

#### THE STELLAR APARTMENTS FIRST YEAR ENERGY LESSONS

Alison Kwok, Annie Chiang, Ryan Dirks Eric Schmidt, Ashley Tuffo University of Oregon

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## AIA Learning Objectives

- Explain the objectives of a pilot project built to Passive House and Earth Advantage targets
- Describe methodology and equipment used to measure energy and environmental quality
- Compare energy use, specifically heating energy
- Compare energy end-use patterns and occupant preferences/behaviors

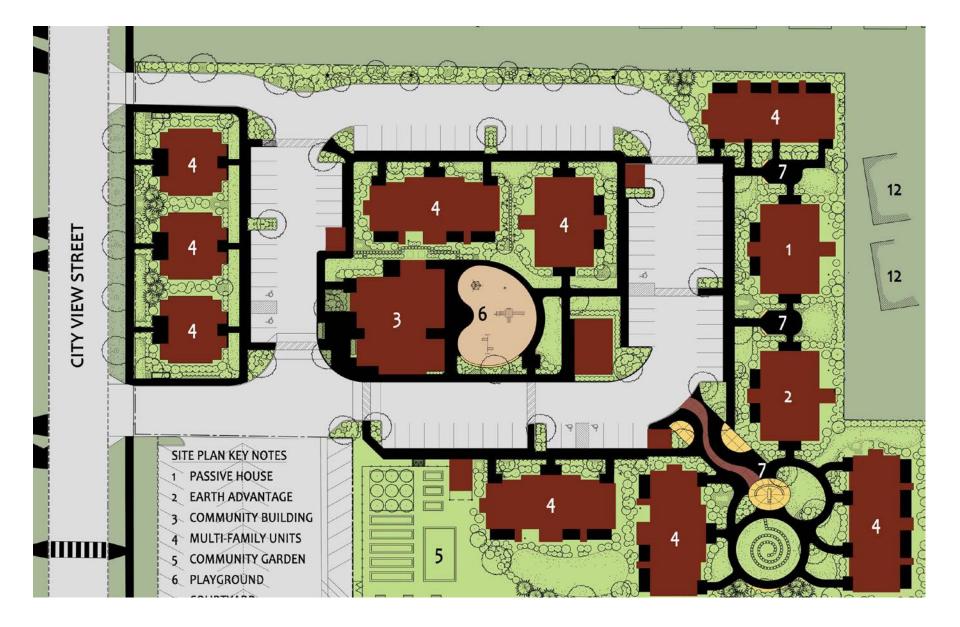
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### The Stellar Apartments – Eugene, Oregon









## Site Amenities



# Design Team

Owner:	St. Vincent dePaul Society of Lane County
Architect:	Bergsund DeLaney Architecture/Planning
Contractor:	Meili Construction
Lead CPHCs:	Win Swafford, Jan Fillinger
Mechanical:	SOLARC, Peter Reppe
Inspiration:	from many



