2004-2005 SCE/SCG/County of Los Angeles Energy Efficiency Partnership Program

RETO-COMMISSIONING: THE PROCESS, COSTS AND PERSISTENCE OF SAVINGS (UTILITY PERSPECTIVE)
2004-2005 SCE/SCG/County of Los Angeles Energy Efficiency Partnership Program

• 2004-2005 CPUC Approved EE partnership Program
  • Program Elements:
    • Retro-Commissioning
      • 11 Facilities (1.6 million GSF) retro-commissioned
    • Retrofit
      • Lighting retrofits
      • Lighting controls
      • Chillers
      • Boilers
    • Technology Transfer
      • Public Agency Forums
      • Local government EE program participation study
    • Public Housing Metering
Partnership RCx Project Coordination

Energy Efficiency Partnership

- SCE
  - Programs and Services
  - Account Management
  - Engineering
  - Procurement
  - RCx Contractor
  - Contractors

- SCG
  - Programs and Services
  - Account Management
  - Engineering

- LA County ISD
  - M & O
  - EEMIS
  - County Departments
  - Buildings

- Contractors
Retro-commissioning (RCx) Goals & Project Funding

- Retro-commissioning Element:
  - Allocated RCx Program Budget: $1.5 M
  - Proposed RCx Goals:
    - 1,400 kW
    - 2.7 MkWh
    - 220,000 Therms

- 11 Facilities (1.6 million GSF) retro-commissioned
- Facilities maintained and operated by Internal Services Dept, County of Los Angeles
What is RCx?

- New building systems should be “commissioned”
  - systems should be checked to ensure they are operating per design
  - Commissioning is often specified but rarely completed (budget overruns, schedule pressure)

- Restoring equipment to original design/operating conditions – RCx (repairs and enhancements)

- Continually monitoring buildings to ensure systems are operating per design conditions – Persistence of savings
RCx Project - Defined Goals

- Optimize operations of Heating, Ventilation and Air Conditioning (HVAC) systems
- Identify optimization and energy efficiency measures
- Improve thermal comfort, ventilation and indoor air quality
- Develop tool for persistence in reduction of electricity and natural gas
- Provide operations staff with comprehensive facility information, update methods to efficiently operate, maintain and monitor HVAC systems
- Develop a reliable RCx process to pass EM&V
Defined Project Tasks

- Whole building energy benchmarking
- Diagnostic measurements
- Prefunctional testing of individual components
- Minor HVAC system repairs
- Building automation improvements
- Functional Performance Testing of HVAC systems
- Install new optimization energy efficiency measures
- Modeled energy savings projections
- System level benchmarks
- Retro-commissioning reports & schematics
- Training manual
Figure 1. Retro-commissioning (RCx) process adapted by SCE/SCG/County of LA Partnership Program.
# RCx Implementation Schedule

