BEFORE THE PUBLIC UTILITIES COMMISSION OF THE

STATE OF CALIFORNIA

Application of Southern California Edison Company (U 338-E) for Approval of its 2012-2014 California Alternate Rates for Energy and Energy Savings Assistance Programs and Budgets	A.11-05-017 (Filed May 16, 2011)
Application of Southern California Gas Company (U 904-G) for Approval of Low-Income Assistance Programs and Budgets for Program Years 2012-2014	A.11-05-018 (Filed May 16, 2011)
Application of Pacific Gas and Electric Company for Approval of the 2012-2014 Energy Savings Assistance and California Alternate Rates for Energy Programs and Budget (U 39-M)	A.11-05-019 (Filed May 16, 2011)
Application of San Diego Gas & Electric Company (U 902-M) for Approval of Low-Income Assistance Programs and Budgets for Program Years 2012-2014	A.11-05-020 (Filed May 16, 2011)

ENERGY SAVINGS ASSISTANCE PROGRAM AND HEATING, VENTILATION, AND AIR CONDITIONING QUALITY MAINTENANCE PROGRAM ALIGNMENT FINAL REPORT FILED BY SOUTHERN CALIFORNIA EDISON COMPANY (U-338-E) ON BEHALF OF ITSELF, SOUTHERN CALIFORNIA GAS COMPANY (U 904-G), SAN DIEGO GAS & ELECTRIC COMPANY (U 902-M), AND PACIFIC GAS AND ELECTRIC COMPANY (U 39-M)

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Dated: **December 21, 2012**

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Pursuant to Ordering Paragraph 55 of Decision 12-08-044, Southern California Edison Company ("SCE"), on behalf of itself, Southern California Gas Company, San Diego Gas & Electric Company, and Pacific Gas and Electric Company (collectively, the "Joint Utilities"), hereby submits the attached Energy Savings Assistance (ESA) program and Heating, Ventilation, and Air Conditioning Quality Maintenance (HVAC QM) program alignment final

report. This report is being served on the service lists for proceedings A.11-05-017, A.12-07-001, and R.09-11-014.

Respectfully submitted,

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December 21, 2012

Attachment

ESA and HVAC QM Alignment – Final Report

ESA and HVAC QM Alignment – Final Report

Prepared for:

Pacific Gas and Electric Company

San Diego Gas and Electric Company

Southern California Edison Company

Southern California Gas Company

Prepared by:

Richard Heath and Associates, Inc.

12/18/2012

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1.0 INTRODUCTION

Re: D.12-08-044, Sec. 3.6.5.1.11. Central Air Conditioner Service (SCE) and Ordering Paragraph 55.

In the August 23, 2012, Decision (D.12-08-044) for the 2012-2014 Energy Savings Assistance (ESA) Application, the CPUC directed the IOUs to investigate approaches to align, coordinate, or integrate these ESA Program offerings (i.e. SCE's Central AC Service) with the mainstream Heating, Ventilation and Air Conditioning Quality Maintenance (HVAC QM) program and to report on the feasibility of aligning these programs and, if feasible and appropriate, how they would propose to modify their ESA Program offerings to conform to the HVAC QM program objectives.

Specifically the IOUs were asked to produce a report that addressed the following four items[1]:

(1) Duct Test and Seal Component: Is it appropriate to consider Duct Test and Seal as a measure in conjunction with the maintenance service in the ESA Program? If not, what is an appropriate package of maintenance measures for the low-income market segment?

(2) Market segment: How should HVAC maintenance programs be designed and targeted to the single-family and multifamily market segments?

(3) Maintenance service delivery: The mainstream HVAC QM program provides specialized training and requires participating contractors to utilize trained technicians that follow certain service protocols. ESA Program contractors would need to either (a) receive similar training for their own technicians or (b) partner with contractors who have trained staff, or (c) the Commission would need to devise other appropriate approaches ensure HVAC QM is executed in the field. Which program deliver model makes the most sense for the ESA Program?

(4) Funding: Who should pay for repair and ongoing maintenance? Since these systems are only offered to owner-occupied low-income homes, should this be offered at a 100% subsidy, co-pay or are there other approaches to consider?

After investigating approaches to align, coordinate, or integrate ESA Program offerings with the HVAC QM Program, the utilities provide the following recommendations to modify their ESA Program offerings to incorporate the applicable HVAC QM program objectives.

- Do not implement the HVAC QM approach in the ESA Program until more is known about the market acceptance, cost effectiveness and savings potential of the current design of the HVAC QM Program.

[1] CPUC, Decision 12-08-044, Decision on Large IOU's 2012-2014 Energy Savings Assistance (ESA) and California Alternative Rates for Energy (CARE) Applications, August 23, 2012, page 115.

- Incorporate prescriptive air sealing into the existing ESA Program HVAC Tune-Up components for all central systems. The new tune-up package will include, but is not limited to:
  - Prescriptive air sealing
  - Visual inspection of HVAC system, including ducts
  - Filter replacement or cleaning
  - Blower fan cage cleaning
  - Condenser coil cleaning and fin straightening
  - Refrigerant charge evaluation and adjustment
- Evaluate adding the energy-efficient brushless, permanent magnetic, blower motor replacement measure to the ESA Program's list of measures for central heating and air conditioning systems and heating-only forced-air units.

2.0 DEFINITIONS

For the purposes of this document, the following definitions shall apply.

Tune-Up: A one-time maintenance activity used to optimize performance of a piece of equipment.

Maintenance: A servicing activity required on a regular interval to maintain or restore the operation of a piece of mechanical equipment.

Duct Test and Seal: An ESA Program measure that includes duct testing per ESA Installation Standards Chapter 10 and duct sealing per ESA Installation Standards Chapter 20. This method of duct sealing uses a pressurized duct test to quantify duct leakage.

Title 24 Duct Testing: Required by state building code to be performed by a HERS Rater in CZ 2 and 9-16 anytime and existing HVAC system is altered[2]. Various testing protocols are used to meet the requirements based system type, preexisting conditions, duct location, etc[3].

Prescriptive Duct Sealing: A method of sealing ducts employed by the HVAC QM Program wherein all accessible joints, connections, and register boot gaps must be sealed using Title 24 approved materials and methods[4].