# Pilot Study





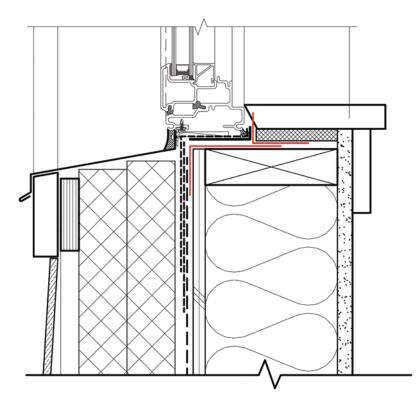




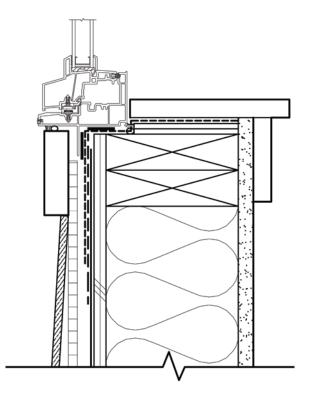


## Wall Sections

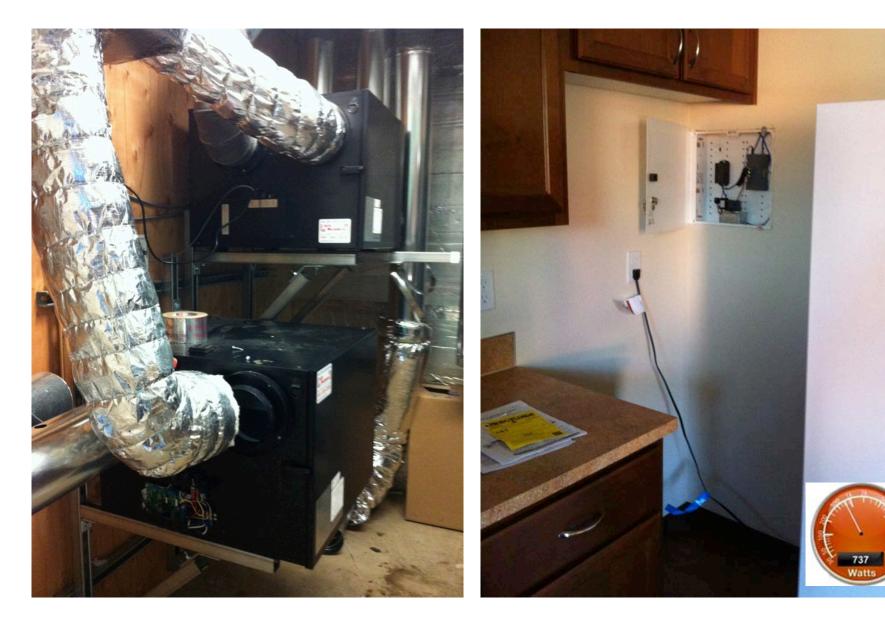
#### **Passive House**



#### **Earth Advantage**









## MOU: St. Vincent dePaul and University of Oregon

- Evaluate energy and IAQ
- Calculate costs and payback
- Identify lessons learned
- Produce final report

#### MEMORANDUM OF UNDERSTANDING BY AND BETWEEN ST. VINCENT DE PAUL SOCIETY OF LANE COUNTY, INC. AND

ALISON KWOK, DEPARTMENT OF ARCHITECTURE, UNIVERSITY OF OREGON

#### Introduction

St. Vincent de Paul Society of Lane County, Inc., hereafter referred to as SVIP, and Alison Newk, Department of Architecture, University of Oregon, enter into this Memorandum of Understanding (MOU) with regard to the energy use and indoor air quality monitoring study at Stallar Apartments in Eugene, Ot. This is not a legally binding agreement. The purpose of this MOU is to clearly delineate the roles and responsibilities of both parties.

Stellar Apartments is a 54 min multi-famity affordable lousing davelopment located in Eugence, 040. One of the two-be buildings at the development will be built to the Possive House design standard. This pilot project will evaluate the differences in this type of construction by comparing it to another building on site, built to Earth Advantage standards, with the same design and solar orientation. This project provides a rate opportunity to monitor energy use and indice air quality [102] data between the two buildings (6 units in each building) and evaluate the value of pursuing the Passive House approach for multi-family projects.

#### **Project Objective**

The objective of this study is to monitor and evaluate energy usage and IAQ data in the two buildings at Stellar Apartments for a period of two years and produce a final report that summarizes the findings.

The following monitoring equipment will be installed in the Earth Advantage and Passive House buildings:

- eMonitors to monitor energy use in each unit
- UAQ sensors to monitor CO2, air temperature, relative humidity and VOCs to provide a fuller picture of tenants' air quality and comfort
- An internet connection for two years
- Custom eMonitor dashboard that will aggregate the data

The purpose of the final report will be to evaluate the value of pursuing the Passive House approach for multi-family projects. The report will include the following:

- Evaluation of the energy savings and IAQ benefits.
- Calculation of the costs and payback period.
  Identification of lessons learned from designing and building to Passive House standards.
  What would we do differently?
  - what would use do differently?
    What measures can be applied to any construction project, not just projects seeking PHUS certification? For example, incorporating better air seeling strategies for all future projects.

