An Overview of
The CA Whole House Home Energy Rating System (HERS II)

Presented by CalCERTS, Inc.

Background

- In 1992 the first Home Energy Rating System (HERS) was established in California, called California Home Energy Rating System (CHERS).

- It was developed primarily to provide cost effectiveness calculations for Energy Efficiency Mortgages.

Background

- The first HERS scale was a 0-100 scale where higher is better.

- A new home that just met the Title 24 Energy Codes at that time was automatically given a rating of 80.

- An Energy Star home (15% better than code) got a score of 85.

Background

- This first HERS program was partly funded by the California Energy Commission but it was not regulated or controlled by it.

- The State of California saw a need for a consistent, reliable, standardized, regulated home energy rating system that utilities and other incentive programs could rely on and trust.

Background

- Public Resources Code (PRC) Section 25942 directed the Energy Commission to adopt a statewide California Home Energy Rating System (HERS) Program for residential dwellings.

Background

- **Phase I** of the California HERS Program . . . established the basic operating framework . . . for raters who are performing field verification and diagnostic testing services for demonstrating compliance with Title 24 Building Energy Efficiency Standards.

- Aka "HERS I" Raters or "Compliance Raters"

Background

- The "Compliance Raters" serve as special inspectors working on behalf of the local building department for the purposes of verifying compliance to the Title 24 Energy Codes, for both:
  - newly constructed homes and
  - alterations to existing homes

Background

- The purpose of the 2008 revisions to the HERS regulations was to implement **Phase II** of the HERS Program by extending Phase I to cover whole-house home energy ratings of existing (and newly constructed) homes.

- Aka "HERS II" Raters

Background

- Phase II puts in place the remaining elements of PRC Section 25942:

  - **Consistent**, **accurate**, and **uniform** ratings based on a **single** statewide rating scale.

  - **Reasonable** estimates of potential utility bill savings, and **reliable** recommendations on cost-effective measures to improve energy efficiency.

  - (cont'd next slide)

Background

- Phase II puts in place (cont'd):

    - Labeling procedures that will meet the needs of home buyers, homeowners, renters, the real estate industry, and mortgage lenders with an interest in home energy ratings.

    - Proposed approaches for determining measure cost-effectiveness and recommendations for energy efficiency improvements, including cross checking against utility bills.

Background

- The specific details of an approved HERS II program is published in the "HERS Technical Manual" (CEC-400-2008-012-CMF)

"HERS II" is . . . .

- Specifically defined and mandated by Title 20, Chapter 8 Article 4, Section 1670-1675.

- A **California Whole House Home Energy Rating System** administered by a HERS Provider (e.g., CalCERTS).

- Reviewed, approved, and regulated by the California Energy Commission (CEC).

"HERS II" is . . . .

- A **standardized,** statewide process for evaluating and ranking **ENERGY** improvements to a home.

- A process that uses a **CEC approved** software tool to accurately and consistently perform the energy use calculations on a home.

- A process that can provide **independent**, non-biased energy upgrade recommendations without conflict of interest.

"HERS II" is NOT . . .

- A building performance program. (but it certainly could enhance one)

- A combustion safety program. (but combustion safety is required as part of the energy upgrades)

- A program that results in energy savings all by itself (but it will help result in the most cost effective energy savings possible).

To Be Effective "HERS II" must . . .

- Work in **close** conjunction with an effective building performance contractor program that includes combustion safety, tracking, and quality assurance/quality control.

How Does HERS II Compare to BPI?

- HERS II simply **enhances** the energy efficiency evaluation process of BPI. Nothing else.

- BPI does not formally standardize the process of evaluating energy features or provide a HERS score.

- HERS II does. This is important to utilities and other incentive programs.

What is "BPC"?

- BPC is "Building Performance Contractor" a program designed and regulated by the California Energy Commission and administered by HERS providers similar to HERS II.

- Formally known as the "California Building Performance Contractor", it is also established by the CA HERS Regulations (Title 20).
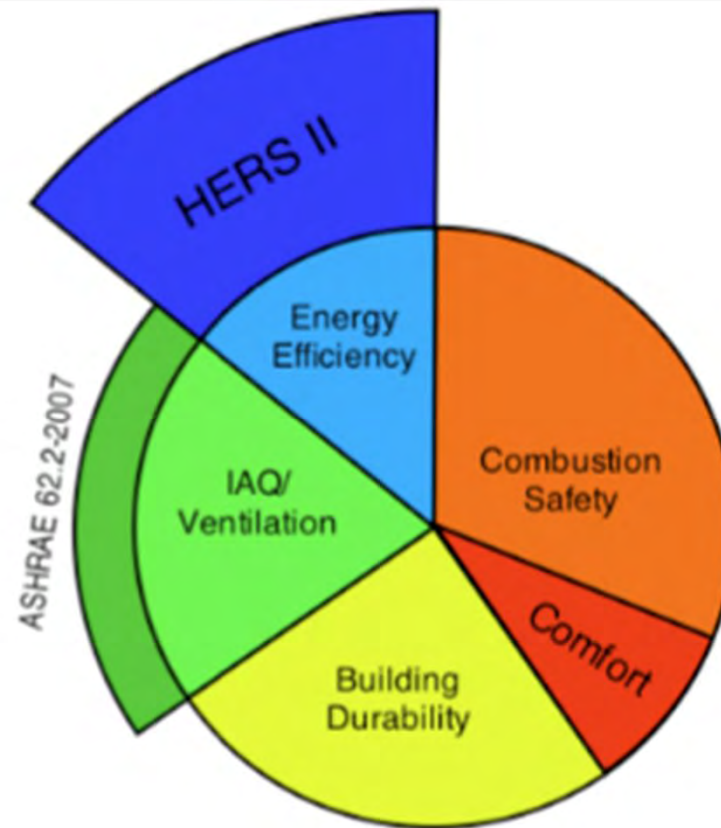
What is "BPC"?

- A BPC is a general contracting **company** that:
  - Is been trained and certified by BPI
  - Is been trained and certified in all of the HERS protocols (HERS I and II)
  - Is subject to special Quality Assurance evaluations
  - Reports all of the jobs to a registry for tracking

What is "BPC"?

- A BPC is a general contracting **company** that is allowed to determine the energy feature upgrades and install them.

