



# 2010 CABEC Conference, SLO LEED FOR HOMES & TITLE 24

Antonia Tsobanoudis, CEPE, LEED AP+ HOMES  
Certified LEED for HOMES Green Rater, GPR, CGBP

Southern Living Idea Home  
Photo by Rob Moody

# In 45 minutes, we will answer

- What is LEED for Homes?
- How appropriate is the Mid-Rise Pilot?
- What Reports are required?
- How do I calculate the Mid-Rise Performance Credit in CA?
- How do I calculate EA10? For MF?

# U.S. Green Building Council

- Founded in 1993
- Non-profit: 501(c) 3
- Mission based organization
- Committed to expanding sustainable building practices
- Headquarters in Washington D.C.  
(residential: San Diego, CA)



# USGBC's Mission

To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy and prosperous environment that improves the quality of life.

# What is Green Building?

## Common Misconceptions:

It's weird

It's about solar panels

It's outside my budget

It doesn't affect me







**JOE SERNA JR. CALIFORNIA EPA HEADQUARTERS BUILDING SACRAMENTO, CALIFORNIA**

**34%** more energy efficient

**200+** tons of waste diverted from landfill each year

**\$12** million increase in asset value

LEED® Facts	
Cal/EPA Sacramento, CA	
LEED for Existing Buildings Certification awarded November 1, 2008	
<b>Platinum</b>	<b>60</b>
Sustainable Sites	13/16
Water Efficiency	8/8
Energy & Atmosphere	30/32
Materials & Resources	10/10
Indoor Environmental Quality	12/16
Innovation & Design	2/5
*Out of a possible 78 points	



5 May 2010

LEED for HOMES and Title 24



6

# Why LEED for *Homes*?

In the United States, residential units  
consume  
22% of the nation's energy  
and cause  
20% of its greenhouse gas emissions.

2030





# Benefits of LEED Homes

- EA Section
- Resource Efficient
- Durable Homes
- Comfortable
- Healthy Homes
- Reduced Waste
- Certified Green Building



# Top 3 Benefits of a Green Home

*According to green homeowners*

**1. Healthier  
place to live**

**2. Lower  
operating  
costs**

(avg. 18% savings on  
energy and water)

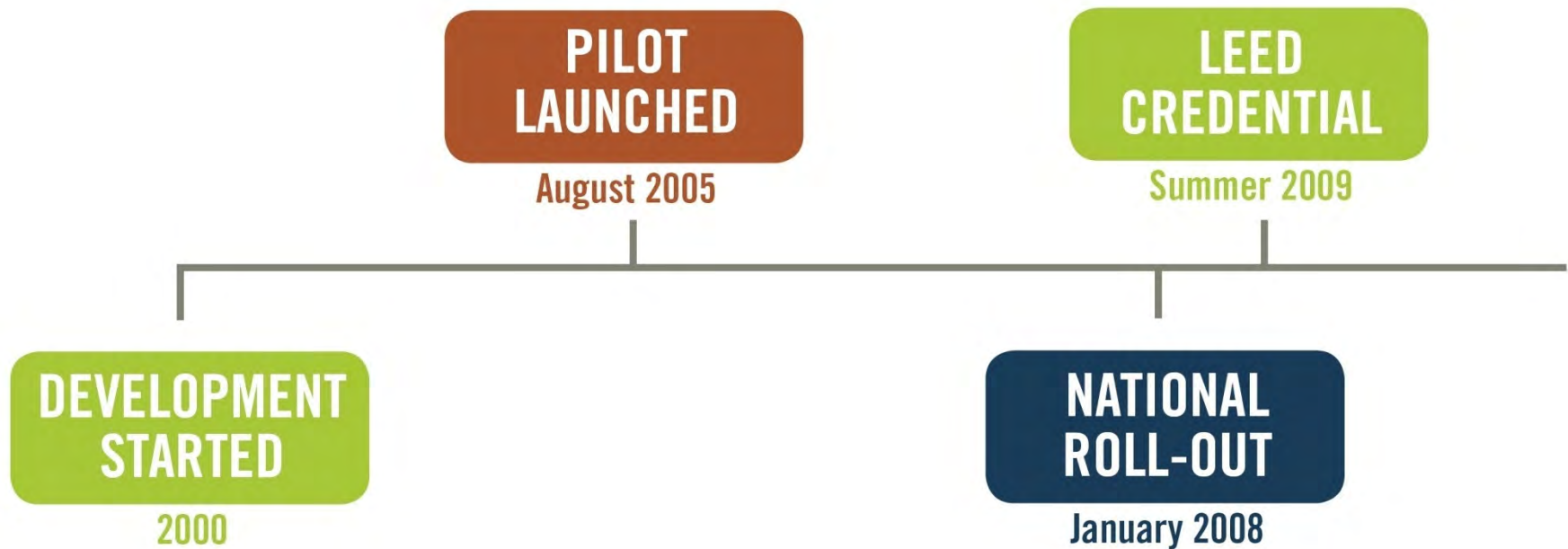
**3. Part  
of a more  
sustainable  
lifestyle**

