

SCE Comprehensive Mobile Home Program HVAC QM: Data Analysis – Phase II Volume II: Process Evaluation

Submitted to:

Southern California Edison

July 16th, 2014



ADM Associates, Inc.

Prepared by:
Adam Thomas
Steven Keates, P.E.
Julianna Mandler
Jay Blatchford
Donald Dohrmann, Ph.D.

Corporate Headquarters:
3239 Ramos Circle
Sacramento, CA 95827
Tel: (916) 363-8383

ADM Associates Inc.
Energy Research & Evaluation

200 Brown Road
Suite 208
Fremont, CA 94539
Tel: (510) 371-0763

Contents

| | |
|--|------|
| 1. Executive Summary | ES-1 |
| 1.1 Program & Study Background..... | ES-1 |
| 1.2 Key Findings & Recommendations | ES-2 |
| 2. Overview of Study | 2-1 |
| 2.1 Program Overview | 2-1 |
| 2.2 Research Goals..... | 2-2 |
| 2.3 Methods & Approaches | 2-3 |
| 3. Materials Review | 3-1 |
| 3.1 Program Implementation Plan..... | 3-1 |
| 3.2 Participant Application Form | 3-1 |
| 3.3 SCE QM Field Guide with ENERGY MEASURE™ HVAC | 3-2 |
| 3.4 Program Logic Model..... | 3-3 |
| 4. Program Process Review | 4-1 |
| 4.1 Technician Recruitment & Training | 4-1 |
| 4.2 Customer Recruitment & Enrollment | 4-2 |
| 4.3 Customer Qualification | 4-3 |
| 4.4 Installation | 4-7 |
| 4.5 Data Processing & QA | 4-8 |
| 4.6 Post-Inspection & Quality Assurance..... | 4-9 |
| 5. Conclusions & Recommendations..... | 5-1 |
| 6. Appendix A: Interview Guides | A-1 |
| 7. Appendix B: Revised Logic Model..... | B-1 |

1. Executive Summary

This is an Executive Summary of Volume II of the Phase II Data Analysis of the HVAC Quality Maintenance (QM) measure implemented as part of Southern California Edison's (SCE) Comprehensive Manufactured Home Program (CMHP). Volume I of this evaluation provides the results of ADM's analysis of the on-site test data collected for HVAC QM for the CMHP. Volume II documents the findings from a process evaluation of the data collection procedures associated with the QM measure.

1.1 Program & Study Background

The CMHP is a coordinated effort between SCE and SoCal Gas (SCG) to provide comprehensive energy efficiency retrofits to mobile and manufactured home communities. The program provides installation of energy-efficient products in the dwellings and common areas of manufactured home parks at no charge to the customer.

The CMHP began in 2006. The program provided direct installation of high-saving measures, including CFLs, low flow devices, and water heater improvements. Further, the program included AC tune-up. AC tune-up was removed from the program as part of a larger guidance from the CPUC for the California IOUs to move towards more comprehensive Quality Maintenance. The move to QM enhanced the savings that could be attained from each residence but also significantly increased the data collection requirements. Further, at this time the program was moved from portable digital data collection by program implementation staff to third-party validation of test readings via a quality control contractor's call center.

Over the course of implementation of QM, several issues with the data were identified which would lead to some level of doubt over the validity of the savings estimates. Due to this uncertainty, HVAC QM implementation was discontinued in 2012.

This study is a two-part Phase II evaluation of the CMHP HVAC QM program. Program staff had rolled out HVAC QM for mobile homes using the existing Single Family home model as a starting point to facilitate implementation, while being aware that the Single-Family implementation protocols were not an exact fit for the CMHP. Due to this, SCE requested this study in part to identify the gaps in the process and develop best practices for performing the type of work necessary for this market segment. The overall goals of this Phase II study are to:

- 1) Continue validation of the Residential HVAC Quality Maintenance and Evaporator Motor Retrofit Work Paper; and
- 2) Conduct a process evaluation of the program.

The workpaper validation is included in Volume I of this report. Volume II comprises the process evaluation of the program. Research goals of the process evaluation include:

- Conduct a qualitative assessment of the program theory/logic model;

- Identify if program theory/logic model assumptions been supported by program stakeholder experiences and if they should be modified in order to meet program expectations;
- Characterize any program implementation challenges that exist;
- Determine if there are too many stakeholders in the program processes;
- Assess whether the program-specified procedures being followed;
- Identify if all steps/data points in the program are valuable and repeatable/defensible;
- Define and evaluate quality control processes;
- Provide actionable recommendations for improvements to the overarching program design and various implementation processes;
- Recommend training opportunities and/or enhancements to the program; and
- Identify what opportunities exist for increasing the program's efficiency and effectiveness.

1.2 Key Findings & Recommendations

Though this is not a full and formalized process evaluation, this study did yield qualitative findings that would indicate possible areas for program enhancement. Overall, ADM found the program stakeholders (Synergy and CSG) to be willing and engaging partners with SCE in advancing energy efficiency in the mobile home community. However, the introduction of HVAC QM brought with it significant technical and logistical difficulties, and these have been among the driving factors in motivating SCE to request this study. Key findings included:

1.2.1 Program Documentation

ADM completed a review of program documentation, including the Program Implementation Plan (and associated program theory logic model), participant application forms, on-site data collection forms, and the HVAC QM Field Guide. HVAC QM was introduced to the CMHP during the 2012 bridge period, and as a result program implementation staff utilized the PY2009-2011 logic model in the PY2013-2014 PIP. Implementation of HVAC QM for mobile homes was then ceased in 2013 due to the devaluing of savings. The needed research to update the logic model had not been completed at that time, and one of the purposes of this study was to provide recommended logic model updates to reflect these developments. Areas of the logical model that required updating included:

- Incorporation of the role of CSG; and
- Incorporation of the HVAC QM measure and its impact on SCE's QA/QC process.

It is critical that these two points are addressed in the program logic model as they introduced an additional party in the implementation process (CSG) and added several steps to the QA/QC of CMHP projects (such as the CSG Call Center).

ADM found redundancies in certain program documentation as well. The Participant Application and the On Site Data Collection Form both contain fields in which test-in and test-out measurements would be recorded. We would recommend that program staff either remove the test measurement fields from the participating application form (if this is intended to be customer-facing) or consolidate these two into one form if it is to be largely filled out by Synergy technicians.

1.2.2 Coordination & Organization

In interviews with staff at SCE, CSG, and Synergy, it became apparent to the ADM team that there were disconnects between the stakeholders in their perception of program operations. Examples of this were most acutely focused in the role of the CSG call center, the value it contributes to the program, and to what extent the CSG call center serves as a barrier to implementation. Staff at Synergy and CSG gave widely different estimates in terms of how much time the call center adds to an individual job, with CSG stating 4-5 minutes whereas Synergy estimated 10-15 minutes. In our observations of 15 installation jobs, we found that an average of 10 minutes for each of the two calls needed (test-in and test-out) was most typical. Further, CSG indicated that shutting down the call center at 5:30 PM is not problematic due to low implementation volume, while Synergy stated that the 5:30 PM shutdown of the call center had in the past prevented them from completing jobs in residences where the occupants could not get home from work in time.

Further, it was found that there is to some degree a lack of formal communication incorporating all parties. SCE holds separate meetings with CSG and Synergy, and program staff indicated that the CMHP could benefit from a quarterly update meeting where all three organizations are present.

1.2.3 QA/QC Processes

The current program structure requires Synergy to call into the CSG call center for a census of HVAC QM jobs, during which Synergy technicians read off their measurements for CSG to manually enter into the EM-HVAC software platform. Though this study did not include a formal program benchmarking within its scope, it is the view of the ADM team that use of a call center for manual data entry is not within best practices for residential HVAC tune-up programs. It is significantly more common for HVAC tune-ups programs to utilize portable software platforms that program technicians can use on site on a laptop or tablet PC.

CSG has indicated that though they have an internal goal to eventually make EM-HVAC a portable software platform, it is at this time restricted to central-server applications and they

do not have a timeline for development of a field-compatible version. ADM concludes that this is a barrier to widespread implementation of HVAC QM and imposes unneeded costs. The CMHP would be better-served by providing a suitable portable software platform and instead using the program QA/QC budget to support random ride-along inspections by CSG staff. The call center could then be used in a more focused manner; instead of requiring the call center for all projects, a system could be developed through which the portable software requires a call-in after a certain number (or type) of fault codes are activated during test-in or test-out.

