ZNE CASE STUDY

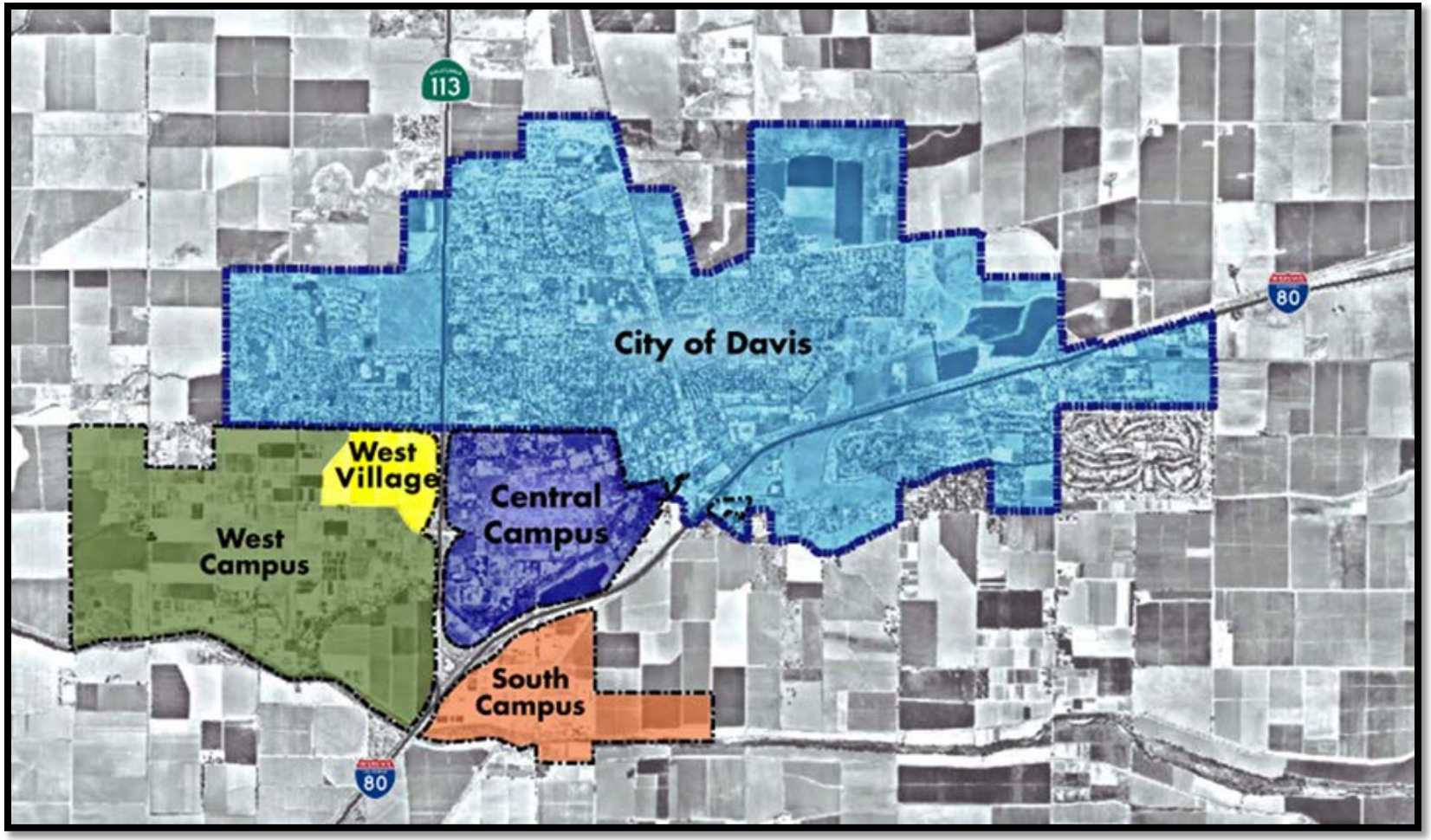
Presenter: Mary Hayakawa, UC Davis Real Estate Services