# 4 Levels of LEED Certification

Varying Performance Levels



# History & Future

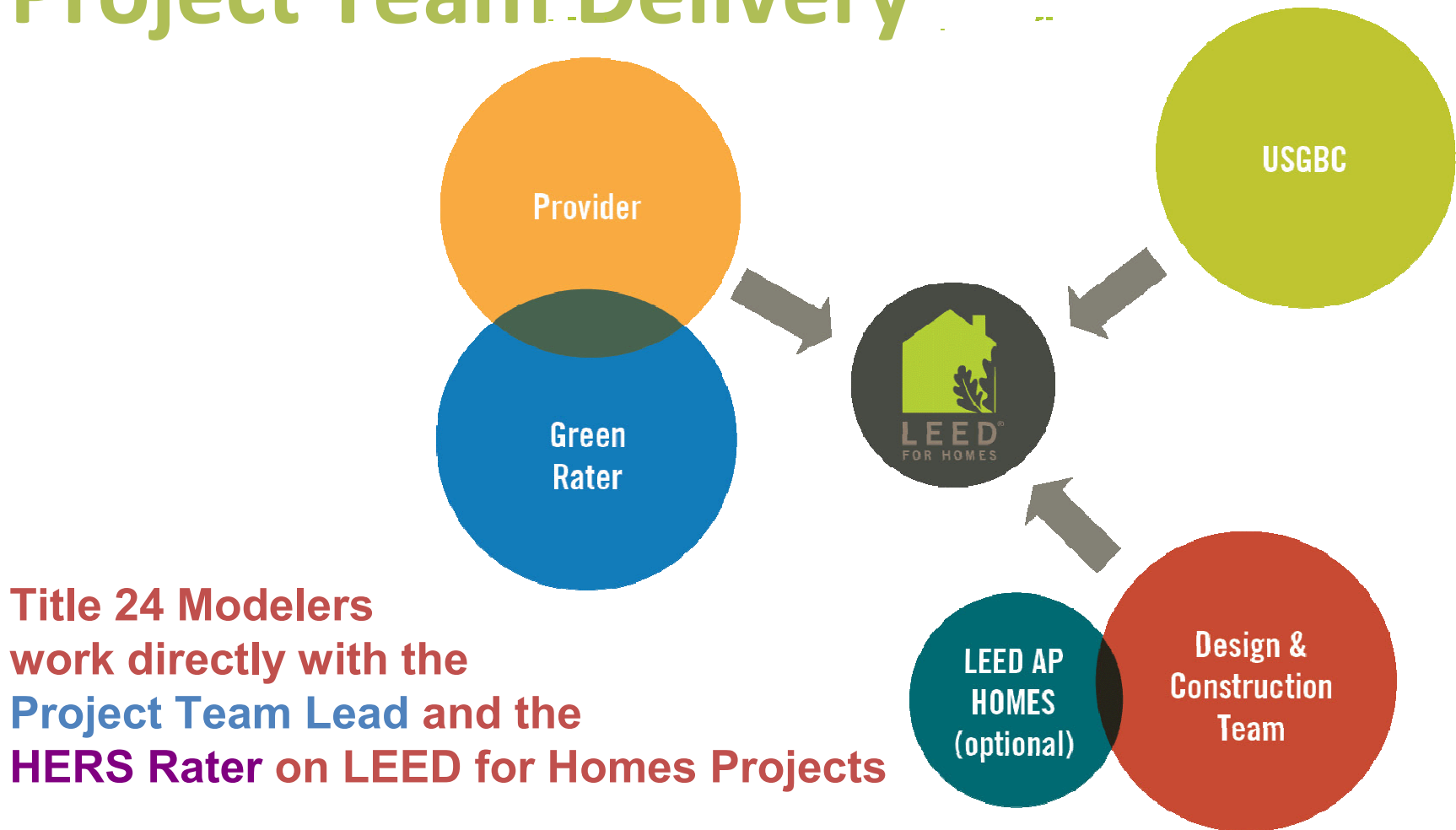


# Future In California for Modelers

- Good to get at least your CEPE
  - NSHP and Advanced Homes Incentives
- CEPE – pass the CABEC test
- CEA – CEPE in Residential/Non-res *plus*
  - 5 references for authored T24
  - 6 hours CEU
  - Professional Practices Workshop
  - \$125 application fee



# Project Team Delivery



# LEED for Homes Deliver Process

## Project Phases

Early Planning

Design ← T24 support doesn't stop here

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Construction/Third-Party Verification