Health, Safety and Comfort Measure: In 2002 the CPUC stated that energy-related hardships are "adverse impacts on the comfort, health, and safety of low-income customers that can be mitigated by access to low income energy efficiency programs and services".[5] The CPUC also recognizes Health, Safety and Comfort (HSC) measures as non-energy benefits in the ESA Program. These measures are installed to ensure the health, safety, and/or comfort of clients and may not result in any energy savings and often increase energy use. Health, safety and comfort benefits are captured in non-energy benefit categories such as fewer fires, indoor air quality (CO-related), fewer illnesses and lost days from work/school, net household benefits

[2] 2008 Residential Compliance Manual Section 8.4.2
[3] 2008 Residential Appendix RA3 – Residential Field Verification and Diagnostic Test Protocols., Table RA3.1-2 Duct Leakage Tests
[4] Residential HVAC Quality Maintenance and Assessment and Repair Checklist V1.4, January 5, 2012
[5] 2002 Reporting Requirements Manual, CPUC.

from comfort, and noise.[6]

3.0 OVERVIEW OF ESA PROGRAM

As stated in the final decision, "the ESA Program is a low-income program that, at its core, it is an energy efficiency program. Thus, the program must be directed, administered and delivered in a manner so as to yield significant energy savings. To achieve optimal energy savings, the ESA Program must be administered cost-effectively to yield maximum energy savings at reasonable costs."[7]

3.1 ESA PROGRAM HVAC COMPONENTS

As a component of the California Energy Efficiency Strategic Plan, "the Commission has adopted a Big/Bold Strategy to provide all eligible and willing low income customers the opportunity to participate in the LIEE programs and to offer cost-effective and quality-of-life improving energy efficiency measures in their residences."[8] The ESA Program includes a very robust HVAC component which provides a number of heating, ventilation, and air conditioning measures to low-income households that vary by climate zone, system type, and utility program (see Table 1).

Table 1: Description of HVAC-Related Offerings

Offerings	Description	Climate Zone
NGAT	Natural Gas Appliance Testing (NGAT) is performed to ensure that combustion appliances in weatherized homes are left in safe operating conditions. NGAT is required in the ESA program anytime weatherization measures alter a natural gas appliance or anytime the weatherization scope of work includes shell air sealing (both duct and shell). Pre-weatherization, appliance-off NGAT procedures consist of visual checks of all combustion appliances to determine if combustion problems exist that cannot be corrected. If problems that cannot be corrected are identified during the NGAT visual inspection then no infiltration measures may be installed during weatherization. After weatherization is complete, appliance-on NGAT procedures determine if all combustion appliances are operating safely. When hazardous combustion conditions are identified, the appliance is shut down by the NGAT inspector and the occupant is referred to an R&R program or, in rental units, the building owner may need to replace the unit.	ALL
Furnace Replacement	Furnaces that cannot be repaired are replaced in owner occupied residences. This is a health, safety, and comfort measure as it does not save energy.	ALL
A/C Replacement	Room A/C replaced when existing unit is non-operable or more than 15 years old.	10-16

[6] Comments of the DRA on the Proposed Decision on the Large Investor-Owned Utilities' 2012-2014 ESA and CARE Programs, May 16, 2011, page 11.
[7] CPUC, Decision 12-08-044, Decision on Large IOU's 2012-2014 Energy Savings Assistance (ESA) and California Alternative Rates for Energy (CARE) Applications, August 23, 2012, Page 3.
[8] California Long Term Energy Efficiency Strategic Plan, September 2008, page 25.

Table 1: Description of HVAC-Related Offerings

Offerings	Description	Climate Zone
- Room		
A/C Replacement - Central	Operational Central AC Replaced when SEER less than 9.0 (PG&E) or 10.0 (SCE). Owner occupied only except for SCE who charges a $500 property owner copay for rental units.	13,14,15
A/C Tune-up - Central	Service on Central A/C systems includes: • System evaluation, cleaning and correction as needed: air filters, blower fan, indoor evaporator coil, outdoor condenser coil, • Motor operation evaluation and correction • Airflow assessment • Refrigerant charge	2,4,11,12,13,16
A/C Services - Central	This measure applies only to central A/C systems installed under the SCE "AC-Replacement – Central" measure. The measure consists of "A/C Tune-up – Central" measure conducted every two years after installation.	ALL SCE CZ
Heat Pump	A/C Tune-Up applied to heat pumps	13-15
Evaporative Coolers	Window Evaporative coolers installed in SF and MH with operational mechanical cooling systems.	10-16
Evaporative Cooler Maintenance	NOTE: Although "maintenance" is in the name of this measure, it is a one-time measure.	ALL SCE CZ
Duct Test and Seal	Duct Testing and sealing of existing ductwork. To qualify for sealing, must have min 28% initial duct leakage. Ducts must be sealed to below 15% leakage. SF and MH only. Natural gas space heating – all CZ, Electric space heating	10-16
Forced Air Unit Standing Pilot Change Out	Operable natural draft, standing pilot furnace conversion to electronic ignition.	ALL
Furnace Clean and Tune	One time natural gas burner cleaning and adjustment,	5-10, 13-16

3.2 HVAC-Related Measures Installed 2011

The following tables list the HVAC-related measures offered in the ESA Program. Table 2 lists the HVAC-related measures installed in 2011 in the ESA Program. Table 3 shows expenditure state wide for each measure. Table 4 lists average measure cost per utility of HVAC measures.

Table 2: 2011 Annual Utility Report – HVAC Measures Installed[9]

ESA HVAC-Related Measures	PG&E	SCG	SCE	SDG&E	Total 2011
Furnace Replacement	3,458	13,000	5	4,296	20,759
A/C Replacement - Room	3,385	-	928	255	4,568
A/C Replacement - Central	92	-	3,053	58	3,203
A/C Tune-up - Central	12,888	-	-	54	12,942
A/C Services - Central	-	-	8	-	8
Heat Pump	-	-	74	-	74
Evaporative Coolers	6,048	-	11,869	-	17,917
Evaporative Cooler Maintenance	-	-	11	-	11
Duct Sealing	3,730	2,478	2,643	832	9,683
FAU Standing Pilot Change Out	-	127	-	352	479
Furnace Clean and Tune	-	21,265	-	7,463	28,728

Table 3: HVAC-Related Measures % of Total Expenditures 2011[10]

ESA HVAC-Related Measures	Total 2011 – All IOUS	Average $/unit	% of Total ESA Expenditures
Furnace Replacement	$19,677,326	$948	6.9%
A/C Replacement - Room	$4,444,322	$973	1.6%
A/C Replacement - Central	$11,065,067	$3,455	3.9%
A/C Tune-up - Central	$3,264,732	$252	1.1%
A/C Services - Central	$1,040	$130	0.0%
Heat Pump	$273,615	$3,698	0.1%
Evaporative Coolers	$14,693,470	$820	5.2%
Evaporative Cooler Maintenance	$880	$80	0.0%
Duct Sealing	$6,733,668	$695	2.4%
FAU Standing Pilot Change Out	$142,343	$297	0.0%
Furnace Clean and Tune	$1,811,735	$63	0.6%
Total ESA Program Expenditures	$285,255,571	$744	

[9] PY 2011 Energy Savings Assistance Program Annual Report (PG&E, SDG&E, SCE, and SCG), ESAP Table 2, ESAP Expenses and Energy Savings by Measures Installed, four separate reports, one for each utility.
[10] Ibid