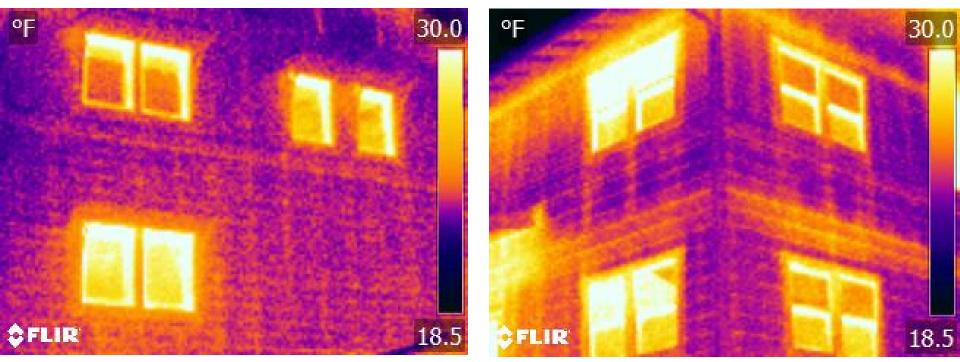
This report will be developed in consultation with the Patsike House project partners, including the City of Eugene and EWEB. The report language and formatting will be oriented to designers, builders, and developers as the primary target audience. The report will be shared with other municipalities, utilities,



## Envelope: check on thermal bridging?

#### **Passive House**

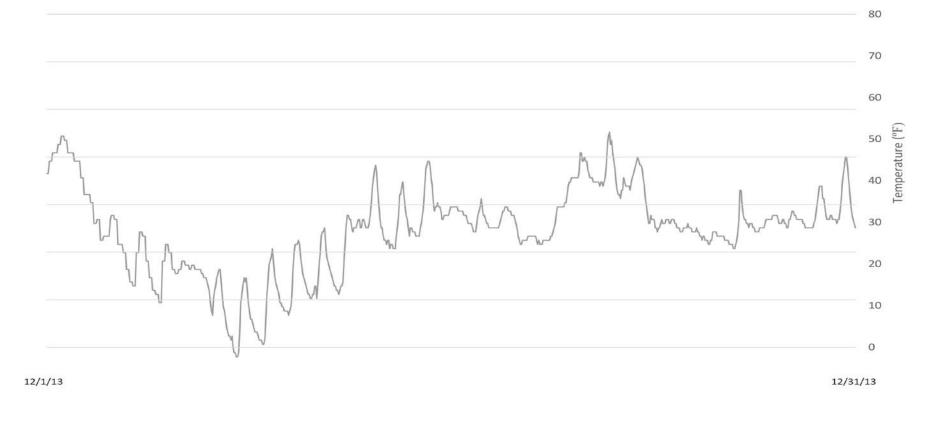
**Earth Advantage** 



Outdoor Temperature: 11 F



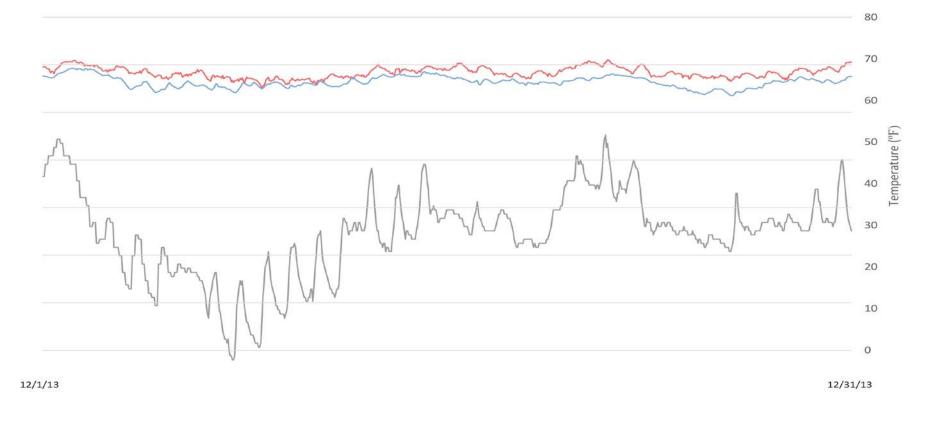
## Heating: December Outdoor Temp



—— Outdoor Temperature



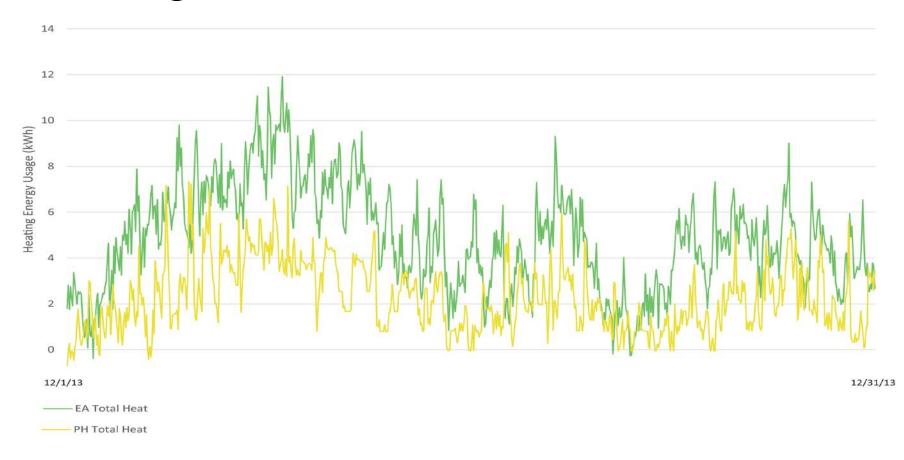
## Heating: December Outdoor Temp + Indoor