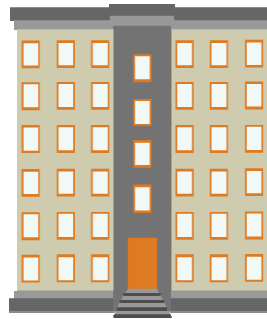
Certification

Reflect on Achievement

# Program Scope and Applicable Building Types



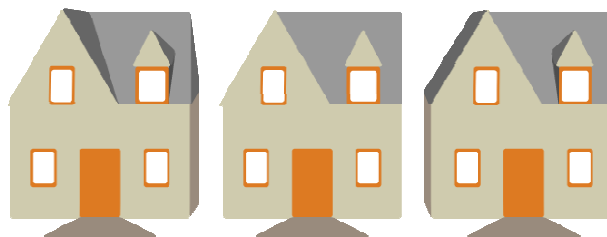
Single-Family Homes



Mid-Rise Pilot



Low-Rise Multifamily



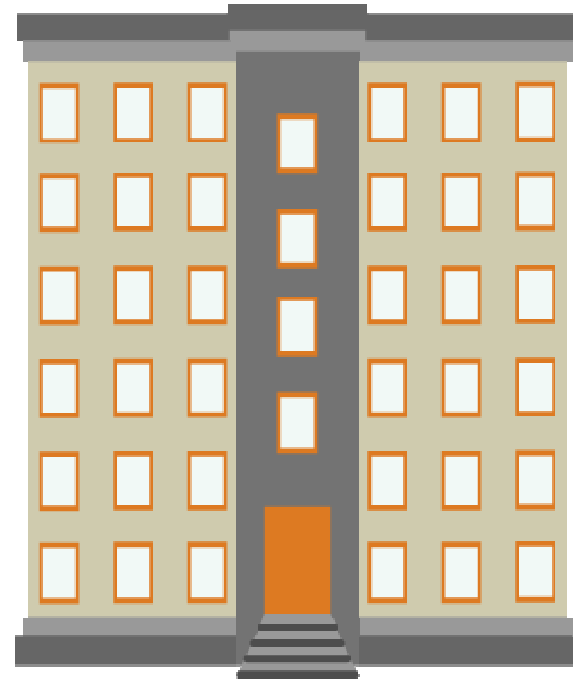
Single-Family Production



Gut Rehab

# Mid-Rise Pilot

- Over 4 stories
- 6 story
- Mixed Use
- Adapted Credits,  
similar structure as SF
- Bldg must have kitchen



# Model As....

- Custom Homes
  - “SINGLE FAMILY DETACHED”
- Gut Rehab
  - Under 3 stories?
    - **MODEL as NEW!!!**
      - Correlates to ResNet and IECC 2004
    - High-Rise Residential?
      - **MODEL as EXISTING!!!**
        - Correlates to ASHRAE 90.1, Appendix G



# Model As....

- Townhomes, duplexes
  - “SINGLE FAMILY ATTACHED”
  - SINGLE UNITS per PLAN
    - Shared walls
- Condos, Apartments, Stacked Flats
  - MULTI-FAMILY
    - Same as permit report

# The Rating System: Simple & Streamlined

18

prerequisites

8

categories

136

points available

Energy &  
Atmosphere Section

38 pts (28% of 136)

EA1: 19 points

EA10: 10 points

A	B	C	D	E	F	G	H	I	J	L	M	N	O	P	Q	R	S	
161	<b>Energy &amp; Atmosphere (EA)</b> (Minimum 0 EA Points Required)										<b>Max: 38 Y:31</b>		<b>Final: 31</b>					
162	<b>1. Optimize Energy Performance in California</b>																	
163	<b>1.1</b> Performance of ENERGY STAR for Homes										<b>Prereq.</b>		Y		Y			
164	<b>1.2</b> Exceptional Energy Performance										19		15		15			
165	5 IECC climate zone										43		Percent above Title-24					
166																		
169	<b>7. Water Heating in California</b>																	
170	<b>7</b> Efficient Hot Water Distribution System (meet one of the following)										2		0		2			
171	<input type="checkbox"/> a) Structured plumbing system <input type="checkbox"/> b) Central manifold distribution system										<input checked="" type="checkbox"/> c) Compact design of conventional system							
172	<b>8. Lighting</b>																	
173	<b>8.1</b> Title-24 Lighting										<b>Prereq.</b>		Y		Y			
174	<b>8.2</b> Improved Lighting (meet one of the following, see Rating System for pts)										1		0		0			
175	<input type="checkbox"/> a) Indoor lighting - three ENERGY STAR lights <input type="checkbox"/> b) Exterior lighting - four PV-integrated lights																	
176	<b>OR 8.3</b> Advanced Lighting Package (meet one of the following)										3		3		3			
177	<input type="checkbox"/> a) all lightings is high-efficacy <input type="checkbox"/> b) At least 60% of fixtures are ENERGY STAR labeled										<input checked="" type="checkbox"/> c) At least 90% of all lamps are ENERGY STAR labeled							
178																		
179	<b>9. Appliances</b>																	
180	<b>9.1</b> High-Efficiency Appliances (meet any, see Rating System for pts)										2		2		2			
181	<input checked="" type="checkbox"/> a) ENERGY STAR labeled refrigerator <input type="checkbox"/> b) ENERGY STAR labeled ceiling fans in living/family room and all bedrooms										<input checked="" type="checkbox"/> c) ENERGY STAR labeled dishwasher using 6.0 gallons per cycle or less <input checked="" type="checkbox"/> d) ENERGY STAR clothes washer							
182	<b>9.2</b> Water-Efficiency Clothes Washer										1		1		1			
183																		
184	<b>10. Renewable Energy in California</b>																	
185	<b>10</b> Renewable Energy System										10		10		10.0			
186	9,971 Annual reference electric load, kWh/yr										3,521		Electricity supplied by renewable system, kWh/yr					
187	35.3% Percentage of annual reference electric load supplied by renewable system																	
188																		
191	<b>11. Residential Refrigerant Management</b>																	
192	<b>11.1</b> Refrigerant Charge Test										<b>Prereq.</b>		Y					
193	Summary \ Exp Checklist \ Checklist \ Accountability Form \ MF HSA c																	

