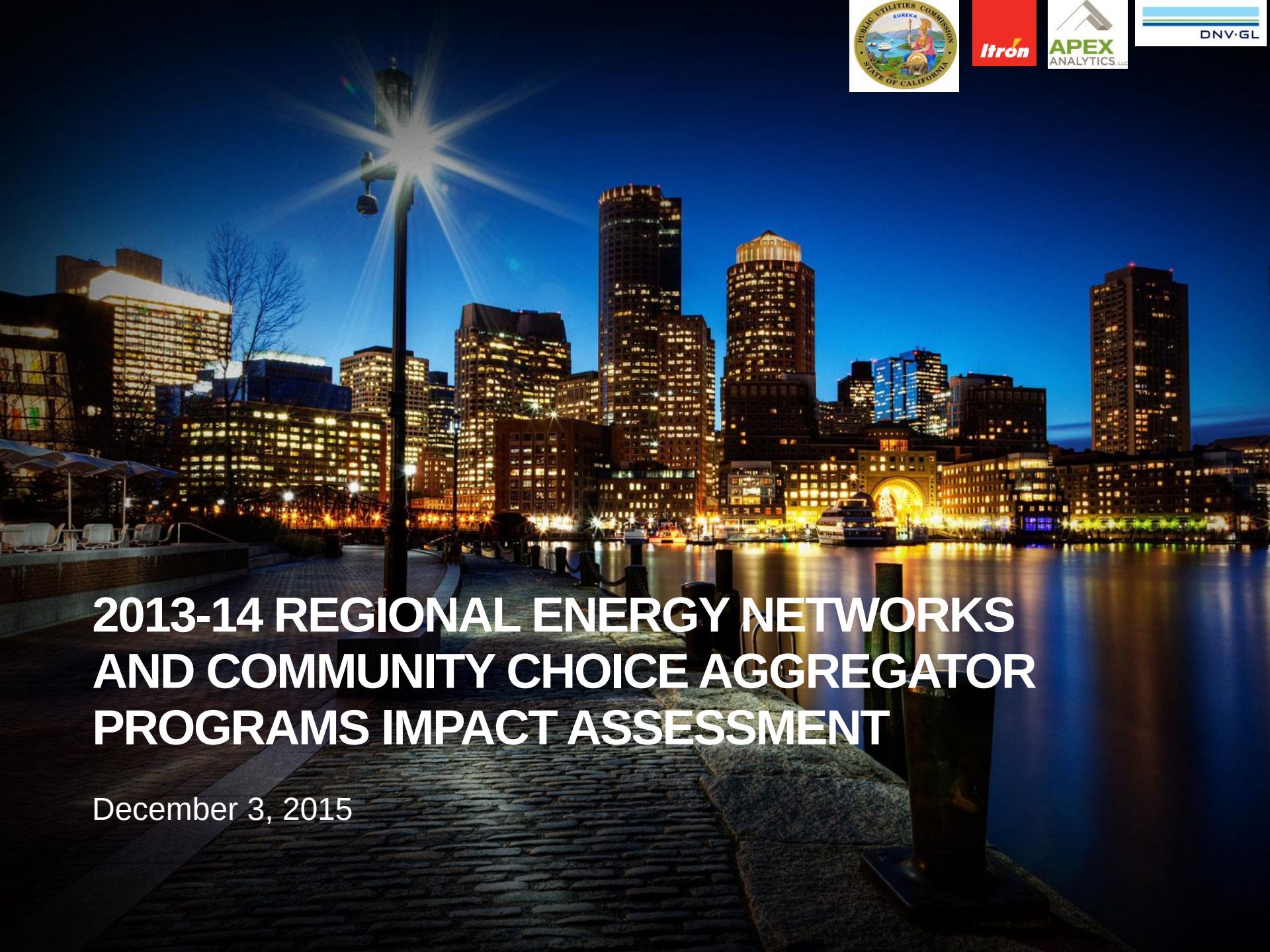


2013-14 REGIONAL ENERGY NETWORKS AND COMMUNITY CHOICE AGGREGATOR PROGRAMS IMPACT ASSESSMENT

December 3, 2015

STUDY GOALS

Impact Assessment:

- Primary goal - perform an impact assessment to develop more reliable estimates of program cost effectiveness

Non-Resource Assessment:

- Secondary goal - document the programs' non-resource accomplishments to identify benefits outside of ex ante savings claims

A more comprehensive ex post impact evaluation is planned in the 2015 EM&V budget.

ANALYSES CONDUCTED BY PROGRAM

PA	Program	Gross Impact Assessment	NTG Analysis	Cost-Effectiveness Analysis	Evaluability Assessment	Accomplishments Assessment
BayREN	Single Family Home Upgrade	X		X	X	X
	Multifamily Whole Building Upgrade	X	X	X	X	X
	Codes and Standards Program					
	Energy Efficiency Financing Portfolio					
SoCalREN	SF Home Upgrade and MF Whole Building	X		X	X	X
	Financing					
	Regional Energy Center				X	X
MCE	Multifamily Program	X		X	X	X
	Small Commercial Program	X	X	X	X	X
	Single Family Program				X	X
	Finance Pilots Program					

GROSS ASSESSMENT

MCE SMALL COMMERCIAL & MULTIFAMILY PROGRAMS

- EX ANTE REVIEW OF ALL DEEMED MEASURES
- EVALUATION UPDATE OF DEEMED AND CALCULATED SMALL COMMERCIAL LIGHTING MEASURES

MCE EX ANTE REVIEW OF DEEMED MEASURES

Objective – Determine if the ex ante savings provided in MCE's tracking data for deemed measures were reported correctly.