- They may NOT perform HERS I verification on their own jobs.
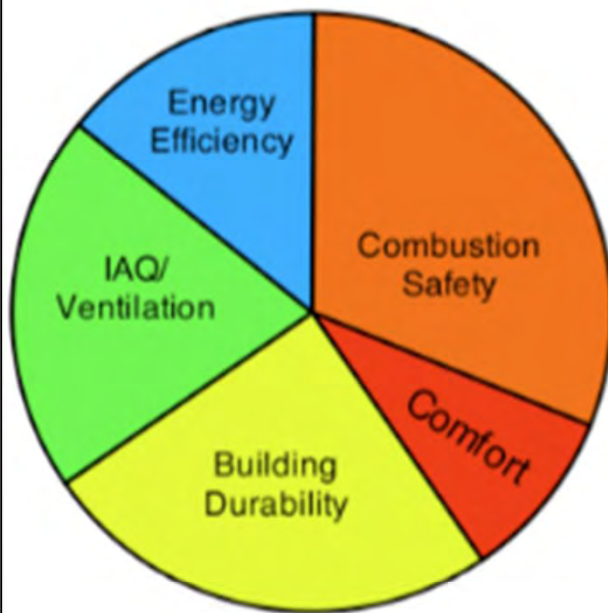
BPI

BPC

Quality Assurance
Quantification of Energy Savings
Technical Support
Registry (Data Collection and Results Reporting)

What is "BPC"?

- When the contractor makes the recommendations and installs them, this is referred to as the "contractor model".

- A variation on this is to have an independent third party rater make the recommendations and then a qualified contractor installs them. This is referred to as the "consultant model".
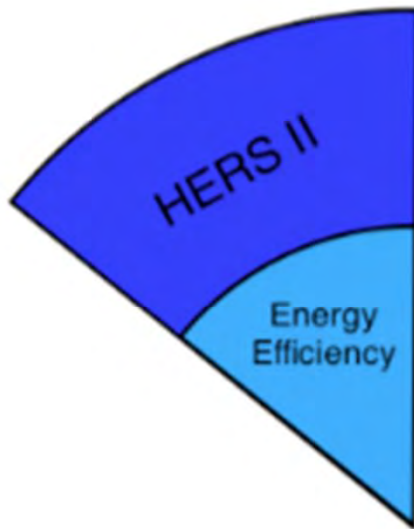
Consultant
(HERS II Rater)
Makes Recommendations
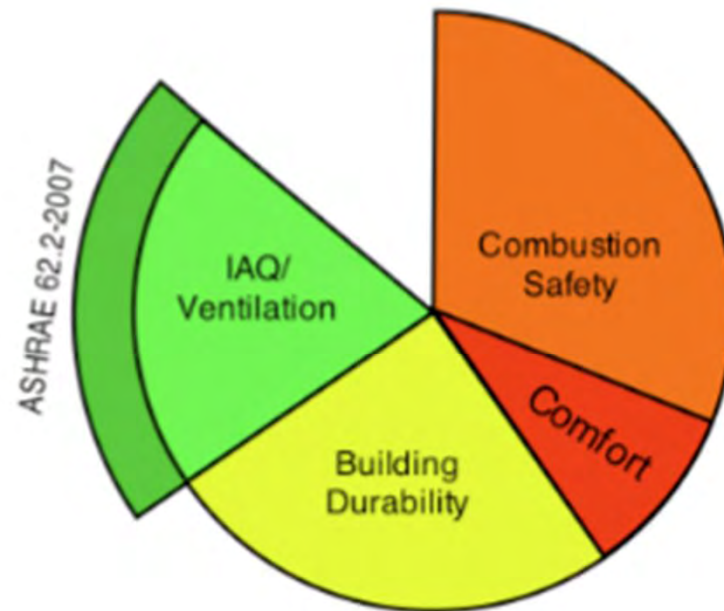
Contractor
(BPI Accredited)
Installs Features

"Consultant Model"

CA Whole House HERS Raters (HERS II)

- Currently, CalCERTS is the only HERS provider with an approved HERS II program.

- To become a CA Whole House Rater through the CalCERTS program, you need to take the classes specified and approved by the CEC.

- These include classes related to being a Title 24 "Compliance Rater" aka "Field Verification and Diagnostic Testing Rater" aka "HERS I Rater".

CalCERTS Class	Number of Days	Topics Covered
Class I – HERS Basics	(1-day)	Specific Title 20/Title-24 topics (conflict of interest, provider QA, rater agreements, etc.) Basic thermodynamics. Energy Audit Basics.
Class II – Hands-On Lab	(1-day)	Specific T-24 protocols for all HERS tests that require specialized diagnostic tools including duct leakage testing, blower door, airflow, fan watt draw, and insulation density s
Class III – Alterations to Existing Homes	(1-day)	Specific T-24 codes, protocols, and forms for HERS testing as required when alterations are made to an existing home (change-outs and cut-ins)
Class IV – Newly Constructed Buildings	(2-days)	Specific T-24 codes, protocols, and forms for HERS testing when required on newly constructed residential buildings.
Field Verification and Diagnostic Testing Field House	(2-3 hours)	Field testing on a typical alteration project. Registry practice house.
Class VII – Whole House Rater	(3-days)	HERS Technical Manual, Field Data Collection, and CalRATEpro HERS II Software
Whole House Rater Field House	(2-3 hours)	Field testing on a typical whole house rating
Combustion Safety (proposed)	(1-Day)	CO testing, worst-case depressurization, etc.
Total	9.5 days	

CA Whole House HERS Raters (HERS II)

- You must also take some basic combustion safety training.

- Detailed descriptions, pricing and schedules of all CalCERTS training are available on the CalCERTS website.

www.calcerts.com

CA Whole House HERS Raters (HERS II)

- We are in discussions with BPI and the CEC on offering reciprocity for some of the training for BPI Certified Professionals.

- This may reduce the number of days of training for BPI Professionals.

CA Whole House HERS Raters (HERS II)

The HERS II Process

1. Field Data Collection and "Test In"
2. Data Entry to Create Computer Model of House
3. Fine Tune Model with Actual Energy Bills
4. Evaluate Energy Upgrades with Estimated Feature Costs
5. Assist Homeowner in Getting Bids (optional)
6. Finalize Model with Actual Feature Costs
7. Monitoring Installation of Features (optional)
8. Final Inspection and "Test Out"
9. Issue Final Certificate

The HERS II Process

1. Field Data Collection and "Test In"

- The Rater visits the house to collect the information necessary to create a computer model of the home.