ZNE Stakeholder Meeting | November 28, 2012

UC DAVIS WEST VILLAGE

- Owner: **West Village Community Partnership, LLC**
- Design Consultants: **Studio E, MVE, SWA, DEG, LCRA**
- Location: **Davis, CA**
- Completion Date: **Phase 1/2011, Phase 2/2012, Phase 3/2013**
- Building/Occupancy Type: **Multi-Family, Mixed Use, SFR's**
- Total Sq. Ft.: **1.6 Million Sq. Ft.**

UC DAVIS WEST VILLAGE



PROJECT SUMMARY

- 130 acres (First Phase)
- 1,980 Student Housing Beds
- 42,500 Sq. Ft. Retail
- 343 Faculty/Staff Homes
- Total Cost $300 Million
- Public-Private Partnership
- Los Rios Community College
- Planned for ZNE

PROJECT GOALS & OBJECTIVES

- **Housing Accessibility**
- **Environmental Responsiveness**
- **Quality of Place**
- **Goal of ZNE grew out of Environmental Responsiveness**

TIMELINE

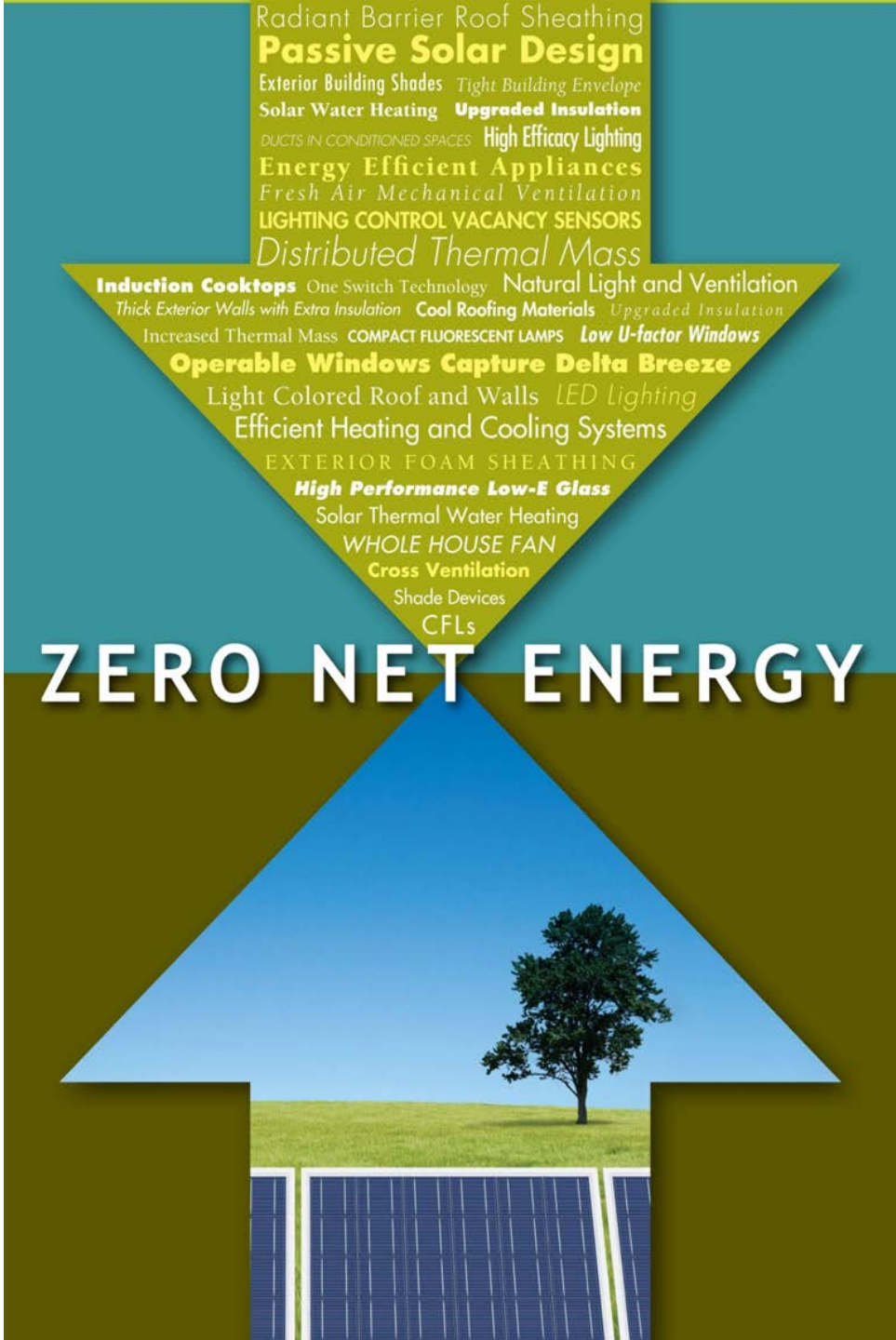
2006	2007	2008	2009	2010	2011
UC Davis EEC assembles project advisory committee	**EEC** report with **Davis Energy Group** energy efficiency 'packages' (*funded by **DOE** Build America Program*)	**Chevron Energy Solutions** conducts financial and technical analysis of Zero Net Energy Concept for WVCP **Davis Energy Group** updates energy efficiency packages	**UC Davis & WVCP** brief **EEC Board of Advisors** in Washington, D.C. **California Energy Commission** awards **$2M 'RESCO'** grant to UC Davis	**Department of Energy** awards **$2.5M Community Renewable Energy Grant** to UC Davis **CPUC** awards **$2.5M CSI RD&D Grant** to UC Davis	**West Village** opens with Village Square, Los Rios & Student Housing **August 2011** **CEC** awards **$ 500,000 Matching Grant** as match for **DOE Grant** **E3** selected as advisor for **CSI RD&D Grant**