# Energy & Atmosphere Reports Required

## LOW-RISE Residential

- EA p 1
  - CF-1R
  - CF-4R
- EA c 10
  - ECON-1 (E-Pro) or Above Code (MP)
  - CF-1R-PV Report

## HIGH-RISE Residential

- EA p 1
  - PERF-1, UTIL-1, ECON-1
  - EA1 Calc Worksheet
- EA c 10
  - ECON-1
  - CSI Report

# EA 1 Energy Performance for CA

## LOW-RISE Residential

### Prerequisite is Energy Star for Homes

1. 15% lower energy use than Title 24
2. Quality Insulation Installation
3. Tight Ducts
4. Right Sizing of HVAC Equipment



# EA 1 Energy Performance for CA

## LOW-RISE Residential – Prereq 1.

### 15% lower energy use than Std Title 24

- **LEED Homes can push the envelope**
  - Understand available assemblies
  - Know ACM and Title 24, especially wrt non-traditional systems (radiant, GSHP, SolarDHW)
  - HERS Raters are integral & mandatory
- **NFRC Rated Windows**
- **Work with Green Rater for any exceptions**

# EA 1 Energy Performance for CA

## LOW-RISE Residential – Prereq 2.

### Quality Insulation Inspection (QII)

- CA uses QII / Thermal Bypass Checklist
- Closed Cell Spray Foam
  - 2008 QII Protocol
- Metal-framed buildings allowed
  - Must meet TBC
  - Must have insulation equivalents for rigid board
  - No QII Credit

# EA 1 Energy Performance for CA LOW-RISE Residential – Prereq 3.

## Tight Duct Test

- Required for Energy Star for Homes
- Modeling for Radiant Systems

# EA 1 Energy Performance for CA

## LOW-RISE Residential – Prereq 4.

### Right Sizing Equipment

- ACCA Manual J, S, & D or Equivalent
- CA Software uses equivalent ACCA method: ASHRAE Fundamentals
- Modeling loads per room is required
- Apply latent loads properly

# EA 1 Energy Performance for CA

## MID-RISE Residential Pilot Prerequisites

- Aug 2008, last update
  - Pilot update coming Q2 – Q3
- Performance - whole building energy
  - Multiple reports okay
- Must be 14% better than code
- Include Reduced Envelope Leakage in Bid Docs



# EA 1 Energy Performance for CA

## MID-RISE Residential Pilot Prerequisites

### Modeling Reports for Prereq's

- EnergyPro
  - multiple reports when non-res space >20%
  - PERF-1, UTIL-1, ECON-1
  - Mid-Rise EA1 Worksheet
- BD+C allows other energy models

# **EA 1 Energy Performance for CA**

## **MID-RISE Residential Pilot Prerequisites**

- **Adapting Title 24 High-Rise Res**
- **Use EA1 Worksheet**
- **Always refer to Appendix B. in Mid-Rise Guidance:**

**“Model Adjustments for Energy Performance Calculations for mid-rise buildings in California participating in LEED for Homes”**

## Energy Performance Calculator for California Mid-rise Buildings for LEED for Homes, EA Prerequisite 1.1 and EA Credit 1.3

To complete this spreadsheet, follow the guidance provided in Appendix A of the LEED for Homes Program Guidelines for Mid-rise Buildings in California. The cells in green require inputs by the user; the cells in gray are calculations or fixed values and should not be altered. The value in yellow represents the overall energy reduction for the Proposed Design. This value does not automatically transfer to the other sheets in this file.

### Title-24 Model Results (all values in kBTU/SF)

	Proposed Design	Standard Design
Space heating		
Space cooling		
Fans		
Heat rejection		
Pumps & Misc.		
DHW		
Lighting		
Receptacle		
Process		
Total	0	0

### Modified Loads for LEED for Homes (all values in kBTU/SF)

	Proposed Design	Standard Design
Space heating	0.00	0.00
Space cooling	0.00	0.00
Fans	0.00	0.00
Heat rejection	0.00	0.00
Pumps & Misc.	0.00	0.00
DHW	0.00	0.00
Lighting	0.00	0.00
Receptacle	#DIV/0!	#DIV/0!
Process	0.00	0.00
Total	#DIV/0!	#DIV/0!
Energy Reduction:	#DIV/0!	

