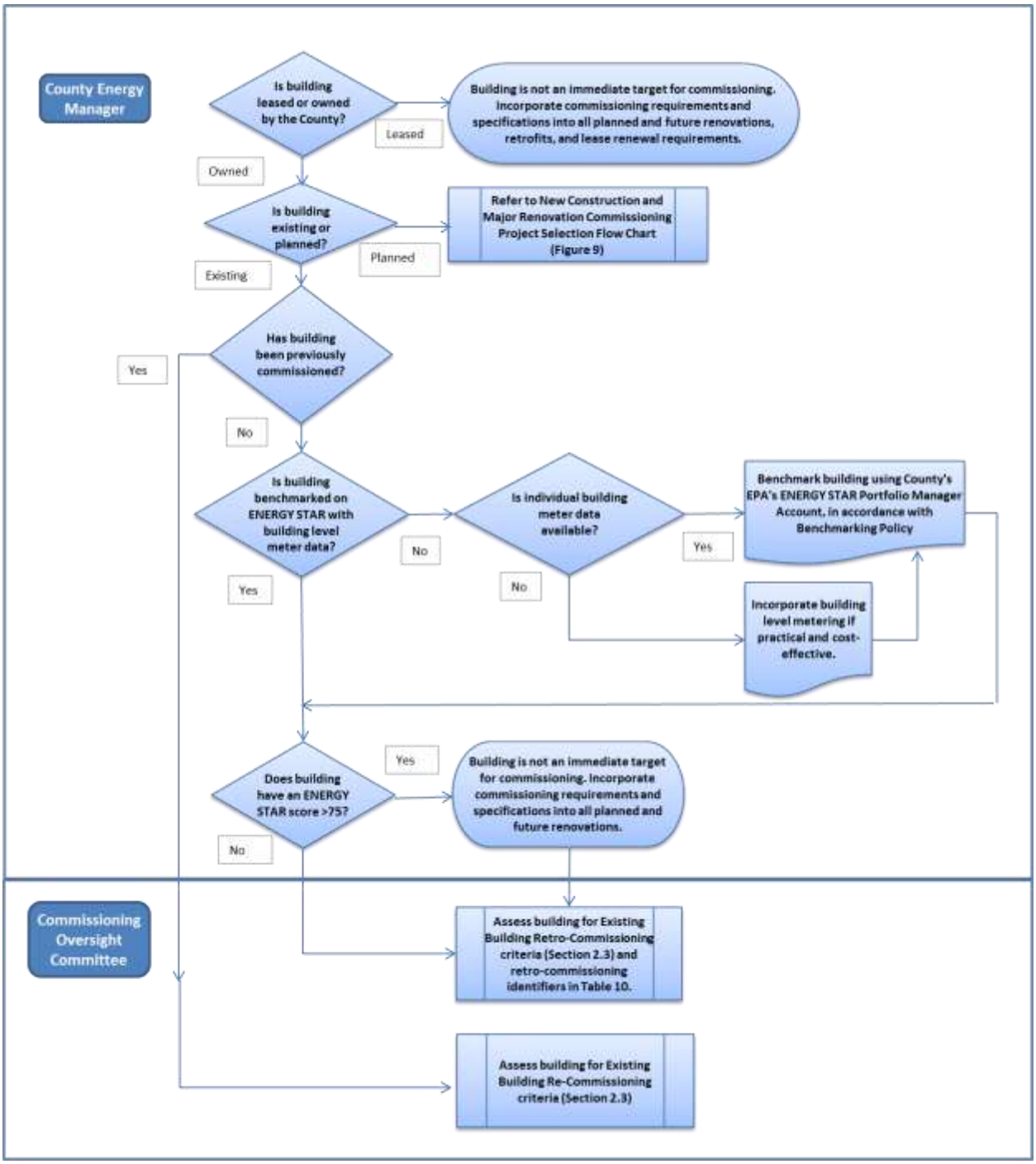

Figure 7: Existing Building Retro-Commissioning Project Selection

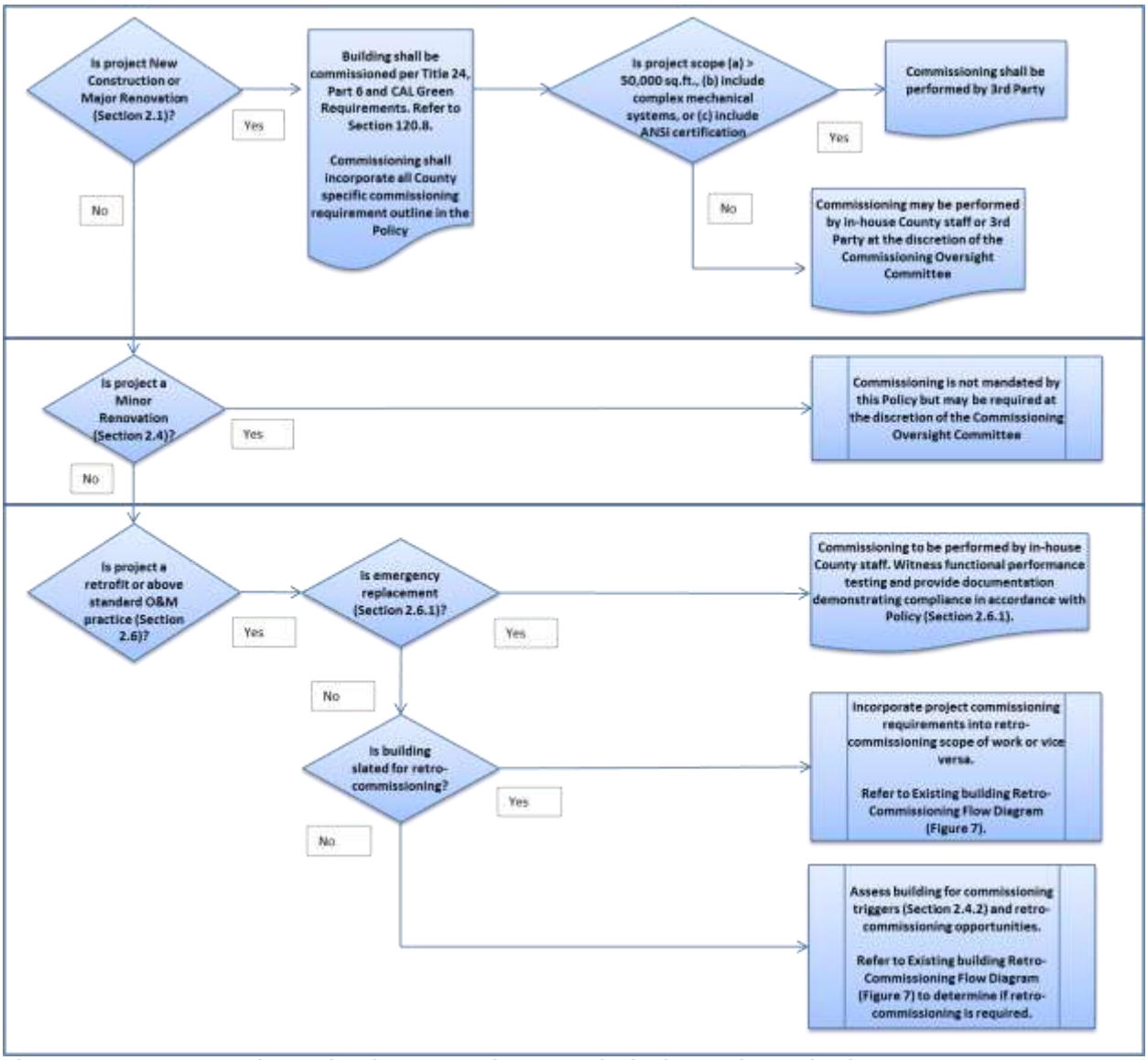

Figure 8: New Construction and Major Renovation Commissioning Project Selection

3.3 Commissioning Process Requirements

3.3.1 County Approved Commissioning and Retro-Commissioning Process

The following resources have been used to develop the County's new construction and major renovation and existing building retro-commissioning processes.