1.2.4 Technician Training

Synergy reports that the average tenure of their current technician staff is 3-4 years, with some technicians working on the program as long as seven years. Synergy reported that there has been no significant turnover among their technician staff in the past 18 months. The technicians are put through a training course by Program Managers at Synergy and CSG. This training course consists of one day in the classroom (lasting 6-8 hours) in which staff at Synergy instruct technicians on general AC tune-up practices. During this training, CSG provides instruction on instrumentation and measurement techniques to provide accurate readings for QM. Synergy staff report that their measurements have been improved as result of instruction from CSG and that they feel their technicians are more capable as a result of CSG's input.

When benchmarked against the standards set for QM technicians in the SCE HVAC Quality Maintenance Program, the training standards and certification guidelines for technicians servicing the CMHP were found to be less stringent. Technicians providing QM services for single family homes are required to have North American Technician Excellence (NATE) certification or other recognized industry equivalents. Synergy program management staff indicated that program activities have not led to any professional certifications for their technicians, but that they would see value in doing so. However, this must be balanced against the cost of training and certification as well as the added barrier to staffing that this could induce. Further, the CMHP produces a significantly greater volume of projects than the single family home program. To balance these considerations, Program staff should consider endeavoring to support the professional certification of the CMHP crew leaders in order to ensure that QM for mobile homes is implemented adequate rigor and quality control. With a NATE-certified crew leader overseeing the QM jobs, there could be better assurances of accurate data collection.

On-site, ADM observed that the installation work by the program technicians would benefit from additional training. Issues identified included taking amp readings at the blower while the cabinet was open and that the coil cleaning process was performed in a manner that did not correspond with practices set out in the HVAC QM Field Guide. Further, ADM found that temperature measurements were often taken in locations that are not adequately representative of the system. For example, during ride-alongs ADM observed return air

temperature sensors placed on top of the air handler and not in the direct air stream. The location was affected by ambient heat from the fan motor, leading to a higher return air temperature measurement. In another instance, ADM observed a program technician taking temperature measurements on the opposite side of the residence from the blower¹. Though these did not happen on all jobs, instrumentation errors were observed in four of the 15 jobs for which ADM was present.

¹ For further detail on instrumentation and measurement issues, see findings in Volume I of this study.

2. Overview of Study

This document reports the findings from a workpaper validation and process evaluation of the SCE CMHP HVAC QM measure. This study provides the data analysis needed to support refinement of the HVAC QM measure for mobile and manufactured housing applications.

2.1 Program Overview

The Comprehensive Manufactured Home Program (CMHP) is a direct install program intended to serve lower income customers who do not qualify for low-income services. The target customers are mobile home owners and property owners/managers. The program covers both individual units and common areas. The majority of the energy savings for this program is coming from HVAC related activities.

The CMHP HVAC Quality Maintenance Program seeks to optimize packaged and split system HVAC units in manufactured and mobile homes as part of a more comprehensive direct install program. The QM measure consists of multiple treatments related to ductwork and HVAC unit optimization. Air conditioning systems must be in working order to be eligible for the program; repair of non-functioning units is not covered in this program. Services are intended to improve the energy efficiency and performance of systems operating in "suboptimal" conditions. The HVAC Quality Maintenance possible treatments in the program are:

- Refurbish degraded ducts;
- Restore and improve duct system insulation;
- Duct sealing;
- Condenser coil cleaning;
- Evaporator coil cleaning;
- New air filter to match the blower;
- TXV attachment and insulation correction; and
- Refrigerant system test and charge adjustment.

Program implementation is supported by staff at SCE, Conservation Services Group (CSG), and Synergy Companies. The roles of each of these organizations is as follows:

- **SCE:** SCE staff are responsible for oversight of program implementation contractors, assistance in marketing or legal issues, and in conducting independent post-inspection of completed jobs.
- **Synergy:** Synergy is the third-party implementation contractor (3P) for the CMHP. As the 3P, they are responsible for marketing, recruitment, and installation activities.

- **CSG:** CSG provided assistance in technician training associated with the HVAC QM measure. Further, CSG conducts real-time QA of QM jobs via their call center, through which Synergy technicians call in their readings to be entered in the EM-HVAC software package.
 - **Roltay Energy Services:** Roltay, under subcontract to CSG, developed the EM-HVAC software package utilized in the quality assurance of HVAC QM.

2.2 Research Goals

The objectives of the Process Evaluation portion of this research are to:

- Conduct a qualitative assessment of the program theory/logic model;
- Identify if program theory/ logic model assumptions been supported by program stakeholder experiences and if they should be modified in order to meet program expectations;
- Characterize any program implementation challenges that exist;
- Determine if there are too many stakeholders in the program processes;
- Assess whether the program-specified procedures being followed;
- Identify if all steps/data points in the program are valuable and repeatable/defensible;
- Define and evaluate quality control processes;
- Provide actionable recommendations for improvements to the overarching program design and various implementation processes;
- Recommend training opportunities and/or enhancements to the program; and
- Identify what opportunities exist for increasing the program's efficiency and effectiveness.

Table 2-1 provides a summary of the research activities by researchable issues.

Table 2-1 Summary of Activities by Researchable Issues

| Process Evaluation Activity | | | | | |
|---|-------------------------|----------------------------|--|----------------|------------|
| | Subtask 1 | Subtask 2 | Subtask 3: Program Staff Interviews | | |
| Process Evaluation Key Researchable Issues | Materials Review | Program Logic Model | SCE | Synergy | CSG |
| Qualitative assessment of logic model | | ✓ | ✓ | | |
| Assessment of program theory / logic assumptions | | ✓ | ✓ | ✓ | ✓ |
| Characterizing implementation challenges | | ✓ | ✓ | ✓ | ✓ |
| Assessment of extent of stakeholder input | | ✓ | ✓ | | |
| Assessment of adherence to program procedures | ✓ | ✓ | ✓ | ✓ | ✓ |
| Assess value, repeatability, & defensibility of data points | ✓ | | ✓ | ✓ | ✓ |
| Evaluate QA/QC processes | ✓ | | ✓ | ✓ | ✓ |
| Recommend overarching program design improvements | ✓ | ✓ | ✓ | ✓ | ✓ |
| Recommend training opportunities/enhancements | ✓ | ✓ | ✓ | ✓ | ✓ |
| Identify opportunities to improve program effectiveness | ✓ | ✓ | ✓ | ✓ | ✓ |

2.3 Methods & Approaches

The approach to the process evaluation of CMHP HVAC QM included the following activities:

- **Program Documentation Review.** ADM conducted a review of program documentation for the CMHP. Documents reviewed include:
 - **Program Implementation Plan**
 - **QM Field Guide**
 - **Participant Application Form**
 - **Field Data Collection Form**
 - **Call Center Scripts**
- **In-depth interviews with program actors.** ADM conducted interviews with staff from each stakeholder group involved in the implementation of the CMHP. This included staff from SCE, Synergy, CSG, and Roltay Inc. The interviews completed are summarized in Table 2-2.

Table 2-2 Summary of Interviews Completed

| Organization | Staff Member | Interview Date | Title |
|--|---------------------|-----------------------|------------------------|
| Southern California Edison | Catherine Tugade | 4/8/2014 | Program Manager |
| | Jose Buendia | 4/8/2014 | Program Manager |
| Synergy | Doug Price | 4/14/2014 | Operations Manager |
| | Jared Slusser | 4/14/2014 | Program Manager |
| | Elliot Smith | 4/14/2014 | Production Manager |
| Conservation Services Group | Susan Buchan | 4/14/2014 | Senior Program Manager |
| | Gregory Kozykoski | 4/14/2014 | Operations manager |
| | Aubrey Dayton | 4/11/2014 | Call Center Supervisor |
| | Marco Fortunato | 4/15/2014 | EM-HVAC Specialist |
| | Mike Withers | 4/15/2014 | Field Manager |
| Roltay Inc. Energy Services ² | Buck Taylor | 4/11/2014 | EM-HVAC Developer |

- **Ride-Alongs with Synergy Staff.** ADM conducted ride-alongs to a sample of HVAC QM installations. These installations were scheduled specifically for the purposes of this study, as this measure is presently not included in the CMHP. Ride-alongs were performed for five days. During this period, an engineer at ADM observed the installation process of a different technician on each day. Each technician was observed in the process of QM implementation at three different mobile home residences, for a total sample of 15 jobs observed.