ENERGY REDUCTION

Energy efficiency measures designed to reduce energy demand by 50%.

ENERGY PRODUCTION

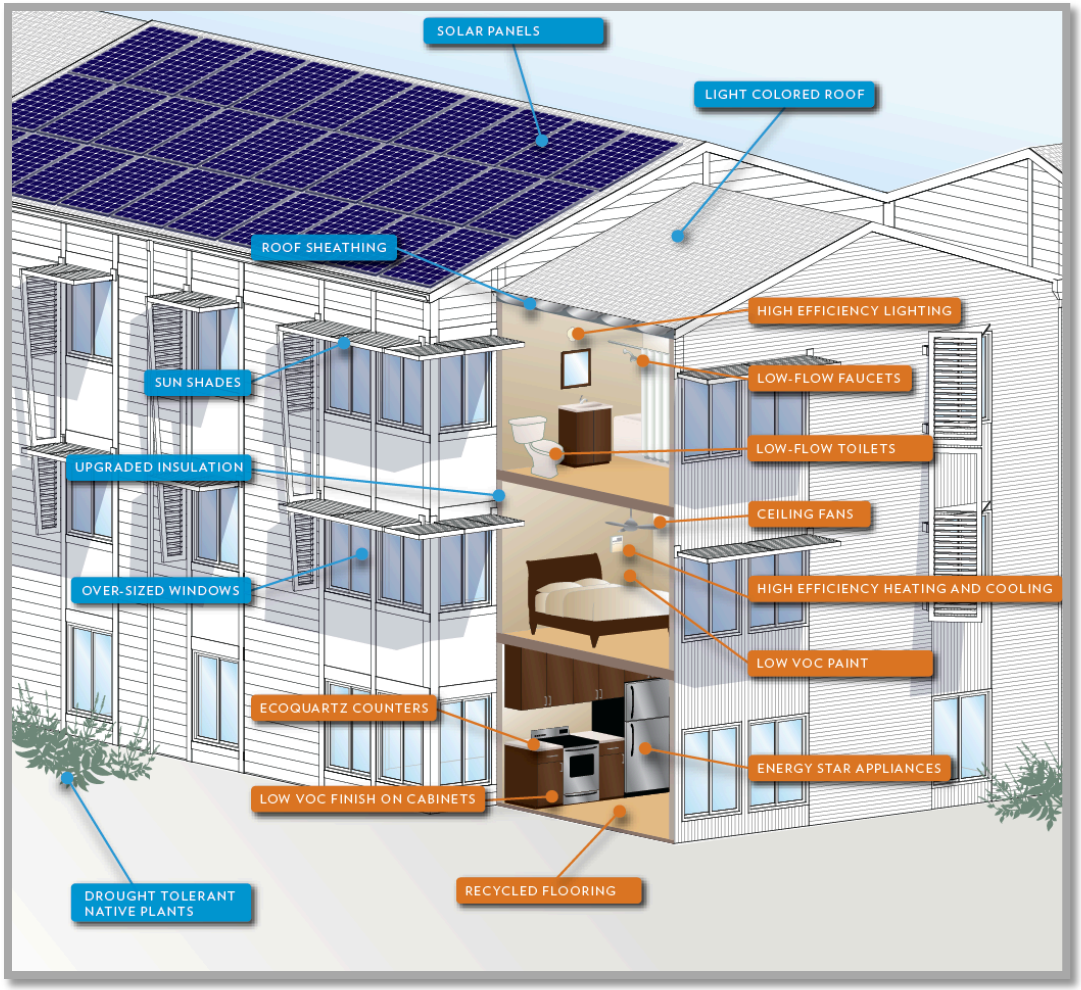
Solar PV system designed to produce renewable energy to meet community needs.