- ------ EA Average Indoor Temperature
- —— PH Average Indoor Temperature
- —— Outdoor Temperature

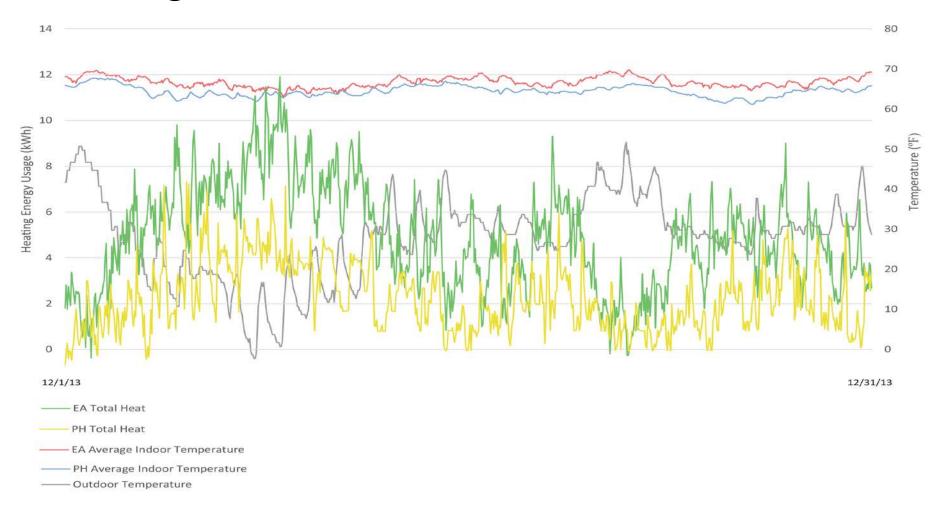


## Heating: December PH and EA heating use

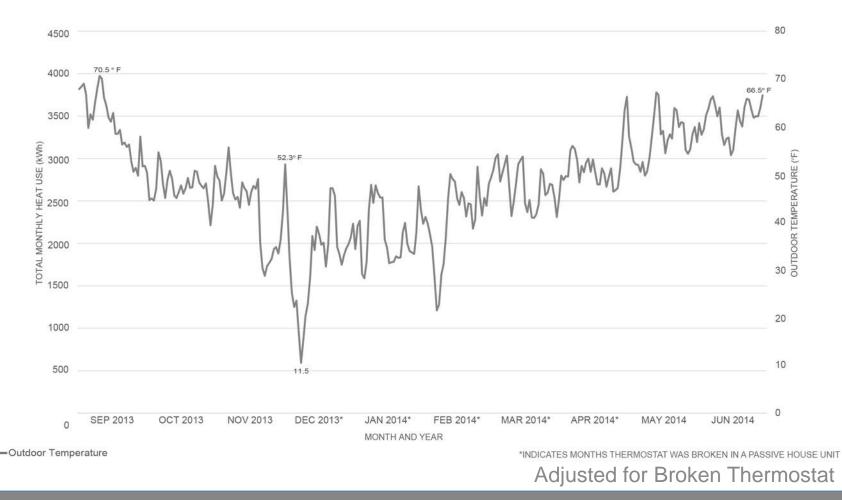




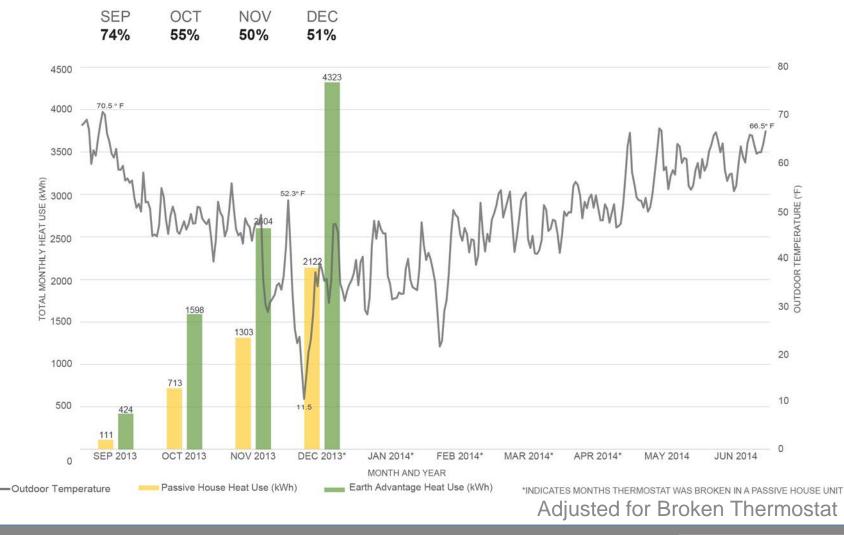
## Heating: December PH and EA heating use + temps



