

Green Property Condition Assessment Recommendations for the Mark-To-Market Green Initiative

A Study Conducted by:

**Strategic Energy Innovations
and Facility Strategies Group**

On Behalf of:



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The California Sustainability Alliance (the Alliance) is an innovative market transformation program funded by California utility customers under the auspices of the California Public Utilities Commission. The Alliance leverages action on environmental initiatives such as climate, smart land use and growth, renewable energy, waste management, water use efficiency and transportation planning to help the State of California achieve its aggressive energy efficiency goals more effectively and economically. In partnership with public and private organizations throughout California, the Alliance precipitates widespread market transformation by tackling major barriers to sustainability.

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TABLE OF CONTENTS

Executive Summary	1
INTRODUCTION	2
Average and Marginal Resources	2
Background	2
Purpose	3
Documents Reviewed	4
Analysis of Recent M2M Green PCA Report	5
Opportunities Within the Report	6
Report Amendment	7
RECOMMENDATIONS FOR M2M GUIDANCE DOCUMENTS	9
Improve Technical Analysis Requirements.....	9
Improve Economic Analysis Requirements	10
Improve Monitoring Requirements.....	11
Improve Contractor Selection and Qualifications Criteria.....	13

EXECUTIVE SUMMARY

Opportunities exist to enhance the current *Mark-to-Market (M2M) Green Initiative Draft Implementation Guidelines* and supporting documents as a means to ensure Green PCA contractors properly and thoroughly address the stated “green” components included in the revised goals of the M2M Initiative. Without additional criteria and requirements subsequent Green PCA reports will not have identified key green- and energy-related opportunities. Specifically, the following three documents have been identified for revisions:

- The current “Statement of Work” requirements do not address the unique and complex requirements of an energy and environmental analysis and financing project in specific enough terms to comprise the “Green” portion of the PCA. This includes the list of ECMs to be considered, the engineering and financial, analytical and data gathering methodology to be used, and the approach to incorporate the energy financing into the PAE’s restructured financing for the property.
- The recent *Draft Green Guide Update – Utilities in M2M Transactions* contains guidance related to collecting utility baseline data and post-retrofit monitoring and verification that should be incorporated into the “Statement of Work” and “M2M Draft Implementation Guidelines.” Monitoring approaches should be specified for specific measures and for the overall site consumption.
- The *Attachment 3: Green Physical Assessment Statement of Work and Contractor Qualifications* document does not sufficiently clarify the skills and qualifications required of the green PCA implementer, other than requiring LEED AP or an equivalent certification.

With these specific concerns in mind, several recommendations to enhance the performance and delivery process for the Green M2M Initiative are outlined in this study. They are primarily related to improving technical and economic analysis requirements, improving utility monitoring requirements, and providing more specific selection and qualifications criteria for green PCA implementers.

INTRODUCTION

Average and Marginal Resources

There are significant opportunities to introduce green building technology and methods into California's existing affordable housing stock over the coming years, as the existing housing stock reaches a point in its life cycle where rehabilitation is necessary for the continued use and economic viability of the property. Because most of the existing housing stock in California and elsewhere was built prior to the application of comprehensive energy efficiency standards and current green building practices, project rehabilitation is an ideal time to replace and upgrade inefficient building and mechanical systems and use products less detrimental to the environment.

In response to these potential opportunities, agencies like HUD have launched new initiatives providing incentives to affordable housing owners that encourage greater green and energy efficient investments as part of project recapitalization. Providing more favorable financing terms and enabling project debt to be restructured to accommodate "green" investments, even as rents are set to ensure greater long-term affordability for low income households, will likely be important models for tapping into the green potential of the existing housing stock.

Background

The Mark-to-Market (M2M) Green Initiative, introduced by HUD's Office of Affordable Housing and Preservation (OAHP) during July 2007, is a nationwide pilot initiative designed to incorporate Green principles into the property rehabilitation required in conjunction with M2M restructuring as well as into the repairs and replacements that are scheduled to occur over the next 20 years of the project's life.

Each property undergoing a M2M restructuring is subject to a Physical Condition Assessment (PCA), a detailed inspection used to identify rehabilitation needs and estimate repairs and replacements. For projects in the Green Initiative, the PCA scope is broadened to include green opportunities, such as energy efficiency, recycling and indoor air quality.

The Participating Administrative Entity (PAE) selected by HUD and the property owner highlight the opportunities, costs, and benefits of a variety of green

alternatives at each property. HUD OAHP does not stipulate what elements must be included in any given property. Once the PAE has determined the feasibility of a Green Restructure and the property owner has decided to proceed, the PAE orders the PCA report.