- Every deemed claim ID was reviewed for MCE.
- Each impact parameter was compared to DEER and/or PG&E's workpapers and updated with correct values.
  - The majority of records required at least one update to an impact parameter
    - Every small commercial claim ID
    - Two-thirds of multifamily claim IDs
    - Many changes were small rounding errors, but larger discrepancies were identified.

MCE EX ANTE REVIEW OF DEEMED MEASURES

- Savings values were updated with the correct values.
  - Corrected lifecycle gross savings values were approximately 60-70% of the reported values.
  - Reported values are generated from program tracking data submitted to the CPUC.

	First Year Gross Savings			Life Cycle Gross Savings		
	Reported	Reviewed	GRR	Reported	Reviewed	GRR
kW	34.78	29.03	83%	358.28	226.06	63%
kWh	203,339	189,618	93%	2,015,731	1,440,971	71%
Negative Therms	-1,312	-1,190	91%	-14,280	-10,300	72%
Positive Therms	7,812	4,854	62%	93,116	56,617	61%
Total Therms	6,500	3,665	56%	78,836	46,318	59%

Note: Positive therms are associated with gas measures, negative therms are associated with electric measures.

MCE DEEMED EX ANTE REVIEW - CONCLUSIONS & RECOMMENDATIONS

- MCE should set up an internal process to check the quality and consistency of ex ante data reported to the CPUC and ensure they are providing detailed measure descriptions and references to ex ante assumptions.
  - MCE did not provide key references for their ex ante assumptions or provide detailed measures descriptions.

- MCE should ensure critical fields needed for savings calculations are filled in and valid.
  - Critical impact parameter fields for savings calculation purposes were not valid or were found to be inconsistent for MCE.

EVALUATION UPDATE OF DEEMED MCE SMALL COMMERCIAL LIGHTING MEASURES

Objective – Develop savings values for MCE Small Commercial deemed indoor lighting measures.

- Ex post results were utilized from two CPUC evaluations:
  - 2013 Nonres Downstream Deemed ESPI Impact Evaluation
  - 2010-12 Nonres Downstream Lighting Impact Evaluation
- The following indoor lighting measures were evaluated:
  - CFLs
  - LED lamps and reflector lamps
  - Linear fluorescents delamping
- The majority of savings claims were updated
  - Approximately two-thirds of the demand reduction
  - Over half of the energy savings

EVALUATION UPDATE OF DEEMED MCE SMALL COMMERCIAL LIGHTING MEASURES

- Evaluated first year gross savings were a quarter less than claimed savings
- Evaluated lifecycle year gross savings were about a third less than claimed savings
  - Smaller than first year due to reductions to EUL

	First Year Gross Savings			Life Cycle Gross Savings		
	Claimed	Evaluated	GRR	Claimed	Evaluated	GRR
kW	21.05	15.55	74%	209.68	134.53	64%
kWh	84,361	63,857	76%	873,032	550,726	63%

DEEMED SAVINGS EVALUATION UPDATE - CONCLUSIONS AND RECOMMENDATIONS

- Future ex ante and deemed savings updates should incorporate evaluation results.
  - Significant variability was found between ex ante and evaluated values for deemed measures.

EVALUATION UPDATE OF CALCULATED MCE SMALL COMMERCIAL LIGHTING MEASURES

Objective – Develop savings values for MCE Small Commercial calculated indoor lighting measures.

- Savings values were developed for 38 calculated project applications.
  - The sample represented 53% of the claimed first year gross savings.
  - Every measure group was represented.

EVALUATION UPDATE OF CALCULATED MCE SMALL COMMERCIAL LIGHTING MEASURES

- Evaluated and claimed results compared well for first year gross savings.
- Evaluated lifecycle gross savings values were 74-81% of claimed values.
- At the measure level there was significant variability:
  - First year gross realization rates varied from 52% to 132%.
  - Lifecycle gross realization rates varied from 44% to 138%.

	First Year Gross Savings			Life Cycle Gross Savings		
	Claimed	Evaluated	GRR	Claimed	Evaluated	GRR
kW	89.85	89.77	100%	1181.58	912	77%
kWh	640,776	670,303	105%	8,535,196	6,893,661	81%
Therms	-2794	-2834	101%	-35528	-26359	74%

CALCULATED SAVINGS EVALUATION UPDATE - CONCLUSIONS AND RECOMMENDATIONS

» MCE should estimate EULs as part of the calculated application process using site-specific operating hours developed for the project, and DEER based service lives.

- MCE's ex ante EULs for LED measures were much greater than evaluated estimates for calculated measures, and were not documented as part of the project calculation workbooks.

» MCE should consider either:

1. Collecting and utilizing site-specific operating hours developed by activity area,
2. Utilize operating hour values from the 2010-2012 and 2013-2014 nonresidential lighting impact evaluations, or
3. Utilize the Deemed path if they are going to rely on default values.
   - MCE is relying on default operating hours that are typically greater than evaluated values.

CALCULATED SAVINGS EVALUATION UPDATE - CONCLUSIONS AND RECOMMENDATIONS

- Document lifecycle savings in the project calculation workbooks and ensure the dual baseline calculation is done correctly in the claimed database:

  = (First baseline savings * RUL) + (second baseline savings * (EUL-RUL))

  - Lifecycle savings values were not documented in MCE's calculation workbooks.

- MCE should ensure that savings values in the project calculation workbooks match claimed savings in the tracking data.
  - Roughly half of the calculated savings values in the tracking data did not match the project calculation workbooks.