² Roltay Inc. Energy Services is under subcontract to CSG, and is not directly contracted with SCE.

3. Materials Review

In completing the process evaluation of the CMHP, ADM conducted a review of program documentation for the CMHP. Documents reviewed include:

- **Program Implementation Plan**
- **Participant Application Form**
- **QM Field Guide**
- **Field Data Collection Form**
- **Call Center Scripts**

3.1 Program Implementation Plan

ADM received the excerpted Program Implementation Plan (PIP) for the CMHP from SCE. The PIP provides a high-level summary of the measures to be included in a CMHP direct install application as well as key market barriers, program goals, and strategies to be applied in the 2013-2014 cycle. In reviewing the PIP, ADM found some needed updates. This includes:

- **Detailing the role of the QA/QC contractor in the process.** The PIP describes the activities to be completed by the program implementation contractor but does not include a description of the role of the external QA/QC contractor. Steps to correct this would include:
 - **Adding qualitative description of the QA/QC process (including the call center); and**
 - **Describing the software package used for HVAC QM.**
- **Update the Program Logic Model.** The Program Logic Model is a duplicate from the 2009-2011 program cycle and requires updating to incorporate HVAC QM. This is described in further detail in Section 3.4.
- **State explicit participation goals for the HVAC QM measure (if applicable).** If SCE has a separate goal for implementation of HVAC QM (as a subset of the 3,000 annual participants in the CMHP), this should be explicitly stated in Table 5 of the PIP.

3.2 Participant Application Form

The Participant Application Form was developed by Synergy to support the implementation of the CMHP. The form is designed to be filled out largely by the program technician rather than the participant. Most of the form is dedicated to the recording of field measurements associated with HVAC QM. ADM's findings in reviewing the Participant Application Form are as follows:

- The “Refrigerant Charge” table appears to have extraneous columns and number disagreement.

| | 1 Condensing Temperature | 2. Suction Pressure | 3. Suction Temperature | 4. Liquid Pressure | 5. Liquid Temperature | | | 8. Charge Difference (7- | Refrigerant Adjustment |
|----------|--------------------------|---------------------|------------------------|--------------------|-----------------------|--|--|--------------------------|------------------------|
| Test In | | | | | | | | | |
| Test Out | | | | | | | | | |

Figure 3-1 Refrigerant Charge Table Excerpt – Participant Application Form

The form details the measurements associated with Refrigerant Charge. As seen in Figure 3-1, there are entries numbered 1-5, specified as:

1. Condensing Temperature
2. Suction Pressure
3. Suction Temperature
4. Liquid Pressure
5. Liquid Temperature

Following this, the form includes two blank columns before skipping to “8. Charge Difference). This would either indicate that there are two extraneous columns, or that Measurement #6 and Measurement #7 are not printing correctly in the form.

- **More fundamentally, this form is likely duplicative of the data recorded in the “Field Data Collection Form”.** All HVAC measurements recorded in the Participant Application Form are also recorded in the Field Data Collection Form. Given this, program staff should consolidate these forms to reduce the chance for erroneous data entry.

3.3 SCE QM Field Guide with ENERGY MEASURE™ HVAC

The SCE QM Field Guide with ENERGY MEASURE HVAC (“Field Guide”) details the steps to be taken when conducting measurements as part of QM implementation. The specifics of data points are discussed more thoroughly in Volume I of this report. As such, the review of this document in this volume is limited to a qualitative assessment of the manner in which the information is presented and its appropriateness for the CMHP.

The information is presented largely in a straightforward manner. However, due to the need to quickly ramp up implementation, the program used the single family field guide and has not developed a separate field guide for mobile homes.

This section presents the program theory as set out in the 2013-2014 Program Implementation Plan. ADM reviewed this program theory to assess:

- Whether actions have corresponded to program theory;
- Where actions deviate from program theory, what have been the consequences;

- Where outcomes have aligned or not aligned with program theory; and
- Whether deviations in outcomes or actions from program theory should be addressed by correcting actions of program staff or by updating the program logic model.

3.4 Program Logic Model

Program implementation staff utilize the PY2009-2011 logic model in the PY2013-2014 PIP. The model lists activities, outputs, short-, intermediate-, and long-term outcomes. The program logic model further indicates instances where outside agencies or other SCE programs may be engaged as a result of CMHP program activities.

The 2013-2014 program logic model (continued from PY2009-2011) is presented in Figure 3-2. This model was reviewed by ADM, with the assumed activities and outcomes addressed in interviews with staff from SCE, Synergy, and CSG in order to address whether program actions and outcomes have corresponded with program theory.

3.4.1 Activities

ADM's review of the program activities concluded the following:

- **“Coordination with Other Utilities”**. The CMHP is jointly-implemented with SoCal Gas (SCG). Further, Synergy implements the similar Direct Install for Mobile and Manufactured Homes Program (DIMMHP) for Pacific Gas & Electric (PG&E).
- **“RFP Process to Select Implementer”**. Synergy was selected through a competitive RFP process to implement the CMHP.
- **“Engineering Assessment & Standards Monitoring”**. These steps were incorporated into initial program development and into program updates since inception in the 2005-2008 program cycle.
- **“Reconcile Ex-Ante with Ex-Post; adjust forecast if necessary”**. This procedure has been implemented for measures within the CMHP that have been selected for M&V by the Energy Division (ED).
- **“Design Program & Admin Process”**. This has occurred in program development and reflects in the 2013-2014 Program Implementation Plan. Staff from SCE report that program design and administration activities have corresponded to program design.
- **“Outreach & Promotion Activities”**. In support of program implementation, Synergy has conducted outreach through community events arranged with park management. Synergy staff report also leveraging local government partnerships (LGPs) in order to enhance marketing and to build confidence in the program. This section has been modified to specifically reflect “Outreach and promotion activities with park managers and local governments”.

- **“Receive Inquiries, Qualify & Schedule Customer Visits, Installation & Data Collection”.** Though occurring, the description in this activity does not fully-reflect the added steps associated with HVAC QM. To that end, ADM has modified this section with the following additional boxes:
 - A box to reflect activities by Synergy in support of QM: “Test-in data collected by Synergy in accordance with ‘SCE QUALITY MAINTENACE PROGRAM GUIDE WITH ENERGYMEASURE™ HVAC’ specification and guidelines.”
 - A box to indicate “Validation of collected data by third-party QA/QC contractor” to reflect the current program requirement that CSG validate data collected by Synergy before a measured unit is approved for QM.
- **“Implementer Performs Random QC Verification”. “SCE Performs Random QA Inspections & Verification”.** Synergy and SCE conduct random QC verification as part of the implementation process. However, as with installation and data collection, this does not fully encompass the activities associated with HVAC QM. ADM has added:
 - A box to note “Test-out validation by third-party QA/QC contractor” to account for the test-out validation requirement currently in place. It is currently required that CSG validate the test-out data to grant final approval to a QM installation.
- **“Refer to EMA, CARE, and Other EE Programs As Appropriate”.** In the 2010-2012 process evaluation by Cadmus³, it was found that 8.6% of surveyed CMHP participants participated in other EE programs following their participation in CMHP.

3.4.2 Outputs

Corresponding with the Activities portion, Outputs does not encompass the addition of QM to the CMHP. ADM’s review of the Outputs in the CMHP logic model found the following:

- **“Result of RFP Process: Selected Implementer”.** A competitive RFP process was used, resulting in the selection of Synergy to implement the CMHP.
- **“Additional Approval and/or Modified Measures”.** The CMHP has shown to be flexible in the addition of new measures. This is readily apparent in the addition of HVAC QM and brushless fan motors.
- **“Completed Program Implementation Procedures & Marketing Promotional Material and Links”.**

Amendments to the Outputs component of the program logic model include:

³The Cadmus Group, Inc., 2013 “2010-2012 PG&E Direct Install for Mobile and Manufactured Homes Program (DIMMHP) and SCE Comprehensive Manufactured Home Program (CMHP) Process Evaluation Study”

- Addition of “Technicians trained in QI/QM”, as this is earned through the training procedures associated with the QM measure.