Table 4: Average Measure Cost by Utility[11]

ESA HVAC-Related Measures	PG&E	SCG	SCE	SDG&E
Furnace Replacement	$1,106	$1,085	$1,206	$407
A/C Replacement - Room	$1,032	-	$753	$995
A/C Replacement - Central	$1,857	-	$3,494	$3,932
A/C Tune-up - Central	$253	-	-	$123
A/C Services - Central	-	-	$130	-
Heat Pump	-	-	$3,698	-
Evaporative Coolers	$638	-	$913	-
Evaporative Cooler Maintenance	-	-	$80	-
Duct Sealing	$756	$1,271	$237	$166
FAU Standing Pilot Change Out	-	$310	-	$292
Furnace Clean and Tune	-	$61	-	$68

4.0 OVERVIEW OF MAINSTREAM HVAC QM PROGRAM

According to PG&E's 2012 – 2014 Energy Efficiency Portfolio the Residential HVAC Quality Maintenance (HVAC QM) Program is statewide market transformation and energy efficiency with the goal of transforming California's HVAC market to ensure that:

- HVAC maintenance is of the highest quality;
- Quality maintenance practices are easily recognized and requested by customers;
- The HVAC value chain is educated and understands their involvement with energy efficiency and peak load reduction; and
- The above changes lead to sustained profitability for HVAC trade allies as the business model for maintaining heating and cooling systems changes from a commodity-based to a value-added service business.

As this is a new program, preliminary EM&V Results are projected to be available by Q1, 2014. These results will help evaluate the program to determine if the extensive standards approach with an optional maintenance contract is the best strategy to achieve the program goals.

The Residential HVAC QM Program is based on the ANSI/ACCA Standard 4, an industry consensus standard suitable for code adoption. The NGAT safety protocols are added to enhance the ACCA4 treatment of furnace safety checklist items. Two energy efficiency measures are added to achieve savings: Airflow Correction and Retrofit Brushless Permanent Magnet Blower Motor. This program intends to implement a residential maintenance program and be focused on comprehensive, continuously improving O&M activities that capture energy

[11] Ibid

savings and provide a high value to the end-user thus driving the intense level of market transformation of the HVAC industry envisioned by the Strategic Plan.[12]

In addition to the market transformation aspect of the HVAC QM Program, it is also an energy efficiency program. Ex-ante savings estimates per climate zone are shown in Appendix A. As shown in appendix A, only the "Airflow Correction" and "Blower Motor Retrofit" measures have attributed energy savings while "ACCA 4 System Assessment", "Refrigeration System Diagnostic" and "1 year QM Service Agreement" have no attributed savings.

4.1 HVAC QM Program Components

The HVAC QM Program is a combination market transformation and energy efficiency program. It could also be considered to be a residential HVAC retro-commissioning, retrofit, and maintenance program. This rebate program applies to single-family and duplex units.

Although this program should be viewed as a comprehensive approach to HVAC system maintenance as envisioned by the industry standard, the program design does break the comprehensive effort into a few separate measures for ease of providing incentives to drive desired behavioral change and tracking results. These rebated measure sets in this program include:

- Basic assessment and inventory of HVAC system per ACCA Standard 4 with addition of ESA NGAT safety testing.
- Adjust, repair and renovate ducts to reduce leakage, increase airflow and improve insulation. Activities may include:
  - Return grill resizing
  - New filters
  - Supply and Return duct resizing
  - Duct routing and mounting improvement
  - Prescriptive duct system sealing
  - Duct insulation
- Fault Detection and Diagnosis (FDD) of the refrigeration system after Airflow Correction.
- Condenser coil/evaporator coil/ blower motor cleaning as required by ACCA4 and as necessary to pass the refrigerant system FDD.
- TXV installation correction and insulation resulting in improved System EER
- Blower motor retrofit - replace existing PSC motor with energy-efficient brushless permanent magnet motor
- QM-Standard (ACCA Standard 4) optional mechanical service agreements after other measures are completed.

Frequency of installed measures in the HVAC QM Pilot program is shown in Table 5.

Table 5: PG&E HVAC QM Measure Frequency

HVAC QM Measure	PG&E

[12] PG&E 2013-2014 Energy Efficiency Portfolio Statewide PIP Residential Program, PGE2100, July 2, 2012, page 139.

Initial Assessment	2,198 systems*
Airflow Correction	987
Refrigeration System Service	167
High Efficiency Blower Motor Retrofit	79
QM Service Agreement Rebate	1,274

*** NUMBERS REFLECT 2012 YTD AS OF DEC. 7, 2012.**

5.0 PROGRAM ALIGNMENT

While the ESA Program's mix of stand-alone, HVAC-related offerings provide many of the same services as the HVAC QM Program, there are also measures unique to each program. The ESA Program offerings include measures for window AC units, evaporative coolers, and heating-only systems. The HVAC QM Program includes retro-commissioning measures that require modifications and improvements to a home's HVAC system to optimize efficiencies and correct inadequacies which are more than maintenance procedures. Table 6 is a direct comparison of the two programs.

Table 6: Comparison Between ESA HVAC and HVAC QM Program Components

	ESA Program HVAC Measures	HVAC QM Rebate Program
Type of Program	Low-Income Residential, Direct Install	Residential Core Energy Efficiency and Market Transformation
Cost Per Household	Average cost 2010 – 2012 program $1,100 for all ESA Program Wx activities[13]	Estimated average $922 for HVAC QM Activities not including initial assessment or ongoing service agreement.[14]
Ongoing Costs	SCE Central AC Service is the only ongoing maintenance service	Optional Annual Maintenance Service Agreement Fee
Climate Zones	All (varies by measure)	All except 1, 3, 5, and 9
Housing Types	SF, MH, MF as defined in P&P	SF/Duplex
Safety Diagnostics	NGAT Testing	NGAT Testing
Service Delivery	ESA Program Contractors HVAC Contractors	Participating HVAC contractors who meet program requirements
Protocol	Statewide Installation Standards and Policies and Procedures	ACCA Standard 4, program Policies and Procedures, SAMobile technician software
Weather limitations	AC Tune-up are seasonal Furnace systems no weather limitations	Refrigerant FDD diagnostics can only be performed when temperature is adequate for testing AC systems.
Program Components		
Program	**ESA Central AC Tune-Up**	**HVAC QM**

[13] PG&E, ESA Program and CARE Program Annual Report for Program Year 2011, page 71.
[14] Appendix A, Table 1