- This includes a sketch of the home accurate enough to calculate
  - Floor areas
  - Wall areas
  - Window/door/skylight areas
  - Roof areas
  - Etc.

The HERS II Process

1. Field Data Collection and "Test In"

- A Field Data Collection Form guides the Rater through this process.
- Other data collected includes:
  - Opaque surface types (R-values)
  - Window types
  - HVAC system
  - Water heating system
  - Appliances
  - Lighting
  - Electric Bills and Utility Rates

The HERS II Process

1. Field Data Collection and "Test In" (cont'd)

- Diagnostic Testing may be performed as part of this process, or default values may be used, depending on the program requiring the HERS II rating, if any.

- Diagnostic tests done on **_existing_** homes include:
  - Duct leakage testing
  - Blower Door testing

The HERS II Process

2. Data Entry to Create Computer Model of House

- The data collected in the field is entered into the HERS II software.

- This can be done on site or at rater's office.

- The model is run and checked for accuracy using a "Data Input Summary Report" that tabulates all of the inputs.

The HERS II Process

3. Fine Tune Model with Actual Energy Bills

- Twelve months of electric and gas utility bills (consumption, demand, and costs) can be entered into the software.

- The software "Normalizes" the bills to remove erratic behavior issues and adjust for actual weather during the 12 months covered by the bills.

- The Normalized bills are compared to estimated bills generated by the software model.

The HERS II Process
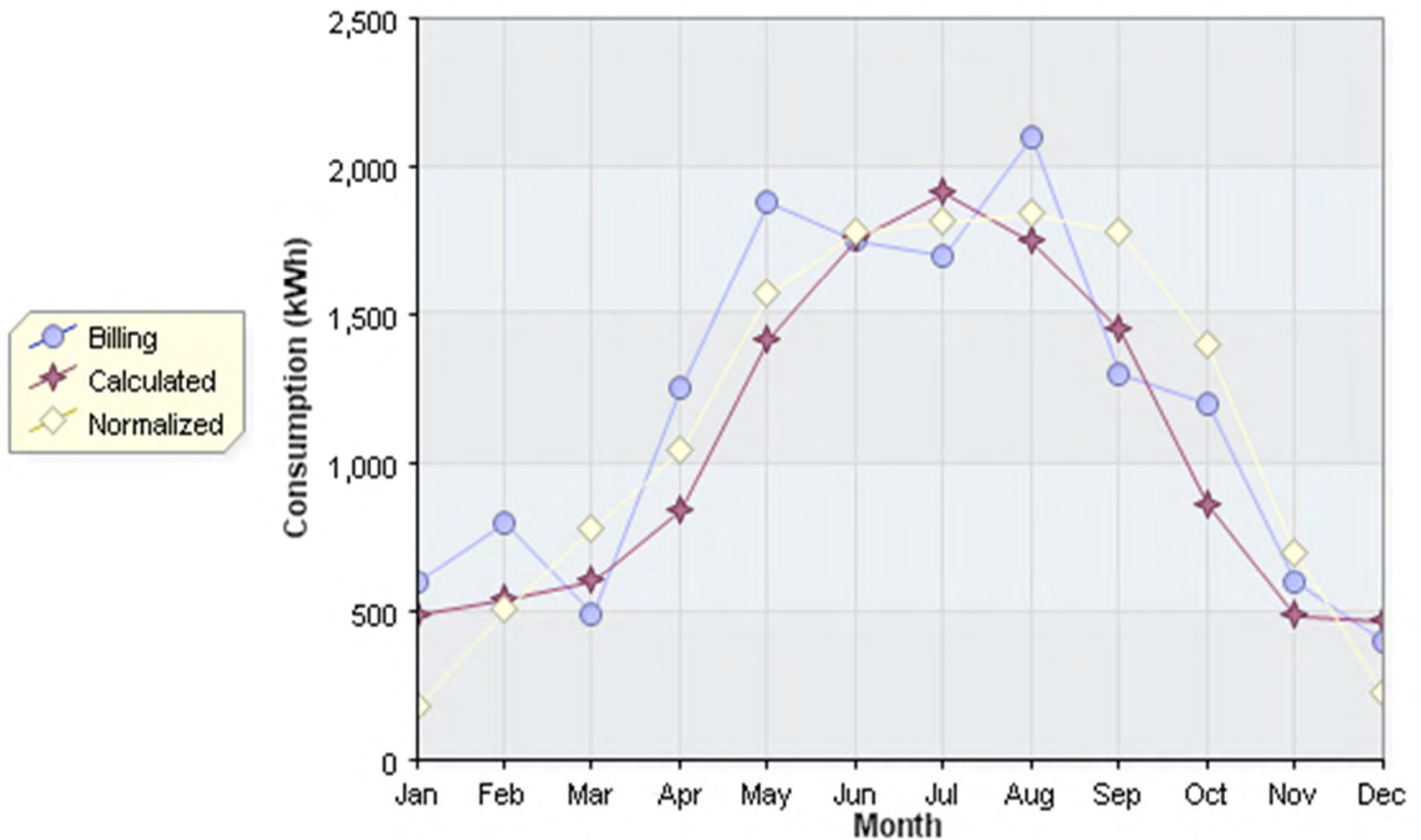
The HERS II Process

4. Evaluate Energy Upgrades with Estimated Feature Costs

- Once the model has been calibrated, the rater can then begin to evaluate a variety of potential upgraded energy features.

- The rater starts by entering estimated costs. These can come from the DEER database or rough cost estimates from reliable sources.

- The rater must make it very clear that the initial costs are very rough and may change substantially up or down, depending on special conditions.

The HERS II Process

4. Evaluate Energy Upgrades with Estimated Feature Costs (continued)

- The software automatically runs the before and after cases, calculates the savings and evaluates the cost effectiveness.

- If multiple upgrades are run, it will **rank** them in order of cost effectiveness.

The HERS II Process

5. Assist Homeowner in Getting Bids (optional)

- If desired and agreed to between the rater and homeowner, the rater can assist the homeowner in reviewing bids and scopes of work to ensure consistency with energy upgrade recommendations.

- Raters must be fully independent from the contractors.

The HERS II Process

6. Finalize Model with Actual Feature Costs

- Once bids have been received, the rater can update the feature costs in the software and re-evaluate the cost effectiveness.

- The ranking order of recommended upgrades may change based on revised costs.