UC DAVIS WEST VILLAGE ENERGY INITIATIVE PROGRAM GOALS

- **Zero Net Energy from the Grid on an annual basis**
- **Deep Energy Conservation Measures**
- **Multiple integrated renewable resources at a community scale**
- **Smart Grid**
- **No higher cost to the developer**
- **No higher cost to the consumer**

ENERGY SAVINGS APPROACHES
Student Housing



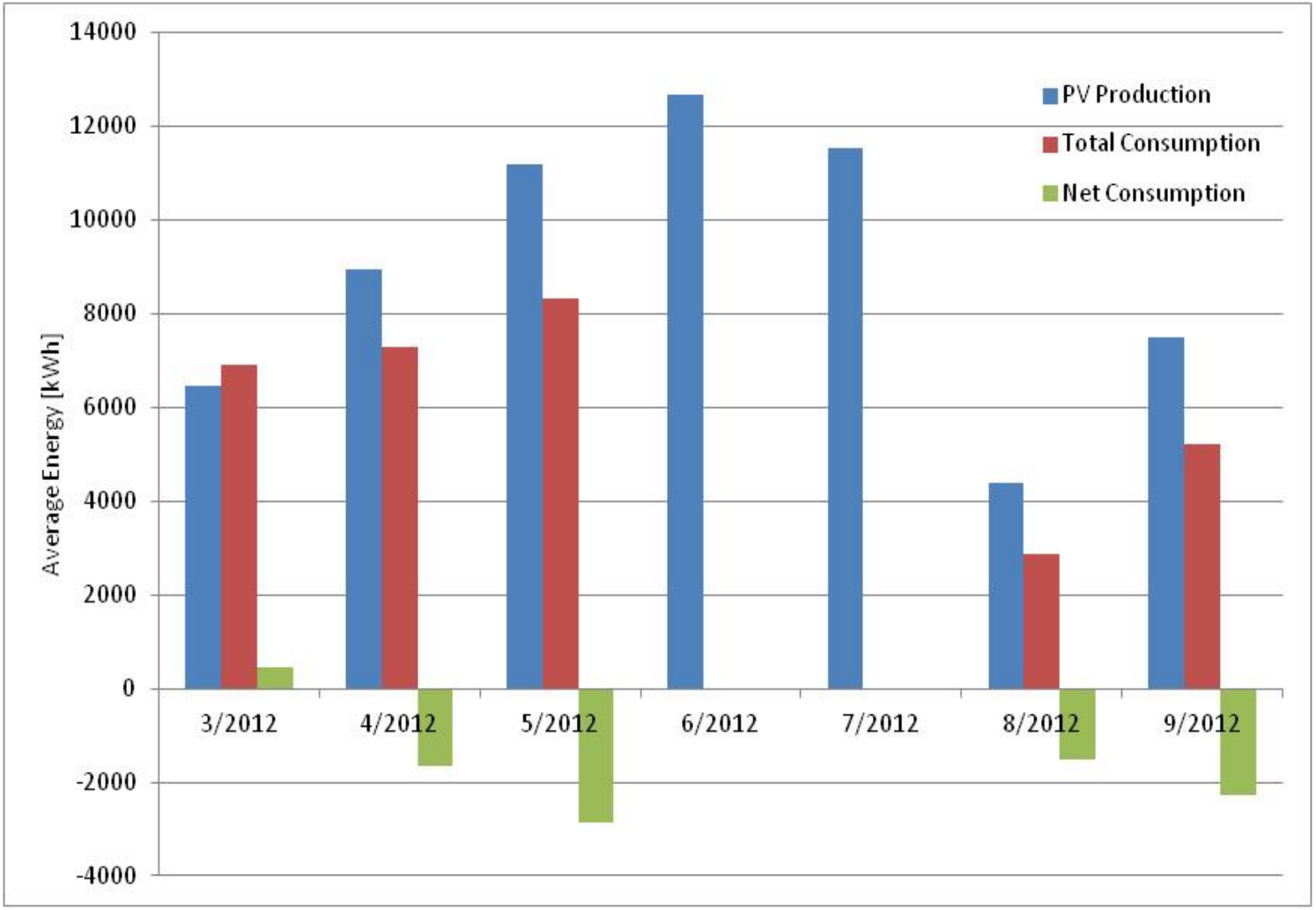
ENERGY SAVINGS APPROACHES

Measure	Specification
Envelope	
Exterior Wall Construction	2x6 16"oc
Exterior Wall Insulation	R-21 Batt w/ 1/2" R-2.5 Exterior Sheathing
Foundation Type & Insulation	Slab - Uninsulated
Additional Thermal Mass	1/2" Gypcrete on floors 2 & 3
Roofing Material & Color	CRRC Certified Roofing Product
Ceiling Insulation	R-49 Blown Cellulose
Radiant Barrier	Yes
House Infiltration - Blower Door Test *(HERS)*	Yes, SLA 3.0
Thermal Bypass Inspection - QII *(HERS)*	Yes
Glass Properties: U-Value / SHGC	
Slider & Sliding Glass Door	Gilwin Dual Vinyl - 0.32 / 0.23