### Building Inputs

Units	
Conditioned area	ft <sup>2</sup>
Avg BR per unit	
Type of clothes dryer	gas

### Modifications to DHW loads

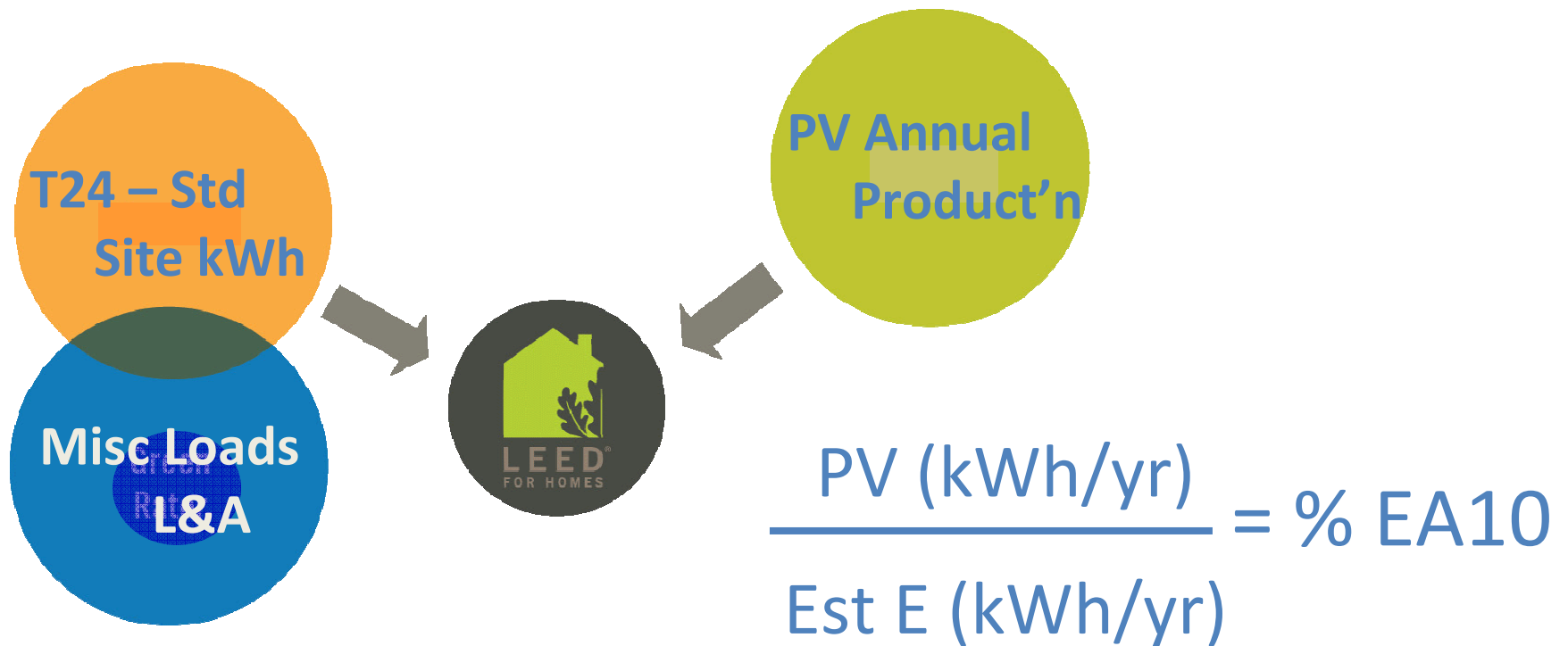
	Proposed Design	Standard Design	
Showerhead		2.5	GPM
Faucets		2.2	GPM
Clotheswasher			Gallons / year
Dishwasher		1,935	Gallons / year
Fixture multiplier	0.360		
Appl. multiplier	0.000		

### Modifications to Receptacle loads

	Proposed Design	Standard Design	
Refrigerator			kWh/yr
Dishwasher		400	kWh/yr
Clothes washer		310	kWh/yr
Clothes dryer (elec)	38	38	kWh/yr
Clothes dryer (gas)	27	27	therms
Stove / range	600	600	kWh/yr
Misc. plug loads	1.37	1.37	Kwh/ft <sup>2</sup> /yr

# EA 10 Renewable Sources

## SF & MF Residential



# Reports & Calcs for EA c 10

## Single-Family

- Est Energy (Site Std)
  - ECON-1 (E-Pro) or Above Code (MP8)
  - L&A Equation  
Misc, Lighting & Appliances
  - Annual PV Production  
kWh/yr (CF-1R-PV)



# Davis Energy Group EA10 Tools

- DEG LR EA 10 Calculator 2008 update
- Multi-Family and Mid-Rise PV Calculator will be out soon
- Insulation and PV can both be sexy!