The green PCA Report contains three parts: a physical needs assessment that identifies building repairs and replacements required during the first year following restructuring and the subsequent twenty years, with cost estimates for both “traditional” and “green” measures along with benefits, financial and otherwise, for the “green” measures; an energy audit that identifies energy-related improvements to the property, their cost, and a simple financial payback analysis; and an Integrated Pest Management Plan and Inspection.

HUD OAHP produced their *Mark-to-Market (M2M) Green Initiative Draft Implementation Guidelines* on September 26, 2007 to articulate the major requirements and approach for the M2M Green Initiative, including how prospective properties are identified, property owner participation incentives and requirements, and the preparation of the Green PCA Report. The document also included attachments addressing the PCA Statement of Work and Contractor Qualifications. These guidance documents have been undergoing revision as OAHP fine tunes the pilot initiative and gains additional experience with Green M2M Restructuring plans.

Purpose

Based on the review of a Green PCA report conducted under the requirements of the current HUD OAHP’s guidance documents, it was determined that the M2M Green Initiative guidance documents can be improved so that Green PCA reports adequately address the new “green” components of the PCA and the supporting analyses for the energy audit portion of the PCA. This study analyzes a recent Green PCA report and examines the policy and program guidance documents that detail requirements that must be met, in terms of report content and analytical approach. The primary goal is to identify areas for improvement and recommendations that would enhance the overall performance and delivery process for the Green M2M Initiative, and result in Green PCA reports and analyses that more closely meet HUD OAHP’s expectations.

Documents Reviewed

This report examines one of the first Green PCA analyses to be prepared under the Green M2M Program, a review of the Denair Manor Apartment complex in Turlock, CA.

To gauge the completeness and effectiveness of the Green M2M program guidance that addresses green- and energy-related opportunities, the authors next reviewed the following documents (available as of June 2008) for content:

- The US HUD OAHP *Mark-to-Market Green Initiative Draft Implementation Guidelines* (Version 5, September 26, 2007)
- Attachments 1 (October 2007) and 3 (April 2008, Version 9) of the *Mark-to-Market Green Initiative Draft Implementation Guidelines entitled Green Physical Condition Assessment Statement of Work and Contractor Qualifications*
- The US HUD OAHP memo entitled *Draft Green Guide Update – Utilities in Green M2M Transactions* (March 2008)
- The US HUD OAHP M2M program description entitled *Green Initiative – The Greening of the M2M Portfolio* (July 20, 2007)
- The M2M Green PCA report developed by EMG Corporation for the Denair Manor Apartments facility (February 2008)
- The US HUD OAHP memo *To: PAEs and Interested Parties in Utility Use Monitoring* (not dated)
- The US HUD OAHP memo entitled *Draft Green Guide Update – Sizing Heating and Cooling Systems* (March 2008)
- *Attachment 10: Owner’s Green Commitments – M2M Green Initiative Draft Green Guide* (March 2008, Version 6)
- The HUD OAHP *Green Physical Condition Assessment (GPCA) Checklist for Review of Green Elements* (May 30, 2008, Green PCA Checklist v8)
- The HUD OAHP *Payback Analyses Underwriting Tool – Attachment 5 to the Draft Green Guide* (Version 9, Excel Spreadsheet)
- The HUD OAHP *Traditional vs. Green Rehab Breakdown – Addendum to M2M Underwriting Model* (Version 7, Excel Spreadsheet)
- The HUD OAHP *Green Underwriting Tools: PCA Addendum* (November 8, 2007, Excel Spreadsheet)

Recommendations for improving the M2M Green Initiative program guidance, implementation procedures and reporting requirements based on analysis of these documents are contained in detail below.

Analysis of Recent M2M Green PCA Report

One of the first Green PCA reports prepared under the Green M2M Program, a review of the Denair Manor Apartment complex in Turlock, CA, was examined in this study to ascertain whether sustainable and energy-related elements of the PCA—the “green” portion—were adequately addressed.

Upon review, it was found that the report is largely focused on the physical needs assessment portion of the PCA and provides little analysis or recommendations related to the sustainable and energy-related elements that could potentially benefit the property owner and tenants. The site walkthrough, as described in Chapters 5 through 11, generally concentrates on the physical condition and maintenance needs for the property, including a cursory review of most building systems. It lists the type of utilities and providers, provides a basic description of the architectural and structural aspects of the buildings, the mechanical and electrical systems, the condition of dwelling units, including the type and age of appliances, estimates for critical and long-term physical needs, and lists items that can be classified as critical repairs and 12-month physical needs.