FINAL MCE GROSS ASSESSMENT RESULTS

- The final evaluated results for MCE's small commercial and multifamily measures were based on:
  - Evaluation updates for:
    - All small commercial calculated lighting measures
    - Indoor CFL, LED and delamping small commercial deemed measures
  - Corrected ex ante values for all remaining measures
- Evaluated lifecycle gross savings values were
  - 76 and 80% of claimed kW and kWh values
  - 63 and 76% of claimed positive and negative therm values

	First Year Gross Savings			Life Cycle Gross Savings		
	Claimed	Evaluated	GRR	Claimed	Evaluated	GRR
kW	125	119	95%	1,548	1,176	76%
kWh	872,920	878,904	101%	10,927,628	8,789,328	80%
Negative Therms	-4,106	-4,017	98%	-49,807	-37,618	76%
Positive Therms	8,127	5,170	64%	97,349	60,850	63%
Total Therms	4,021	1,153	29%	47,541	23,232	49%

GROSS ASSESSMENT

REN MULTIFAMILY WHOLE BUILDING PROGRAMS

- DATABASE ASSESSMENT
- ENGINEERING SIMULATION MODEL REVIEW
- ENGINEERING DESK REVIEW
- CONSUMPTION ANALYSIS
- BASELINE ANALYSIS

REN MULTIFAMILY DATABASE ASSESSMENT

Objective – Assess completeness of tracking databases and ensure fields necessary for evaluation were tracked.

- Reviewed the IOU and REN tracking databases and CPUC-claimed savings information.
- Specific fields assessed
  - Participant contact information
  - Measures installed (quantity, location, efficiency)
  - Preexisting conditions
  - Types of and fuels for property hot water, cooling, and space heating systems
  - Utility account numbers for each property and unit

REN MULTIFAMILY DATABASE ASSESSMENT

The RENs and IOUs databases contain varying levels of completeness:

- ●: data provided were completely populated;
- ◑: some of the data were populated;
- ◌: most or all of the data were missing or inaccessible.

Attribute		PA			
		SDG&E	PG&E	BayREN	SoCalREN
Participant Contact Information		●	●	●	●
Measure Details					
	Type	●	◌	●	●
	Quantity	◑	◌	●	●
	Location	●	◌	●	◌
	Efficiency	●	◌	●	●
Preexisting Conditions		●	◌	●	●
Property Systems (Type and Fuel)					
	Hot Water Systems	●	◌	◌	◑
	Space Cooling	●	◌	◑	◑
	Space Heating	●	◌	◑	◑
Property Details					
	Quantity of Tenant Units	●	◌	●	●
	Bedrooms	●	◌	●	●
	Bathrooms	●	◌	●	●
Utility Account Numbers					
	Tenant Spaces	●	◌	◑	◌
	Common Areas	●	●	◑	●

REN MULTIFAMILY DATABASE ASSESSMENT

- Lifecycle savings
  - BayRen calculates lifecycle savings as
    $$Savings_{Lifecycle} = Savings_{ER} * EUL$$
  - Correct lifecycle calculation should account for a code baseline after RUL period, or:
    $$Savings_{Lifecycle} = (RUL * Savings_{ER}) + \big((EUL - RUL) * Savings_{Code}\big)$$
- Project EUL
  - RENs have assigned an 18 year EUL for all projects
  - Should be a savings weighted value, based on measures installed at each project

REN MULTIFAMILY ENGINEERING SIMULATION MODEL REVIEW

Objective – Compare methods & assumptions used to model energy savings

- Interviews and EnergyPro input file review
- ID and select most similar BayREN, SoCalREN and SDG&E projects for comparison

» EnergyPro Versions

- BayREN uses a unique version of EnergyPro, called EnergyPro Lite
- Others use EnergyPro Nonresidential

» Populating EnergyPro

- Both RENs and SDG&E all require rigorous levels of training and certification requirements for their contractors/raters.

REN MULTIFAMILY ENGINEERING SIMULATION MODEL REVIEW

- Use of External Calculators
  - BayREN and SoCalREN also utilize savings calculations from additional sources:
    - CPUC-specific dispositions (if any),
    - Workpapers or DEER-based calculations (the defaults)
- Baseline Conditions:
  - All three PAs use actual existing building conditions as the assumption of baseline conditions for all participants and all measures
- Calibrating to Billing Usage Data
  - Billing data is not being utilized to calibrate the simulation models.

REN MULTIFAMILY ENGINEERING DESK REVIEW

Objective – Compare ex ante savings claims (simulation models), to savings from engineering algorithms.

- Six projects evaluated - desk review savings only 11-29% of claimed kW and kWh, but 226% of claimed therm savings.
  - At project level, realization rates varied significantly, from 4% to 857%

	First Year Gross Ex Ante Claim	Desk Review First Year Gross Savings	GRR
kW	114.6	12.56	11%
kWh	679,320	200,300	29%
Therms	28,345	64,171	226%

REN MULTIFAMILY ENGINEERING DESK REVIEW

Various factors may be affecting this comparison, varying directions and magnitudes:

- **Baseline Assumptions:**
  - Ex ante modeled savings assumed early replacement (ER) on all project measures.
  - The engineering review sources did not always differentiate savings between ER and replacement on burnout (ROB).
- **Stacking Effect:**
  - Simulation models can account for the interactive affects of combining measures, or a “stacking effect,”
  - The engineering review did not account for these interactions.
- **Available Data:**
  - Data required for the engineering review were not always available, such as size (capacity), location, and/or pre-existing (baseline) conditions.

REN MULTIFAMILY CONSUMPTION ANALYSIS

Objective – Ensure claimed savings were reasonable (10-20%) relative to project annual billing (gas and/or electric).