# EA10 Tools

## SF EA 10 Calc

- Est Energy
  - Space H&C
  - DHW
- L&A
- PV Prod
- %PV
- Ex Perf

**LEED for Homes EA 10 Renewable Energy in California**  
Calculation Sheet Based on 2005 Title 24

Project Name: \_\_\_\_\_ Data: \_\_\_\_\_

CFA = \_\_\_\_\_ sqft Title-24 Software Used: MicroPac

Heating/DHW Fuel: Gas Heat, Gas DHW

% Better Than T-24: \_\_\_\_\_

**Annual Base Load Calculations**  
Annual reference electric load is defined as the amount of electricity that a Standard Title 24 Home (Title 24 Reference Home) would consume in a typical year. Annual reference electric load in the Standard Design home must be determined using the following procedures:

a) EnergyPro - from ECON-1 report OR MicroPac - from the "Above Code Report": Input Annual Electrical energy use (kWh for Year) for Standard Case. Do Not Use Proposed Values  
OR \_\_\_\_\_ kWh/yr

b) Estimate electricity consumption associated with space heating, space cooling, and DHW based on the outputs of the Title-24 compliance software (MicroPac or EnergyPro). Source electric energy use must be used for these calculations. NOT TDV energy units. TDV units are not valid for determining annual energy consumption. Source energy use is reported in kBtu/yr.

c) Design Source Electrical Energy Use (kBtu/yr) (from Title-24)

	MicroPac	EnergyPro
Space Heating	_____	_____
Space Cooling	_____	_____
DHW	_____	_____
Fans	_____	_____
Pumps	_____	_____

HVAC/DHW Electrical Energy (Std Design) = \_\_\_\_\_ kWh/yr

c) Estimate electricity consumption associated with lighting and appliances (L&A) using the following formula:  

$$L\&A \text{ consumption} = 0.519 * [3940 + 5.273 * CFA - 566.7 * FL\% + CFA * FL\%]$$
 Where CFA is conditioned floor area of the home and FL% is the fraction of overall lighting in the LEED home that is high-efficacy. A complete inventory of all the lighting in the home is not necessary; a "best estimate" for FL% is acceptable.

FL % Estimate = \_\_\_\_\_

L & A Consumption = \_\_\_\_\_ kWh/yr

d) Total Annual Electricity Consumption is sum of HVAC/DHW Loads and L & A Consumption:  
 Assumed Annual Base Load = \_\_\_\_\_ kWh/yr

e) Obtain annual electricity supplied from renewable energy system. If renewable energy system is a solar electric (photovoltaic or PV) system installed under the California New Solar Homes Partnership (NSHP) or California Solar Initiative (CSI), obtain the annual production number from the CFI R-PV form (bottom of page 1 of form).

Annual kWh Production = \_\_\_\_\_ kWh/yr

% Electricity Supplied by renewable energy system = \_\_\_\_\_

LEED for Homes Points EA 10 = \_\_\_\_\_ pts  
 + ID 3 (Exemplary Performance) = \_\_\_\_\_ pts  
 (Max 4 pts)

Available if 2005 T-24 performance is 35%  
 Reference ID# EA 10-05 for CA

Blue cells are input cells  
 Yellow cells are calculated cells



# EA10 Tools SF EA 10 Calc

Updated 03/26/2010

up (c) 2007

Updated 03/26/2010

\*TDV energy use is reported in Title 24 reports. To obtain Source electrical energy use:

## MicroPas

Source values per square foot of conditioned floor area for space cooling, space heating, and DHW for the Standard Design can be obtained from the MicroPas database files (generated when run is completed).

The Standard Design values can also be obtained from the results using the C-HERS version of MicroPas, which reports both Source and TDV values for Standard and Proposed cases.

## EnergyPro

Source energy values per square foot of conditioned floor area are obtained by running the residential module of EnergyPro with the "Report Source Energy" box checked in the Calculation Options menu. If DHW and space heating are gas, then only use space cooling, fans, and pumps should be used in the calculation.

## ID 3 Points per IDR# EA 10-06 of CIR/ID Database

Projects in California may be awarded exemplary performance credit for installing a renewable energy system that offset more than 30% of the annual reference electric load. These points are only available if the project also earns at least 12 points in EA 1.2. Points should be awarded in the following way: 1 point for offsetting 36%; 2 points for offsetting 42%; 3 points for offsetting 48%; and 4 points for offsetting 54%.

# Recap Reports for EA c 10 & MF

## Multi-Family Low Rise

- PV (kWh/yr)
  - CF-1R-PV Report
- Est E (std)
  - ECON-1 (E-Pro) or Above Code (MP)
  - L&A Equation for res
  - **ECON-1 for non-res**