1) California Commissioning Guide: Existing Buildings; California Commissioning Collaborative (California Commissioning Collaborative, 2006).
2) California Commissioning Guide: New Buildings; California Commissioning Collaborative (California Commissioning Collaborative, 2006).
3) Retro-commissioning Program Toolkit for Local Governments; California Sustainability Alliance (California Sustainability Alliance, November 2012).

These processes define the County's expectations for the Commissioning processes, as well as the County's roles and responsibilities and opportunities to leverage the commissioning process for in-house training. Table 10 and Table 11 provide an overview of the new construction and major renovation commissioning and existing building retro- and re-commissioning process and key deliverables, respectively. These are general processes that apply more and less to all commissioning projects and will be adapted on a project by project basis by or with approval from the Commissioning Oversight Committee.

Table 10: New Construction and Major Renovation Commissioning Process Overview[33]

Process	Key Deliverables	Title 24, Part 6 Requirement and Guidance[34]
Pre-Design Phase		***Section 120.8 (a)-(i)***
● select an appropriate Commissioning Authority	● Owner's Project Requirements	refer to Section 120.8(b)
● Pre-Design Phase commissioning meeting	● Commissioning Plan	refer to Section 120.8(f)
Design Phase		
● Design Phase commissioning meeting	● Commissioning Plan	refer to Section 120.8(f)
● perform commissioning focused design review	● Regular commissioning progress reports	
● develop commissioning requirements for the specification	● Basis of Design and Design narrative	refer to Section 120.8(c)
● begin planning for verification checklists, function tests, Systems Manual, and training requirements	● Issues Log	
	● Design Phase Design Review	refer to Section 120.8(d)
	● Commissioning specifications for bid document	refer to Section 120.8(e)
Construction Phase		
● Construction Phase kick-off meeting	● Updated Commissioning Plan	refer to Section 120.8(f)
● review submittals, monitor development of Shop and Coordination Drawings	● Reports of submittal reviews	
● review O&M Manuals	● Completed verification checklists and functional test reports	refer to Section 120.8(g)
● performing on-going construction observation	● Systems Manual	refer to Section 120.8(h)
● perform verification checks	● Minutes from the commissioning meeting	
● perform diagnostic monitoring	● Issues Log	
● perform functional performance testing	● Commissioning progress reports	
● develop Re-commissioning Plan	● Commissioning Report	refer to Section 120.8(i)
● verify and review training of Owner's staff	● Systems operating training	refer to Section 120.8(h)
Occupancy/Operations /Warranty Phase		
● resolve outstanding commissioning issues	● Summary report from seasonal testing	
● perform seasonal / deferred testing	● Warranty review of each systems	
● perform near warranty-end review	● "As operated" sequence of operations	
	● Findings from Occupancy and Operations Phase	
	● Final Issues Log and Commissioning Report	refer to Section 120.8(i)

[33] Adapted from the California Commissioning Collaborative, California Commissioning Guide: New Buildings.
[34] The requirements and sections are as indicated in Title 24, Part 6 2013. This Policy establishes criteria for minimum commissioning requirements and shall be in accord with all County adopted codes and relevant ordinances.

Table 11: Existing Building Re- and Retro-Commissioning Process Overview[35]

Process	Key Deliverables
Planning Phase	
● project selection	● Owner's Operating Requirements
● define project objectives and obtain support	● Retro-commissioning Plan
● select a commissioning lead	
● document current operating requirements	
● perform an initial site walk through	
● assemble the retro-commissioning team	
● project kick off meeting	
Investigation Phase	
● review the facility documentation	● Diagnostic Monitoring Plan
● perform diagnostic monitoring	● Master List of Findings
● perform functional tests	● List of improvements selected for immediate implementation
● perform simple repairs	
● prioritize and select improvements	
Implementation Phase	
● implement selected operational improvements	● Implementation Plan
● verify results	● Implementation Summary Report
Hand-off Phase	
● training	● Final Report
● close out meeting	● Systems Manual
● implement persistence strategies	● Re-commissioning Plan

[35] Adapted from the California Commissioning Collaborative, California Commissioning Guide: Existing Buildings.

3.3.2 Mandatory Criteria for Requiring Commissioning in Major and Minor Renovations and Existing Buildings

Commissioning activity within the County can be triggered under different scenarios, specifically all new and planned construction activity as well as poor building operational and maintenance performance will result of the commissioning process outlined in Table 12. Those criteria alone are not sufficient to ensure the Policy will have influence across the range of County's buildings. New construction projects in the County account for a very small portion of the County's building portfolio. As indicated in Table 5, the County has significant stock in buildings less than 10,000 square feet, unique buildings that have no representative benchmark for performance comparison, and buildings that share common utility accounts and meters, limiting the number of buildings that could be quantitatively assessed for commissioning.

Table 12: Commissioning Triggers

Activity	New Construction and Major Renovation[36]	Minor Renovation Projects[37]	Tenant Improvements	Building Performance
Commissioning	X	X	X	
Retro-Commissioning		X	X	X
Re-Commissioning		X	X	X

As a result, the following requirements are in place to identify commissioning opportunities in buildings with planned construction activity, where commissioning in this Policy may otherwise have only been applied to the affected building systems. The Policy in effect, requires that for all planned construction, the project is provided by a Departmental Building Coordinator for consideration by the Commissioning Oversight Committee to select the building for commissioning activity. In such cases, commissioning of the planned construction activity should to the extent possible coincide and be integrated with the retro-commissioning requirement.

Planned Construction Activity

1) All new construction and major renovation projects and their affected systems.
2) All tenant improvements that result in changes to architectural layout (walls and ceilings), occupancy and occupancy density, use or function, and their affected systems.
3) All building minor renovation projects that directly or indirectly impacts the operational or maintenance performance of the building and its systems.
4) All equipment or system retrofit projects.

[36] Refer to Section 2.4 for Major Renovation and Minor Renovation Project definitions.
[37] Refer to Section 2.4 for Major Renovation and Minor Renovation Project definitions.

Additional Considerations

1) Buildings receiving above standard operational and maintenance activities.
2) Buildings with inefficient equipment, systems, and controls shall receive additional consideration beyond basic functionality[38].
3) Changes in building use or occupancy.
4) Onset of operational problems or other operational programmatic needs.

3.3.3 County Review, Approval, and Joint Acceptance Approach

This Policy requires County acceptance of all commissioning documents that are instruments of third-party commissioning teams. This ensures the County has ample input into the commissioning process that will lead to a high-performance building aligned with the County's Owners Project Requirements. Table 13 and Table 14 provide minimum acceptable County requirements for commissioning documents.

[38] The proponent for repair or modification to a facility with an inefficient system or control must produce a life-cycle cost analysis for replacement (or augmentation with) a modern efficient system when evaluating repair needs in excess of $5,000. This analysis must include an assumed time value of money (simple payback only is not acceptable) and must be presented to the County Facilities Manager and the County Energy Manager for review and approval. It is encouraged to use an engineering consultant for this analysisd. Repairs or modifications in excess of that amount can be made to inefficient systems only in emergency situations where the welfare of the County and public are at stake in a real manner as agreed by the County Facilities Manager and the County Energy Manager.