The HERS II Process

7. Monitoring Installation of Features (optional)

- If desired and agreed to between the rater and homeowner, the rater can monitor the installation of the upgraded energy features to ensure quality installation and consistency with modeling assumptions.

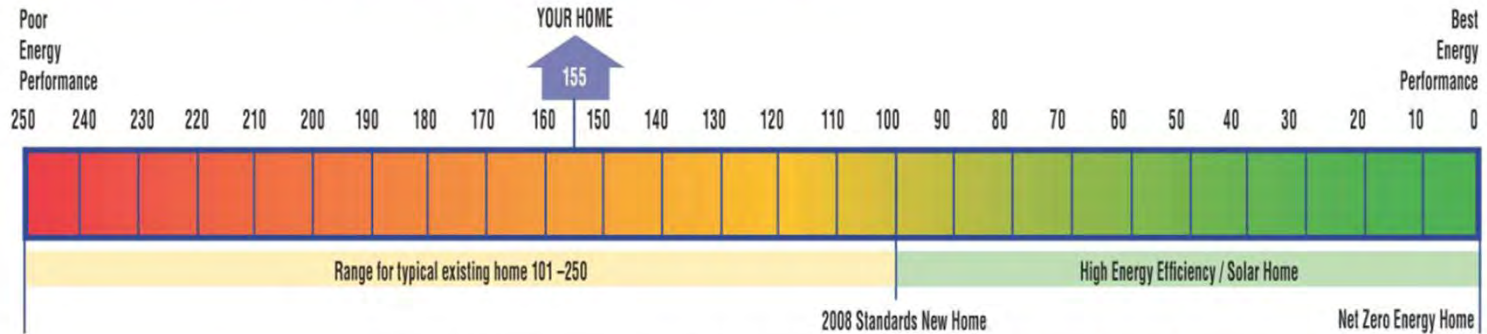# The HERS II Process

8. Final Inspection and "Test Out"

- Once the features have been installed, the rater will perform a final inspection to ensure consistency with scopes of work.

- The rater can also perform final diagnostic testing (duct leakage and blower door) if necessary.

The HERS II Process

9. Issue Final Certificate

- Upon satisfactory completion of all inspections and diagnostic testing, the rater will issue a final certificate that will show the home's final HERS score.

- These are typically required to obtain rebate checks.

California Home Energy Rating Certificate

Poor Energy Performance

YOUR HOME

155

Best Energy Performance

250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0

Range for typical existing home 101–250

High Energy Efficiency / Solar Home

2008 Standards New Home

Net Zero Energy Home

Information goes here on compliance with other programs:

Qualifying Information Goes Here:

HERS Provider and/or Sponsor Co-Branding Logos Go Here:

Energy Impact

Greenhouse Gas Emissions
Carbon Dioxide xxx tons/year

Energy Consumption
Electricity (kWh/year)
Cooling   —
Lights   —
Appliances   —
Total   —
Natural Gas (therms/year)
Space Heating   —
Water Heating   —
Total   —

Operating Cost ($/year)
Electricity   —
Gas   —
Total   —

Renewable Energy Production
None

Ancillary Energy Uses
Swimming pool
Spa
Landscape lighting

Site Information

Address
123 Jones Street
Anywhere, California 9410x

General Information
Conditioned Floor Area   2,200 ft^2
Bedrooms   4
House Type   Single Family
Foundation Type   Slab-on-Grade

Energy Efficiency Features

Insulation
Ceiling   R-19
Wall   R-11
Floor over crawlspace   None
Slab Edge   None

Windows
Frame   Aluminum
Glazing   Single

Heating System
Gas furnace, 0.80 AFUE
Unsealed air distribution ducts

Cooling System
None

Water Heating System
Gas storage type, 0.52 EF

Official Home Energy Rating

in conformance with the requirements of the California Energy Commission

www.energy.ca.gov

HERS Provider:
Acme Energy Rated Homes
934 Energy Efficient Way
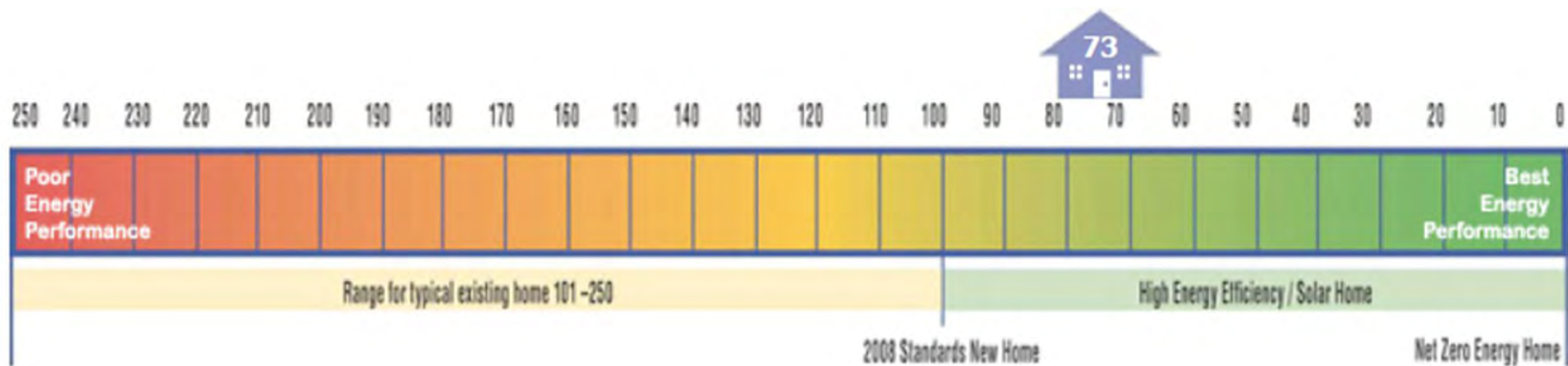Power Junction, California
www.AcmeEnergyRatedHomes.com