- Three primary steps:
  - Linking billing data to project data
  - Validating comprehensiveness of billing and savings data
  - Comparing the claimed savings to actual pre-program billing data
- 12 months of pre-installation billing
- 27 electric (out of 81) and 24 gas (out of 83) projects for BayREN were used for the analysis.
  - No SoCalREN projects were analyzed (they only had 2 projects)

REN MULTIFAMILY CONSUMPTION ANALYSIS

- Across both gas and electric savings, 3 projects showed abnormally high and 3 projects showed abnormally low savings
- More than a quarter of the sites had a first year savings to annual bill ratio outside of a typical range:

REN	Billing Period	Total Number of Projects Reviewed	Savings to Usage Ratio			
			<10% Savings	10%–19% Savings	20%–50% Savings	>50% Savings
Electric						
SoCalREN	12 Month Pre-Installation	25	14	8	3	0
Gas						
BayREN	12 Month Pre-Installation	23	5	9	6	3

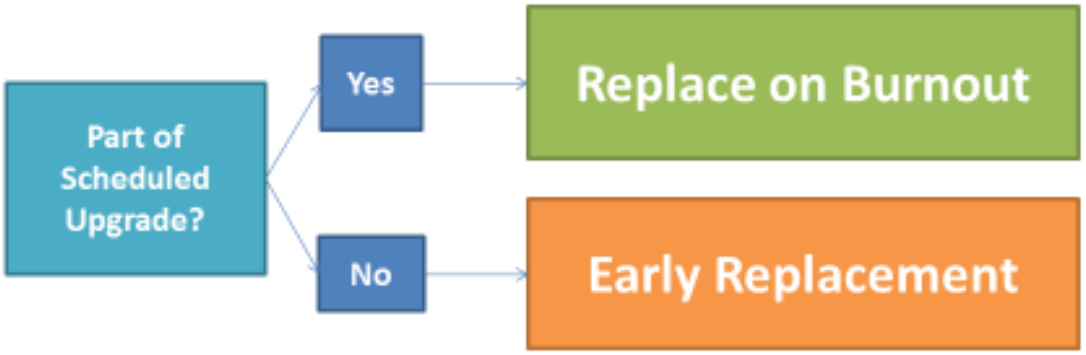
REN MULTIFAMILY BASELINE ANALYSIS

Objective – Determine if appropriate ER/ROB baseline assumptions were applied.

- The RENs assume 100% ER designation.
- The evaluated ER/ROB designation was based on phone survey responses to:
  - Equipment working status
  - Equipment age
  - Equipment expected remaining life
  - Retrofit was part of regularly scheduled/government-mandated upgrade

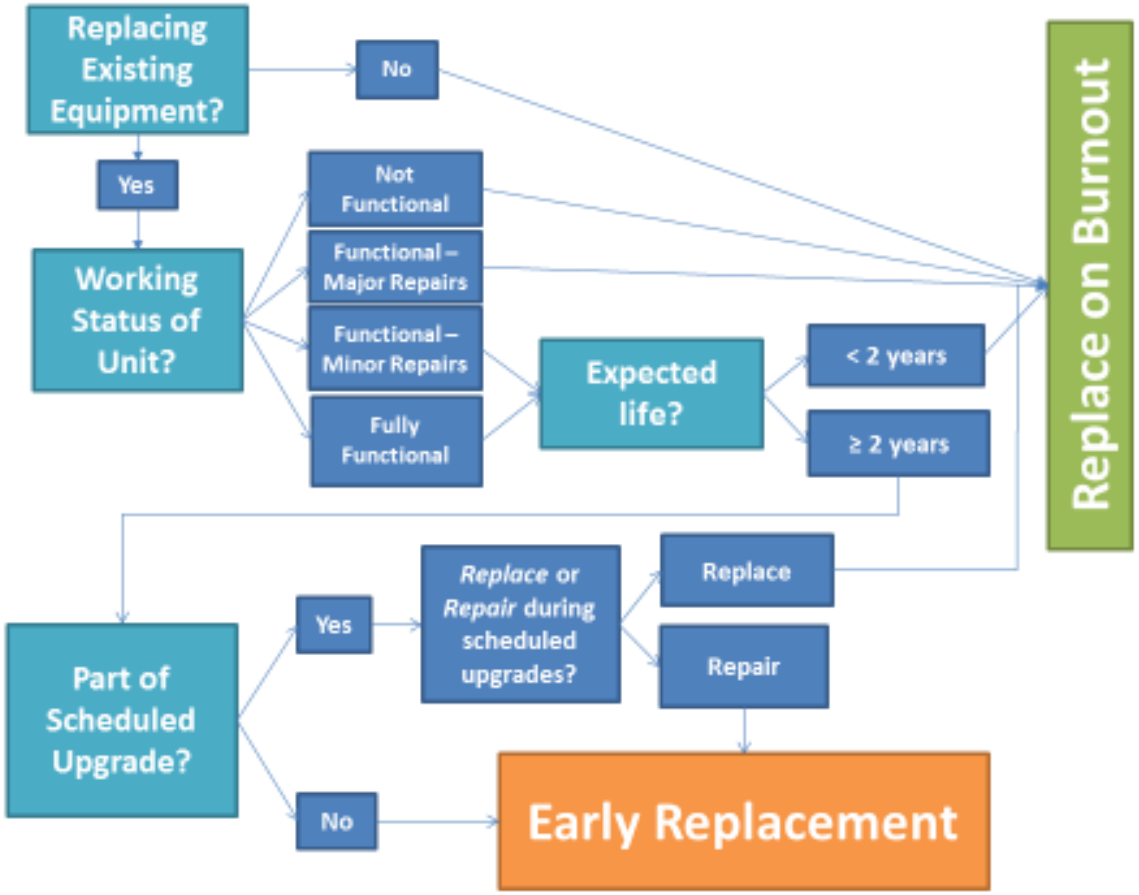
REN MULTIFAMILY BASELINE ANALYSIS

- Lighting and thermostat measures were assumed to be ER measures.
- Windows, roofing, small DHW, and insulation assumed ROB unless not part of regularly scheduled, planned, or government-mandated upgrade



REN MULTIFAMILY BASELINE ANALYSIS

» All other measures utilized the following logic:



REN MULTIFAMILY BASELINE ANALYSIS

- A number of measures were found to have an ER designation ≤67%, indicating first year and lifecycle savings may be over-estimated:
  - Other DHW – 20% ER
  - Windows – 48% ER
  - Small DHW – 67% ER

Measure Category	Measure(s)	% ER
Shell/Insulation (n = 19)	Insulation (Attic, Wall, Floor, Crawlspace)	83%
Shell/Windows (n = 16)	Windows	48%
Small DHW (n = 41)	Faucet Aerator, Low-Flow Showerhead, Pipe Insulation	67%
Appliance (n = 3)	Clothes Washer, Refrigerator	100%
Large DHW (n = 21)	Storage/Tankless/Boiler Water Heaters, Hot Water Demand Control	84%
Other DHW (n = 5)	Water Heater Pump, Water Heater Boiler Controls, Thermostatic Radiator Valve	20%
Space Heating (n = 3)	Space Heating Boiler	100%

REN MULTIFAMILY GROSS ASSESSMENT – CONCLUSIONS AND RECOMMENDATIONS

- IOUs and RENs should ensure all key fields are collected and easily accessible for all completed projects.
  - IOU and REN EUC MF tracking data have varying levels of completeness.

- The RENs and IOUs should collaborate and agree on consistent methods to estimate savings.
  - BayREN, SoCalREN, and SDG&E use different approaches to calculating savings for some MF measures.

- The RENs should collect meter numbers for MF participants to allow for improved matching of program and billing data.
  - Matching program data to billing data by accountIDs was largely unsuccessful, likely due to high turnover rate for MF tenants.

REN MULTIFAMILY GROSS ASSESSMENT – CONCLUSIONS AND RECOMMENDATIONS

- The RENs should set up a system whereby savings estimates can be shared and verified by the IOUs for MF participants.
  - Inability to calibrate to actual bills may lead to savings estimates that are either overestimated or under the targeted program savings threshold.

- Simulation models and billing analysis would provide a more effective approach, and site visits would allow verification of the key model inputs.
  - It was difficult to validate claimed savings via an engineering desk review because of interactive effects, stacking effects, and differences in baseline assumptions.

- The RENs should set up an intake survey to better determine the appropriate baseline for each project and measure.
  - A substantial portion of projects may not qualify for early replacement because of planned improvements, installation of new equipment, or replacement of equipment that was in poor condition.

REN MULTIFAMILY GROSS ASSESSMENT – CONCLUSIONS AND RECOMMENDATIONS

- The RENs should calculate lifecycle savings for ER projects using the ER baseline for the RUL period, then using a code baseline for the remainder of the EUL.
  - The RENs have assumed an ER baseline on their first year savings, they are not always calculating lifecycle savings to reflect a change in baseline after the end of the project RUL.

- The RENs should be sure to use the correctly weighted and calibrated EUL and RUL that results in the correct lifecycle savings values, rather than the 18-year EUL currently reported in the tracking database.
  - Tracking database did not suggest weighted EUL was being utilized.

GROSS ASSESSMENT

REN SINGLE FAMILY HOME UPGRADE PROGRAMS

- WORKPAPER REVIEW
- SAVINGS COMPARISON

REN SINGLE FAMILY HOME UPDATE WORKPAPER REVIEW

Objective – Determine the level of consistency between the workpapers among the RENs and IOUs.

- Neither BayREN nor SoCalREN had a workpaper approved by CPUC for the 2013-14 program cycle.
- Five different methods were used by each REN to calculate the savings throughout the 2013-14 program period.
  - This consisted of workpapers, calculators or a combination of both
- Both RENs were using an outdated version of a savings calculator (EUCA version 11).
  - The calculator had an error that used a baseline wattage value of zero when a code baseline was not available.
  - For SoCalREN, this resulted in reporting negative lifecycle savings values for some measures.

REN SINGLE FAMILY HOME UPDATE SAVINGS COMPARISON

Objective – Compare the REN savings values with the IOU values to see if there was consistency across the PAs, and help assess the reliability of the values.

- Overall the BayREN and PG&E values were the same or similar for most measures analyzed.
- There were very few comparison points for SoCalREN and SCE.
  - For the limited comparisons made, average values varied greatly between SoCalREN and SCE.

REN SINGLE FAMILY GROSS ASSESSMENT - CONCLUSIONS AND RECOMMENDATIONS

- All implementers should use consistent workpapers.
  - The RENs utilized five different sets of workpapers during the 2013-2014 single family Home Upgrade program.

- Ensure the most recent approved version of the EUCA calculator is being used.
  - An older version of the EUCA calculator was used which had an error, resulting in the miscalculation of lifecycle savings.

- A consistent set of measure codes should be developed to represent measures or bundles of measures, and utilized by all implementers.
  - There were no common measure codes in the workpapers or tracking data across IOU or REN.

NET-TO-GROSS ANALYSIS

NET-TO-GROSS ANALYSIS

Objective – Develop ex-post NTGRs for MCE Small Commercial and BayREN Multifamily Whole Building retrofits

- MCE Commercial Measures
  - 20 participants were surveyed to estimate NTGRs
  - Utilized existing NTGR algorithm and survey battery used for the 2013 and 2014 Nonresidential Deemed ESPI Impact evaluations

- REN Multifamily Whole Building Measures
  - 32 participants were surveyed to estimate NTGRs
  - Utilized the existing NTGR algorithm and survey battery used for the 2013-14 Statewide Multifamily Impact Evaluation

NET-TO-GROSS – MCE SMALL COMMERCIAL

- The ex post NTGR weighted by kWh savings is approximately a quarter lower than the ex ante value – 0.62 versus 0.86.

n	Ex ante NTGR kWh	Ex Post NTGR kWh	Relative Precision	Ex ante NTGR kW	Ex post NTGR kW	Relative Precision
20	0.86	0.62	9%	0.78	0.65	7%