## Multi-Family High Rise

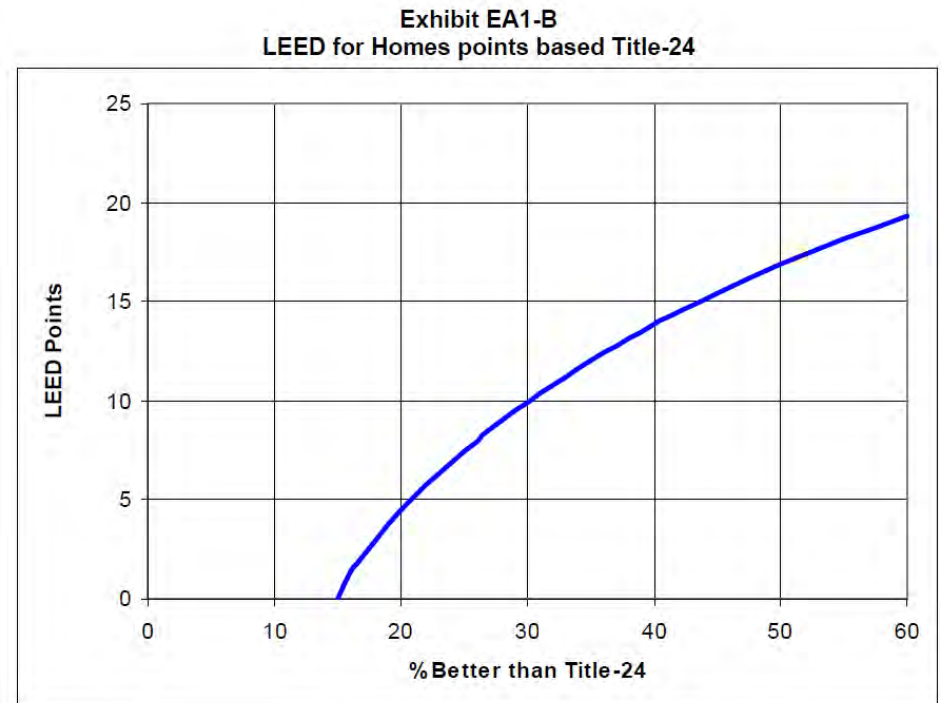
- PV
  - CSI Report
- Est E (std)
  - Use the Standard Energy from EA 1 Worksheet

# Innovative Design & Exemplary Performance

- ID Credits are awarded in the ID Section (IDc3.1 – 3.4)
- Only up to 4 points for all Sections
- Various Types
  - ID Requests
  - Pre-approved Forms
  - Exemplary Performance
  - EA 1 and EA 10 are allowed up to 4 points

# Innovative Design & Exemplary Performance

- EA 1 Performance
  - T24-2005 > 60%
- EA10
  - PV % reduction >30%
  - T24-2005 > 35%



# 39%

of Certified LEED Homes are  
**Affordable Homes**

**\*As of March 2009**

As reported at time of registration. For affordable project funding eligibility guidelines, please visit [www.usgbc.org/homes](http://www.usgbc.org/homes).

# First Community Housing

- First Community Housing certified 35 affordable units at GOLD level in LEED for Homes.
- It was also certified GOLD in LEED-NC and GreenPoint Rated.
- They have subsequently brought in 224 more affordable units to be certified in LEED-H.





# LivingHomes

- The first Platinum certified home in LEED for Homes is in Santa Monica, CA.
- Modular construction



# Grupe Homes

- Grupe Homes in Rocklin has certified 71 homes in LEED for Homes. They are the first production builder to be certified.
- Additional homes are expected to be certified.





# Blue Star Corner

- Blue Star Corner certified 20 market rate units in LEED for Homes.



# Why LEED for Homes?

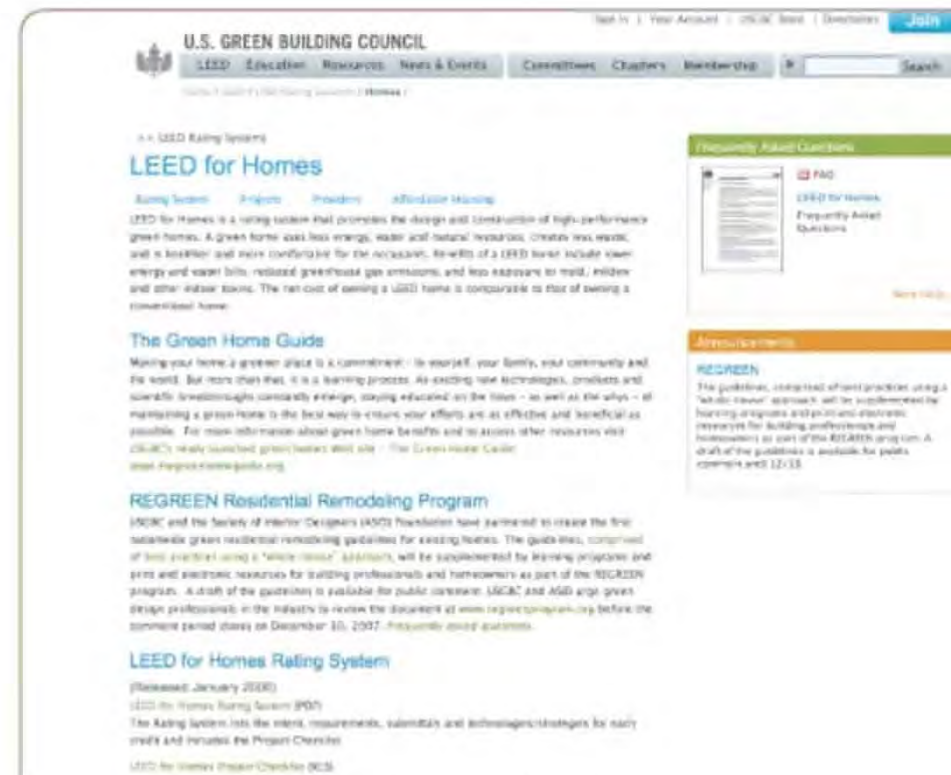
- National program, internationally-recognized standard
- Rigorous, true third-party certification
- Required third-party Performance Testing
- Partner to many regional green programs
- Homeowner assurance of home's green measures through third-party verification
- Strong marketing support for LEED in 2009-2010
- Superior way to differentiate your offering