Table 6: Comparison Between ESA HVAC and HVAC QM Program Components

FAU Standing Pilot Retrofit	Replace FAU standing pilot with IGPID – installed per IS section 29	Not program component unless sold to client by HVAC contractor, 100% of cost to customer if installed
Furnace Clean and Tune	Includes minor adjustments, cleaning, motor service and other repairs required to ensure safe operation of furnace installed per IS section 26.	Furnace clean and tune if needed, 100% of cost to customer if installed
Furnace Repair/Replace	Replacement of furnaces with uncorrectable NGAT fails in owner occupied dwellings per IS sections 18 and 19	Furnace repaired or replaced if needed, 100% of cost to customer if installed
Room AC	Room A/C replaced in CZ 10-16 when existing unit is non-operable or more than 15 years old per IS section 22	N/A
Smart Fan Delay	New measure installed per IS section 32 in PG&E Territory	N/A
AC Tune-up	Diagnostic Tune-up per weatherization Installation Standards (IS) See Table 1	ESA Program A/C Tune-Up treatments are addressed in HVAC QM Program
Airflow Correction	• New filters (clean electrostatic filters) • Condenser coil/evaporator coil/ blower motor cleaning • Duct Test & Seal when T-24 requires.	Adjust, repair and renovate ducts to reduce leakage, increase airflow and improve insulation. May include: • Return grill resizing • New filters • Supply and Return duct resizing • Prescriptive duct sealing • Duct insulation Utility Rebate Available
Refrigeration System Service	• Refrigerant charge levels check (subcool or weigh-in method) • Condenser coil/evaporator coil/ blower motor cleaning • Fixed orifice system diagnostics. • TXV diagnostics	• Fault Detection and Diagnosis and correction of refrigerant charge levels using SAMobile • Condenser coil/evaporator coil/ blower motor cleaning • TXV installation correction and insulation resulting in improved System EER Utility Rebate Available
High Efficiency Blower Motor Retrofit	Not offered	Replace existing PSC motor with energy efficient brushless permanent magnet motor Utility Rebate Available
HVAC Service	SCE Central AC Service (SCE Only)	Encouraging the optional purchase of ACCA Standard 4 complying service agreement with rebate.

6.0 RESPONSE TO COMMISSION'S DIRECTIVE

The Commission ordered the IOUs to investigate approaches to align, coordinate, or integrate the ESA Program offerings with the mainstream HVAC QM program and report on the feasibility of aligning these programs and, if feasible and appropriate, how they would propose to modify their ESA Program offerings to conform to the HVAC QM program objectives. Specifically the Commission asked the IOUs to produce a report that addressed the following four items:

1) Duct Test and Seal Component
2) Market Segment
3) Maintenance Service Delivery
4) Funding

6.1 DUCT TEST AND SEAL COMPONENT

This duct testing and sealing question had two components: a) Is it appropriate to consider Duct Test and Seal (DTS) as a measure in conjunction with the maintenance service in the ESA Program, and b) If not, what is an appropriate package of maintenance measures for the low-income market segment.

Question #1a*: Is it appropriate to consider Duct Test and Seal (DTS) as a measure in conjunction with the maintenance service in the ESA Program?*

Response #1a: It is not appropriate to consider the Duct Test and Seal (DTS) measure in conjunction with ongoing maintenance service in the ESA Program as:

- DTS has not demonstrated adequate savings to meet the cost-effectiveness threshold and had shown very little savings in the 2009 LIEE Impact Evaluation due to the high cost of testing versus the amount of sealing performed.
- The HVAC QM Program's Airflow Correction component utilizes a more cost-effective "prescriptive duct sealing" approach instead of "duct testing and sealing". This procedure eliminates the duct testing component while managing to effectively seal ducts.
- SCE's Central AC Service, as previously offered should not include DTS as a maintenance component as DTS is required by Title-24 when major modifications, repair, or replacement to the HVAC system are performed. Thus is not needed as an ongoing maintenance measure to be performed two-years after a new system is installed.

Findings:

- The IOUs requested that the DTS measure be retired in the 2012-2014 Program Application because DTS failed the cost-effectiveness threshold and had shown very little savings in the 2009 LIEE Impact Evaluation[15]. Furthermore, in SDG&E's ESA Program it accounts for a very small portion of the portfolio (1% of the total program expenditures).[16] However, the Commission denied the retirement of DTS and ordered

[15] "Impact Evaluation of the 2009 California Low-Income Energy Efficiency Program", EcoNorthwest, June 16, 2011, page 81.
[16] Ibid, ESA Program PD, page 84.

DTS (Ordering Paragraph #50) to be added back while a new impact evaluation is conducted.

- In the period between 01/01/2012 - 12/12/2012, the PG&E ESA Program has performed duct testing in 10,474 homes, but only duct sealed 3,236 units. This shows that only 31% of homes tested receive duct sealing treatment. Duct testing in the PG&E program accounts for approximately 47% of the total measure cost yet has no associated energy savings[17].
- SCE's Central AC Service measure is a follow-up measure designed to provide maintenance services to AC units installed through SCE's AC Replacement service. As a requirement of Title-24, DTS is performed at the time the Central AC is replaced.
- DTS is not one of the measures in the HVAC QM program (see Table 1). The HVAC QM Program includes prescriptive duct sealing as one of the components required to qualify for the Airflow Correction rebate. PG&E's post-installation inspection tests have shown that prescriptive duct sealing reduced duct leakage to approximately 11% without duct testing.[18]

Question #1b*: What is an appropriate package of maintenance measures for the low-income market segment?*

Response #1b-1: Currently all of the utilities provide some level of HVAC tune-up and measures to the low-income sector. Some are done within the weatherization component of the ESA Program while some are "stand-alone" AC tune-up or furnace "clean and tune" programs or repair and replacement programs. With the exception of SCE Central AC Service, none of the tune-up/maintenance programs utilize "on-going" service similar to that promoted by the HVAC QM Program.

Until more is known about the cost-effectiveness of the HVAC QM Program and it's on-going service contract rebate component, it is not prudent to utilize the QM approach with the low-income sector. The costs of applying this program to the low-income sector could be significant. Additionally, the HVAC QM program currently only targets central air conditioning systems, which in many low-income communities are not present. Currently no HVAC QM program component for heating-only forced air units exists.

In conjunction with current HVAC-related offerings, the recommended approach is to develop a basic HVAC tune-up and maintenance measure package that covers both heating-only FAUs and central AC systems. This package of tune-up and maintenance activities should consist of, but is not limited to:

1) Basic HVAC Tune-up and Maintenance Activities
   - Visual inspection of HVAC system, including ducts.
   - Prescriptive Air Sealing
   - Filter replacement or cleaning.
   - Blower fan cage cleaning.
   - Condenser coil cleaning and fin straightening.

[17] Data from PG&E Database
[18] Based on PG&E's Central Inspection Program quality assurance test results.

- Refrigerant Charge evaluation and adjustment.