Water Heating Equipment	
Water Heater Type & Efficiency	Central E-Tech Heat Pump 115, EF 2.7
HW Distribution	Recirculation, Timer+Temp
Appliances & Lighting	
EnergyStar Appliances	Fridge/Dishwasher/Clothes Washer
Dryer Fuel/ Oven / Range Fuel	Electric
Miscellaneous Load Control	One Switch Wiring, Energy Usage Displays
Fluorescent Lighting Package	100% w/ Vacancy Controls

ENERGY SAVINGS APPROACHES

Measure	**Specification**
HVAC Equipment	
Heating Type & Efficiency	HP / 8.5 HSPF
AC Type & Efficiency	HP / SEER 15 / EER 12.5
Duct Location & Insulation	Conditioned Space R-6
Duct Leakage Verification *(HERS)*	Tested, <6%
Verify Refrigerant Charge Credit *(HERS)*	Yes
Verify High EER *(HERS)*	Yes
Verify Cooling Coil Air Flow *(HERS)*	Yes
Verify Fan Watt Draw *(HERS)*	Yes
Verify Cooling Right Sizing	Manual J & Manual D
Mechanical Ventilation	Exhaust, Standard
PV System	
PV Solar System Type & Capacity	SunPower SPR-225 & SPR-445 Modules: 2.6-4.7 kW/unit