3.4.3 Short-Term Outcomes

Amendments to the Short-Term Outcomes in the CMHP logic model include:

- “Program Gross kW and kWh savings” is changed to “Program Gross kW, kWh, and Therms savings”. This captures the effects of joint-implementation of the CMHP with SoCal Gas (SCG).
- The addition of “Improved safety, home comfort and AC performance” as an immediate non-energy benefit of CMHP participation. Improvements in home safety were identified in the “2010-2012 PG&E Direct Install for Mobile and Manufactured Homes Program (DIMMHP) and SCE Comprehensive Manufactured Home Program (CMHP) Process Evaluation Study” completed by Cadmus as being in the forefront of the minds of program participants due to improve lighting in their residence as well as the improved exterior lighting levels due to common area retrofits.

3.4.4 Intermediate Outcomes

Amendments to the Intermediate Outcomes in the CMHP logic model include:

- Specification of Environmental and Other Non-Energy Benefits, including:
 - Improved health & safety; and
 - Improved home comfort.
- Addition of a box to specify Other Program Participation.

3.4.5 Long-Term Outcomes

No changes were made to the Long-Term Outcomes section.

The updated draft logic model can be found in Appendix B.

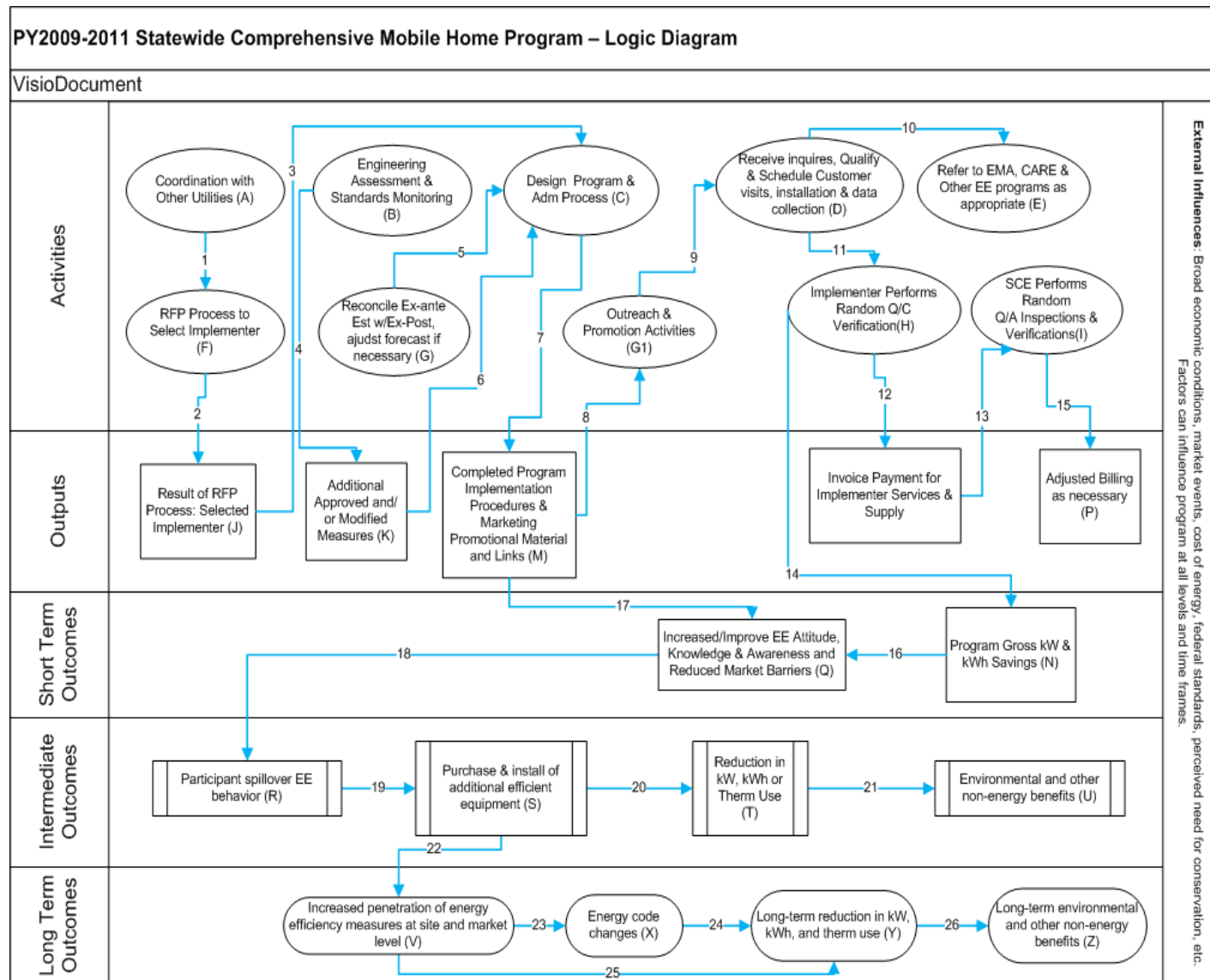


Figure 3-2 CMHP PY2009-2011 Program Logic Model

4. Program Process Review

This chapter details the program process associated with the CMHP, including:

- 1) Technician training
- 2) Customer recruitment & enrollment
- 3) Customer qualification for QM
- 4) On-site testing & data validation
- 5) Data processing & QA
- 6) Post-inspection & QC

4.1 Technician Recruitment & Training

The CMHP implements QM through direct employees of the program implementer (Synergy). This differs from the larger HVAC QM delivery mechanism to single family homes, through which QM is provided by HVAC trade allies. The training of program technicians is completed both by Synergy and CSG.

Synergy reports that the average tenure of their current technician staff is 3-4 years, with some technicians working on the program as long as seven years. Synergy reported that there has been no significant turnover among their technician staff in the past 18 months. The technicians are put through a training course by Program Managers at Synergy and CSG. This training course consists of one day in the classroom (lasting 6-8 hours) during which staff at Synergy instruct technicians on general AC tune-up practices. During this training, CSG provides instruction on instrumentation and measurement techniques to provide accurate readings for QM. Synergy staff report that their measurements have been improved as result of instruction from CSG and that they feel their technicians are more capable as a result of CSG's input.

To benchmark the extent of technician training applied in the CMHP, ADM reviewed the qualification guidelines for participating technicians in the SCE HVAC Quality Maintenance Program. Guidelines for technicians providing services to the single family community include⁴:

"A minimum of 2 years Heating, Ventilation & Air Conditioning service experience."

"A Universal EPA license, refrigerant Transition and Recovery Certification, Class II or Universal, as required by 40 CFR Part 82, Subpart F, and a current

⁴Energy Market Innovations, 2014 "Southern California Edison HVAC Quality Maintenance Program Rapid Feedback Process Evaluation". Pg. 35

certification issued under a Program approved by the U.S. Environmental Protection Agency.”

“Hold either appropriate certification from one of the following recognized industry certification bodies: UA STAR, NATE, HVAC Excellence, RSES, NCI, NEBB, TABB, or an equivalent that has been pre-approved by SCE (please contact the Program for preapproval), OR have an HVAC Technician Certificate from an accredited HVAC vocational training program or school.”

“Maintain compliance with any and all required License or Code requirements as specified by the governing jurisdictions where work will be performed.”

“The service technicians assigned to maintain mechanical systems will be qualified to service the equipment type under contract as well as associated pneumatic, electric, and electronic controls.”

When benchmarked against the standards set for QM technicians in the SCE HVAC Quality Maintenance Program, the training standards and certification guidelines for technicians servicing the CMHP were found to be less stringent. Technicians providing QM services for single family homes are required to have North American Technician Excellence (NATE) certification or other recognized industry equivalents. Synergy program management staff indicated that program activities have not led to any professional certifications for their technicians, but that they would see value in doing so. However, this must be balanced against the cost of training and certification as well as the added barrier to staffing that this could induce. Further, the CMHP produces a significantly greater volume of projects than the single family home program. To balance these considerations, Program staff should consider endeavoring to support the professional certification of the CMHP crew leaders in order to ensure that QM for mobile homes is implemented adequate rigor and quality control. With a NATE-certified crew leader overseeing the QM jobs, there could be better assurances of accurate data collection.

4.2 Customer Recruitment & Enrollment

Customer recruitment for the CMHP is managed directly through program staff at Synergy. As a DI program, CMHP program staff are in direct contact with end-use customers through the recruitment process.

Recruitment efforts by staff at Synergy are directed to overcome previously-identified barriers unique to the mobile/manufactured home sector. Specifically, this market sector is characterized by lower income levels than average for SCE (\$41,000 within this market sector,

compared to median income of \$73,000 for SCE residential customers overall)⁵. Further, this market segment has in the past displayed mistrust of the program offerings.