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Start Date</th>
<th>Start Week</th>
<th>Start Month</th>
<th>Finish Date</th>
<th>Finish Week</th>
<th>Finish Month</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1220</td>
<td>Weekly Staff Meeting - May 17</td>
<td>3</td>
<td>12</td>
<td>MAY</td>
<td>17</td>
<td>12</td>
<td>MAY</td>
<td>3 weeks</td>
</tr>
<tr>
<td>1221</td>
<td>Weekly Staff Meeting - June 21</td>
<td>6</td>
<td>12</td>
<td>JUNE</td>
<td>21</td>
<td>12</td>
<td>JUNE</td>
<td>4 weeks</td>
</tr>
<tr>
<td>1222</td>
<td>Weekly Staff Meeting - July 25</td>
<td>9</td>
<td>12</td>
<td>JULY</td>
<td>25</td>
<td>12</td>
<td>JULY</td>
<td>5 weeks</td>
</tr>
<tr>
<td>1223</td>
<td>Weekly Staff Meeting - Aug 29</td>
<td>12</td>
<td>12</td>
<td>AUGUST</td>
<td>29</td>
<td>12</td>
<td>AUGUST</td>
<td>6 weeks</td>
</tr>
<tr>
<td>1224</td>
<td>Weekly Staff Meeting - Sept 26</td>
<td>15</td>
<td>12</td>
<td>SEPTEMBER</td>
<td>26</td>
<td>12</td>
<td>SEPTEMBER</td>
<td>7 weeks</td>
</tr>
<tr>
<td>1225</td>
<td>Weekly Staff Meeting - Oct 31</td>
<td>18</td>
<td>12</td>
<td>OCTOBER</td>
<td>31</td>
<td>12</td>
<td>OCTOBER</td>
<td>8 weeks</td>
</tr>
<tr>
<td>1226</td>
<td>Weekly Staff Meeting - Nov 28</td>
<td>21</td>
<td>12</td>
<td>NOVEMBER</td>
<td>28</td>
<td>12</td>
<td>NOVEMBER</td>
<td>9 weeks</td>
</tr>
<tr>
<td>1227</td>
<td>Weekly Staff Meeting - Dec 26</td>
<td>24</td>
<td>12</td>
<td>DECEMBER</td>
<td>26</td>
<td>12</td>
<td>DECEMBER</td>
<td>10 weeks</td>
</tr>
</tbody>
</table>

**Group 1: Business Unit/Claritas Clinics**

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Start Date</th>
<th>Start Week</th>
<th>Start Month</th>
<th>Finish Date</th>
<th>Finish Week</th>
<th>Finish Month</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1230</td>
<td>Complete PPT Forms 1</td>
<td>5</td>
<td>12</td>
<td>JANUARY</td>
<td>5</td>
<td>12</td>
<td>JANUARY</td>
<td>1 week</td>
</tr>
<tr>
<td>1231</td>
<td>Complete PPT Forms 2</td>
<td>8</td>
<td>12</td>
<td>FEBRUARY</td>
<td>8</td>
<td>12</td>
<td>FEBRUARY</td>
<td>2 weeks</td>
</tr>
<tr>
<td>1232</td>
<td>Approve PPT Forms 1</td>
<td>11</td>
<td>12</td>
<td>MARCH</td>
<td>11</td>
<td>12</td>
<td>MARCH</td>
<td>3 weeks</td>
</tr>
<tr>
<td>1233</td>
<td>Approve PPT Forms 2</td>
<td>14</td>
<td>12</td>
<td>APRIL</td>
<td>14</td>
<td>12</td>
<td>APRIL</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>

**Group 2: Clinics**

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Start Date</th>
<th>Start Week</th>
<th>Start Month</th>
<th>Finish Date</th>
<th>Finish Week</th>
<th>Finish Month</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1240</td>
<td>Complete PPT Forms 3</td>
<td>17</td>
<td>12</td>
<td>MAY</td>
<td>17</td>
<td>12</td>
<td>MAY</td>
<td>5 weeks</td>
</tr>
<tr>
<td>1241</td>
<td>Complete PPT Forms 4</td>
<td>20</td>
<td>12</td>
<td>JUNE</td>
<td>20</td>
<td>12</td>
<td>JUNE</td>
<td>6 weeks</td>
</tr>
<tr>
<td>1242</td>
<td>Approve PPT Forms 3</td>
<td>23</td>
<td>12</td>
<td>JULY</td>
<td>23</td>
<td>12</td>
<td>JULY</td>
<td>7 weeks</td>
</tr>
<tr>
<td>1243</td>
<td>Approve PPT Forms 4</td>
<td>26</td>
<td>12</td>
<td>AUGUST</td>
<td>26</td>
<td>12</td>
<td>AUGUST</td>
<td>8 weeks</td>
</tr>
<tr>
<td>1244</td>
<td>Complete PPT Forms 5</td>
<td>29</td>
<td>12</td>
<td>SEPTEMBER</td>
<td>29</td>
<td>12</td>
<td>SEPTEMBER</td>
<td>9 weeks</td>
</tr>
<tr>
<td>1245</td>
<td>Complete PPT Forms 6</td>
<td>1</td>
<td>12</td>
<td>OCTOBER</td>
<td>1</td>
<td>12</td>
<td>OCTOBER</td>
<td>10 weeks</td>
</tr>
<tr>
<td>1246</td>
<td>Approve PPT Forms 5</td>
<td>4</td>
<td>12</td>
<td>NOVEMBER</td>
<td>4</td>
<td>12</td>
<td>NOVEMBER</td>
<td>11 weeks</td>
</tr>
<tr>
<td>1247</td>
<td>Approve PPT Forms 6</td>
<td>7</td>
<td>12</td>
<td>DECEMBER</td>
<td>7</td>
<td>12</td>
<td>DECEMBER</td>
<td>12 weeks</td>
</tr>
</tbody>
</table>