2) These basic HVAC tune-up and maintenance activities can be easily conducted by weatherization workers or an HVAC technician; they are low-cost measures; and can be performed at any time of the year (with the exception of refrigerant charge evaluation and adjusting) for central forced-air systems in single-family, multifamily, and mobile homes.

Findings:

- Incorporating the whole HVAC-QM Program components into the ESA Program will incur significant costs to the ESA Program. The estimated costs of the HVAC QM for the measures alone, not including the diagnostics activities, is almost $1,000 per household (see Appendix A) of which a large portion is the cost of the testing components. These costs will vary as not all components will be needed at all times. These costs are almost as much as the average cost in 2010 to weatherize a household ($1,139[19]) and half as much as replacing the whole system (1,857).
- The HVAC QM Program is a new program and has not yet been subjected to an EM&V analysis. Applying it to the ESA Program an energy efficiency program before actual savings and cost effectiveness have been determined would not be prudent.

Response #1b-2: One of the components of the HVAC QM Program, the replacing of existing PSC blower motors with energy-efficient, brushless permanent magnet motors has shown significant savings in the DEER analysis and should be evaluated for addition as a new measure in the ESA Program with central AC systems. Further investigation should be conducted to determine if this motor retrofit is cost-effective in heating-only central systems.

Findings:

- This measure is one of two measures rebated in the HVAC QM Program. Adding the energy-efficient, brushless, permanent magnet blower motor replacement measure would cost about $300 per household as determined by PG&E's work paper for their service territory.
- PG&E's work paper (PGECOHVC139 R0) shows that it would save between 160 and 1300 kWhs a year depending on the climate zone and tonnage of the AC system. Savings estimates using these motors on heating-only forced air units has not been conducted at this time.
- These savings, as demonstrated in the work paper, are greater than the savings from the HVAC QM Program's air flow correction measure, which includes duct sealing and renovation.

6.2 MARKET SEGMENT

Question #2*: How should HVAC maintenance programs be designed and targeted to the single-family and multifamily market segments?*

[19] PG&E, ESA Program and CARE Program Annual Report for Program Year 2011, page 71

Response #2-1: The ESA Program HVAC tune-up and maintenance offerings should be made available for all low-income households and should be included in the ESA Program's package of measures offered at no cost to single-family, multifamily, and mobile home households.

Findings:

- Currently other ESA Program HVAC-related measures are provided to all low-income market segments. These measures should be included.
- Furnace Repair and Replacement (R&R) and AC replacement measures currently are provided only to owner-occupied residences throughout the State. SCE offers A/C replacement to owner and renter-occupied dwellings with a copay requirement for the owners of the properties. It was determined that with rental units it is the owner's responsibility to provide operating heat to occupants. Tune-up and maintenance activities are conducted on working systems to reduce energy consumption and increase comfort. Owners of rental housing, should provide regular maintenance, but are not required to have their HVAC system operate at peak efficiency.
- While owners of rental units receive the benefit of having their equipment maintained, the energy savings, bill reduction, and comfort benefits goes to the occupants who pay the utility bills. Unlike the R&R program, where the capital improvements benefit the owner, tune-ups and maintenance are not capital improvements and the occupants are the primary beneficiaries of the service.

6.3 MAINTENANCE SERVICE DELIVERY

Question #3: *The mainstream HVAC QM program provides specialized training and requires participating contractors to utilize trained technicians that follow certain service protocols. ESA Program contractors would need to either (a) receive similar training for their own technicians or (b) partner with contractors who have trained staff, or (c) the Commission would need to devise other appropriate approaches ensure HVAC QM is executed in the field. Which program deliver model makes the most sense for the ESA Program?*

Response #3-1: For the program proposed in this document the ESA Contractor can deliver the services in-house or subcontract services out to an HVAC/mechanical services company. Additional training would only be needed in cases where the contractor or the contractor's employees do not have sufficient skills to perform basic tune-up and maintenance activities.

Response #3-2: Should the Commission decided to incorporate the HVAC QM Program as a component of the ESA Program then the service delivery method could encompass both suggested delivery methods (a) ESA Program contractors would need to receive similar training for their own technicians and/or (b) they can partner with contractors who have trained staff.

6.4 FUNDING

Question #4: *Who should pay for repair and ongoing maintenance? Since these systems are only offered to owner-occupied low-income homes, should this be offered at a 100% subsidy, co-pay or are there other approaches to consider?*

Response #4-1: This response to Question #4 applies to SCE's on-going maintenance program for on central air conditioning systems install in their AC replacement program. Since the central AC replacement program is provided to both owner-occupied and tenant-occupied

households with a co-pay, the ongoing maintenance should be provided to the same households regardless of occupancy status. Because this measure only applies to newly-installed central AC systems there should be very little in the way of repair or maintenance needed for a few years. If repairs are needed after installation it is the installer's responsibility for repairing defects during the warranty period and should bear those costs on their own outside of the program.

Response #4-2: Applying SCE's approach to providing AC repair and replacement services to both tenant and owner-occupied households could make these services more available to more households, if the owners comply. However, because having adequate heat in a housing unit is the responsibility of landlords, the owners should burden some the cost for repair over a certain amount or replacement of the heating systems.

Heating and air conditioning tune-up measures, as opposed to ongoing maintenance measures, should be a program expense provided to both owner and tenant-occupied households.

7.0 RECOMMENDATIONS

After investigating approaches to align, coordinate, or integrate ESA Program offerings with the HVAC QM Program the utilities provide the following recommendations to modify their ESA Program offerings to incorporate the applicable HVAC QM program objectives.

- Do not implement the HVAC QM approach in the ESA Program until more is known about the market acceptance, cost effectiveness and savings potential of the current design of the HVAC QM Program.
- Incorporate prescriptive air sealing into the existing ESA Program HVAC tune-up components for all central systems, that includes but is not limited to:
  - Visual inspection of HVAC system, including ducts
  - Prescriptive air sealing
  - Filter replacement or cleaning
  - Blower fan cage cleaning
  - Condenser coil cleaning and fin straightening
  - Refrigerant charge evaluation and adjustment
- Evaluate adding the energy-efficient brushless, permanent magnetic, blower motor replacement measure to the ESA Program's list of measures for central heating and air conditioning systems and heating-only forced-air units.

APPENDIX A

HVAC QM Measure Cost and Savings Analysis

Appendix A: HVAC QM Measure Cost and Savings Analysis

Measure cost and savings values for the HVAC QM package of measures and the blower motor retrofit were taken from PG&E's work paper PGECOHVC139-R0 and supporting documentation are shown in Table A-1.