In the subsequent chapter covering green building principles (Chapter 12), there is a limited comparison matrix (“Traditional vs. Green Comparison Table”) that addresses a few green-oriented replacements and estimated costs. The report identifies components that would need replacement either immediately, within the first year, or over the course of the next twenty years, and compares the cost of traditional replacements and “green” replacements, including their attendant financial benefits. These include better parking asphalt (sealed for less noise), better roofing and roofing insulation materials (using recycled roof membrane, and higher R-value cellulose insulation, in place of the existing blown type insulation), improved windows (replacing aluminum, single-pane windows with double-pane, low-E glass, vinyl clad substitutes), better HVAC systems (replace air handlers with programmable-thermostat-equipped, Energy Star furnaces), and better flooring and wall materials (substitute environmentally sustainable equivalents).

Chapter 13 covers the energy audit portion of the green PCA. It provides one year of baseline utility data and identifies four potential energy conservation opportunities for the property, including the installation of window sun shades, controlling air leakage, converting laundry to cold rinse, and replacing incandescent lighting with CFLs in dwelling units. The report provides a ballpark estimate of savings with these measures installed and briefly describes their basic cost and simple payback. In the final “Issues and Recommendations” section (Chapter 13.2), the GPCA report lists some additional potential ECMs including replacing refrigerators with high efficiency units, briefly discusses HVAC sizing, and suggests several inspection and maintenance procedures that could reduce energy use.

Opportunities Within the Report

The area of greatest opportunity for improvement is strengthening the requirement for detailed analysis and recommendations related to the sustainable and energy-related aspects of what is ostensibly a “green” PCA report. The chapters based on the property walkthrough discuss in reasonable detail the physical condition and maintenance requirements of the property, in line with a typical physical needs assessment, but do not provide the information needed for a more in-depth analysis of green- and energy-related opportunities for the property. Specifically:

- The report describes the type of appliances, ceiling insulation, building mechanical and electrical systems, and type of windows and envelope features, but does not delve into the detailed specifications—size, brand and efficiency rating, R-value for insulation—for these systems and components that should be considered as part of a preliminary energy audit or sustainability analysis.
- As noted above, there are four “green” features recommended, and four ECMs suggested. The PCA walkthrough did not address many other energy-consuming building systems, including the elevator system motors and domestic hot water systems. These areas could be more robust and include more options.
- There is no mention of potential water conservation opportunities, such as high-efficiency plumbing fixtures, clothes washers, irrigation devices and sprinklers.

- Though the recommendation was made to limit air leakage, the weatherization sealing was not examined during the walkthrough or was not discussed in the physical conditions section of the report.
- The analysis performed to provide annual energy savings calculations for air leakage, window sun shades, lighting upgrades, and washing machine replacements, as contained in the cost-benefit worksheets, is not presented in sufficient detail. Calculations and assumptions used in those calculations were not provided.
- The utility baseline used for the economic analysis utilized just one year's worth of data, which may be too brief a period to account for weather- and occupancy-related factors.

In conclusion, the report focused heavily on the physical needs assessment of the PCA process—identifying and estimating costs for critical, short- and long-term repairs, replacements and maintenance—without sufficient consideration of potential energy-related and sustainable opportunities. The data needed for a thorough sustainability and energy audit of the property was not recorded on the facility walkthrough that would have been needed for detailed energy and water analyses.

Report Amendment

A follow-up report for the Denair Manor development was prepared to specifically address potential sustainable and energy-related opportunities for the property, including a more thorough walkthrough, data gathering approach and analysis. The report offered:

- A detailed description of property electric, gas and water consumption for the one year of utility data available with separate breakouts by building to look for elevated energy intensity levels.
- A detailed description of energy-consuming equipment at the property, including lighting, hot water, HVAC, thermostats/controls with relevant specifications--energy-efficiency ratings, wattage, size, etc.
- A detailed description of water-consuming equipment, including plumbing fixtures and irrigation devices, along with flow ratings and measurements.
- A thorough examination of all building systems for energy-, water- and sustainable/health-related opportunities.