Table 13: New Construction and Major Renovation Review Criteria

Required Commissioning Documents	Minimum County Criteria		Minimum County Criteria
Pre-Design Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
select a commissioning lead	Commissioning authority must meet the following qualifications: 1) have relevant experience performing retro-commissioning for projects with similar systems and complexity		Commissioning authority must meet the following qualifications: 1) have relevant experience performing retro-commissioning for projects with similar systems and complexity
Owner's Project Requirements	Commissioning Oversight Committee and Departmental Coordinators author		Commissioning Oversight Committee and Departmental Coordinators author
Commissioning Plan	Third party authors		Commissioning Oversight Committee develops short-form plan with departmental coordinator
Design Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
Commissioning Plan	Third party authors		Commissioning Oversight Committee develops short-form plan with departmental coordinator
regular commissioning progress reports	Third party authors		Capital project manager provides, Commissioning Oversight Committee reviews
comments on the BOD and Design Narrative	Third party authors		Commissioning Oversight Committee authors
Issues Log	Third party authors, joint acceptance for 100% documents		Departmental coordinator or capital project manager authors, joint acceptance for 100% documents
commissioning specifications for bid document	Third party authors, capital project manager insures inclusion		Capital project manager provides, Commissioning Oversight Committee reviews
Construction Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
updated Commissioning Plan	Third party authors		Commissioning Oversight Committee develops short-form plan with departmental coordinator
reports of submittal reviews and training completion	Third party reviews		Capital project manager provides from contractor, Commissioning Oversight Committee reviews
completed verification checklists and functional tests	Third party authors, witnesses, and reviews		Capital project manager provides from contractor, Commissioning Oversight Committee reviews
Systems Manual	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides from contractor, Commissioning Oversight

Required Commissioning Documents	Minimum County Criteria		Minimum County Criteria
			Committee reviews (likely n/a)
minutes from the commissioning meeting	Third party authors		Capital project manager provides, Commissioning Oversight Committee reviews
Issues Log	Third party authors, joint acceptance for substantial completion		Departmental coordinator or capital project manager authors, joint acceptance for 100% documents
commissioning progress reports	Third party authors		Capital project manager provides, Commissioning Oversight Committee reviews
Commissioning Report	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Occupancy/Operations/ Warranty Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
summary report from seasonal testing	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
warranty review of each systems	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
"as operated" sequence of operations	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides from contractor, Commissioning Oversight Committee reviews
findings from Occupancy and Operations Phase	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
final Issues Log and Commissioning Report	Third party authors, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews

Table 14: Existing Building Re- and Retro-Commissioning Review Criteria

Required Commissioning Documents	Minimum County Criteria		Minimum County Criteria
Planning Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
Select a commissioning lead	Commissioning authority must meet the following qualifications: 1) have relevant experience performing retro-commissioning for projects with similar systems and complexity		Commissioning authority must meet the following qualifications: 1) have relevant experience performing retro-commissioning for projects with similar systems and complexity
Owner's Operating Requirements	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Retro-commissioning Plan	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Investigation Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
Diagnostic Monitoring Plan	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Master List of Findings	Third-party provides, Commissioning Oversight Committee reviews ● List of Findings shall include description of measure, estimated energy savings, estimated implementation costs, list of non-energy benefits, and life-cycle cost analysis for all measures with a SPP > 3 years. ● Measures shall include interactive effects and shall be documented by means approved by County Energy Manager or Capital Projects Project Manager at project kick-off.		Capital project manager provides, Commissioning Oversight Committee reviews ● List of Findings shall include description of measure, estimated energy savings, estimated implementation costs, list of non-energy benefits, and life-cycle cost analysis for all measures with a SPP > 3 years. ● Measures shall include interactive effects and shall be documented by means approved by County Energy Manager or Capital Projects Project Manager at project kick-off.
List of improvements selected for immediate implementation	Third-party provides, Commissioning Oversight Committee reviews ● Measures shall be selected based on greatest net present value. ● All measures with SPP < 12 months shall be implemented. ● List of Findings shall be prioritized in by net present value or cost-to-benefit analysis in accordance with NIST		Capital project manager provides, Commissioning Oversight Committee reviews ● Measures shall be selected based on greatest net present value. ● All measures with SPP < 12 months shall be implemented. ● List of Findings shall be prioritized in

Required Commissioning Documents	Minimum County Criteria		Minimum County Criteria
	Handbook 135.		by net present value or cost-to-benefit analysis in accordance with NIST Handbook 135.
Implementation Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
Implementation Plan	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Implementation Summary Report	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Hand-off/Verification Phase	***THIRD PARTY Commissioning***		***IN-HOUSE Commissioning***
Final Report	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Systems Manual	Third-party provides, Commissioning Oversight Committee reviews		Capital project manager provides, Commissioning Oversight Committee reviews
Re-commissioning Plan	Third-party provides, Commissioning Oversight Committee reviews		Commissioning Oversight Committee authors

3.4 County Resource Requirements

3.4.1 Roles and Responsibilities

This Policy identifies and assigns roles and responsibilities to County staff that play a key role in the commissioning processes. The County staff below make-up the Commissioning Oversight Committee but may also have distinct commissioning roles aside from the committee. Roles and responsibilities are identified in Table 15 and Table 16 below.

County Energy Manager

The County Energy Manager's primary role is to act on behalf of the County as the lead energy guru. The County Energy Manager will:

1) Coordinate with the Department Building Coordinators to identify existing and new construction projects that are good candidates for the commissioning process.
2) Lead the Commissioning Oversight Committee commissioning review and selection process.
3) Receive County Board of Supervisors approval for upcoming fiscal year commissioning projects.
4) Report to the County Board of Supervisors previous year and Policy successes.

County Facilities Manager

The County Facilities Manager's primary role is to act on behalf of the County as the lead maintenance and facility conditions and history expert. The County Facilities Manager will:

1) Identify ongoing maintenance issues and concerns to avoid.
2) Comment on proposed designs and equipment.
3) Identify "repeat offenders" ready for retro-commissioning.

County Architect

The County Architect's primary role is to act on behalf of the County as an additional facility conditions and history expert. The County Architect will:

1) Identify ongoing maintenance issues and concerns to avoid.
2) Comment on proposed designs and equipment.
3) Identify "repeat offenders" ready for retro-commissioning.

Capital Projects Project Manager

Unbder the direction of the Capital Projects Manager, the Project Manager's primary role is to represent the County's interest in proper design and construction implementation of the commissioning process. The Capital Projects Project Manager will:

1) Participate in the Commissioning Oversight Committee commissioning review and selection process.
2) Assist in developing commissioning scope of work and specifications.

Department Building Coordinators

The Department Building Coordinators primary role is to act as the primary communicator on behalf of their department in representing new construction and existing building retrofit, renovation, and above standard operational and maintenance activity. The Department Building Coordinator will:

1) Coordinate with the County Energy Manager to identify existing and new construction projects that are good candidates for the commissioning process.
2) Provide the County Energy Manager a listing of all upcoming year planned construction activity.
3) Participate in the Commissioning Oversight Committee commissioning review and selection process.
4) Follow up on requests by the Commissioning Oversight Committee for additional information.
5) Be responsible for all budgeting, planning, and implementation activity resulting from Commissioning Oversight Committee selected commissioning projects.
6) Providing and annually updating the County Energy Manager energy performance results from all commissioning activity occurring in said department.