The primary targets for marketing outreach are the management companies for mobile home communities. Park managers serve as a program gatekeeper in that staff from Synergy cannot conduct on-site recruitment without management approval. Staff at Synergy reported that mobile home park managers tend to be protective of their residents and may be suspicious of an apparent free offer. Program staff indicated that this has been improved dramatically with the introduction of co-branded marketing materials that include SCE's logo alongside Synergy's.

Initially, the program marketing approach was geared towards providing a central presentation in the mobile home common area through which Synergy staff would educate a large number of park residents at once. This was found to be ineffective, and Synergy instead changed the marketing approach to obtaining approval from park management to conduct door-to-door canvassing for recruitment.

4.3 Customer Qualification

When conducting an in-home assessment for the CMHP, technicians at Synergy would identify whether the residence's air conditioner was qualified for QM. This process includes requirements for on-site testing of a range of key metrics, including liquid line temperature and pressure, supply and return dry and wet bulb temperatures, and measured CFM. During the qualification process, the technician at Synergy is required to contact the CSG Call Center to validate their measurements. The validation process with the call center is as follows:

1. Synergy technicians call Customer Service Representative (CSR) through their toll-free, dedicated line. Directly connects with the California or Massachusetts office.
2. CSG follows a script to guide technician through the data inputs.
3. Tech ID is given at the beginning of the phone call and repeated back as validation.
4. A site address is provided by the Synergy technician. The address is validated and the project is added to the database. A customer's name, account number, and phone number are also added to the project information. This step helps prevent duplicate entries in the database as well as logs the number of test-in and test-out's for each site.
5. CSR asks for specific inputs from data collected by Synergy technicians, which includes:
 - Manufacturing and model numbers
 - System type
 - Compressor type

⁵ Bureau of the Census, 2009. *American Community Survey, Three-Year Data*

- SEER
- Capacity in tons
- Evaporator manufacture, model number, serial number
- Fan type
- Refrigerant type
- Metering device
- Line set length
- Elevation

6. After inputs are filled in, CSR submits the data, and runs the test. Test results produce a “pass” or “fail”.

If the test-in “fails”, the CSR will attempt to guide the technician through the error codes detailed. If this does not mitigate the issue, the call is referred to the Technician On-Call (TOC). The TOC is a staff member at CSG with a background in HVAC that can delve further into the specific issues surrounding the site. The TOC identifies changes that need to be made in the on-site testing, and when these changes are completed, an override code is entered. The test is run again until it “passes”, producing the message, “System meets Test In requirements.”

The call center procedure is utilized for a census of mobile home QM projects. Synergy staff report that of all the QA/QC steps associated with the QM measure, the call center portion is perceived to be the most onerous. Synergy reports that the typical call length with the CSG call center is 10-15 minutes. CSG staff provided a shorter estimate, indicating that calls are generally completed in 4-5 minutes. In our observations of 15 installation jobs, we found that an average of 10 minutes for each of the two calls needed (test-in and test-out) was most typical. It is generally acknowledged by all parties that call times were significantly longer during the initial introduction of the call center, but that they have shortened as call center staff obtained experience with the program. However, the varied stakeholders in the CMHP appear to have a disagreement in perception in how long calls were taking to complete during the latter portion of the QM implementation period.

The CSG call center is open from 8:30 AM – 5:30 PM. CSG indicated that calls placed prior to opening are automatically routed to their Massachusetts call center, whose staff has also been trained on the CMHP HVAC QM process. CSG staff indicated that the call center used to be open until 7:00 PM but they found they were receiving minimal calls after 5:30 PM so this was discontinued in order to reduce program costs.

Synergy staff reported that they have found difficulty with the call center in that it precludes staff from engaging in work after 5:30 PM. Though they agree that most projects are

completed before 5:30 PM, it was from their perception not an uncommon occurrence, and they expressed a desire for increased flexibility in their implementation to account for the occasional late installation. Further, they report that the staff from the Massachusetts call center (who handle early-morning calls) are slower than those in the California call center.

These steps are summarized in Figure 4-1.

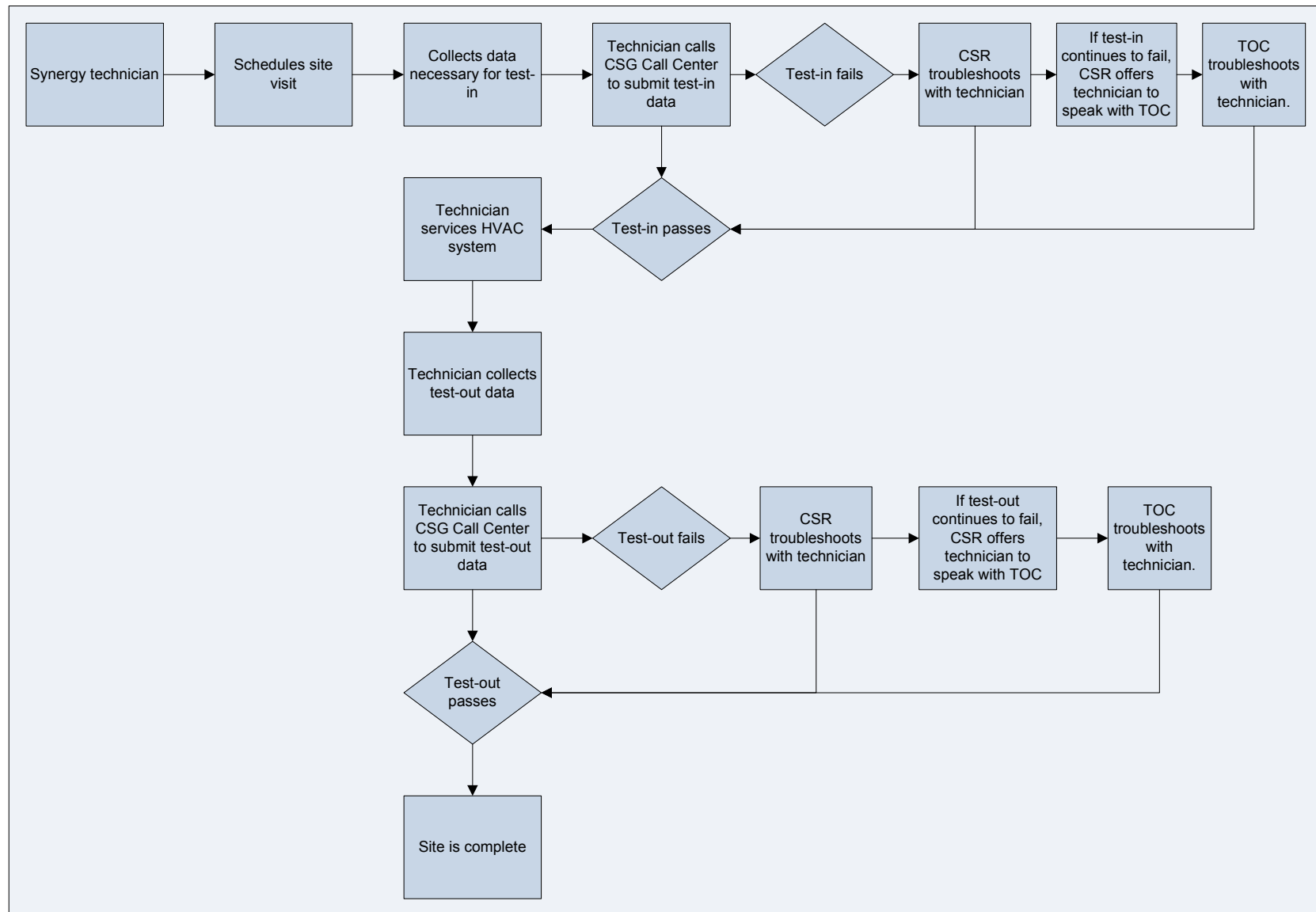


Figure 4-1 CMHP QM Customer Qualification Process Flow

Staff at SCE and Synergy both commented that this process screens out units that are in too poor of condition for QM. Synergy staff indicated that in the CMHP they come across a fair number of units that require more significant repair work rather than just maintenance, and in those instances the repair needs are identified to the customer but no further service on the unit is provided.