**Group 3: Training**

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Start Date</th>
<th>Start Week</th>
<th>Start Month</th>
<th>Finish Date</th>
<th>Finish Week</th>
<th>Finish Month</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1250</td>
<td>Program, Training Module 1</td>
<td>10</td>
<td>12</td>
<td>JANUARY</td>
<td>10</td>
<td>12</td>
<td>JANUARY</td>
<td>2 weeks</td>
</tr>
<tr>
<td>1251</td>
<td>Program, Training Module 2</td>
<td>13</td>
<td>12</td>
<td>FEBRUARY</td>
<td>13</td>
<td>12</td>
<td>FEBRUARY</td>
<td>3 weeks</td>
</tr>
<tr>
<td>1252</td>
<td>Program, Training Module 3</td>
<td>16</td>
<td>12</td>
<td>MARCH</td>
<td>16</td>
<td>12</td>
<td>MARCH</td>
<td>4 weeks</td>
</tr>
<tr>
<td>1253</td>
<td>Program, Training Module 4</td>
<td>19</td>
<td>12</td>
<td>APRIL</td>
<td>19</td>
<td>12</td>
<td>APRIL</td>
<td>5 weeks</td>
</tr>
<tr>
<td>1254</td>
<td>Program, Training Module 5</td>
<td>22</td>
<td>12</td>
<td>MAY</td>
<td>22</td>
<td>12</td>
<td>MAY</td>
<td>6 weeks</td>
</tr>
<tr>
<td>1255</td>
<td>Program, Training Module 6</td>
<td>25</td>
<td>12</td>
<td>JUNE</td>
<td>25</td>
<td>12</td>
<td>JUNE</td>
<td>7 weeks</td>
</tr>
<tr>
<td>1256</td>
<td>Program, Training Module 7</td>
<td>28</td>
<td>12</td>
<td>JULY</td>
<td>28</td>
<td>12</td>
<td>JULY</td>
<td>8 weeks</td>
</tr>
<tr>
<td>1257</td>
<td>Program, Training Module 8</td>
<td>1</td>
<td>12</td>
<td>AUGUST</td>
<td>1</td>
<td>12</td>
<td>AUGUST</td>
<td>9 weeks</td>
</tr>
<tr>
<td>1258</td>
<td>Program, Training Module 9</td>
<td>4</td>
<td>12</td>
<td>SEPTEMBER</td>
<td>4</td>
<td>12</td>
<td>SEPTEMBER</td>
<td>10 weeks</td>
</tr>
</tbody>
</table>

**Group 4: Operations**

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Start Date</th>
<th>Start Week</th>
<th>Start Month</th>
<th>Finish Date</th>
<th>Finish Week</th>
<th>Finish Month</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1260</td>
<td>Complete PPT Forms 7</td>
<td>6</td>
<td>12</td>
<td>OCTOBER</td>
<td>6</td>
<td>12</td>
<td>OCTOBER</td>
<td>1 week</td>
</tr>
<tr>
<td>1261</td>
<td>Complete PPT Forms 8</td>
<td>9</td>
<td>12</td>
<td>NOVEMBER</td>
<td>9</td>
<td>12</td>
<td>NOVEMBER</td>
<td>2 weeks</td>
</tr>
<tr>
<td>1262</td>
<td>Approve PPT Forms 7</td>
<td>12</td>
<td>12</td>
<td>DECEMBER</td>
<td>12</td>
<td>12</td>
<td>DECEMBER</td>
<td>3 weeks</td>
</tr>
<tr>
<td>1263</td>
<td>Approve PPT Forms 8</td>
<td>15</td>
<td>12</td>
<td>JANUARY</td>
<td>15</td>
<td>12</td>
<td>JANUARY</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>