Table 15: New Construction and Major Renovation Commissioning Process - Participation Roles and Responsibilities[39]

Legend L - Lead S - Support A - Approve P - Participate I - Inform V - Verify (→ is the symbol for commissioning deliverable)	Commissioning Oversight Committee Member	Department Building Coordinator		Commissioning Oversight Committee Member	Department Building Coordinator
Pre-Design Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
Select a commissioning lead	L/A/S/P	S		L	
Pre-Design Phase commissioning meeting	P	P		L	P
Develop preliminary commissioning Scope of Work	L/S/P	S		L	S
Establish budget for all commissioning work and integrate costs for commissioning into project budget	S	L		S	L
→ Owner's Project Requirements	L/A/S	S		L/S	S
→ Commissioning Plan	L/S	S		L	S
Design Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
Design Phase commissioning meeting	P			L	P
Perform commissioning focused design review	I/P			L/A	
→ Commissioning Plan	A/I	I		L	I
Develop commissioning requirements for the specification	I/P/S	I		L	I
Begin planning for verification checklists, function tests, Systems Manual, and training requirements	I/P/S			L	
→ Regular commissioning progress reports	A				
→ Comments on the Basis-of-Design and Design Narrative	A			L	A
→ Issues Log	A			L/A	
→ Commissioning specifications for bid document	A/I			L/A	I
Construction Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
Construction Phase kick-off meeting	P			P	
Review submittals, monitor development of Shop and Coordination Drawings	A			A	
Review O&M Manuals	A/I/S			A	
Performing on-going construction observation	P			L/V	
Perform verification checks	I/P			L/V	
Perform diagnostic monitoring	I/P			**L/V**	

[39] Adapted from the GSA, the building commissioning guide and the California Commissioning Collaborative, California Commissioning Guide: New Buildings

Legend **L - Lead** **S - Support** **A - Approve** **P - Participate** **I - Inform** **V - Verify** **(→ is the symbol for commissioning deliverable)**	**Commissioning Oversight Committee Member**	**Department Building Coordinator**		**Commissioning Oversight Committee Member**	**Department Building Coordinator**
Perform functional testing	I/P			L/V	
Develop Re-commissioning Plan	I/P/A	P		L	P
Verify and review training of Owner's staff	I/A			L	
→ Updated Commissioning Plan	A			L	
→ Reports of submittal reviews and training completion	A			L	
→ Completed verification checklists and functional tests	A			L	
→ Systems Manual	A			L	
→ Minutes from the commissioning meeting	A	P			
→ Issues Log	I/A	A		L/V/A	A
→ Commissioning progress reports	I/A				
→ Commissioning Report	A			L	
Occupancy/Operations/Warranty Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
Resolve outstanding commissioning issues	I/P/A			I/P/A	
Perform seasonal / deferred testing	I/P/A	I		L	I
Perform near warranty-end review	P/A			L	
→ Summary report from seasonal testing	A			L	
→ Warranty review of each systems	A			L	
→ "As-Operated" sequence of operations	A			A	
→ Findings from Occupancy and Operations Phase	A			L	
→ Final Issues Log and Commissioning Report	A			L/A	
Tenant / Occupant Training	A/S/P	S/P		L/A	S/P

Table 16: Existing Building Re- and Retro-Commissioning Process – Participation Roles and Responsibilities[40]

Legend **L - Lead** **S - Support** **A - Approve** **P - Participate** **I - Inform** **V - Verify** **(→ is the symbol for commissioning deliverable)**	**Commissioning Oversight Committee Member**	**Department Building Coordinator**		**Commissioning Oversight Committee Member**	**Department Building Coordinator**
Planning Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
Select project	L	S		L	S
Define project objectives and obtain support	L	S		L	S
Select a commissioning lead	L/A/S/P	S		L	
Develop preliminary commissioning Scope of Work	L/S/P	S		L	S
Establish budget for all commissioning work and integrate costs for commissioning into project budget	S	L		S	L
→ Document the current Owner's Operating Requirements	L/A/S	S		L/S	S
Perform an initial site walk through	P	S		L	P
→ Retro-commissioning Plan	L/S	S		L	S
Assemble the retro-commissioning team		L		L	
Project kick off meeting	P	P		L	P
Investigation Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
Review the facility documentation	I/P	S		L	S
→ Diagnostic Monitoring Plan	I/S/A			L	
Perform diagnostic monitoring	I/P			L/V	
Perform functional tests	I/P			L/V	
Perform simple repairs	I/A			L	
→ Master List of Findings	I/A	A		L/V/A	A
→ List of improvements selected for immediate implementation	A	A		L	A
Implementation Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
→ Implementation Plan	A				
Implement selected operational improvements	P/V			L/V	
Verify results	A			L/V	

[40] Adapted from the GSA, the building commissioning guide and the California Commissioning Collaborative, California Commissioning Guide: Existing Buildings

Legend **L - Lead** **S - Support** **A - Approve** **P - Participate** **I - Inform** **V - Verify** **(→ is the symbol for commissioning deliverable)**	**Commissioning Oversight Committee Member**	**Department Building Coordinator**		**Commissioning Oversight Committee Member**	**Department Building Coordinator**
→ Implementation Summary Report	A			L	
Hand-off / Verification Phase	***THIRD PARTY Commissioning***			***IN-HOUSE Commissioning***	
→ Final Report				L	
→ Systems Manual				L	
→ Re-commissioning Plan	I/P/A	P		L	P
Training	I/P	P		L	P
Close out meeting					
Implement persistence strategies	S	L		S	L
Tenant / Occupant Training	A/S/P	S/P		L/A	S/P

3.5 Cost of Compliance and Budgeting Approach

3.5.1 New Construction and Major Renovations Commissioning and Existing Building Re- and Retro-Commissioning

The County Five-Year Capital Improvement Program (CIP) budget includes line-item budgeting for funded and unfunded projects. The *Major Improvement to Building Facilities* data is used to project estimates for the cost of commissioning for Major and Minor Renovation under the purview of this Policy. Estimates for New Construction projects have been omitted, as new construction projects (as it pertains to this Policy) have historically represented a small constituent of County construction.

Retro- and re-commissioning cost estimates are based on the criteria and assumptions established in Section 1.1 and Figure 1 and Figure 2. It assumes retro-commissioning is performed on the County's largest 9 buildings (buildings greater than 30,000 sq.ft.) over the five-year period immediately following the adoption of this Policy. Subsequent years would see retro-commissioning performed at a rate of 20% for the remaining County owned and operated buildings greater than 10,000 sq.ft. with retro-commissioned buildings re-commissioned on average every 5 years. Table 17: Initial Commissioning Budget Assumption Matrix was used as the basis for costs estimating using retro-commissioning and re-commissioning cost basis of $0.27/sq.ft. and $0.13/sq.ft., respectively.

Figure 9 below shows the cumulative aggregate[41] County potential for utility bill financial savings in contrast to the annual estimated costs of commissioning through a 2020 planning horizon. The disparity between cumulative savings and annual costs support the cost-effectiveness of commissioning and its potential to bring long-term energy savings to the County.

[41] Includes commissioning for major and minor renovations and retro- and re-commissioning projects.