4.4 Installation

When qualified for QM, Synergy technicians then begin providing the services entailed under this measure. QM improvements include:

- Refrigerant charge correction;
- Airflow adjustment;
- Air filter cleaning or replacement;
- Coil cleaning
- Brushless fan motor installation;
- Duct sealing; and
- Suction line insulation.

Following the completion of QM installation, the Synergy technician contacts the CSG call center to repeat the process detailed in Figure 4-1. The same validation procedure is put in place for the post measurements as imposed on the pre-measurements, with the same referral process to the TOC as-needed.

ADM rode along for three QM jobs with five separate technicians (for a total of 15 observed installations). The goal of these ride-alongs was to observe the implementation process, assess whether it corresponded to stated program procedures, and to identify any training gaps⁶. A typical visit would begin with the Synergy technician placing their testing equipment and opening the cabinet to determine the refrigerant metering device for the cooling coil. The technician would then activate the air conditioner. Subsequently, the technician would collect airflow measurements while waiting for the refrigeration system to reach steady state. Power measurements were either taken at the home's breaker box or directly at the blower and condensing unit. When the power measurements for the blower were taken at the blower, ADM observed that the cabinet would be open. The open cabinet would affect the fan's airflow and amp draw, and could potentially result in inaccurate measurements. Further, ADM found that temperature measurements were often taken in locations that are not adequately representative of the system. For example, during ride-alongs ADM observed return air

⁶ Further detail on the ride-along findings are presented in Volume I of this report.

temperature sensors placed on top of the air handler and not in the direct air stream. The location was affected by ambient heat from the fan motor, leading to a higher return air temperature measurement. In another instance, ADM observed a program technician taking temperature measurements on the opposite side of the residence from the blower

Once the system reached steady-state (generally occurring in around 10 minutes), the supply and return temperatures as well as refrigeration system temperature and pressure would be recorded. At this time the call to CSG is placed. ADM observed that the call to CSG took roughly 10 minutes (more closely corresponding to Synergy's estimate than CSG's estimate of how long call-ins for the CMHP take).

Typically, the actual work completed for most sites included cleaning the condenser coil with water, installing a new air filter, and cleaning and brushing the cooling coil. For a small number of projects, ADM observed that the technician adjusted the fan speed to a higher speed if possible. It was ADM's finding that the cleaning of the condenser coil at times was rushed (constituting a quick cleaning with a hose).

The system would then be turned on again and run until it reached steady-state. Most systems were fixed orifice and the charge was adjusted based on the refrigerant superheat goal. TXV systems were adjusted based on a subcooling goal. Once steady state was reached, a call-in for test-out with CSG was placed. This call also took on average 10 minutes. ADM observed that many of the EM-HVAC error codes were overridden during these processes. When asked to speak to this issue, staff at CSG indicated that this was common practice.

4.5 Data Processing & QA

Data processing and QA is first performed during the technician call-ins. Each attempt at entry of field measurements is recorded. As a result, one residence may have several test-in or test-out entries, as each test attempt is a distinct line-item in the tracking data. In the 2010-2012 cycle (prior to the introduction of QM), data was entered through the Synergy Technical System Database (STS), which compiled collected data as well as a history of program activities at a site⁷. In interviews with program staff it was indicated that this process automated the compilation of on-site test data.

With the introduction of QM, there was an added level of complexity in the introduction of the call center. HVAC QM calculations are performed using the EM-HVAC software. This program was developed for CSG by Roltay Inc. Energy Services in order to provide validation of test-in and test-out measurements for all HVAC tune-up and QM programs. The software is hosted on CSG's central server, and is utilized by the CSRs during the technician call-ins. CSRs manually

⁷ Evergreen Economics, 2012 "SoCal Gas 2010-2011 Residential Program Process Evaluation Final Report"

enter data read by the Synergy technician over the phone. CSRs are instructed to read back all datapoints to obtain confirmation from the Synergy technician before continuing.

In our review of the EM-HVAC platform, ADM found that most staff members at CSG involved in program QA/QC were not well-versed in how the software works. ADM found a significant number of datapoints overridden with default values. Further, data definitions were not easy to come by. ADM requested a data dictionary for the EM-HVAC program. Staff at SCE, Synergy, and CSG all indicated that they were not in possession of a data dictionary for the program, and that their guidance on the definition of input values was a “working knowledge”. ADM obtained a data dictionary directly from the EM-HVAC Developer at Roltay. This served to inform the data analysis provided in Volume I of this report.

When asked to describe the QA/QC steps are to ensure accurate recording of data, operations management staff at CSG remarked that “most of it is built into the EM-HVAC system. We instructed all CSRs to read back and confirm with the technician before inputting data in”. Based off of interviews with CSG operations staff, it was ADM’s conclusion that the actual QA is largely derived from “black box” calculations from the EM-HVAC software, with which program staff were not intimately familiar.

ADM inquired as to the need of having EM-HVAC on a central server as opposed to delivering the platform in a manner that would allow for on-site use by Synergy technicians. Findings from interviews with CSG and Roltay staff would indicate that though this is possible (and in fact “on their radar”), it is at present time considered to be a long way from viability. SCE staff stated that it would be their preference to have the testing software used for this program be portable and directly usable by the Synergy technicians, and that there would be internal support for a move to a new software package if EM-HVAC could not be made portable.

4.6 Post-Inspection & Quality Assurance

In addition to the call center validation, post inspections of CMHP projects are conducted:

- 1) First, the Synergy Field Manager conducts a sample of post-verification inspections.
- 2) Second, SCE’s internal staff conducts post-inspections for a sample of projects as part for their standard procedure for all programs.

The standard for SCE’s post-inspection procedure is to conduct a simple random sample draw comprising 8% of retrofitted mobile homes. SCE staff remarked that these post-inspections are geared towards providing visual verification of work performed and measure retention. The sampling is not at present time tailored in a manner which would specifically oversample HVAC QM.

The post inspection process in place for the CMHP corresponds with recommendations detailed in the CMHP process evaluation completed for the 2010-2012 cycle. If HVAC QM is

reintroduced to the CMHP, ADM would recommend stratifying CMHP projects into QM and non-QM groupings, ensuring that HVAC QM is adequately covered in post-inspection during the reintroduction.

5. Conclusions & Recommendations

This section provides the conclusions and recommendations based on the findings of ADM's program staff interviews and review of program materials. Though this was not a full and formalized process evaluation, the evaluation activities conducted yielded findings that could be utilized for program improvement⁸.

With SCE's desire to reintroduce HVAC QM to the CMHP, steps will be needed to mitigate the chances of the reoccurrence of data validity issues that occurred during the last round of implementation. With that, ADM's recommendations are as follows:

- **Recommendation 1: Remove the call center QA as a required portion of program implementation.** The use of the call center for a census of QM jobs adds a significant amount of time to the implementation process. Further, with the call center being more focused on the single family market, there is a lack of familiarity with the unique characteristics of the mobile home community. In addition, despite assurances from program staff to the contrary, it is the view of ADM that this process would be likely to introduce errors to program tracking data as readings are read off and manually recorded.
 - **Recommendation 1a: Provide Synergy technicians with a software package that can be made portable and used readily in the field.** If Recommendation 1 is acted upon, Synergy technicians will need a software package for HVAC QM testing. This package should be made portable and usable on laptops or tablets, as determined by SCE and Synergy staff.
 - **Recommendation 1b: Utilize CSG for increased ride-along inspections.** If Recommendation 1 is acted upon, the resources available at CSG could instead be used for randomly selected ride-along inspections in support of the QA of the CMHP. The ride-along sample should be developed in a manner which stratifies by technician team in order to ensure proper representativeness. An initial approach could be to conduct ride-along inspections for 5% of the installation jobs performed by each technician team.
 - **Recommendation 1c: Maintain the call center for the purposes of technical support for difficult installs.** The call center (particularly with the support of the TOC) can still serve as a fallback for assistance with HVAC QM in the CMHP. One possibility would be to program the portable software package to require a call-in after too many fault codes are triggered.

⁸ Further recommendations pertaining to the on-site measurement procedures are presented in Volume I of this report.