Table 7: Measure Costs

Measure Code	Treatment Number	Treatment	Estimation Method	Average Cost per Home Treated (PGECOHVC139 R0)
TK07	1	System Inventory & Assessment	Market Transformation – No Savings	N/A
TK08	2	Refurbish Ducts	Increased airflow	$351.68
	3	Restore and Improve Duct Insulation	Duct UA (insulation value) is improved	
	4	Duct Seal	Duct leakage reduction	
TK09	5	Clean Evaporator Coil and Blower	EER improvement NOTE: Savings are included in TK08 using Expected Value analysis to capture interactive effects of a holistic QM	$258.65
	6	New Air Filter to Match the Blower		
	7	Clean Condenser Coil		
	8	Thermal Expansion Valve (TXV) Insulation and Attachment Correction		
	9	Refrigerant Charge Correction		
TK10	10	Permanent Magnet Blower Motor Retrofit	CFM/watts blower efficiency	$312.18
TK12	11	One-year Service Agreement	Market Transformation – No Savings	N/A

Source: Measure Cost data taken from PGECOHVC139 R0

It is important to note that the costs shown in Table A-1 are average cost per home participating in the program based on a statistical model described in PGECOHVC139. It is expected that the cost will vary widely, with some homes needing fewer treatment and some homes needing more treatment. The assumptions and some of the factors with potential to affect costs are as follows.

1) Measure TK07 – ACCA 4 Assessment
    a. No measure cost was listed in PGECOHVC0139 for this measure which includes HVAC system inspection and standard utility NGAT evaluation procedures.

b. Actual cost for this measures is estimated to be $100-$200. While list cost for this activity ranges from $100 - $200 contractors conduct this assessment often as a "loss leader" for the value of the rebate ($50) to generate business.

2) Measure TK08 – Air Flow Correction
    a. Measure cost reported in PGECOHVC0139 is based on Duct Test and Seal estimated cost of $129/ton for average system size of 3.27 tons. Cost reduced by $70.34 since no diagnostic testing occurs.
    b. Actual cost may be higher if significant repair is required to meet ACCA standards including
        i. Replacement or Addition of return for systems with undersized return and/or return grill
        ii. Replacement of supply and/or return ducts for undersized ducts
        iii. Insulation of ducts
        iv. Re-mounting for incorrectly positioned duct work.
3) Measure TK09 – Refrigerant Service
    a. Measure cost reported in PGECOHVC0139 is based on coil cleaning measures and refrigerant charge correction
        i. Condenser Coil Cleaning - cost is based on DEER 2011.
        ii. Evaporator Coil Cleaning - cost is assumed to be the same as condenser coil cleaning.
        iii. Refrigerant Charge Correction - cost averages $151.75 per i. However, only 20% of households need service, so cost per household is reduces by 80%.
    b. Actual cost may be higher if significant repair is required to meet ACCA standards including
        i. Replacement of refrigerant due to non-condensables in system
        ii. Repairs required other than system refrigerant charge correction.
            1. Refrigerant loop restrictions
            2. Failing compressor
            3. Weak or failing compressor
4) Measure TK10– Blower motor replacement
    a. Measure cost reported in PGECOHVC0139 based on material cost of $198.85 and labor cost of $75.50 per hour at 1.5 hours per retrofit ($113.75) for a total cost per motor of $312.10 per unit.
5) Measure TK12 – QM Service Agreement
    a. No measure cost was listed in PGECOHVC0139 for this measure
    b. Estimated cost is $100-$150 per year.

Table A-2 shows the estimated cost of each treatment and the rebate range of each measure.

Table 8: Estimated Measure Costs

Measure Code	Treatment Number	Treatment	Estimated Cost of Treatment	Rebate Amount
TK07	1	System Inventory & Assessment	$100 - $200	$0 – $50
TK08	2	Refurbish Ducts	$100 - $400	$250 - $400
	3	Restore and Improve Duct Insulation	$100 - $400	
	4	Duct Seal	$100 - $351	
TK09	5	Clean Evaporator Coil and Blower	$0 - $11	$50-$100
	6	New Air Filter to Match the Blower	$20 - $50	
	7	Clean Condenser Coil	$0 -$11	
	8	Thermal Expansion Valve (TXV) Insulation and Attachment Correction	$0 - $50	
	9	Refrigerant Charge Correction	$50 - $300	
TK10	10	Permanent Magnet Blower Motor Retrofit	$0 - $750	$150 - $300
TK12	11	One-year Service Agreement	$0 - $150	$50
		Estimated Total Costs =	**$470 - $2,449***	**Up to $900**

* The maximum cost is not likely to occur as most systems will not require all activities as this program is dependent on what the condition of the system and the work the customer desire to have performed.

HVAC QM measure savings and measure cost per ton for all climate zones are shown in Table A-3. These costs include measures TK08 and TK09.

Table 9: HVAC QM Measure Savings and Cost (TK08 and TK09)

CZ	Capacity Tonnage	kW/ton	kWh/ton	Therms/ton	Measure Cost/Ton
1	2.1	0.11	0	10.7	$312.23
2	3.4	0.10	47	3.0	$198.37
3	2.9	0.08	12	2.8	$225.76

Table 9: HVAC QM Measure Savings and Cost (TK08 and TK09)

CZ	Capacity Tonnage	kW/ton	kWh/ton	Therms/ton	Measure Cost/Ton
4	2.7	0.09	50	3.1	$242.56
5	3.1	0.04	19	2.8	$214.23
6	3.4	0.06	36	2.3	$198.22
7	2.6	0.10	84	2.7	$256.84
8	3.1	0.06	58	2.4	$213.07
9	3.5	0.12	138	2.9	$190.96
10	3.6	0.16	141	2.7	$185.45
11	3.5	0.10	154	2.0	$189.80
12	3.3	0.10	107	2.2	$200.21
13	3.3	0.11	185	3.1	$199.79
14	4.2	0.19	203	2.8	$157.01
15	4.6	0.14	319	0.6	$143.94
16	3.3	0.15	119	7.7	$201.75

Blower Motor Retrofit measure savings (TK10) and measure cost per ton for all climate zones are shown in Table A-4.