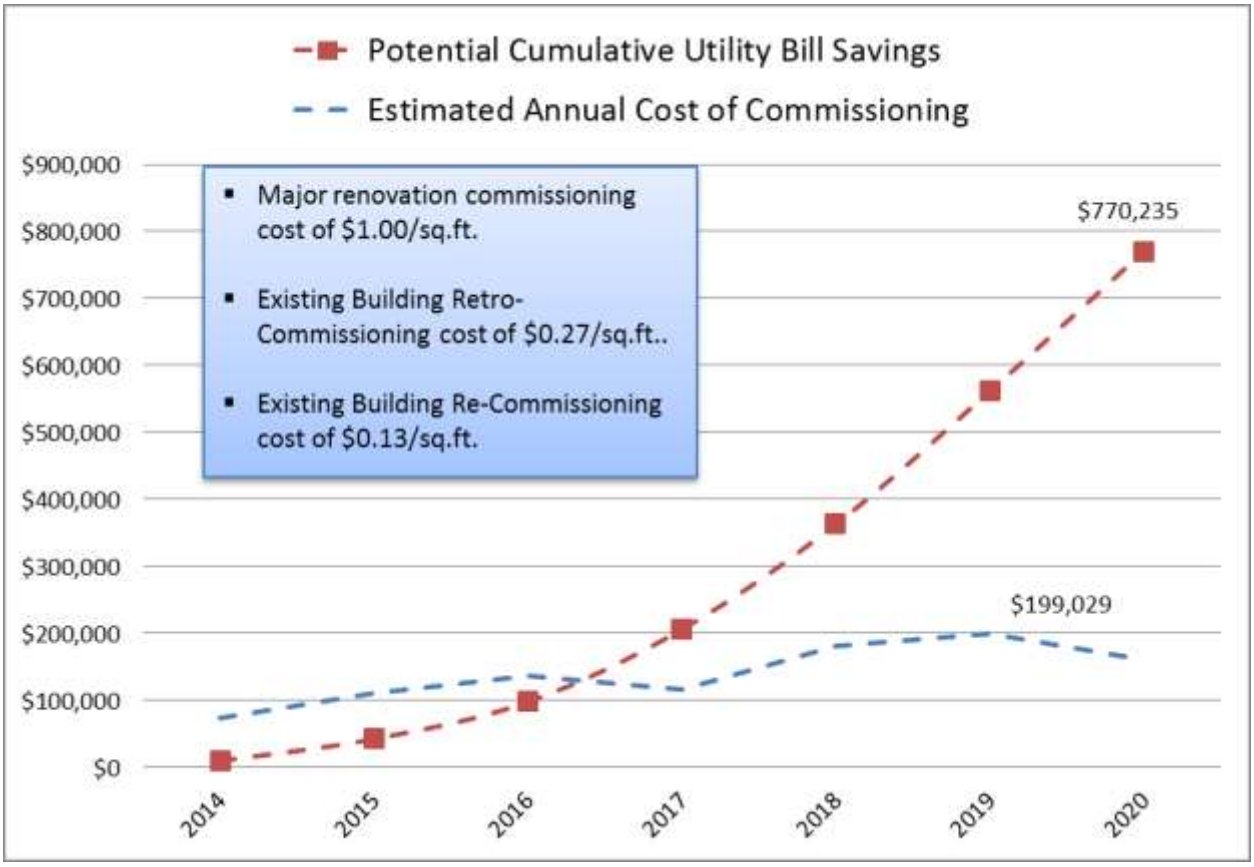

Figure 9: Estimated Costs and Benefits Commissioning[42]

3.5.2 Funding Sources

The Board of Supervisors will approve commissioning projects; funding for approved projects should be appropriated by the department from the appropriate funding source or as otherwise appropriated by the Board of Supervisors.

Departments are encouraged to update their annual budget to include funding for all anticipated new construction and major renovation commissioning, and existing building retro- and re-commissioning projects, as selected by the Commissioning Oversight Committee. Robust budgets should include the costs of commissioning (e.g. external resources, equipment, etc.) and internal departmental staff resources required for implementation with initial estimates taken from Table 17 below and final budgeting numbers from a building assessments provided by third-party.

Departments are encouraged to provide for the Commissioning Oversight Committee's review of their departments commissioning line-item budgeting allowance for before incorporation into the department's final budget plan.

[42] The total cost of commissioning is estimated for both retro-commissioning as well as estimates for major renovations. The benefits (cost savings) are estimated from retro-commissioning projects only.

Table 17[43]: Initial Commissioning Budget Assumption Matrix

Service	Cost for Office Space Per sq.ft.	Cost for 24 Hour/Essential Service Facility Per sq.ft.
New Construction and Major Renovation Commissioning	$1.00 - $1.30	$1.00 - $1.30
Minor Renovation Commissioning	$0.50 - $0.65	$0.50 - $0.65
Existing Building Retro-Commissioning	$0.13 to $0.27	$0.41 to $0.45
Existing Building Re-Commissioning	varies	varies

Commissioning for new construction projects are anticipated to be funded from the project's funding sources, and retro- and re-commissioning projects from funding sources that include the projects funding source, departmental Operating and Maintenance Funds, utility incentives, and other non-traditional financing mechanisms such (e.g. possible Commissioning Revolving Fund) as indicated in Figure 10 and discussed below in Section 3.5.3.

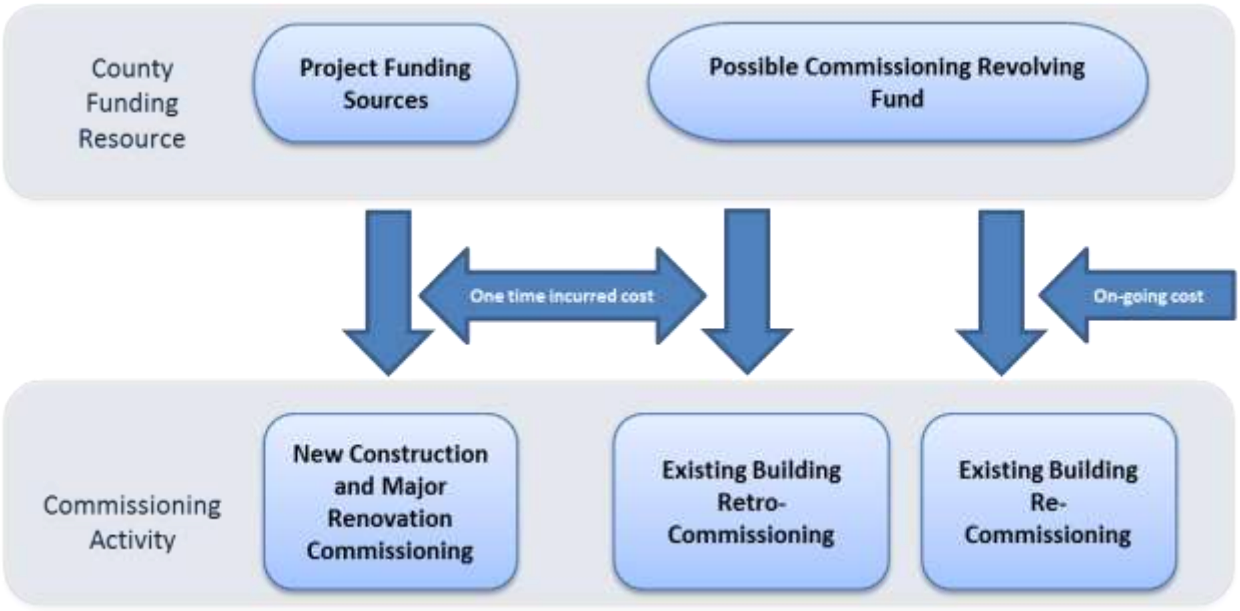

Figure 10: Commissioning Activity Funding Sources

For retro- and re-commissioning projects it's possible to further quantify fee and reduce commissioning cost by: 1) contacting a contractor to perform a site assessment and 2) leveraging other commissioning projects in parallel for economies of scale within departments or across the County portfolio. For projects with limited funding available for commissioning, Departments should consider reducing or eliminating discretionary Architectural spending to allow for proper system commissioning.