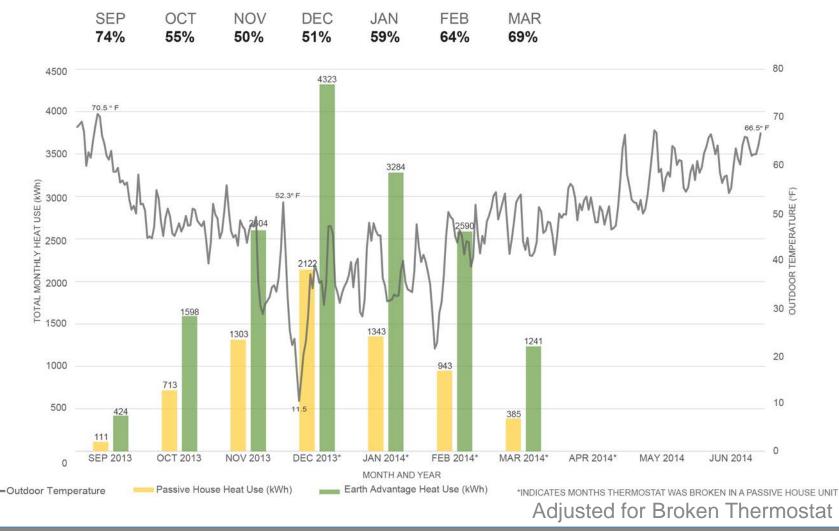




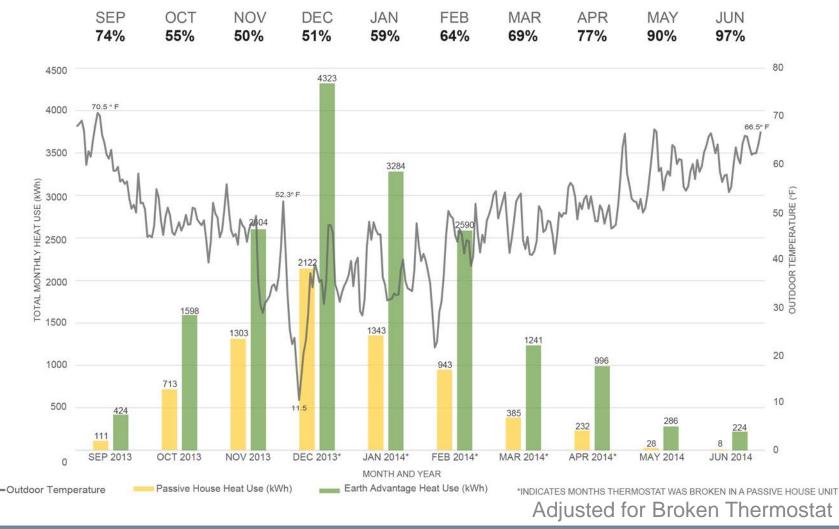






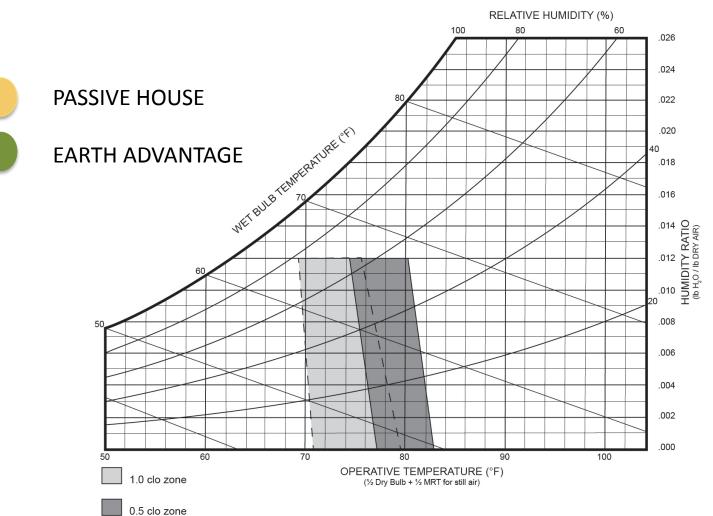






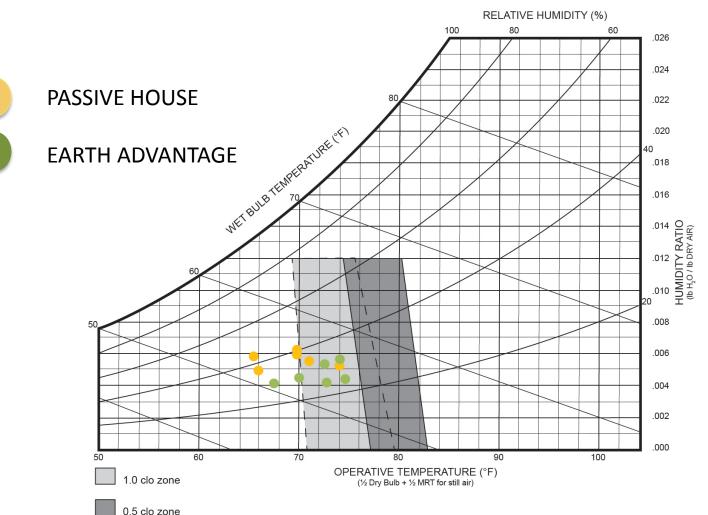


## **Thermal Comfort**



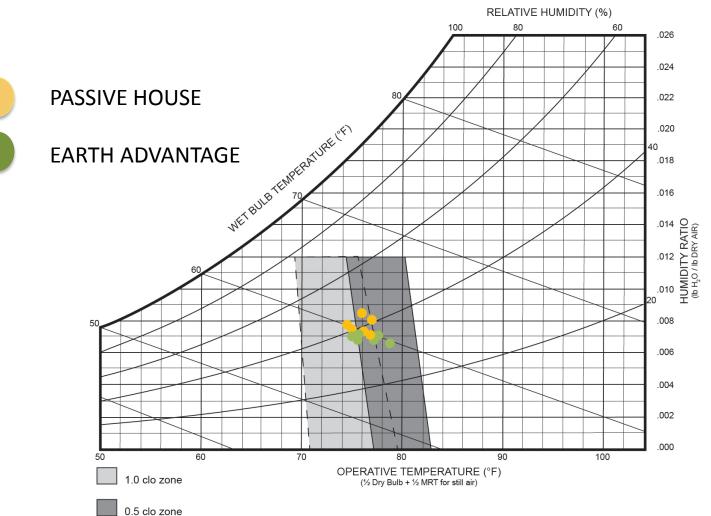


## **Thermal Comfort - December**





# **Thermal Comfort - June**





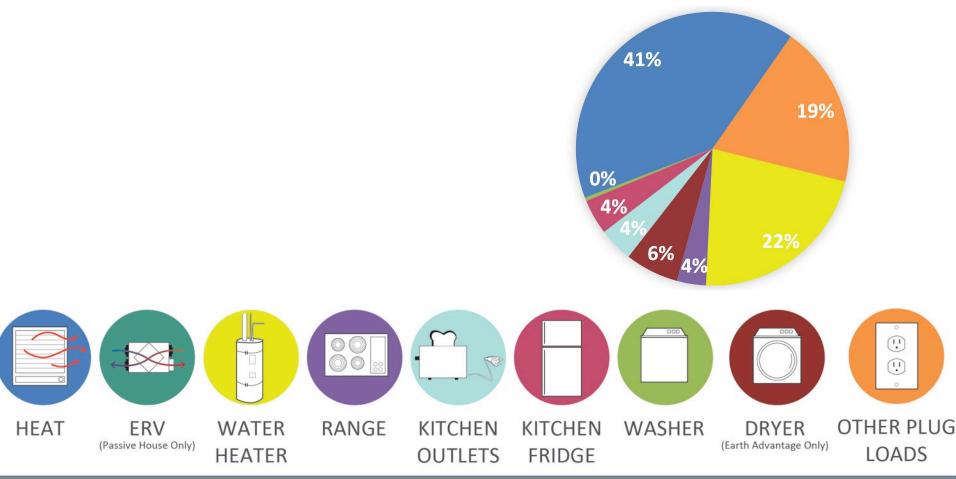