- NTGRs compare very well to results of similar IOU Program Evaluation Results
  - Within 3 percentage points weighted by kWh

Evaluation	n	NTGR kWh	NTGR kW
2013-14 MCE Small Commercial Program	20	0.62	0.65
2013 Nonresidential Deemed ESPI Evaluation of LED Measures	232	0.59	0.60
2010-12 Nonresidential Downstream Lighting Study (no LEDs)	2,443	0.61	0.61

NET-TO-GROSS – BAYREN MULTIFAMILY

- The ex post NTGR weighted by kWh savings is 30% lower than ex ante value – 0.58 versus 0.85.

n	Ex ante NTGR	Ex post NTGR	Relative Precision
32	0.85	0.58	4%

NET-TO-GROSS – CONCLUSIONS AND RECOMMENDATIONS

- MCE and BayREN should consider using the evaluated NTGRs for future ex ante net savings claims.
  - The research found a NTGR of 62% for MCE small commercial measures (weighted by evaluated kWh savings) and 58% for BayREN multifamily measures.
  - Results were statistically significantly different than ex ante values at the 90% confidence interval.

COST EFFECTIVENESS

COST EFFECTIVENESS ANALYSIS

Objective – Update Total Resource Cost (TRC) and Program Administrator Cost (PAC) cost effectiveness metrics using evaluation results and compare to similar IOU programs.

- TRC and PAC will be revised using:
  - Evaluated and corrected gross savings values for MCE Small Commercial and Multifamily measures
  - Evaluated NTGRs for MCE Small Commercial and BayREN Multifamily Whole Building retrofits
  - Corrected lifecycle savings estimates for SoCalREN Single Family Home Upgrade measures
- BayREN Single Family Home Upgrade and SoCalREN Multifamily Whole Building measures were not updated.

COST EFFECTIVENESS ANALYSIS – EVALUATED NET LIFECYCLE SAVINGS

- For the programs that were evaluated, net lifecycle realization rates are in the range of 52% to 88%.
- The SoCalREN single family net realization rate is negative due to correcting an error in the EUCA version 11 calculator that incorrectly gave negative lifecycle savings for some measures.

Program Name	Reported Net Lifecycle			Evaluated Net Lifecycle			Net Realization Rates		
	MW	GWh	MM-Therms	MW	GWh	MM-Therms	MW	GWh	MM-Therms
BayREN-Multifamily	3.0	24.3	2.6	2.1	16.6	1.8	68%	68%	68%
BayREN-Single Family	5.7	1.8	0.7	5.7	1.8	0.7	100%	100%	100%
MCE-Multifamily	0.0	0.6	0.1	0.0	0.5	0.0	70%	88%	65%
MCE-Small Commercial	1.2	9.0	(0.0)	0.7	4.9	(0.0)	61%	55%	52%
SoCalREN-Multifamily	0.4	2.6	(0.0)	0.4	2.6	(0.0)	100%	100%	100%
SoCalREN -Single Family	(0.4)	(1.9)	(0.4)	1.4	0.9	0.2	-342%	-49%	-45%

COST EFFECTIVENESS ANALYSIS – TRC AND PAC RATIOS

- Evaluated TRC and PAC ratios differ from reported values in roughly the same proportion as the net realization rates.
  - No program has an evaluated TRC or PAC that is cost effective.
  - However, looking only at 2014 results, MCE's Small Commercial program has a TRC of 1.15 and a PAC of 1.05.
  - Note that projected values are based on the Program Implementation Plans.

Program Name	TRC Ratios			PAC Ratios		
	Projected	Reported	Evaluated	Projected	Reported	Evaluated
BayREN-Multifamily	0.67	0.38	0.27	0.97	0.44	0.30
BayREN-Single Family	0.56	0.05	0.05	1.29	0.06	0.06
MCE-Multifamily	1.06	0.25	0.23	2.42	0.28	0.24
MCE-Small Commercial	1.94	1.52	1.15	9.36	1.95	1.05
SoCalREN-All*	0.74 (elec) 0.51 (gas)	(0.05)	0.03	1.26 (elec) 0.79 (gas)	(0.06)	0.04

*SoCalREN projected separate TRC and PAC Ratios for gas and electric fuels.

COST EFFECTIVENESS ANALYSIS – IOU COMPARISON

A set of similar IOU programs were selected for comparison for the TRC and PAC ratios.

- The IOU Single Family Home Upgrade and Multifamily Whole Building programs were compared against the BayREN and SoCalREN programs.
- Three PG&E Programs were selected for comparison against MCE's Small Commercial program based on the following characteristics:
  - At least 80% of their savings from lighting measures [MCE 90%]
  - At least 5% from refrigeration [MCE 10%]
  - At least 60% from small/very small sized participants [MCE 61%]
  - No more than 15% from medium sized participants [MCE 10%]
  - No more than 2% in the large category [MCE 0%]
- No program was identified as a good comparison for MCE's Multifamily program.

COST EFFECTIVENESS ANALYSIS – MCE-PG&E COMPARISON

- MCE Small Commercial TRC and PAC values are less than half the size of the Madera and Energy Fitness programs, but similar to the LGEAR program.
  - The LGEAR program has significantly more participation.
  - MCE's participation is similar to the Madera program.

Program Name	Number of Participants	Net Lifecycle Savings			Cost Effectiveness	
		MW	GWh	MMTherms	TRC	PAC
MCE-Small Commercial	85	0.7	4.9	(0.0)	0.76	0.73
PGE-Energy Fitness	658	18.4	94.0	(0.3)	1.99	1.99
PGE-LGEAR	4,805	15.6	176.2	(0.5)	0.82	0.88
PGE-Madera	117	1.4	8.4	(0.0)	1.70	1.66

COST EFFECTIVENESS ANALYSIS – REN-IOU COMPARISON

- The REN and IOU Home Upgrade and Multifamily Whole Building programs all have TRCs in the range of 0.02 and 0.28.
- BayREN's multifamily program is relatively comparable to the other IOU programs and has the highest TRC.