- **Recommendation 2: Update the Program Implementation Plan with findings from this study.** As discussed prior, the PIP to-date has not reflected the introduction of HVAC QM due to the introduction of this measure during the 2012 bridge period and its subsequent discontinuation. Based on study findings, ADM's recommendations for updating the PIP include:
 - **Detailing the role of the QA/QC contractor in the process.** The PIP describes the activities to be completed by the program implementation contractor but does not include a description of the role of the external QA/QC contractor. Steps to correct this would include:
 - Adding qualitative description of the QA/QC process (including the call center); and
 - Describing the software package used for HVAC QM.
 - **State explicit participation goals for the HVAC QM measure (if applicable).** If SCE has a separate goal for implementation of HVAC QM (as a subset of the 3,000 annual participants in the CMHP), this should be explicitly stated in Table 5 of the PIP.
- **Recommendation 3: Update the program theory logic model (PTLM) to reflect the introduction of HVAC QM.** Due to HVAC QM being introduced during the 2012 bridge period and its subsequent discontinuation, the PTLM has not been updated since the 2009-2011 version. Though this PTLM is found to reflect most program activities with reasonable accuracy, the model predates the introduction of HVAC QM and (as per the stated goals of this study) warrants updating. Recommended changes to the logic model include:
 - Adding fields which reflect the role of CSG, including:
 - CSG's role in training Synergy program technicians in HVAC QM;
 - The points of intervention of the CSG in the QA/QC process (specifically referencing the call center);
 - A box to reflect activities by Synergy in support of QM: "Test-in data collected by Synergy in accordance with 'SCE QUALITY MAINTENANCE PROGRAM GUIDE WITH ENERGY MEASURE™ HVAC' specification and guidelines."
 - A box to indicate "Validation of collected data by third-party QA/QC contractor" to reflect the current program requirement that CSG validate data collected by Synergy before a measured unit is approved for QM.

- Addition of “Technicians trained in QI/QM”, as this is earned through the training procedures associated with the QM measure.
- Updates to the program outcomes, including:
 - Changing “Program Gross kW and kWh savings” to “Program Gross kW, kWh, and Therms savings”. This captures the effects of joint-implementation of the CMHP with SoCal Gas (SCG).
 - The addition of “Improved safety, home comfort and AC performance” as an immediate non-energy benefit of CMHP participation. Improvements in home safety were identified in the “2010-2012 PG&E Direct Install for Mobile and Manufactured Homes Program (DIMMHP) and SCE Comprehensive Manufactured Home Program (CMHP) Process Evaluation Study” completed by Cadmus as being in the forefront of the minds of program participants due to improve lighting in their residence as well as the improved exterior lighting levels due to common area retrofits
- Specification of Environmental and Other Non-Energy Benefits, including:
 - Improved health & safety
 - Improved home comfort
- Addition of a box to specify Other Program Participation.

A draft logic model reflecting these developments is included in Appendix B.

- **Recommendation 4: Initiate quarterly meetings with SCE, CSG, and Synergy management staff.** In interviews with program actors from each of the three organizations, it was found that they do not hold scheduled update meetings where all three parties are at the table simultaneously. Instead, SCE will hold separate meetings with Synergy and CSG. ADM recommends the scheduling of a quarterly update meeting with all three parties present, as this would provide a mediated forum through which Synergy and CSG could iron out issues pertaining to the interaction of the implementation and QA/QC processes.
- **Recommendation 5: Condense the “Participant Application Form” and “Field Data Collection Form” to reduce redundancies in data collection.** There are redundancies in the data fields between these two forms. If the Participant Application Form is to be a customer-facing document, it should be simplified to not include detailed test measurements. If the Participant Application Form is intended to be largely filled out by Synergy staff and then signed by the customer, then the two forms should be condensed into one.

- **Recommendation 6: Support ongoing education and training of Synergy crew leaders geared towards obtaining professional certification.** It was found in interviews with program staff that while Synergy technicians hold the needed EPA licensing for Refrigerant Transition and Recovery Certification⁹, they generally do not hold professional certifications. For single family homes, SCE requires two years of experience and NATE certification from participating technicians. The CMHP would be better-served if program staff supported the certification of the crew leaders that oversee the HVAC QM work by Synergy technicians. ADM observed user instrumentation errors in four out of 15 jobs. Requiring a NATE-certified crew leader would put mobile home HVAC QM more in-line with SCE's Single Family contractor requirements. Synergy management staff indicated that they would see this effort as an added benefit and recognize that it could improve performance of the HVAC QM measure in the CMHP.
- **Recommendation 7: Revisit the training of program technicians¹⁰.** Corresponding with Recommendation 6, there are areas in which the training of the CMHP technicians could be enhanced. ADM observed that the coil cleaning performed as part of a QM installation was often a quick spray-down with a hose and was not a thorough cleaning. Further, amp readings were taken at the blower with the cabinet open, which would result in erroneous amp draw measurements. Additionally, ADM found that temperature measurements were often taken in locations that are not adequately representative of the system. For example, during ride-alongs ADM observed return air temperature sensors placed on top of the air handler and not in the direct air stream. The location was affected by ambient heat from the fan motor, leading to a higher return air temperature measurement. In another instance, ADM observed a program technician taking temperature measurements on the opposite side of the residence from the blower.

⁹ This certification is a necessity in order for program technicians to implement a refrigerant charge correction, but does not provide technical expertise on optimizing system efficiency.

¹⁰ This recommendation is discussed in broad, general terms in this volume. Volume I of this study presents further detail on issues pertaining to on-site data collection procedures.

6. Appendix A: Interview Guides

Southern California Edison CMHP Process Evaluation Program Manager Interview Guide

Introduction

Thank you for taking the time to talk with me today. ADM is conducting a process evaluation of the data collection procedures for the Comprehensive Mobile Home Program. We'd like to start this evaluation by getting background information on the recent program history as well as your insights into the current operations of the program. These questions may take as long as 90 minutes.

Background

1. Can you please describe your responsibilities with the CMHP? [PROBE: coordination/division of tasks with Synergy/CSG. Role of SCE program manager in measure workpaper development.]

Program Delivery

2. When was HVAC QM introduced into the CMHP?
 - a. What drove the decision to incorporate HVAC QM into the CMHP?
 - b. How would you characterize the process of introducing HVAC QM?
 - c. What difficulties did you find over the process of introducing HVAC QM?
 - Which of these difficulties were expected? Why?
 - Which of these difficulties were unexpected? Why?
3. Have any changes been made between Phase I and Phase II in response to either customer or stakeholder input?
 - a. What changes?
 - b. What has been the impact of these changes?
4. In the past year, what have you perceived to be the biggest challenges to implementing HVAC QM in the CMHP? [PROBE: obtain all challenges, clarify order of magnitude from greatest to least.]
 - a. Of these, which challenges are unique to the HVAC QM measure?
5. How would you characterize your current working relationship with Synergy?
6. How would you characterize your current working relationship with CSG?

Stakeholder Input

7. Who are the stakeholders in the program processes?

- a. What are their roles? [PROBE: obtain roles for all listed stakeholders.]
- b. Are any of these roles duplicative?
- c. Do any of these stakeholders or their respective roles inhibit program implementation?

QA/QC

8. What is your role in the QA/QC process?
9. Does Synergy adhere to the QA/QC process detailed in the program manual?
 - a. If not, how do they deviate from it and why?
 - b. What has been the outcome of QA/QC of their projects?
 - c. Have you noticed any specific drivers of shortfalls in QA/QC?
10. Does CSG adhere to the QA/QC process detailed in the program manual?
 - a. If not, how do they deviate from it and why?
 - b. What has been the outcome of QA/QC of their projects?
 - c. Have you noticed any specific drivers of shortfalls in QA/QC?
11. How do you use the QA/QC findings?
 - a. Specifically, which QA/QC findings are applied in SCE review of implementation activities?
 - b. Which QA/QC findings are used to assess gross realization?
12. How is the value of each datapoint assessed? I.e., how is it determined whether a datapoint collected as part of QA/QC brings value to the program?

Technician Training

13. What are the successes and challenges associated with the training of CMHP technician teams? [PROBE: obtain answers for each.]
14. How long is the training period for program technicians?
 - a. How long do they spend “in the classroom”?
 - b. How long are their field activities supervised?
 - c. Is there any professional licensing or certification that technicians obtain as part of this training?
 - If yes: does this licensing or certification add value? How so?
 - If no: would the addition of licensing or certification add value? Why or why not?
15. Have you noticed any significant attrition or turnover among the technician teams that serve the program?
16. Is there any way in which current technician training might be improved?

Program Theory

17. In what ways, if any, has roll-out of the CMHP differed from expectations set out in the program plan?
18. Which of these differences are unique to the HVAC QM measure?
19. Would the program be better-served by updating the logic model to reflect findings from the field? Or should field activities be adjusted to correspond to program theory?
[PROBE: obtain an answer for each specified difference from theory-practice.]