[43] Values in table should be revisited annually by the Commissioning Oversight Committee to reflect calculated rates from previous year projects and industry pricing.

3.5.3 Possible Funding Mechanisms

Commissioning Revolving Fund

One recommended funding mechanism is a County established Commissioning Revolving Fund (CRF), which would be approved by a future Board of Supervisor's action. A CRF creates a County "commissioning fund" to retain energy savings from commissioned projects. This money is used as "seed money" to fund or subsidize future commissioning projects and creates a self-perpetuating funding vehicle. Project energy savings would be applied to the fund for a set timeframe, after that, departments would begin to realize the energy savings through reduced utility bill costs. Non-energy benefits (e.g. improved indoor environment and reduced worker absenteeism) are unaffected by the CRF and are realized by the departmental tenant upon completion of the commissioning project.

Leveraging Utility Incentives

To the extent possible the County should leverage available utility incentives, such as SCE's Commercial Retro-Commissioning Program. Incentives are available for projects deemed to have sufficient retro-commissioning opportunity, as identified during the initial scoping phase, and are paid directly to the Commissioning provider to cover the costs of the Investigation Phase. Because not all retro-commissioning projects are ideal candidates for utility incentives, departments should assess buildings for applicability early in the planning and budgeting phase.

3.6 Training

A key component of commissioning is the training of building operations and maintenance staff. Traditionally, training is conducted upon successful implementation of the commissioning plan; either at the end of the *construction phase* or during the *hand-off/verification* phase for commissioning and retro-commissioning projects, respectively.

This Policy positions County staff, specifically Department and County facilities personnel front-and-center in commissioning process. The County can acquire significant benefits by integrating department staff in support roles throughout the commissioning process. Buy-in is created when department staff are integrated in the process and understand how and why improvements were undertaken. This can reduce County commissioning costs and provide properly trained staff with the tools and skillsets to implement persistence saving strategies, and ultimately be trained to provide in-house commissioning for select projects.

Table 18 and Table 19 identify new construction and major renovation commissioning and existing building retro- and re-commissioning opportunities for the training of County staff.

Table 18: New Construction and Major Renovation Commissioning – In-House County Training Opportunities

Legend (→ is the symbol for commissioning deliverable)	Commissioning Oversight Committee Member	Department Building Coordinator / Facilities Group
Pre-Design Phase		
select a commissioning lead	X	
Pre-Design Phase commissioning meeting	X	X
develop preliminary commissioning Scope of Work	X	
establish budget for all commissioning work and integrate costs for commissioning into project budget	X	X
→ Owner's Project Requirements		X
→ Commissioning Plan	X	X
Design Phase		
Design Phase commissioning meeting	X	X
perform commissioning focused design review	X	
→ Commissioning Plan	X	X
develop commissioning requirements for the specification	X	
begin planning for verification checklists, function tests, Systems Manual, and training requirements		X
→ regular commissioning progress reports		X
→ comments on the Basis-of-Design and Design Narrative	X	
→ Issues Log	X	X
→ commissioning specifications for bid document	X	
Construction Phase		
Construction Phase kick-off meeting	X	X
review submittals, monitor development of Shop and Coordination Drawings	X	
review O&M Manuals	X	
performing on-going construction observation		X
perform verification checks	X	X
perform diagnostic monitoring		X
perform functional testing		X
develop Re-commissioning Plan	X	X
verify and review training of Owner's staff		X
→ updated Commissioning Plan		X
→ reports of submittal reviews and training completion		X
→ completed verification checklists and functional tests		X
→ Systems Manual		X

Legend (→ is the symbol for commissioning deliverable)	Commissioning Oversight Committee Member	Department Building Coordinator / Facilities Group
→ minutes from the commissioning meeting		X
→ Issues Log		X
→ commissioning progress reports		X
→ Commissioning Report	X	X
Occupancy/Operations/Warranty Phase		
resolve outstanding commissioning issues	X	X
perform seasonal / deferred testing		X
perform near warranty-end review		X
→ summary report from seasonal testing		X
→ warranty review of each systems		X
→ "as operated" sequence of operations		X
→ findings from Occupancy and Operations Phase	X	X
→ final Issues Log and Commissioning Report	X	X

Table 19: Existing Building Re- and Retro-Commissioning – In-House County Training Opportunities

Legend (→ is the symbol for commissioning deliverable)	Commissioning Oversight Committee Member	Department Building Coordinator / Facilities Group
Planning Phase		
select project	X	
define project objectives and obtain support	X	
select a commissioning lead	X	X
develop preliminary commissioning Scope of Work	X	
establish budget for all commissioning work and integrate costs for commissioning into project budget		X
→ document the current Owner's Operating Requirements		X
perform an initial site walk through	X	X
→ Retro-commissioning Plan	X	X
assemble the retro-commissioning team	X	X
project kick off meeting	X	X
Investigation Phase		
review the facility documentation		X
→ Diagnostic Monitoring Plan	X	X
perform diagnostic monitoring		X
perform functional tests		X
perform simple repairs		X
→ Master List of Findings		X
→ List of improvements selected for immediate implementation	X	X
Implementation Phase		
→ Implementation Plan		X
implement selected operational improvements	X	X
verify results		X
→ Implementation Summary Report	X	X
Hand-off / Verification Phase		
→ Final Report	X	X
→ Systems Manual		X
→ Re-commissioning Plan	X	
training		X
close out meeting	X	X
implement persistence strategies		X

3.7 Leveraging Industry Resources and Best Practices

The County has two building policy frameworks that can be leveraged to ensure successful implementation of the Commissioning and Retro-Commissioning Policy. They are: Facilities Policy Framework and Sustainable Public Architecture Policy. Both of these documents have been approved by the County Board of Supervisors and provide the Policy a context that emphasizes its relevancy within County operations.

Likewise, there are numerous commissioning standards and resources that have been compiled that the County can leverage to supplement the Policy and facilitate consistent documentation throughout the commissioning process. Some of these resources are listed in Table 21 and Table 21 below.