**Group 5: Software**

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Start Date</th>
<th>Start Week</th>
<th>Start Month</th>
<th>Finish Date</th>
<th>Finish Week</th>
<th>Finish Month</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1270</td>
<td>Complete PPT Forms 9</td>
<td>18</td>
<td>12</td>
<td>JANUARY</td>
<td>18</td>
<td>12</td>
<td>JANUARY</td>
<td>5 weeks</td>
</tr>
<tr>
<td>1271</td>
<td>Complete PPT Forms 10</td>
<td>21</td>
<td>12</td>
<td>FEBRUARY</td>
<td>21</td>
<td>12</td>
<td>FEBRUARY</td>
<td>6 weeks</td>
</tr>
<tr>
<td>1272</td>
<td>Approve PPT Forms 9</td>
<td>24</td>
<td>12</td>
<td>MARCH</td>
<td>24</td>
<td>12</td>
<td>MARCH</td>
<td>7 weeks</td>
</tr>
<tr>
<td>1273</td>
<td>Approve PPT Forms 10</td>
<td>27</td>
<td>12</td>
<td>APRIL</td>
<td>27</td>
<td>12</td>
<td>APRIL</td>
<td>8 weeks</td>
</tr>
<tr>
<td>1274</td>
<td>Complete PPT Forms 11</td>
<td>30</td>
<td>12</td>
<td>MAY</td>
<td>30</td>
<td>12</td>
<td>MAY</td>
<td>9 weeks</td>
</tr>
<tr>
<td>1275</td>
<td>Complete PPT Forms 12</td>
<td>3</td>
<td>12</td>
<td>JUNE</td>
<td>3</td>
<td>12</td>
<td>JUNE</td>
<td>10 weeks</td>
</tr>
<tr>
<td>1276</td>
<td>Approve PPT Forms 11</td>
<td>6</td>
<td>12</td>
<td>JULY</td>
<td>6</td>
<td>12</td>
<td>JULY</td>
<td>11 weeks</td>
</tr>
<tr>
<td>1277</td>
<td>Approve PPT Forms 12</td>
<td>9</td>
<td>12</td>
<td>AUGUST</td>
<td>9</td>
<td>12</td>
<td>AUGUST</td>
<td>12 weeks</td>
</tr>
</tbody>
</table>
HVAC RCx Measures

- Tested and calibrated all existing controls
- Improved Chiller Sequencing
- Installed customized Purge Cycles
- Optimized Economizer Controls
- Improved Boiler Combustion Efficiency
- Installed Boiler Hot Water Reset Controls
- Installed Discharge Air Reset Controls
- Improved VAV Static Pressure Controls
- Performed Diagnostic Air and Hydronic Testing
- Selective air balancing and terminal box repairs
RCx+EEMIS+M&O=Optimized HVAC

- HVAC RCx Project
  - Funding
  - Contract w/ RCx Provider
  - Optimize buildings

- Maintenance & Operations
  - Continue optimized operations

- EEMIS
  - Automation
  - System-level Benchmarks
  - Monitoring
  - M&O Support

Optimized HVAC Building Operations
County Buildings EUI Pre-RCx

% of buildings w/ lower EUI

Cal-Arch Chart

Whole Building Energy Use Intensity (kBtu/sqft-yr)
Downey Public Library Headquarters Energy Use Density

Figure 1-1. Summary of Energy Usage by EEM

Conversion factors:  
1 kWh = 3.413 kBTU  
1 kBTU = 1,000 Btu  
1 therm = 100 kBTU = 100,000 Btu
Energy Efficiency Measure Projected Savings