PERFORMANCE RESULTS



ENERGY SAVINGS APPROACHES
Single Family Homes

ENERGY SAVINGS APPROACHES
Single Family Homes

	Package A	**Package B**
BUILDING ENVELOPE:		
Walls / Ceilings	Advanced Framing, 2x6, 24" o.c.	Advanced Framing, 2x6, 24" o.c. **+ 1" exterior foam insulation & 5/8" drywall**
Windows	Reduced glazing per revised design	Reduced glazing per revised design (22% of floor area)
HVAC:		
Heating	Combined Hydronic w/ Condensing Tankless WH	Combined Hydronic w/ Condensing Tankless WH
Distribution	Return air paths for bedrooms	Return air paths for bedrooms
Ventilation Cooling		**Whole House Fan**
Studios	Ductless mini-split heat pump	Ductless mini-split heat pump
WATER HEATING:		
Type / Energy Factor	Condensing Tankless Water Heater / 0.96 EF	Condensing Tankless Water Heater / 0.96 EF
Solar Water Heating	None	None
3RD PARTY TESTING / VERIFICATION:		
HVAC System	System Airflow / Fan Watt Draw Testing	System Airflow / Fan Watt Draw Testing
LIGHTING / APPLIANCES:		
High Efficacy Lighting	Same as base package	Same as base package
Energy Star Appliances	Clothes washer, Refrigerator	Clothes washer, Refrigerator

ENERGY SAVINGS APPROACHES
Single Family Homes

Package	Incremental Cost	Net Incremental Cost (after incentives)
Basic Performance	$ 4,993	$ 1,831
Advanced – A	$ 6,372	$ 2,554
Advanced - B	$ 11,924	$ 7,883

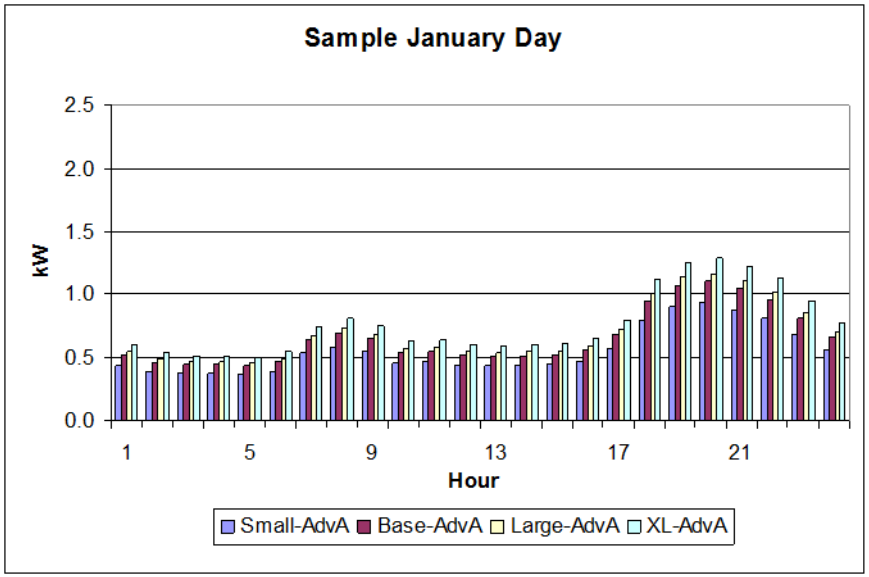
ENERGY SAVINGS APPROACHES
Single Family Homes

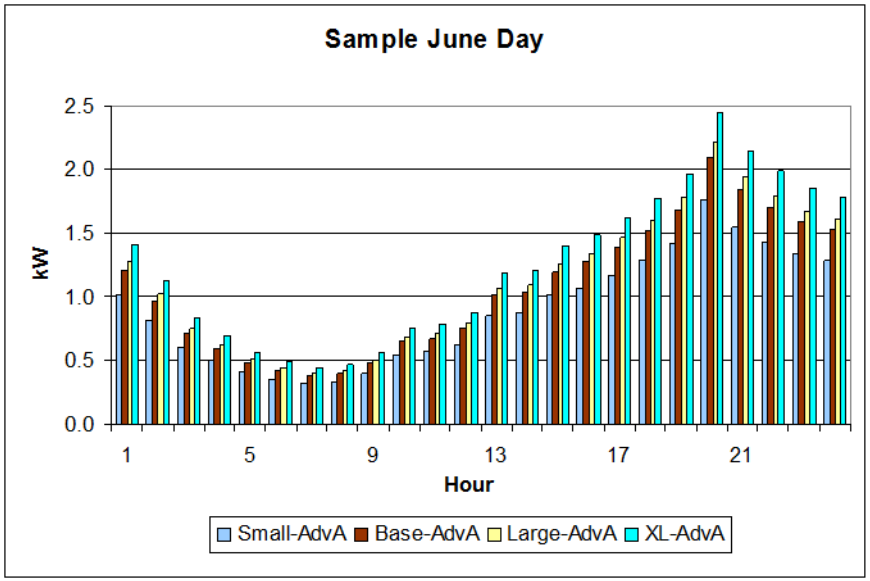
- Savings are relative to Title 24 + 15%
- Energy use includes 60% of studio
- Title-24 % savings are for the main house only