Table 20: Existing Building Retro-Commissioning Template Documents and Resources Available

Resource	Located at (as of May 2013):	General Resource / Process / Practices / Benefits	Market Sector / Equipment Specific Guidelines	RCx Project Selection	Owner's Program Requirements	RCx Implementation Plan	Specifications	RCx RFP Checklist	Plans / Checklists / Reports
California Sustainability Alliance; Retro commissioning Program Toolkit for Local Governments; November 2012	http://www.lgc.org/freepub/energy/newsletter/winter2013/page05.html	X		X		X			
California Commissioning Collaborative; California Commissioning Guide; Existing Buildings; CEC-500-2006-75; 2006	http://www.cacx.org/resources/documents/CA_Commissioning_Guide_Existing.pdf	X							
A Retro commissioning Guide for Building Owners	http://www.peci.org/sites/default/files/epaguide_0.pdf	X			X	X	X	X	
ASHRAE Advanced Guideline	https://www.ashrae.org/	X	X						

Resource	Located at (as of May 2013):	General Resource / Process / Practices / Benefits	Market Sector / Equipment Specific Guidelines	RCx Project Selection	Owner's Program Requirements	RCx Implementation Plan	Specifications	RCx RFP Checklist	Plans / Checklists / Reports
Series									
U.S Energy Star Building Upgrade Manual	http://www.energystar.gov/ia/business/EPA_BUM_Full.pdf	X	X						
Commissioning for Federal Facilities	http://www1.eere.energy.gov/femp/pdfs/commissioning_fed_facilities.pdf	X							
Retro-Commissioning Handbook for Facility Managers	http://www.oregon.gov/ENERGY/CONS/BUS/comm/docs/retrocx.pdf	X		X	X	X	X	X	X
Federal Energy Management Program, Operations and Maintenance Best Practices	http://www1.eere.energy.gov/femp/pdfs/omguide_complete.pdf	X							

Table 21: New Construction and Major Renovation Commissioning Template Documents and Resources Available

Resource	Located at (as of May 2013):	General Resource / Process / Benefits	Market Sector / Equipment Specific	Construction and Design Review Checklist	OPR	Specs	RFP Checklist / Sample Contract	Plans / Checklists / Reports	BOD
California Commissioning Collaborative; California Commissioning Guide; New Buildings; 2006	http://www.cacx.org/resources/documents/CA_Commissioning_Guide_New.pdf	X							
2013 Energy Efficiency Standard, Title 24, Part 6		X		X					
ASHRAE Guideline 0-2005	https://www.ashrae.org/	X			X	X	X	X	X
ASHRAE Handbook	https://www.ashrae.org/	X	X						
Commissioning for Federal Facilities	http://www1.eere.energy.gov/femp/pdfs/commissioning_fed_facilities.pdf	X							
A Guide to Building Commissioning	http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-21003.pdf	X					X	X	
GSA; the building commissioning guide	http://www.wbdg.org/ccb/GSAMAN/buildingcommissioningguide.pdf	X							

4 Tracking Success, Providing Recognition, and Maintaining Persistence in Commissioning

4.1 Sharing Best Practices and Providing Recognition

It is the County's intent to communicate the results of this Policy to promote the collaboration of best practices within and across County departments and provide transparency to the local community leaders and constituents. As such, case studies serving as "example projects" will be required for select projects as determined by the Commissioning Oversight Committee. Projects may be selected based on scope, budget, and ability to replicate benefits across the County's departments and portfolio.

This Policy directs the Commissioning Oversight Committee to develop a basic case study framework for departments that addresses the following minimum criteria:

1) Project selection determinants.
2) Existing building energy consumption (or new building projected consumption).
3) Realized energy benefits.
4) Realized non-energy benefits.
5) Estimated annual utility bill cost savings.

Furthermore, this Policy directs the County to establish a communications plan for reporting Policy success that has capability to provide both internal and outward facing communications that could a centralized website and repository.

4.2 Tracking Energy Savings and Monitoring Success

All commissioning projects shall include cost effective measurement and verification strategies that are commensurate with the project's cost and complexity of its systems and equipment, to aid in the verification, monitoring, and tracking of energy and operational and maintenance performance. Measurement and verification shall be consistent with the latest methods stipulated in the International Performance Measurement and Verification Protocol (IPMVP) and supplemented by data available through the County's Maintenance Connection software and Utility Manager System, or as otherwise stipulated by the Commissioning Oversight Committee. Building performance data will be used by the County to:

1) Track individual building energy and utility bill financial savings.
2) The basis for demonstrating savings and reporting Policy success to the County Board of Supervisors.
3) Identify irregularities in building performance for corrective action.
4) Identify changes in building performance that are indicators of long-term building degradation and need for re-commissioning.

Select projects (as determined by the Commissioning Oversight Committee) shall integrate building-level metering with the County's Utility Management System (UMS) and County controls front-end system to facilitate real time measurement and verification and trending of building system and equipment performance and response to changes in building performance and reporting to the ENERGY STAR Portfolio Manager. This feature of the UMS is being

installed in key County buildings to track on-going energy use and will help the County identify and respond to anomalies in energy usage. New construction and major renovation projects, existing buildings identified as commissioning priorities, and building situated on campus environments (e.g. Calle Real/San Antonio Campus) are good candidates.

5 Specifications and Set-Points

5.1 Specifications, Minimum Content

The following specifications will be incorporated into the project documentation for all new construction and retro-commissioning projects. The specifications are to be customized on a per project basis by the Capital Projects Division of General Services and further customized by the project design teams responsible for the specifications in larger projects.

5.1.1 Commissioning Specifications

01 91 13 General Commissioning Requirements [*current version available from Capital Projects Group*]

22 08 00 Commissioning of Plumbing Systems [*current version available from Capital Projects Group*]

23 08 00 Commissioning of HVAC Systems [*current version available from Capital Projects Group*]

26 08 00 Commissioning of Electrical Systems [*current version available from Capital Projects Group*]

5.1.2 Control System Specifications

23 09 23 HVAC Controls [*current version available from Capital Projects Group*]

25 55 00 Integrated Automation Control of HVAC [*current version available from Capital Projects Group*]

5.1.3 Test and Balance Specifications

23 05 93 Testing Adjusting and Balancing for HVAC [*current version available from Capital Projects Group*]

5.2 HVAC Set-Points

The following HVAC system set-points are required for all new construction commissioning and existing building retro-commissioning. Departments may request a variance through General Services to maintain heating and cooling temperature set-points within the guidelines established by The Occupational Safety and Health Administration (OSHA) Office Limits for Temperature.

1) Effective December 2013, HVAC settings shall be 69°F for heat and 73°F for cooling for all County of Santa Barbara facilities.
2) Effective December 2014 the HVAC settings shall be 69°F for heat and 74°F for cooling for all County of Santa Barbara facilities.

Exceptions:

a) These limits shall not apply in areas where other temperature settings are required by law or by specialized needs of equipment, server rooms, or scientific experimentation.
b) For County office spaces with limited or no heating and cooling:
    i. If a building does not have a cooling system or a proper cooling system, then the cooling setting shall not apply or shall be set higher.
    ii. If a building does not have a heating system or proper heating system, then the 69°F heating setting shall not apply or should be set lower.

1) Per the County of Santa Barbara Energy Action Plan, domestic hot-water temperature set points should not be set above 115°F.

Exceptions:

a) These limits shall not apply in areas where other temperature settings are required by law or by specialized needs of equipment or scientific experimentation.

Appendix A: Definitions and Acronyms

Commissioning Oversight Committee

A consensus based committee consisting of County of Santa Barbara staff that includes the County Energy Manager, County Facilities Manager, County Architect, and select staff from Capital Projects and County departments. The role of the Commissioning Oversight Committee is to annually identify, review, and select commissioning and retro-commissioning projects for County Board of Supervisors approval.

Utility Manager System (UMS)

Building energy performance management system that tracks the County's owned and operated building energy consumption data. When paired with building level-metering it can be used to facilitate real time measurement and verification, trending of building system and equipment performance, and response to changes in building performance. The County is establishing a bridge that will allow direct reporting to the County's ENERGY STAR Portfolio Manager Account. This Policy requires that all County owned and operated buildings energy generation and utility consumption[44] be reported through the County's UMS.

Maintenance Connection

Building maintenance front-end software operated by the County's Facility Group that manages, maintains, coordinates, and records County owned and operated building maintenance and operations activities. The software's Service Request function includes building tenant complaint logs at the campus, building, and room level; and all maintenance and preventative maintenance activities at the building and individual equipment level. The software also acts as a repository for building documentation such as architectural and engineering documents, construction photos to the extent that they are available.