- ECM opportunities listed include: lighting, ceiling fans, refrigerators, elevator motors, wall A/C units, packaged terminal heat pumps, common-area A/C, roof-pack A/C, cottage heat pumps, windows, attic insulation, thermostats, high-efficiency DHW, solar thermal DHW, PV, and roof/paint upgrades to reduce A/C loads.
- Water conservation opportunities include: low-flow plumbing fixtures, clothes washers, drip irrigation, xeriscaping, and high efficiency sprinkler heads.
- The report also examined “green” site improvements that addressed overall sustainability of the property, including better resource efficiency and indoor air quality for residents. Measures identified included hardscaping upgrades, low-VOC carpeting, natural linoleum floor tile, low-VOC paint, bamboo cabinetry, prohibition of indoor smoking by residents, and green cleaning product use.

The supporting analyses conducted to determine the potential savings and paybacks associated with these measures accounted for usage patterns and thermostat setpoints, and actual physical quantities and specifications of fixtures/systems, etc., that are required for accurate energy and water savings estimates.

RECOMMENDATIONS FOR M2M GUIDANCE DOCUMENTS

The authors reviewed all available (as of June 2008) program guidance that addresses the green- and energy-related requirements of the M2M Program and set forth the statement of work requirements for green PCA contractors selected by PAE firms to conduct the GPCA. These documents were reviewed to determine what areas could be enhanced to deliver more thorough green PCA reports and analyses going forward. The primary observation is that the documents do not discuss requirements in sufficient detail to ensure that Green PCA firms deliver thorough PCA reports and accompanying analyses that account for all potential green and energy-related opportunities.

Improve Technical Analysis Requirements

Data Gathering

The data gathering requirements for a physical needs assessment and those of an energy audit are very different and unique. The current “Statement of Work” guidance (*Attachment 3*, April 2008) does not clearly articulate the procedures that should be followed to gather the data needed to address the energy- and green-related aspects of the PCA. Walkthroughs to perform an energy audit and to assess green opportunities require additional data, including a record of the type, capacity, and efficiency rating for building systems, and components, along with usage patterns and temperature setpoints. Some of the data and process requirements of an energy audit are discussed in the energy audit guidance in *Attachment 3*, but a detailed list of walkthrough data and analysis needs is not provided.

It is recommended that a detailed walkthrough checklist be prepared to assist the facility inspector in obtaining all of the information necessary for subsequent analysis and reporting. A single guidance document should also be developed to facilitate compliance with all program requirements.

Listing of Green ECMs

The Statement of Work guidance does not provide a sufficiently detailed minimum listing of “green” building systems and components that should be considered as potential opportunities in the PCA analysis and report. *Attachment 3* addresses a few issues, including cost/benefit and useful life calculations, disabled person requirements, HVAC sizing under Manual J, ductwork leakage, and the requirement for owner/tenant discussions. The *Green PCA Addendum* described above provides a more detailed list of potential energy

and green measures, but is not yet comprehensive. The current version of the *M2M Green Initiative Draft Implementation Guidelines* provides a more detailed listing of potential ECM opportunities.¹

A detailed analysis to identify other potential ECMs was not performed for Denair Manor Apartments in the initial GPCA report. Perhaps, “green building principles” and energy- and water-saving upgrades are suggested for consideration generally only when building components and systems are deemed to be at the end of their useful life. This approach makes sense for large building systems such as boilers, but is not recommended for retrofit scenarios with shorter payback periods.

The *Implementation Guidelines* and statement of work guidance should include a more detailed listing of potential ECMs to be considered than even the one found in the *Green PCA Addendum*, include at a minimum:

- Building envelope upgrades (additional roof insulation, wall insulation for gut rehab projects, radiant roof barrier, window replacement, etc)
- HVAC (heating and cooling equipment replacement or tuning, thermostat operation, duct sealing, duct insulation, etc)
- Lighting (fixture replacement, lamps and ballast replacement, lighting controls, etc)
- Equipment and Appliances (motors, domestic hot water systems, refrigerators, dishwashers, clothes washers, dryers, etc)

Each ECM should also be analyzed independently with no interactive consumption effects using both an immediate or bulk replacement analysis and an incremental or “sunk cost” analysis. The energy audit should clearly rank the proposed ECMs based on their projected savings calculations and payback periods after considering the physical needs assessment observations of major building systems that are at the end of their useful life or are in poor physical condition.

Improve Economic Analysis Requirements

The current Statement of Work guidance does not provide a detailed procedure for assessing the economic benefits (utility savings) of energy efficient upgrades

¹ Pgs 8-11.

considered as part of the Green PCA. Utility savings can offer the property owner an additional financing source and reduce the amount borrowed through conventional loans. However, *Attachment 3* energy audit requirements only requires that PCA contractors provide estimates for annual energy savings and simple payback for measures proposed.