LEED → "Leadership" for Market Innovators

# Next Steps

Visit [www.usgbc.org/homes](http://www.usgbc.org/homes) for:

- ✓ Rating system
- ✓ List of Providers
- ✓ Purchase Reference Guide
- ✓ Project checklist
- ✓ Education
- ✓ Affordable housing info
- ✓ Other info



# Next Steps

Visit [www.greenhomeguide.org](http://www.greenhomeguide.org) for:

- ✓ Project case studies
- ✓ Consumer resources
- ✓ Ask an expert
- ✓ Other info

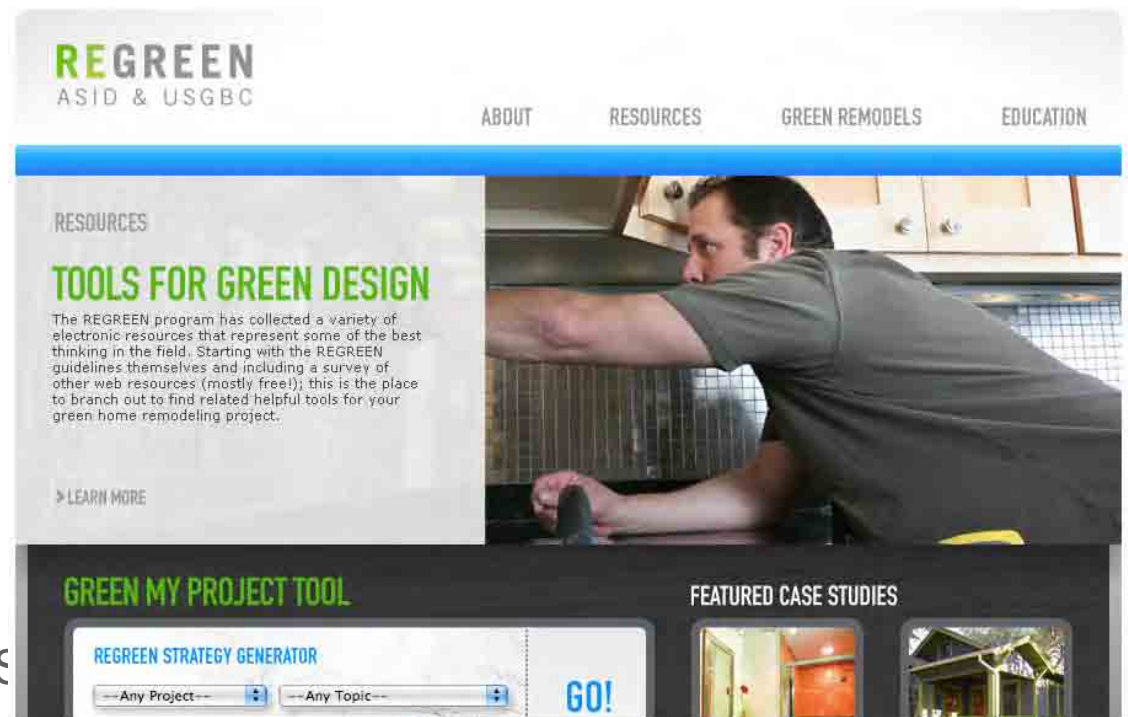




# Next Steps

Visit [www.regreenprogram.org](http://www.regreenprogram.org) for:

- Residential Remodeling Guidelines
- Education
- Case Studies



# Next Steps

## Contact your local USGBC Chapter

- ✓ Become an advocate
- ✓ Network with other professionals
- ✓ Ask about a residential green building committee

# Recap

- LEED for Homes—a nationally recognized, 3<sup>rd</sup>-party Green Rating System
- The Mid-Rise Pilot for High-Rise MF bldgs
- LEED for HOMES & above code reports
- Mid-Rise Perf—Appendix & EA Worksheet
- Renewable Energy Credit – SF and MF
- ID Credit and Exemplary Performance
- Next Steps

# THANK YOU!!!

- For more information
  - [www.davisenergy.com/projects/leed-h.php](http://www.davisenergy.com/projects/leed-h.php)
  - [www.usgbc.org/homes](http://www.usgbc.org/homes)
  - [www.greenhomeguide.org](http://www.greenhomeguide.org)
  - [www.regreenprogram.org](http://www.regreenprogram.org)
- New LEED Projects? Nichoel Farris
  - [nfarris @ davisenergy.com](mailto:nfarris@davisenergy.com)
- Antonia Tsobanoudis
  - [antonia @ davisenergy.com](mailto:antonia@davisenergy.com)





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Photo by Rob Moody