Inefficient Equipment, Systems, and Controls

Inefficient systems and controls are defined as including but not limited to motors greater than 5hp at constant speed, single axial fan driven forced air HVAC, constant volume ducted air systems with duct branches numbering three or greater, always-on systems in zones with cyclical occupancy, HVAC schedules in place as a "band aid fix" for persistent maintenance issues, HVAC controllers 3 years old or newer used for thermostatic only control, etc.

Major and Minor Improvements to Existing Buildings and Facilities (Refer to Section 2.4)

[44] This includes utilities consumed by the County but paid for by others as in a County leased and tenanted building and facilities (e.g. under a full-service lease agreement.) This includes all utilities consumed by all County Departments (structures, facilities, equipment, etc.) at the meter level.

Modern Equipment and Controls

Modern efficient systems and controls are defined as including features such as CO2 demand control ventilation, variable refrigerant volume systems, temperature set point reset featuring trim and respond logic, duct static pressure set point reset featuring trim and respond logic[45], rogue zone adverse programming[46], dual maximum logic[47] for fan coil reheat type equipment, differential pressure control of hydronic systems with 2-way valves and variable speed motor drives, etc.

[45] Trim and Logic is modern control strategy that can mitigate rogue zone control by responding to zone control requests only after multiple zones meet the set point criteria.

[46] Rogue zones refer to heating and cooling zones, often served by broken or improperly operating terminal devices or external environmental conditions, which reduce control system performance.

Appendix B: Santa Barbara County Case Studies

Casa Nueva Project

The Casa Nueva[48] [49] project was constructed in 2003 by the County of Santa Barbara. It was built as a high performance building and model for the County for sustainability and energy efficiency. It was honored in the *Savings By Design Energy Efficiency Integration Design Award Program* with the highest award. Although designed to be 20% more efficient than California's Title 24 and incorporated sustainable features, materials, and water efficiency, the 28,000 square foot office building and its systems were never commissioned and the building began to experience operational problems within a few months of occupancy.

After years of operating below par and as one of the County's worst performers, in 2009 the County Board of Supervisors approved the building for retro-commissioning. The retro-commissioning effort is directly responsible for the reduction in occupant complaints and improving the building's energy performance; resulting in savings that is benefiting County through reduced operational and maintenance costs. Although the retro-commissioning effort was successful, it was not able to recoup stranded costs, or those costs incurred during the design and construction processes that may have been avoided through the commissioning process.

The building is an example that high performance design alone is not sufficient to guarantee a building will operate as a high performance building. Engaging the commissioning process from pre-design through the occupancy and warranty periods can identify and resolve potential operational and performance issues before they become real problems and become more difficult and costly to resolve.

[48] http://www.sbcapcd.org/grnbldg.htm; http://www.savingsbydesign.com/award-winners/2005/casa-nueva-santa-barbara-county-office-building
[49] http://youtu.be./watch?v=VroQc7KQCUU

Appendix C: Methodology for Selecting and Results from Survey of County Buildings

To aid in the development of this Policy, site visits were performed on several County owned and operated buildings. The purpose was to ground-truth the Policy by identifying and validating appropriate Policy actions and levers that will facilitate the implementation of this Policy.

A combination of buildings were selected that represent a cross-section and representative sample of the County's owned and operated buildings; including best and worst performers, and samplings from the most prevalent county building conditions, offices and buildings less than 10,000 square feet. Buildings selected were evaluated for the basic signatures characteristic of cost-effective commissioning projects and triggers outlined in this Policy. Table 22 below is a summary of the signature characteristics for the evaluated buildings and identifies the Engineering Building, Administration Building, and District Attorney's Building as prime candidate buildings for retro-commissioning. Nevertheless, opportunities were identified at all buildings surveyed based on known operational and maintenance issues or occupant and are identified in Table 23 below as recently completed (missed opportunity), current opportunity, or future opportunity.

1
2 **Table 22: Building Retro-Commissioning Opportunities as Identified During County Building Site Surveys (April 17th and 18th, 2013)**

Facility Name	Building Size	HVAC System Age/Condition	HVAC System Complexity	Building Energy Intensity	Building Energy Consumption	Building Metering Scheme	Operational/Performance Problems	Planned Major Renovations	Building Control System Technology
F01001 - Schwartz Building	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)
F01004- ENGINEERING BUILDING	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)
F01005- ADMINISTRATION BUILDING	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)
F01006 - District Attorney Office Building	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)
J02028 - Social Service Main Office	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)
Casa Nueva	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)
General Services Maintenance Shop	>10,000 sq.ft.	<=12 years	central plant systems	higher, varies by building type	higher	building level meter	prevalent	no major renovations are planned	direct digital controls (DDC)

3 **Table 23: Defined Commissioning Opportunities Identified During County Building Site Surveys (April 17th and 18th, 2013)**

Opportunity		Facility Name	Area Warranting Commissioning	Condition Warranting Commissioning	Planned Major Renovations
Recently Completed	Major Renovation Commissioning	F01001 - Schwartz Building	Flood Control Tenant Remodel	Previously resolved items: (1) Insufficient domestic hot-water temperature (2) Heating, Ventilating, and Air Conditioning acoustics (3) Insufficient heating within tenant conference room	
Current Opportunity	Major Renovation	F01004-ENGINEERING BUILDING	Community Services Department Tenant Improvement Project	Tenant improvement project underway; conversion from base-building heating, ventilating, and air conditioning systems to variable-refrigerant-volume system	
Upcoming Opportunity	Retro-Commissioning	F01005-ADMINISTRATION BUILDING	Central chilled and hot water plant equipment, distribution system equipment and piping, and terminal equipment	Loss of hot-water distribution piping and system performance leading to Band-Aid requisitions and repairs Chilled-water control set-points	
Upcoming Opportunity	Retro-Commissioning	F01006 - District Attorney Office Building	Central condenser water plant located on grade	Condenser water piping and distribution system; HP reset and damper controls	

Opportunity		Facility Name	Area Warranting Commissioning	Condition Warranting Commissioning	Planned Major Renovations
Upcoming Opportunity	Major Renovation Commissioning	J02028 - Social Service Main Office	Building Heating, Ventilation, and Air Conditioning System		Roof top equipment planned for like-in-kind replacement
Upcoming Opportunity	Re-Commissioning	Casa Nueva	Lighting Control System Construction Materials and Practices	Lighting control system is defunct and select materials used in the construction were inappropriate	

4

Appendix D: Soliciting and Incorporating Stakeholder Feedback

A stakeholder meeting was conducted on May 7, 2013, by ICF International with support from the County Energy Manager and Capital Projects Project Manager. The purpose was to solicit feedback and gather input on the Policy from the County's Green Team and select County staff. Feedback was solicited from approximately 40 County staff that represented a cross section of the County's departments.

One week in advance of the meeting, staff were provided the 50% Final Policy with document for recording their feedback. All feedback received was reviewed by subject matter experts (SMEs) that included ICF, the County Energy Manager, Capital Projects Project Manager, and the County Facilities Manager. Feedback received in advance of the stakeholder meeting was used to facilitate the meetings discussion, whereas feedback received afterwards was reviewed jointly by the SMEs but outside the stakeholder meeting. All comments were objectively reviewed and incorporated based on their merit. Those incorporated were used to refine the Policy specific to the needs of Santa Barbara County.

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