Rating Information
Rating Number   xxxx-yyyy
Certified Rater   EEH, Inc.
                  Stockton, CA
Rating Date: January dd, yyyy
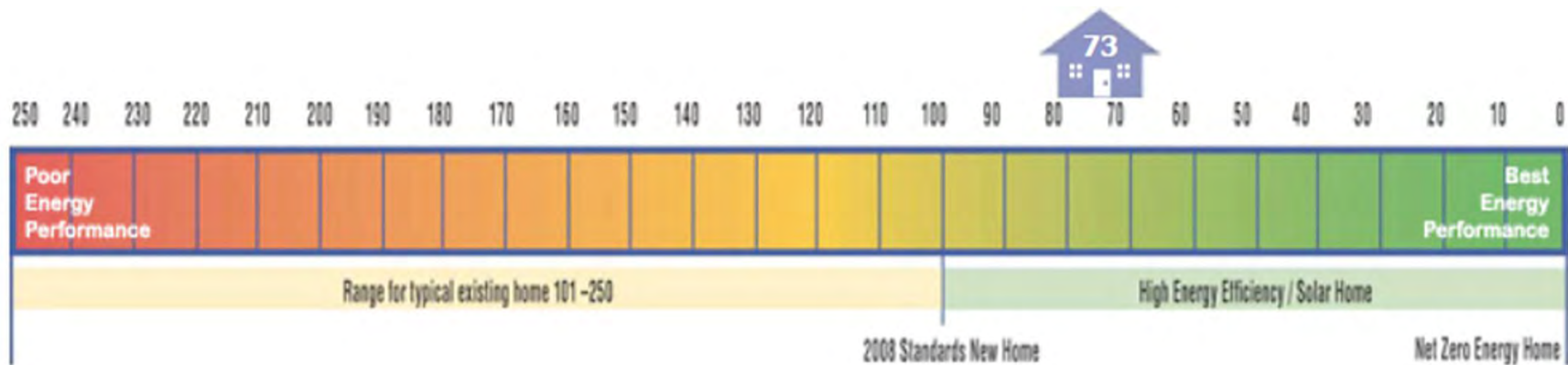
_____

Rater Signature   Date

The HERS II Index

- The scale runs from 250 on the left to 0 on the right. Called the ***California HERS Index,*** the score of the **rated house** is displayed above the scale.
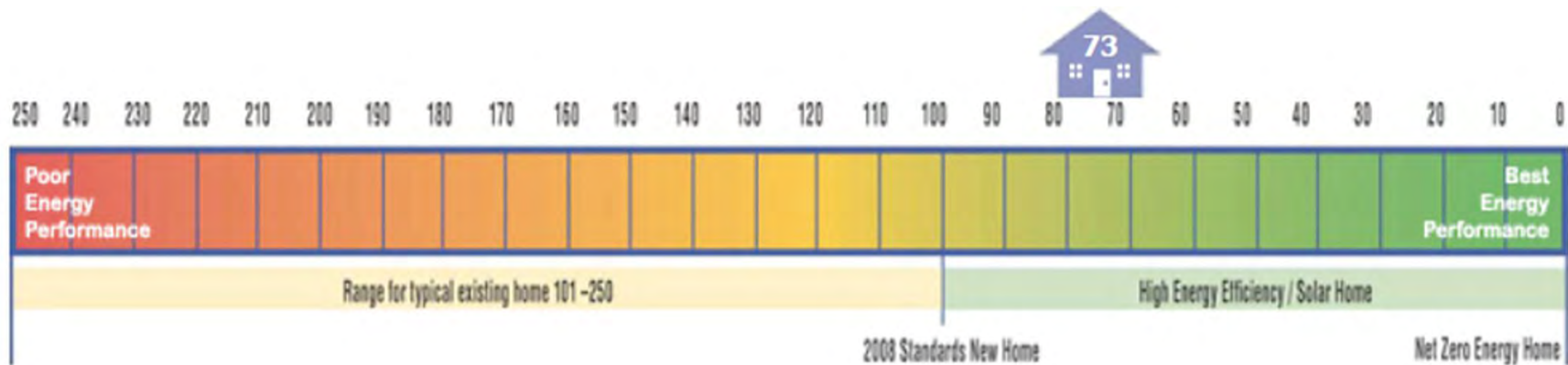
The HERS II Index

- If the home has on-site generation capacity, two points will be displayed above the scale: one without on-site generation and one with on-site generation.
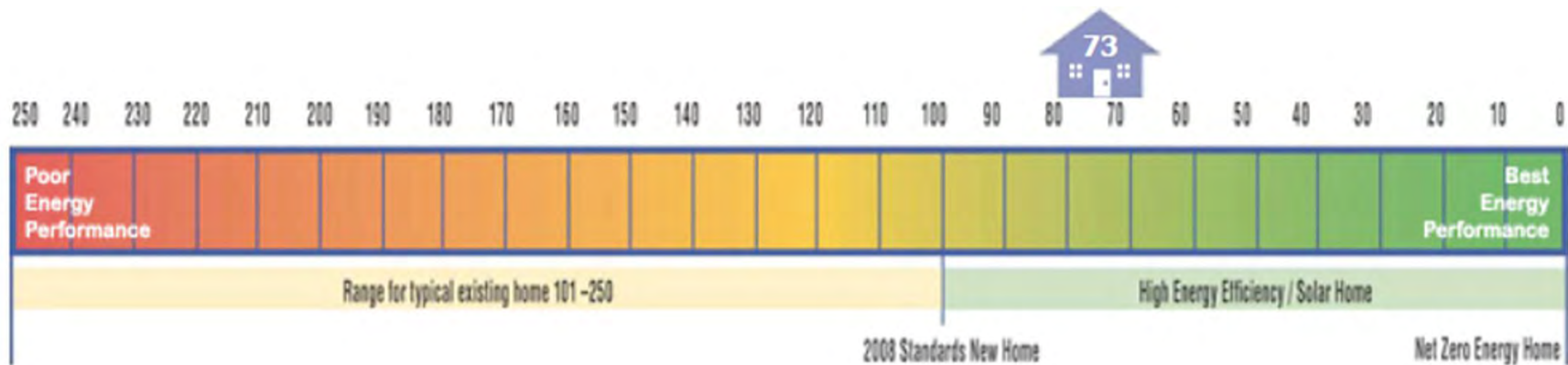
The HERS II Index
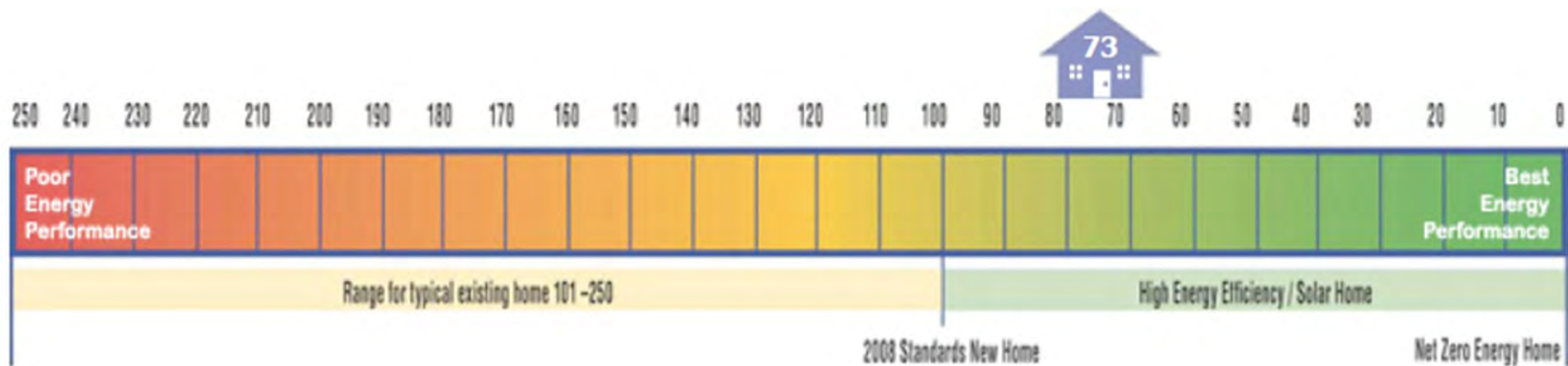
- Below the scale at the 100 mark, a label identifies this position as a typical newly constructed home in compliance with the **2008 Building Energy Efficiency Standards.**