Table 10: Blower Motor Measure Cost and Savings per Climate Zone

CZ	Capacity Tonnage	kW/ton	kWh/ton	Therms/ton	Measure Cost/Ton
1	2.1	0.07	226	-10.3	$128.81
2	3.4	0.12	110	-4.1	$81.84
3	2.9	0.07	100	-4.5	$93.14
4	2.7	0.07	81	-3.0	$100.07
5	3.1	0.04	92	-4.3	$88.38
6	3.4	0.05	47	-1.2	$81.78
7	2.6	0.14	92	-0.3	$105.96
8	3.1	0.07	74	-1.1	$87.90
9	3.5	0.12	113	-1.1	$78.78
10	3.6	0.15	112	-1.0	$76.51
11	3.5	0.19	210	-3.2	$78.30

Table 10: Blower Motor Measure Cost and Savings per Climate Zone

CZ	Capacity Tonnage	kW/ton	kWh/ton	Therms/ton	Measure Cost/Ton
12	3.3	0.15	151	-3.3	$82.60
13	3.3	0.15	181	-1.7	$82.43
14	4.2	0.13	155	-1.5	$64.78
15	4.6	0.16	292	-0.2	$59.38
16	3.3	0.09	112	-3.3	$83.23

APPENDIX B

Final Report Development and Review Process

Appendix B: Final Report Development and Review Process

Development of Final Report

The "ESA and QM Alignment Draft Final Report" was generated as a response by all four IOUs to a directive from the CPUC in the August 23, 2012, Decision (D.12-08-044) for the 2012-2014 Energy Savings Assistance (ESA) Application. In accordance with D.12-08-044, Sec. 3.6.5.1.11. Central Air Conditioner Service (SCE) and Ordering Paragraph 55, the development of this report included the following steps:

1) distribution of report to those on the service list,
2) presentation at a public workshop, and
3) review/receipt of comments and integration into final document

Public Workshop

A public workshop was conducted on December 7, 2012 with the purpose of reviewing the report and securing public comment. Table B-1 documents the attendees, both in person and by phone, at the public workshop.

Table 11: Public Workshop Attendees

Attendee		Organization
Mark	Aguirre	SoCal Gas
Craig	Allen	SoCal Gas
Iona	Anghel	BPI
Nathan	Aronson	RHA
Tom	Barrett	RHA
Ed	Becker	SDG&E
Mauricio	Blanco	SCE
Stephanie	Borba	Western
Greg	Buchler	SCE
Tory	Francisco	CPUC
Ron	Garcia	Reliable
Syreeta	Gibbs	CPUC-ED
Ann	Gressani	CHPC
Dennis	Guido	Staples and Assoc.
Bill	Holloway	PG&E
Marshall	Hunt	PG&E
Davi	Ibarra	SCE
Bobby	Johnson	PG&E
Dan	LaMar	SDG&E
Patti	Landry	PG&E
Cynthia	Mitchell	TURN
James	O'Bannon	RHA

Table 11: Public Workshop Attendees

Attendee		Organization
Mary	O'Drain	PG&E
Emma	Ponco	SoCal Gas
Jeff	Schick	PG&E
Nils	Strindberg	CPUC-ED
Frances	Thompson	PG&E
Yvette	Vasquez	SDG&E
Richard	Villasenor	TELACU
Camille	Watts-Zagha	CPUC-DRA
Kathy	Wickware	SDG&E

Public Review and Comment

As a result of this workshop, comments were received and integrated into the Final Report. Table B-2 documents comments received and how those comments have been addressed in the Final Report.

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
1	Section 1, 2nd paragraph	The Residential HVAC Quality Maintenance (HVAC QM) Program is a statewide market transformation program that will continue the transformation process…	*As a relatively new program, with very little uptake particularly in residential, it might be better to phrase as such, stating something to the effect that it hopes to transform the market, but that it is too early to tell whether the current extensive standards approach with optional maintenance contract will prove out to be the optimal approach, strategy.*	C. Mitchell, TURN	Added verbiage to HVAC QM section.

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
2	Item 1.1	ESA Program HVAC Components	*Could we have a matrix that by utility, indicates each element offered as part of ESAP in their service territory? For instance, from the workshop it appears that while PG&E and SCE both replace central AC units, SCE does so in in renter occupied housing with a $500 co-pay from the property owner; with PG&E offering in owner-occupied with no-copay; and with SDG&E having no central AC replacement.* *It would also be helpful to understand the basis for the differences between utilities.*	C. Mitchell, TURN	Table 3 added to address this comment.
3	Item 1.1, bullet 3	AC Tune-up/Maintenance	*Per the workshop discussion, "maintenance" may not be applicable here if meaning an ongoing / periodic activity.*	C. Mitchell, TURN	Definitions section added
4	Section 2	ESA Program's broad mix of HVAC-related, stand-alone measures...	*From the above requested matrix, will the reader be able to understand all of the "broad mix of HVAC-related, stand-alone measures"?*	C. Mitchell, TURN	Word broad has been removed and more description of each measure is included in table 1
5	Section 2	ESA Program's broad mix of HVAC-related, stand-alone measures provide	*Explain.*	C. Mitchell, TURN	Modified Verbiage to make more clear

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
		many of the same services as the HVAC QM Program; however, they are not limited to central AC systems.			
6	Table 1	Program Components	*could we get average time estimates to perform the work involved in each program component, or program in total?*	C. Mitchell, TURN	This information is not readily available, cost per measure has been included instead
7	Item 3.1	This duct testing and sealing question had two components: a) Is it appropriate to consider Duct Test and Seal (DTS) as a measure in conjunction with the maintenance service in the ESA Program…	*tune-up service?*	C. Mitchell, TURN	Changed
8	Item 3.1, response #1a, bullet 3	The HVAC QM Program's Airflow Correction component utilizes a more cost-effective "prescriptive duct sealing" approach...	*Are the IOUs also willing to offer duct insulation?*	C. Mitchell, TURN	Currently there is not enough information available to assess cost effectiveness of duct insulation
9	Item 3.1, response #1b-1	Currently all of the utilities provide some level of HVAC tune-up and	*strike?*	C. Mitchell, TURN	"Maintenance " defined and report language modified

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
		maintenance measures…			
10	Item 3.1, response #1b-1	With the exception of SCE Central AC Service, none of the tune-up/maintenance programs utilize "on-going" service similar to that promoted by the HVAC QM Program.	*So this is confusing, SCE does offer maintenance agreements in ESAP?*	C. Mitchell, TURN	Addressed in Table 1
11	Item 3.1, response #1b-1	In conjunction with current HVAC-related offerings, the recommended approach is to develop a basic HVAC tune-up and maintenance measure package…	*refer to for ESAP as just tune-ups?*	C. Mitchell, TURN	"Maintenance " defined and report language modified
12	Item 3.1, response #1b-1, item 1), bullet 2	Prescriptive Air Sealing	*And duct insulation?*	C. Mitchell, TURN	Currently there is not enough information available to assess cost effectiveness of duct insulation