## Energy End Use: Monitored Circuits



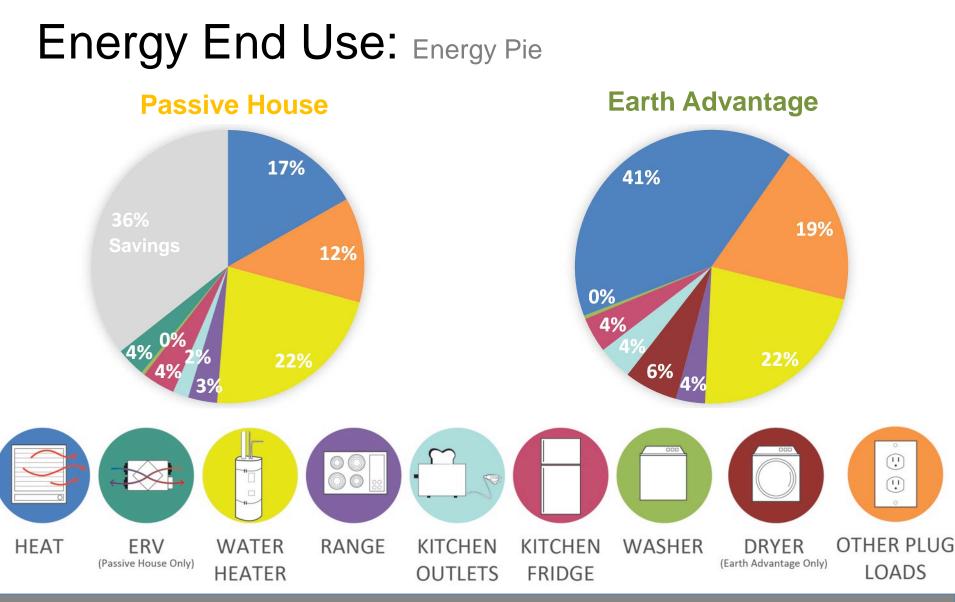


## Energy End Use: Energy Pie











# Energy End Use: Average Energy Use per unit

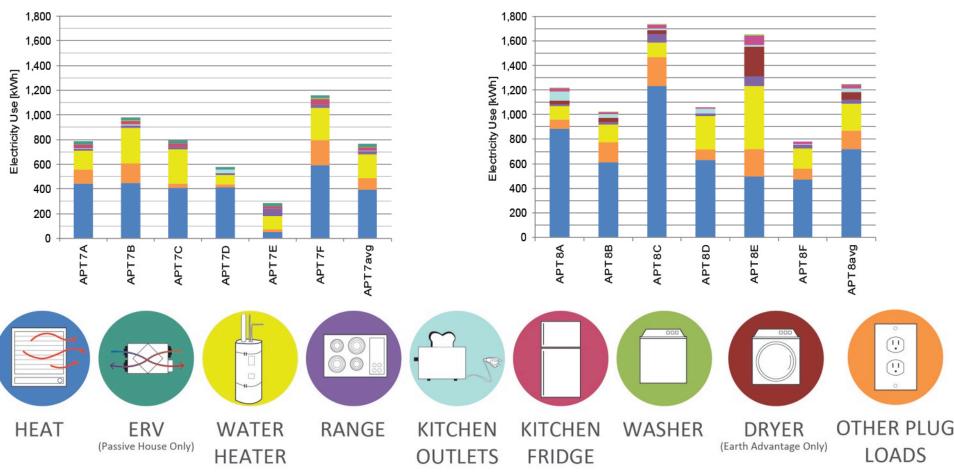
#### **Earth Advantage Passive House** 1,400 1,400 1,200 1,200 Electricity Use [kWh] Electricity Use [kWh] 1,000 1,000 800 800 600 600 400 400 200 200 0 0 <u>1</u>9 <u>~</u> က 10 4 4 SEP '13 <u>~</u> 14 က 4 4 4 $^{\circ}$ 4 4 4 47 4 4 7 5 APR JUN SEP JAN FEB MAR OCT NOV JAN FEB MAR APR JUN JUL OCT ИΑΥ JUL DEC МΑΥ DEC 00 ... (1) OTHER PLUG HEAT ERV WATER RANGE **KITCHEN KITCHEN** WASHER DRYER (Passive House Only) (Earth Advantage Only) LOADS HEATER **OUTLETS** FRIDGE