Package	Annual kWh	Annual therms	Source Energy Savings – over T-24 +15%	Title-24 Savings
Title-24	9,573	795	-	-
Title-24 + 15%	9,173	633	-	15%
Basic Performance	7,343	538	18%	47%
Advanced – A	6,988	476	24%	55%
Advanced - B	6,676	452	28%	58%

ENERGY SAVINGS RESULTS

Property Type	Electric Usage (kWh)	Gas Usage (Therms)
WV SF HOME Base (Adv A)	4,172	377
WV SF HOME Small (Adv A)	4,949	443
WV SF HOME Large (Adv A)	5,231	483
WV SF HOME XL (Adv A)	5,785	545
WV CARRIAGE (Adv A)	3,089	64
TITLE 24 Base	6,734	721
TITLE 24 + 15% Base	6,546	591
TITLE 24 Carriage	4,004	75
TITLE 24 + 15% Carriage	3,723	75

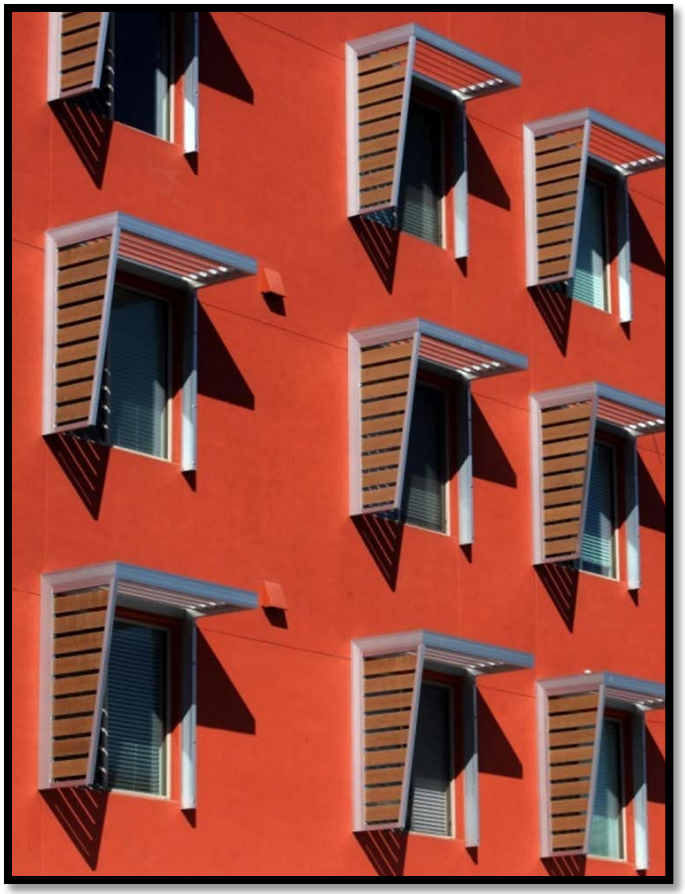




LESSONS LEARNED

Challenges & Opportunities

- **Declining Solar Incentives**
- **Real Construction Project – Timing, timing, timing**
- **No Higher Cost to Developer**
- **Technologies/Constructability**
- **Single Family Homes – Market Realities**



FOR MORE INFORMATION

WESTVILLAGE

UCDAVIS

- **Mary Hayakawa**
- **mghayakawa@ucdavis.edu**
- **http://westvillage.ucdavis.edu**