Future Research

20. Is there anything else about the program you feel is important for us to know or understand?

Southern California Edison

CMHP Process Evaluation

Synergy Program Manager Interview Guide

Introduction

Thank you for taking the time to talk with me today. ADM is conducting a process evaluation of the data collection procedures for the Comprehensive Mobile Home Program. We'd like to start this evaluation by getting background information on the recent program history as well as your insights into the current operations of the program. These questions may take as long as one hour

Background

1. Can you please describe your responsibilities with the CMHP? [PROBE: coordination/division of tasks with SCE/CSG.]

Program Delivery

2. How would you characterize the process of introducing HVAC QM to the CMHP?
3. What difficulties did you find over the process of introducing HVAC QM?
 - Which of these difficulties were expected? Why?
 - Which of these difficulties were unexpected? Why?
4. In the past year, what have you perceived to be the biggest challenges to implementing HVAC QM in the CMHP? [PROBE: obtain all challenges, clarify order of magnitude from greatest to least.]
 - a. Of these, which challenges are unique to the HVAC QM measure?
 - b. What challenges does HVAC QM for mobile homes face that are not faced when providing a similar service to single-family homes?
5. How would you characterize your current working relationship with SCE?
6. How would you characterize your current working relationship with CSG?

QA/QC

7. What is your role in the QA/QC process?
8. What percent of your jobs are inspected by staff at SCE or CSG?
9. How would you characterize the manner in which Synergy interfaces with CSG for the QA/QC process?
 - a. What does CSG look for in their QA/QC process?
 - b. What is the most-commonly identified issue in the QA/QC process?
 - c. What percent of your projects pass QA/QC?

– Clarify: does the percent differ with vs. without HVAC QM.

10. How does Synergy respond to QA/QC findings?
 - a. Specifically, by what metric(s) does CSG and/or SCE judge your organization's work?
 - b. In addition to these, does Synergy have in place any internal metrics for assessment of performance?
11. How is the value of each datapoint assessed? I.e., how is it determined whether a datapoint collected as part of QA/QC brings value to the program?
12. Are there ways by which the QA/QC process could be streamlined?

Technician Training

13. What are the successes and challenges associated with the training of CMHP technician teams? [PROBE: obtain answers for each.]
14. How long is the training period for program technicians?
 - a. How long do they spend "in the classroom"?
 - b. How long are their field activities supervised?
 - c. Is there any professional licensing or certification that technicians obtain as part of this training?
 - If yes: does this licensing or certification add value? How so?
 - If no: would the addition of licensing or certification add value? Why or why not?
15. How much industry experience do technicians have typically prior to joining Synergy? [PROBE: find answers for technician team leader as well as technicians.]
16. What is the current average tenure of technicians servicing the CMHP? [PROBE: find answers for technician team leader as well as technicians.]
17. Have you experienced any significant attrition or turnover among the technician teams that serve the program?
18. Is there any way in which current technician training might be improved?
19. Has Synergy provided recommendations or feedback to CSG on the training process?
 - a. If yes: What were these recommendations? How did CSG respond to them?
 - b. If no: Why haven't you provided recommendations or feedback to CSG?

Data Collection & Transfer

20. What are the steps in place to guide field data collection for HVAC QM?
21. What data is collected as part of an HVAC QM visit?
- a. Which of these datapoints are required for a project to pass QA/QC?
 - b. Are all required datapoints necessary to calculate energy savings associated with QM?
 - c. Are all datapoints that are necessary to calculate energy savings associated with QM listed as “required”?
 - d. What is the mitigation process if a project is found to be missing datafields?
22. What tools are used to collect each datapoint? [PROBE: obtain answers for each datapoint.]
23. How are data collected by field technicians recorded?
24. What is the typical customer disposition during the data collection process?
- a. Do technicians ever seemed rushed when there is a customer with negative disposition?
 - b. Is there any other way in which data collection could be hampered by the occupant?
25. How is this data then transferred to your program tracking database?
- a. What checks are performed on this data at each step?
 - b. How many people handle the data over this process(es)?
 - c. What is the pass-rate for data at each step?
 - d. What steps are taken when data is flagged in this process?
 - e. Are these steps adequate?

Future Research

26. Is there anything else about the program you feel is important for us to know or understand?

Southern California Edison

CMHP Process Evaluation

CSG Program Manager Interview Guide

Introduction

Thank you for taking the time to talk with me today. ADM is conducting a process evaluation of the data collection procedures for the Comprehensive Mobile Home Program. We'd like to start this evaluation by getting background information on the recent program history as well as your insights into the current operations of the program. These questions may take as long as one hour

Background

1. Can you please describe your responsibilities with the CMHP? [PROBE: coordination/division of tasks with SCE/Synergy.]
2. When did CSG become involved with the CMHP?
3. What was the impetus for CSG becoming involved with the CMHP?

Program Delivery

4. How would you characterize the process of introducing HVAC QM to the CMHP?
5. What difficulties did you find over the process of introducing HVAC QM?
 - Which of these difficulties were expected? Why?
 - Which of these difficulties were unexpected? Why?
6. In the past year, what have you perceived to be the biggest challenges to implementing HVAC QM in the CMHP? [PROBE: obtain all challenges, clarify order of magnitude from greatest to least.]
 - a. Of these, which challenges are unique to the HVAC QM measure?
 - b. What challenges does HVAC QM for mobile homes face that are not faced when providing a similar service to single-family homes?
7. How would you characterize your current working relationship with SCE?
8. How would you characterize your current working relationship with Synergy?

QA/QC

9. What is your role in the QA/QC process?
10. What percent of your jobs are inspected by staff at SCE or CSG?

11. How would you characterize the manner in which your organization interfaces with Synergy for the QA/QC process?
 - a. What does CSG look for in their QA/QC process?
 - b. What is the most-commonly identified issue in the QA/QC process?
 - c. What percent of the inspected projects pass QA/QC?
 - Clarify: does the percent differ with vs. without HVAC QM.
12. What is CSG's response when a QA/QC issue is identified on-site?
 - a. Specifically, by what metric(s) does CSG and/or SCE judge Synergy's work?
13. How is the value of each datapoint assessed? I.e., how is it determined whether a datapoint collected as part of QA/QC brings value to the program?
14. Are there ways by which the QA/QC process could be streamlined?

Technician Training

15. What are the successes and challenges associated with the training of CMHP technician teams? [PROBE: obtain answers for each.]
16. How long is the training period for program technicians?
 - a. How long do they spend "in the classroom"?
 - b. How long are their field activities supervised?
 - c. Is there any professional licensing or certification that technicians obtain as part of this training?
 - If yes: does this licensing or certification add value? How so?
 - If no: would the addition of licensing or certification add value? Why or why not?
17. Have you noticed any significant attrition or turnover among the technician teams that serve the program?
18. Is there any way in which current technician training might be improved?
19. Has Synergy provided recommendations or feedback to CSG on the training process?
 - a. If yes: What were these recommendations? How did you respond to them?
 - b. If no: Did CSG ever solicit feedback from Synergy on the training process? Why/why not?

Data Collection & Transfer

20. What are the steps in place to guide field data collection for HVAC QM?
21. What data is collected as part of an HVAC QM visit?

- a. Which of these datapoints are required for a project to pass QA/QC?
 - b. Are all required datapoints necessary to calculate energy savings associated with QM?
 - c. Are all datapoints that are necessary to calculate energy savings associated with QM listed as “required”?
 - d. What is the mitigation process if a project is found to be missing datafields?
22. What tools are used to collect each datapoint? [PROBE: obtain answers for each datapoint.]
23. How are data collected by field technicians recorded?
24. What is the typical customer disposition during the data collection process?
- a. Do technicians ever seemed rushed when there is a customer with negative disposition?
 - b. Is there any other way in which data collection could be hampered by the occupant?
25. How is this data then transferred to your program tracking database?
- a. What checks are performed on this data at each step?
 - b. How many people handle the data over this process(es)?
 - c. What is the pass-rate for data at each step?
 - d. What steps are taken when data is flagged in this process?
 - e. Are these steps adequate?

Future Research

26. Is there anything else about the program you feel is important for us to know or understand?

7. Appendix B: Revised Logic Model

This appendix contains a proposed logic model revision for the CMHP. Added sections are marked by orange boxes, and reflect the stated changes from Section 3.4.