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
13	Section 4	RECOMMENDATIONS	*It might be helpful to the reader to know up front where this is all going; that is, often we include an introductory summary paragraph that is very similar to the conclusion finding/ recommendations.* *What is the timeframe for getting started with these recommendations?* *Also, Tory's comments at the workshop today as to including some estimates as to magnitude of impact in terms of households, savings, etc. would be very helpful.*	C. Mitchell, TURN	Summary added This will be addressed in the Tier 2 advice letter if applicable This will be addressed in the Tier 2 advice letter if applicable
14	Appendix A, Table A-1, TK12, Treatment No. 11	Market Transformation – No Savings	*Is "no savings" really the right characterization? I thought the idea was to keep the system operating and optimal efficiency over time; thus there is an assumption that without ongoing periodic maintenance, system efficiency degrades, leading to more energy usage.*	C. Mitchell, TURN	This savings claim is taken directly from the HVAC QM work paper. It is beyond the scope of this report to investigate savings claims from other programs.
15	Appendix A: HVAC Cost and Savings Analysis, Item 5, description of Table A-2	Table A-2 shows the estimated cost of each treatment and the rebate amount if each measure. Rebate amount vary by utility and are represented	*could we get similar analysis, data presentation, for the recommended ESA Program HVAC measures for central systems, page 10?*	C. Mitchell, TURN	Added Table 3 which shows the measures cost

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
		as a range.			
16	Item 1.1	ESA Program HVAC Components	*We didn't list Free Standing Pilot Retrofit as one of our measures. Why?*	Richard Villasenor, TELACU	Added to report
17	Item 3.1, response #1b-2, bullet 1	Adding the energy-efficient, brushless, permanent magnet blower motor replacement measure would cost about $300 per household as determined by PG&E's work paper for their service territory.	*The Permanent Magnet Blower Motor Retrofit price seems a little low. The prices that we are finding for these types of Motors run between $200-$250 dollars our cost. Once you add the markup and labor we are looking at $375.00-$425.00 for this measure, will the numbers still work?*	Richard Villasenor, TELACU	Addressed in Table A-2 to account for markup.
18	see comment	see comment	*Are we going to install both the above measures (Free Standing Pilot Retrofit and Permanent Magnet Blower Motor) in the same house? That seems like a lot of money to put into a 30-40 year old Furnace. Would it be better to replace it?*	Richard Villasenor, TELACU	These issues are beyond the scope of this report but would need to be addressed prior to implementation
19	see comment	see comment	*What is the status of EM&V for the HVAC QM program? The ESA and HVAC QM alignment Reports says cost-effectiveness is not available. When will it be available, based on anticipated EM&V results?*	Camille Watts-Zagha, CPUC DRA	Initial EM&V results are expected Q1, 2014

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
20	see comment	see comment	*Why aren't work papers from SCE and SDG&E included to demonstrate program costs? In particular, the Decision requires a comparison between SCE Central AC service and HVAC QM.*	Camille Watts-Zagha, CPUC DRA	The program is still being designed and all work papers are not complete. Complete and available work papers were used
21	see comment	see comment	*What is the difference between tune-up and maintenance?*	Camille Watts-Zagha, CPUC DRA	Added definitions section
22	see comment	see comment	*What can be done to make a better apples-to-apples comparison for purposes of alignment?*	Camille Watts-Zagha, CPUC DRA	Provided more information and changed table 5 to address this
23	see comment	see comment	*It may be more appropriate to compare the ESAP HVAC services offered specifically to Single Family dwellings to the HVAC QM, since this will make the comparison more appropriate.*	Camille Watts-Zagha, CPUC DRA	Per the LIEE P&P Manual, all HVAC measures are offered to SF homes.
24	Section 1	OVERVIEW OF ESA AND HVAC QM PROGRAMS	*reference that ESAP is also part of the California Energy Efficiency Strategic Plan (on page 2)*	Camille Watts-Zagha, CPUC DRA	Added as suggested

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
25	Items 1.1 and 1.2	see comment	*make equivalent sections 1.1 and 1.2 to a greater extent. For example:* *1. Section 1.2 states "Basic assessment and inventory of HVAC system per ACCA Standard" 4. To make comparable, have Section 1.1 state "Basic assessment and inventory of HVAC system per ESAP Installation Standard."* *2. Section 1.1 states "measures vary by climate zone, system type and utility." To make comparable, have Section 1.2 specify whether HVAC QM varies by climate zone, system type or utility.* *3. Section 1.2 states HVAC QM applies to single family and duplex units. To make comparable, have Section 1.1 state that ESAP services x, y, and z apply to single-family, and duplex units up to 3 units. ESAP services a, b, and c apply to multi-family dwellings with 4 or more units.*	Camille Watts-Zagha, CPUC DRA	1. Retained original description of ESA program, as this is the description directly from the Installation Standards Added verbiage to report This data resides in the P&P manual and is not duplicated in this report.
26	Item 1.1	see comment	*give an indication of the penetration for all the services listed, for one or 2 years. Specify which services are dependent on another, or are all the services stand-alone?*	Camille Watts-Zagha, CPUC DRA	Need to address - working on this data with QM folks

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
27	Item 1.1	see comment	*Explain if Furnace Repair & Replacement is funded out of the ESAP program. Explain if Furnace Repair and Replacement is implemented by ESAP contractors and if not, by which contractors and under which standards.*	Camille Watts-Zagha, CPUC DRA	Added information to Table 6
28	Item 1.1	see comment	*explain in greater detail why some measures are labeled "Health, Comfort & Safety (HSC)".*	Camille Watts-Zagha, CPUC DRA	Added in definitions section
29	Table 1	Program Components	*Under the "Program Components" section of Table 1, specify that the Central AC tune-up service is only for SCE (if correct). Specify the age of the HVAC equipment that Central AC tune-up service is available for (first bullet at top of page 6 implies SCE's Central AC tune-up service is only for units that were replaced by SCE within 2 years.)*	Camille Watts-Zagha, CPUC DRA	Addressed in Table 1
30	Section 3, item 3.1, response #1a, bullet 1 under "Findings"	RESPONSE TO COMMISSION'S DIRECTIVE	*Do not rely on the 2009 LIEE Impact Evaluation for savings estimate. An alternative source for savings estimate for DTS is the 2005 LIEE Impact Evaluation.*	Camille Watts-Zagha, CPUC DRA	2005 LIIE Impact Evaluation does not address this issue
31	Appendix A, Table A-1: HVAC Cost and Savings Analysis	Average Cost per Home Treated	*Average cost: specify the average cost for HVAC services through ESAP for single-family dwellings, not the average cost for the entire ESAP program. Additionally, specify cost BY UTILITY of ESAP HVAC*	Camille Watts-Zagha, CPUC DRA	Data Added to report

Table 12: Public Comments to Draft Final Report

Item No.	Report Reference	Report Language	Suggested Change/Comment	Author	How Addressed in Report
			services.		
32	general	general	clarify difference between "tune-up" and "maintenance"; clarify whether maintenance is recommended or not,	during public workshop	added definitions sections
33	general	general	include breakdown of ESA offerings by utility and by climate zone including frequency	during public workshop	Added in Tables 2-4
34	general	general	include breakdown of HVAC QM offerings by utility and by climate zone including frequency	during public workshop	Added in Tables 2-4
35	general	general	include comparison between T24 duct test, ESA duct test & seal, and prescriptive duct sealing	during public workshop	added definitions sections