Program Name	Number of Participants	Net Lifecycle Savings			Cost Effectiveness	
		MW	GWh	MMTherms	TRC	PAC
BayREN-Multifamily	95	2.1	16.6	1.8	0.28	0.30
BayREN-Single Family	684	5.7	1.8	0.7	0.05	0.06
SoCalREN-Multifamily	2	0.4	2.6	(0.0)	0.02*	0.03*
SoCalREN - Single Family	120	1.4	0.9	0.2	0.02*	0.03*
PGE-Home Upgrade and MF Whole Building	4,931	86.7	66.7	15.3	0.23	0.83
SCE-Home Upgrade and MF Whole Building	1,700	29.9	22.8	2.0	0.21	0.35
SCG-Home Upgrade and MF Whole Building	2,669	0.0	11.6	4.7	0.24	0.48
SDGE-Home Upgrade and MF Whole Building	642	5.6	4.0	0.6	0.08	0.14

*The SoCalREN TRC and PAC is for their MFM and SFM claims combined. The program costs are not reported by multifamily versus single family in the tracking data, so calculating an individual TRC and PAC was not possible.

COST EFFECTIVENESS ANALYSIS – CONCLUSIONS AND RECOMMENDATIONS

- The RENs and MCE should set up an internal process to ensure that all data sources submitted to the CPUC are in agreement.
  - The RENs' and MCE's tracking data are not in agreement with their 2013-2014 monthly reports.
- The RENs and MCE should set up a quality control process where submitted tracking data is run through cost effectiveness to ensure data runs smoothly and the expected TRC and PAC values are returned.
  - The quality of the RENs' and MCE's tracking data with respect to cost effectiveness parameters was found to be low.

COST EFFECTIVENESS ANALYSIS – CONCLUSIONS AND RECOMMENDATIONS

- SoCalREN should consider tracking the costs associated with the single family program separately from multifamily program to allow for each element to be assessed individually for cost effectiveness.
  - SoCalREN reports combined cost information for its single family and multifamily program elements, which makes it difficult to assess the cost effectiveness of each element individually.
- The RENs and MCE should consider tracking the costs associated with non-resource activities that do not directly benefit the resource elements of their programs to support a more accurate calculation of cost effectiveness.
  - The TRC and PAC cost effectiveness values for the RENs and MCE include costs associated with various non-resource activities within their resource programs that do not directly benefit or support the resource program.

NON-RESOURCE ASSESSMENT

NON-RESOURCE ASSESSMENT – DOCUMENTATION ANALYSIS

Objective – identify additional benefits the programs offer outside of ex ante savings claims

- Work with the RENs and MCE to document all non-resource accomplishments
  - Those identified in Annual Reports
  - Additional accomplishments were identified:
    - via interviews with RENs and MCE
    - in the draft *CPUC 2013-14 RENs Value and Effectiveness Study* conducted by Opinion Dynamics Consulting
    - in non-resource program tracking databases
- Databases to support the 2013-2014 and 2015 (through Q2) non-resource accomplishments were requested from the RENs and MCE (no verification was carried out for the 2015 accomplishments)

NON-RESOURCE ASSESSMENT – EVALUABILITY ASSESSMENT

Objective – assess the quality, completeness, and merging potential of the provided tracking systems in place for the non-resource activities to support future evaluations

- Existing tracking databases for non-resource programs were assessed to determine the following:
  - Are the data tracked in the consistent format and are they complete?
  - Do the databases contain contact information to allow for phone surveys?
  - Can non-resource tracking data be merged to CIS billing data?
  - Are there other variables that could be tracked that would be useful for future evaluations?

NON-RESOURCE ASSESSMENT – IOU TRACKING DATA MERGES

Objective – merge selected non-resource tracking data to IOU resource program tracking data to identify the number of “non-resource participants” that went on to participate in IOU resource programs

- Selected databases were used that had the potential to result in successful merges (i.e., those with record identifiers such as service account IDs, project IDs, addresses, names, phone numbers, etc.)
  - Approximately 2-4 databases per PA were merged to IOU resource program tracking data
  - Varying levels of success were found based on the variables provided in the non-resource tracking data

DOCUMENTATION ANALYSIS – CONCLUSIONS AND RECOMMENDATIONS

- The accomplishments documented in PAs' Annual Reports are reasonably reliable and do not tend to overstate what they have achieved.
  - Verification of most of BayREN's Single Family Home Upgrade and Multifamily Upgrade non-resource accomplishments could be conducted.
  - There was mixed success in verifying SoCalREN's and MCE's non-resource accomplishments for their programs and services.
- Based upon the documentation analysis, this evaluation recommends that the PAs archive databases from which their non-resource accomplishments were taken
  - Some of the databases provided were archived, but not all

EVALUABILITY ASSESSMENT – CONCLUSIONS AND RECOMMENDATIONS

- The RENs and MCE should gather and track more complete contact information, such as names, phone numbers, addresses and emails allow customers to be contacted in the future. They should also add fields such as SAIDs to increase chances of data records being able to be merged to CPUC tracking data, and utility CIS and billing data.
  - RENs and MCE non-resource databases generally contain the necessary data to support future evaluations, though more complete information would improve the evaluability of their non-resource efforts.