EEM Savings per GSF
Optimized Schedule, Economizer and Discharge Air Reset (interactive)

<table>
<thead>
<tr>
<th>Facility</th>
<th>DAT_kWh</th>
<th>Econ_KWh</th>
<th>OptiSch kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dow</td>
<td>0.52</td>
<td>0.89</td>
<td>5.32</td>
</tr>
<tr>
<td>Whitt</td>
<td>0.09</td>
<td>0.58</td>
<td>4.46</td>
</tr>
<tr>
<td>Easl</td>
<td>0.08</td>
<td>0.15</td>
<td>4.43</td>
</tr>
<tr>
<td>Bev</td>
<td>0.03</td>
<td>0.06</td>
<td>3.97</td>
</tr>
<tr>
<td>Elmo</td>
<td>0.12</td>
<td>0.58</td>
<td>2.98</td>
</tr>
<tr>
<td>Bellfl</td>
<td>0.04</td>
<td>0.46</td>
<td>2.44</td>
</tr>
<tr>
<td>LibH</td>
<td>0.69</td>
<td>0.46</td>
<td>1.90</td>
</tr>
<tr>
<td>San</td>
<td>0.03</td>
<td>0.17</td>
<td>1.60</td>
</tr>
<tr>
<td>Mali</td>
<td>0.58</td>
<td>0.02</td>
<td>0.29</td>
</tr>
<tr>
<td>Com</td>
<td>0.16</td>
<td>0.39</td>
<td>0.10</td>
</tr>
</tbody>
</table>
RCx Cost & Utility Savings per GSF
Post-RCx Utility Bill Saving
First Year

RCx $ Savings

$500,000
$450,000
$400,000
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$(50,000)

Library HQ
Bellflower
Beverly Hills
Compton
Downey
East LA
Rio Hondo
Marina CC
Santa Monica
San Fe
What
Total

$ saved (therm)
$ saved (kWh)
Post-RCx kWh Savings Against Baseline

RCx kWh Savings

2006  kWh 3yr avg 02-04
Post-RCx Therm Savings Against Baseline

RCx Therm Savings

2006 Therms-3 yr avg 02-04
Post-RCx kWh EUI

![Graph showing Post-RCx kWh EUI for various libraries and other locations.](image-url)

- **Library HQ**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 6.0 PostRCx_Meas_kWh_EUI: 17.0 PreRCx-kWh_EUI: 23
- **Downey CH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 4.6 PostRCx_Meas_kWh_EUI: 15.4 PreRCx-kWh_EUI: 20
- **Beverly Hills CH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 5.0 PostRCx_Meas_kWh_EUI: 14.0 PreRCx-kWh_EUI: 19
- **EastLAC H**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 0.9 PostRCx_Meas_kWh_EUI: 18.1 PreRCx-kWh_EUI: 19
- **Whittier C H**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 1.9 PostRCx_Meas_kWh_EUI: 16.1 PreRCx-kWh_EUI: 18
- **Malibu C C**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 2.2 PostRCx_Meas_kWh_EUI: 13.8 PreRCx-kWh_EUI: 16
- **ElMonte CH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 2.9 PostRCx_Meas_kWh_EUI: 12.1 PreRCx-kWh_EUI: 15
- **Bellflower rCH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 3.7 PostRCx_Meas_kWh_EUI: 9.3 PreRCx-kWh_EUI: 13
- **SanFern andoCH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: 1.0 PostRCx_Meas_kWh_EUI: 12.0 PreRCx-kWh_EUI: 13
- **SantaMonicaCH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: -0.7 PostRCx_Meas_kWh_EUI: 11.7 PreRCx-kWh_EUI: 11
- **Compton CH**: Avg_meas_EUI_Sav: 2.5 kWh_EUI_Bill_Sav: -0.2 PostRCx_Meas_kWh_EUI: 10.2 PreRCx-kWh_EUI: 10
RCx+EEMIS+M&O=Optimized HVAC