The HERS II Index

- The bottom right side of the scale shows that a score at that end represents a "Net Zero Energy Home".
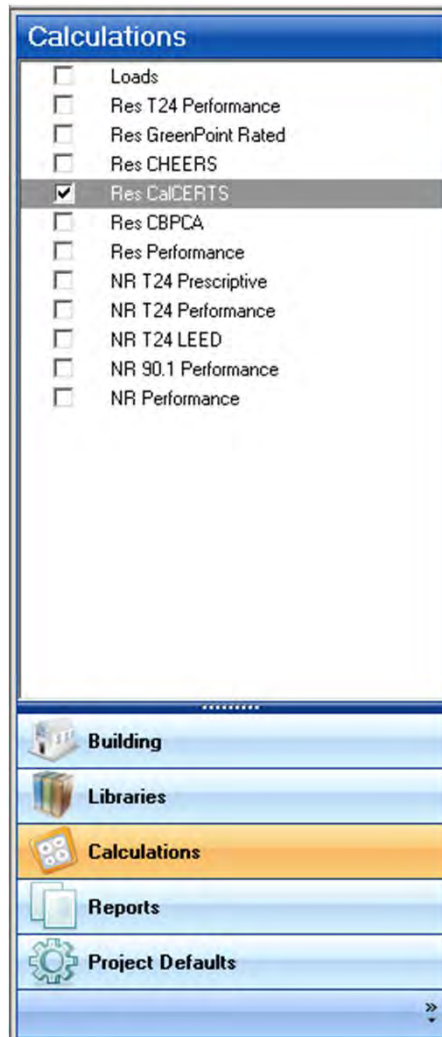
The HERS II Index

- Note that unlike previous HERS "scores", with this new *California HERS Index*, LOWER IS BETTER.

- An index of "0" is the best you can do.

HERS II Software

- The HERS II software is a special version of EnergyPro by EnergySoft.

- You can down load a demo version to look at.

- www.energysoft.com -> Downloads

HERS II Software

Calculations

- Loads
- Res T24 Performance
- Res GreenPoint Rated
- Res CHEERS
- ☑ Res CalCERTS
- Res CBPCA
- Res Performance
- NR T24 Prescriptive
- NR T24 Performance
- NR T24 LEED
- NR 90.1 Performance
- NR Performance

Building
Libraries
Calculations
Reports
Project Defaults

- Energy Pro consists of several **modules**
- We are focusing on the Residential Modules.
- They all use the same basic energy **simulation engine**.
- The different modules do different things with the results of that simulation.
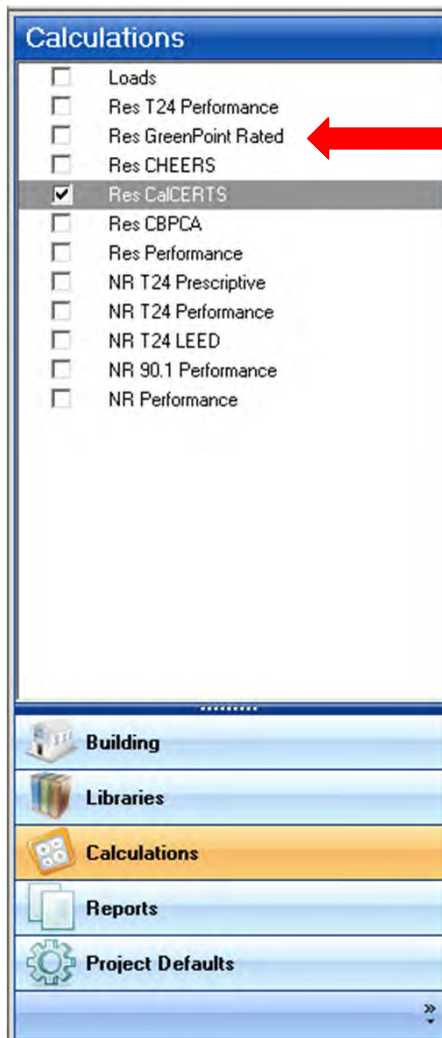
HERS II Software