EVALUABILITY ASSESSMENT – CONCLUSIONS AND RECOMMENDATIONS

- The RENs and MCE should consider reviewing the structure, format, and contents of their databases to improve consistency and usability;
- The RENs and MCE should also develop a data dictionary documenting variable names (with the exception of SoCalREN, who provided data dictionaries with all provided datasets) and document calculations
  - Quality of the non-resource databases reviewed was inconsistent. Some were very easy to use while others required more effort to analyze and understand.
    - In some instances data fields were poorly labeled, data within fields were not consistent, and information on how some accomplishments were calculated were not documented

NON-RESOURCE ASSESSMENT – IOU TRACKING DATA MERGES RESULTS

- Approximately 2-4 non-resource tracking databases were merged to IOU tracking data
- Generally, the databases used for merging were those that customers who received audits/assessments, general assistance, and/or received DI measures (in the case of MCE)

PA	Database	# of Records
BayREN	Single Family Home Upgrade Advisor (HUA) General Inquiry/Qualified Accounts data	2,438/730
BayREN	Multifamily Technical Assistance data	633
SoCalREN	Multifamily Assessment Incentives database	24
SoCalREN	Home Upgrade Assistance project records	428
SoCalREN	Home Upgrade Residential Hotline records	198
SoCalREN	Home Upgrade Residential Coupons records	4
MCE	Small Commercial assessments tracking data	1,779
MCE	Multifamily audits/direct install pipeline tracking data	70

NON-RESOURCE ASSESSMENT – IOU TRACKING DATA MERGES RESULTS

- Depending on the database, a series of merge steps were carried out using common data fields across the non-resource tracking databases and the IOU tracking data. Common data fields used for merging were:
  - Service Account IDs
  - Project IDs
  - Address
  - Name
  - Phone number
  - Email address
- Databases that included account IDs and project IDs had more successful merges than those that did not contain these variables

IOU TRACKING DATA MERGES RESULTS– CONCLUSIONS AND RECOMMENDATIONS

- Future evaluations of the RENs and MCE could replicate this analysis with additional program years and non-resource databases and attempt an attribution analysis in order to quantify the benefits of the non-resource activities.
  - The results of the merges for a sample of non-resource databases provide some evidence that the RENs and MCE are influencing customers to participate in IOU energy efficiency programs
- If the PAs collected more data, provided SAIDs, and improved data consistency, quality, and reliability, future evaluations can attempt to identify the influence the RENs and MCE programs have had on intentions and/or on adoptions made both inside and outside of IOU programs.

SUMMARY

SUMMARY – GROSS ASSEMSSMENT

- MCE Small Commercial and Multifamily measures
  - Evaluated savings < claimed ex ante savings
    - Similar to CPUC evaluations of similar IOU programs
  - Evaluated NTGRs same as IOU programs
- BayREN and SoCalREN Multifamily measures
  - Ex ante savings values are not reliable
  - NTGRs for BayREN's Multifamily measures are significantly lower than ex ante estimates.

- Ex ante claimed data quality will likely be improved over time if recommendations are followed

SUMMARY – NON-RESOURCE ASSESSMENT

- Some non-resource activities may influence energy efficiency adoptions within their programs, in IOU programs, or outside of an EE program.
  - These benefits are not included in the TRC or PAC
  - Magnitude of these benefits could be significant relative to current levels of participation
    - although negligible relative to statewide IOU participation levels
  - Comparison IOU programs typically offer fewer of these types of activities, or are offered in separate programs.
- Future evaluations should consider trying to assess the potential influence on intentions or adoptions from these efforts.

SUMMARY – COST EFFECTIVENESS

- MCE programs
  - Small Commercial program was cost effective in 2014.
    - But less so than some similar IOU programs.
  - Multifamily program unlikely to be cost effective in near term.
- REN programs
  - Unlikely to be cost effective given current values and the values of comparable IOU programs.
  - BayREN Multifamily program was in same range as IOU programs.

SUMMARY – COST EFFECTIVENESS

- Programs are still relatively new.
  - Increases in participation can increase cost effectiveness if costs do not increase proportionally
- If Non-resource benefits can be quantified, this could also lead to increased cost effectiveness

Not just about ex ante claimed savings.

- These programs are also trying to achieve other objectives that conflict with cost effectiveness:
  - Non-resource activities
  - Serving HTR segments
  - Depth of retrofit

SUMMARY – SERVING HARD-TO-REACH

- All three PAs have a program component that focuses on multifamily customers
- MCE small commercial program serves a number of small and very small commercial customers

- Although these are all important markets to serve, it is not necessarily unique to the statewide portfolio for programs to be targeting these segments.

SUMMARY – DEPTH OF RETROFIT

Objective: to install as many energy efficiency measures as possible and not leave energy efficiency opportunities unaddressed.

- The Home Upgrade and Multifamily Whole Building programs offer a whole home/building approach.
- MCE's small commercial program also delivers a wide array of indoor and outdoor lighting measures and some select refrigeration measures.
  - While, this measure mix is not uncommon, MCE was found to install a fewer number of different types of lighting and non-lighting measures than other similar programs offered in PG&E's territory.

SUMMARY – DATA QUALITY AND RELIABILITY

- RENs and MCE need to significantly improve the accuracy and reliability of their reported savings claims and program expenditures. In some cases, the following was found:
  - Inconsistencies between annual/monthly reports and tracking data for program expenditures, demand reduction and energy savings.
  - Inconsistencies between calculation workbooks and tracking data
  - Impact parameters were populated with incorrect values or left blank
  - DEER/workpaper references and measure descriptions not provided
  - Lifecycle savings values were incorrectly calculated
  - Improper use of baselines

- A number of recommendations are made that will lead to:
  - More reliable estimation of ex ante savings claims
  - More accurate reporting of key impact and cost parameters
  - Better support for future evaluations of these programs

NEXT STEPS

IMPORTANT DATES

- 11/20/2015: Draft study was released
- 12/3/2015: Webinar to present study findings
- 12/7/2015: Comments on study due to CPUC
- 1/8/2015: Final report to be released

THANK YOU

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