Additional guidance for calculating savings and payback analysis can be found in the *Payback Analysis Underwriting Tool – Attachment 5 to the Draft Green Guide* (Version 9). The document requires PCA contractors to first consider building systems and components at the end of their useful life and estimate the payback period for Traditional and Green replacements. Second, it recommends that PAEs (and their PCA contractors) choose Green measures even in an early replacement scenario, when the utility savings are 1.5 times the value of the remaining useful life. Lastly, the document provides a list of excepted measures that are presumed to be financially reasonable for end of life replacements, including a variety of Energy Star appliances, windows, for which no payback analysis is required. The analysis is required if early replacement is proposed, however.

The authors recommend that the scope of work and program guidance include more detailed criteria for how the economic/payback analysis is to be performed. Rebates and incentives available should be included in the economic analysis to reduce the initial cost of the measures analyzed. The Green PCA should consider which building systems and components are at the end of their useful life and require replacement before energy and water efficiency considerations are addressed since larger systems like central HVAC are rarely cost effective to replace unless they have reached the end of their useful life and a “sunk cost”, or incremental replacement analysis can be performed.

Improve Monitoring Requirements

The PAEs are required by OAHP to select contractors to collect the baseline data and analyze the ongoing performance of the properties. For utility baseline data collection and monitoring, a Whole Building Approach (Option C) should be used for all utility monitoring with the Retrofit Isolation Approach (Option B) used only for specific measures implemented at the site whose individual utility consumption is small relative to the overall site consumption and where seasonal variations, tenant behavior, etc., could largely influence the savings associated with that specific measure. Measurement samples and specific engineering values must be planned according to methods published by the International

Measurement and Verification Protocol (IPMVP) organization and the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Guideline 14, "Measurement of Energy and Demand Savings."

In order to follow a whole building monitoring approach, utility data for each utility meter must be collected for a period of at least 13 contiguous months although a 24 month contiguous period is preferred. Tenant waivers will be required to enable individually metered data to be collected. Due to the significant variation in individual behaviors, utility data for all apartments should be sought from the utility companies. Data for each utility meter, including owner-paid meters, must be collected for a period of at least 13 contiguous months although a 24 month contiguous period is preferred. Utility data should be reported to HUD at least annually and within 60 days of the last utility bill included in the analysis. Meter data for irrigation should be separated from meter data for indoor use. Data must be obtained for each building including apartment numbers, bedroom counts, total building square footage, and building compass orientation. Weather data must be collected for each month associated with the baseline utility data. Laundry room locations must be identified relative to the buildings and noted for individual meters. Tenant population data for all apartments each month must also be collected. Aggregate monthly consumption and cost data will be used to establish the monthly and utility baseline for future comparisons.

Additional data may need to be collected for utility monitoring depending on the utility data availability and quality, types of measures installed, and type of verification employed. Individual equipment and energy systems, for example, can be measured before and after their installation using the Retrofit Isolation Approach. Natural gas consumption and combustion efficiency for furnaces can be measured before and after retrofit and collected with indoor and outdoor temperatures during the measurement period. Performance of hot water systems can be determined using inlet, tank, and terminal water temperatures, measured gas consumption, and/or combustion efficiency. Electricity consumption for appliances such as refrigerators can be monitored before and after installation, while indoor and outdoor temperature, consumption and electric demand can be collected to determine the performance of air conditioning equipment.

Improve Contractor Selection and Qualifications Criteria

The current *Statement of Work and Contractor Qualifications* (Attachment 3, April 2008) document describes the skills and qualifications required of the green PCA implementer, however these requirements are not stringent enough to ensure that the Green PCA contractors have the skills and experience necessary to conduct the green portions of the PCA, including the energy audit and sustainability analysis. The guidance requires only that PCA contractors possess LEED AP accreditation, have some environmental expertise, ten hours of annual training in green building, sustainability, energy efficiency or indoor air quality, be certified to complete energy audits by RESNET/BPI or be a Certified Energy Manager, and agree to pursue ASHRAE certification (High-Performance Building Design Professional).

The M2M Program guidelines should be changed to specifically require a contractor evaluation and selection process that incorporates specific performance criteria that provides for a detailed assessment of bidder qualifications, technical approach, and cost reasonableness, giving preference for qualified bidders with cost being the least relevant factor in ensuring proper analysis. As noted above, the tasks associated with the energy audit and sustainability analysis, or the “green” portions of the PCA, require specific data collection and analyses that are beyond the scope of a typical physical needs assessment. It may be beneficial to seek out specialized expertise to perform the more complex aspects of the energy and sustainability analysis rather than using a single specialty PCA contractor.