- The energy use simulation that EnergyPro performs is called an ***annual hourly energy simulation***.
- It uses one of sixteen weather files.
- Each file contains 365 days of weather, broken down into 24 hours per day.
- In one simulation run EnergyPro performs the equivalent of 365 x 24 = 8760 heating and cooling load calculations.
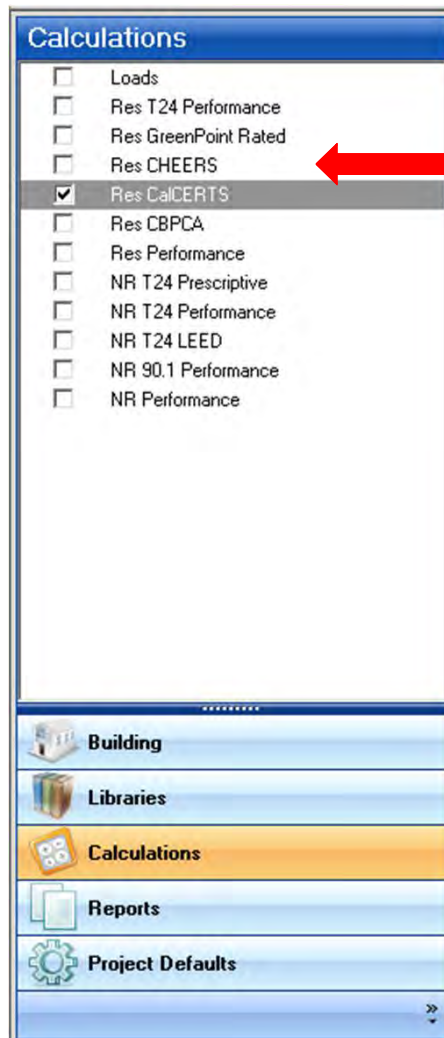
HERS II Software
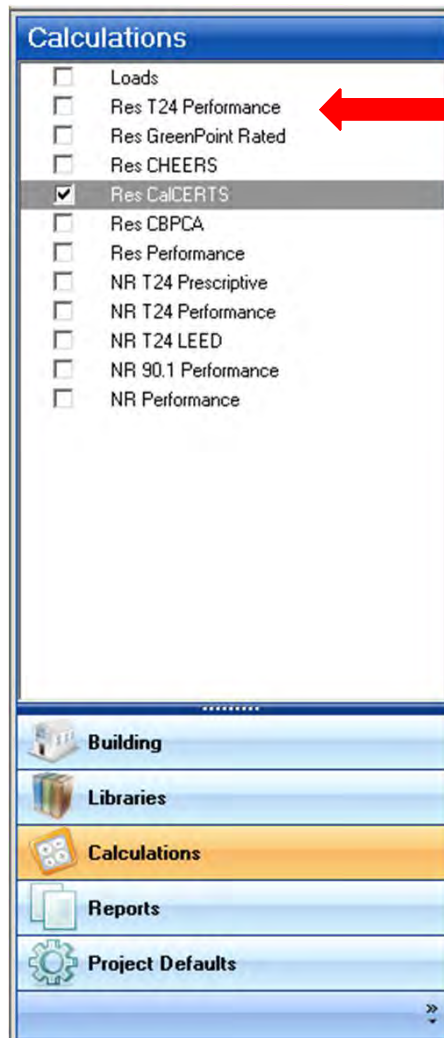
- The "Res T24 Performance" module determines if a **_proposed_** version of a home uses less energy than a CEC defined **_standard_** version of the same house in order to demonstrate that the house meets the Title 24 Energy Codes.
- It is probably the most common use of this software.
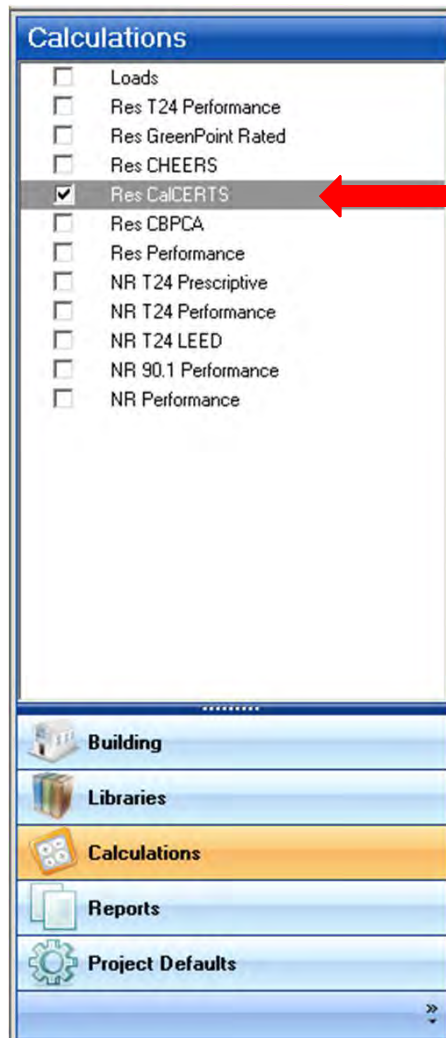
HERS II Software

- The "Res GreenPoint Rated" module helps determine the GreenPoint Score of a home.
- For more information on this module visit:
 - www.builditgreen.org

HERS II Software

Calculations

- ☐ Loads
- ☐ Res T24 Performance
- ☐ Res GreenPoint Rated
- ☐ Res CHEERS ⬅
- ☑ Res CalCERTS
- ☐ Res CBPCA
- ☐ Res Performance
- ☐ NR T24 Prescriptive
- ☐ NR T24 Performance
- ☐ NR T24 LEED
- ☐ NR 90.1 Performance
- ☐ NR Performance

Building

Libraries

Calculations

Reports

Project Defaults

- The "Res CHEERS" module runs a whole house energy simulation for CHEERS programs.
- For more information on this module visit:
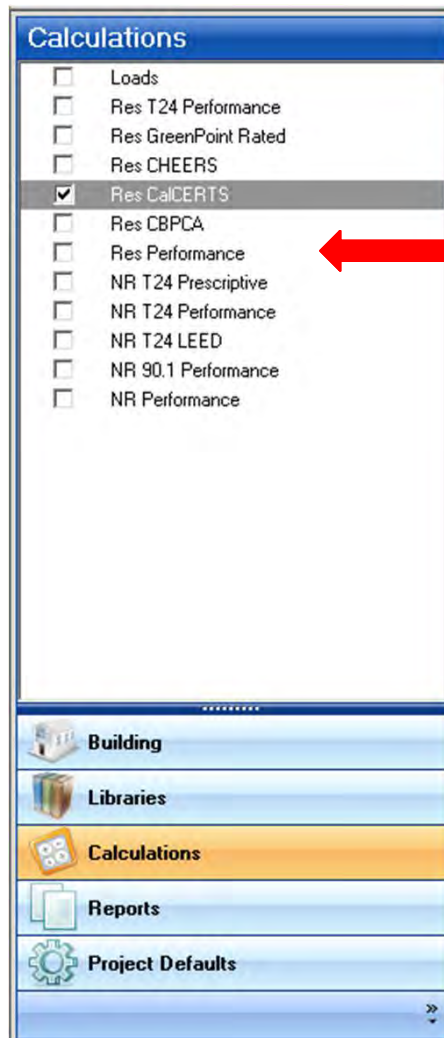 - www.cheers.org