**Optimized HVAC Building Operations**

**HVAC RCx Project**
- Funding
- Contract w/ RCx Provider
- Optimize buildings

**Maintenance & Operations**
- Continue optimized operations

**EEMIS**
- Automation
- System-level Benchmarks
- Monitoring
- M&O Support
RCx Persistence Process – Three Prong Approach

- O&M Personnel studying weekly graphs from EEMIS to monitor equipment operation and defined parameters to ensure persistence of energy savings.
- Energy Analyst comparing optimized state electric and gas performance metrics against benchmarked data.
- Pre-programmed system level benchmarks alert designated ISD personnel about threshold being exceeded.
County of Los Angeles  Enterprise Energy Management Information System (EEMIS)
Verification of Weekly Fan Operation
Chiller Operation Schedule
Public Library Headquarters
Simultaneous Heat/Cool

There is a large number of bin hours when simultaneous heating and cooling occurred. Reheat is not necessary at higher outside air temperatures. Note the low heating ΔT above 75°F OAT.

- Chiller on at 60 deg OAT
- Boiler on at higher than 80 deg OAT
Public Library Headquarters
Post RCx

Boiler off at higher than 75 deg outside air temp.

Chiller off at lower than 65 deg outside air temp.
kWh Performance

Figure 18: Whole building measured kWh consumption compared with benchmark.
System-level Benchmarking EEMIS UCE+

Figure 20: RCx persistence process utilizing Universal Calculation Engine Plus (UCE+).
EM&V Preliminary Results

- EM&V conducted for 10 retro-commissioned buildings.
- 9 courthouses and 1 library headquarter

<table>
<thead>
<tr>
<th></th>
<th>kWh</th>
<th>kW</th>
<th>Therms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised Program Goals</td>
<td>2,713,319</td>
<td>1,401</td>
<td>219,630</td>
</tr>
<tr>
<td>Ex-Ante Savings</td>
<td>4,198,422</td>
<td>11</td>
<td>261,486</td>
</tr>
<tr>
<td>Ex-Ante % of Goals</td>
<td>155%</td>
<td>1%</td>
<td>119%</td>
</tr>
<tr>
<td>Ex-Post Savings</td>
<td>3,826,610</td>
<td>337</td>
<td>259,848</td>
</tr>
<tr>
<td>Realization Rate</td>
<td>91%</td>
<td>3059%</td>
<td>99%</td>
</tr>
<tr>
<td>Ex Post % of Goals</td>
<td>141%</td>
<td>24%</td>
<td>118%</td>
</tr>
</tbody>
</table>
What’s Next?

- **2004 – 2005 RCx Program**
  - 11 buildings (1.6 million GSF)

- **2006-2008 RCx Program**
  - Phase 1: 10 buildings (1.5 million GSF)
  - Phase 2: 14 buildings/facilities (3.2 million GSF)

- Plans for 2009 – 2011 program
Recap: RCx Process, Persistence of Savings and other benefits

- **RCx process**
  - Investigate and resolve operational deficiencies
  - Install and test Energy Efficiency Measures
  - Develop system-level benchmarks

- **Three-prong approach for persistent RCx savings**
  - Facility monitoring
  - Utility bill analysis with whole building benchmarks
  - System-level benchmarks to detect deviations

- **Non-energy benefits**
  - Reduced operating cost
  - Enhanced building operation
  - Improved response time for trouble calls
  - Improved occupancy comfort
Partnership Credits

● County of Los Angeles – Internal Services Dept.
  – Narendra “Amar” Amarnani – Project Manager, ISD
  – Brian Roberts – Section Manager, ISD
  – Howard Choy, Division Manager, ISD
  – Nora Hernandez, Section Manager, ISD

● Southern California Gas Co.
  – Paulo Morais, Project Manager
Contact Information

- Michael B. Lo
  - Southern California Edison
  - Energy Efficiency Division - Partnership Program
  - T: 626-633-3035, E: michael.lo@sce.com