## Energy End-Use: December 2013

#### **Passive House**

Earth Advantage

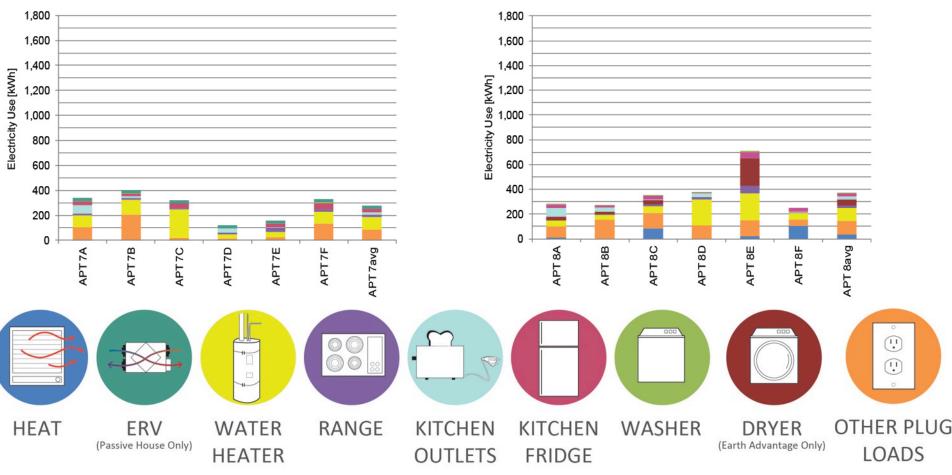




## Energy End-Use: June 2014

#### **Passive House**

**Earth Advantage** 







#### EARTH ADVANTAGE





1 child (10 y.o.)

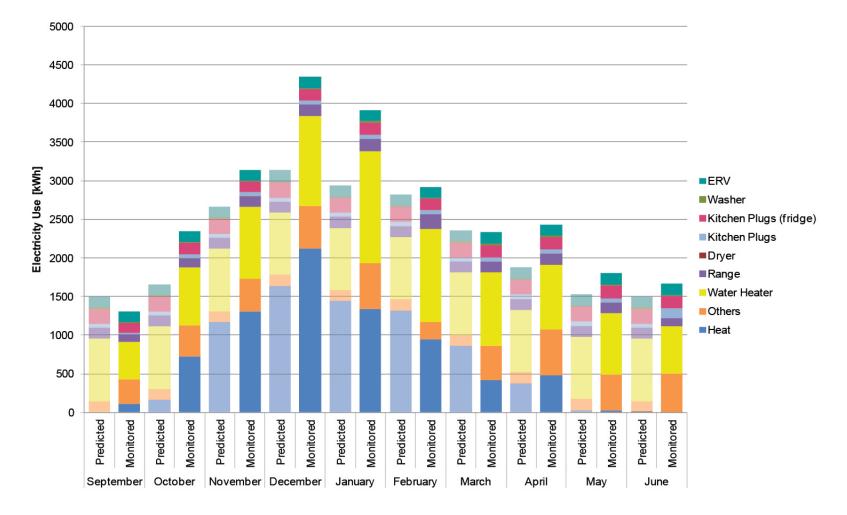
+/- pets



#### Occupancy: 9



## PH Performance: Predicted vs. Monitored





- Energy use: behavior matters
- Tenant knowledge: cannot make assumptions
- Equipment: sometimes fails
- Comparisons: comparing against EA vs. code
- Weather: colder winter & hotter summer





- Continue monthly monitoring analysis
- Complete first year report
- Establish baseline/code energy performance
- Potential tenant survey



# Acknowledgements

- St. Vincent de Paul Society of Lane County
- Bergsund DeLaney Architecture and Planning
- Meili Construction
- CPHCs: Win Swafford, Jan Fillinger
- SOLARC/Peter Reppe
- City of Eugene, EWEB
- UO NetZed Case Study Lab team: Annie Chiang, Ryan Dirks, Ashley Tuffo, Eric Schmidt



# Questions?