HERS II Software

- The "Res CalCERTS" module runs a whole house energy simulation for whole house rating programs.
- For more information on this module visit:
 - www.calcerts.com

HERS II Software
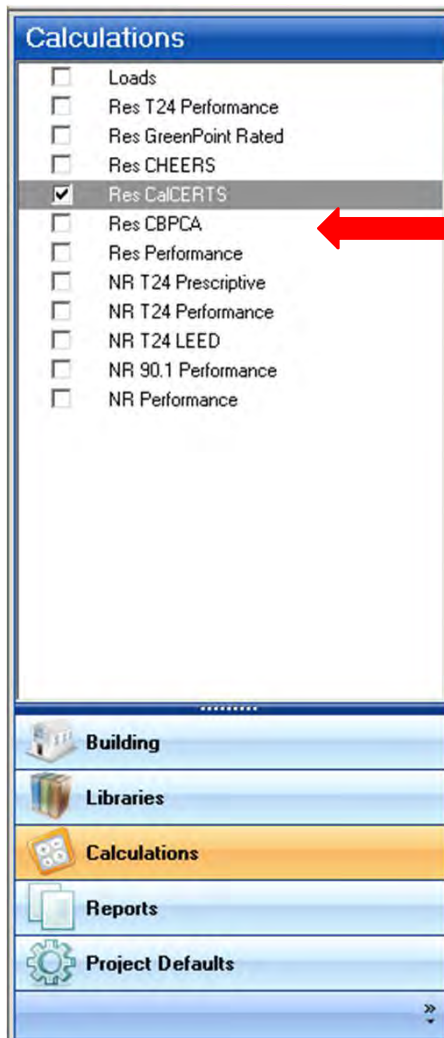
- The "Res CBPCA" module runs a whole house energy simulation for CBPCA programs.
- For more information on this module visit:
 - thecbpca.org

HERS II Software

Calculations
☐ Loads
☐ Res T24 Performance
☐ Res GreenPoint Rated
☐ Res CHEERS
☑ Res CalCERTS
☐ Res CBPCA
☐ Res Performance
☐ NR T24 Prescriptive
☐ NR T24 Performance
☐ NR T24 LEED
☐ NR 90.1 Performance
☐ NR Performance

Building
Libraries
Calculations
Reports
Project Defaults

- The "Res Performance" module is a generic module that runs a whole house energy simulation for research purposes.

HERS II Software
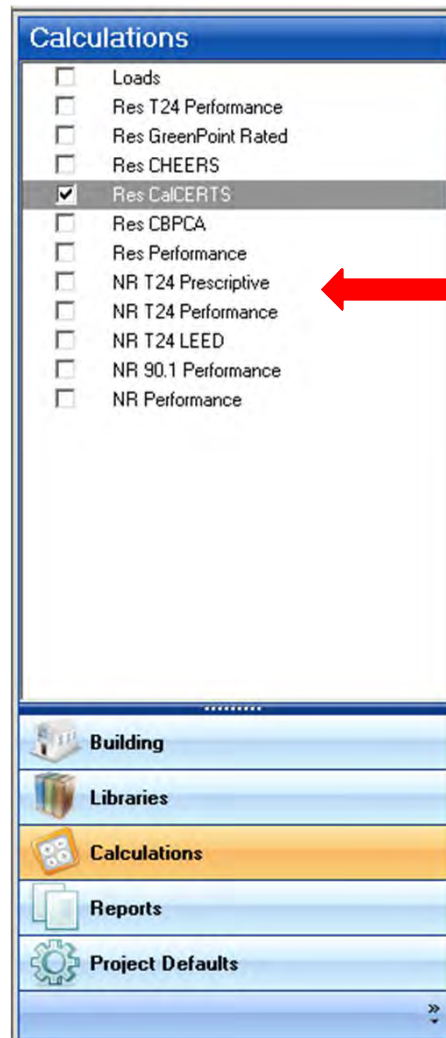
" Energy Pro can also run energy simulation runs on Non-residential buildings.

HERS II Software
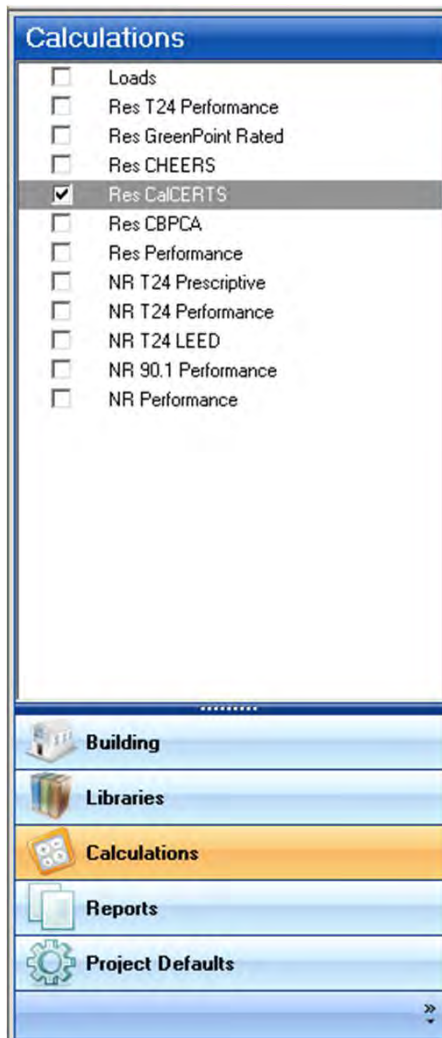
″ Currently, the only approved HERS II module is the CalCERTS module.

″ Also known as "CalRATEpro"

″ You must be a CalCERTS certified HERS II rater to use it.

HERS II Software

- CalRATEpro can be used to model the residential portions of low-rise single family and multifamily buildings.
- Only modeling individual dwelling units of multifamily buildings is approved for HERS II at this time.
- There are some pilot programs going on for modeling entire multifamily buildings.

HERS II Software

- Energy Pro constructs a model of a building by creating a building tree as shown below.
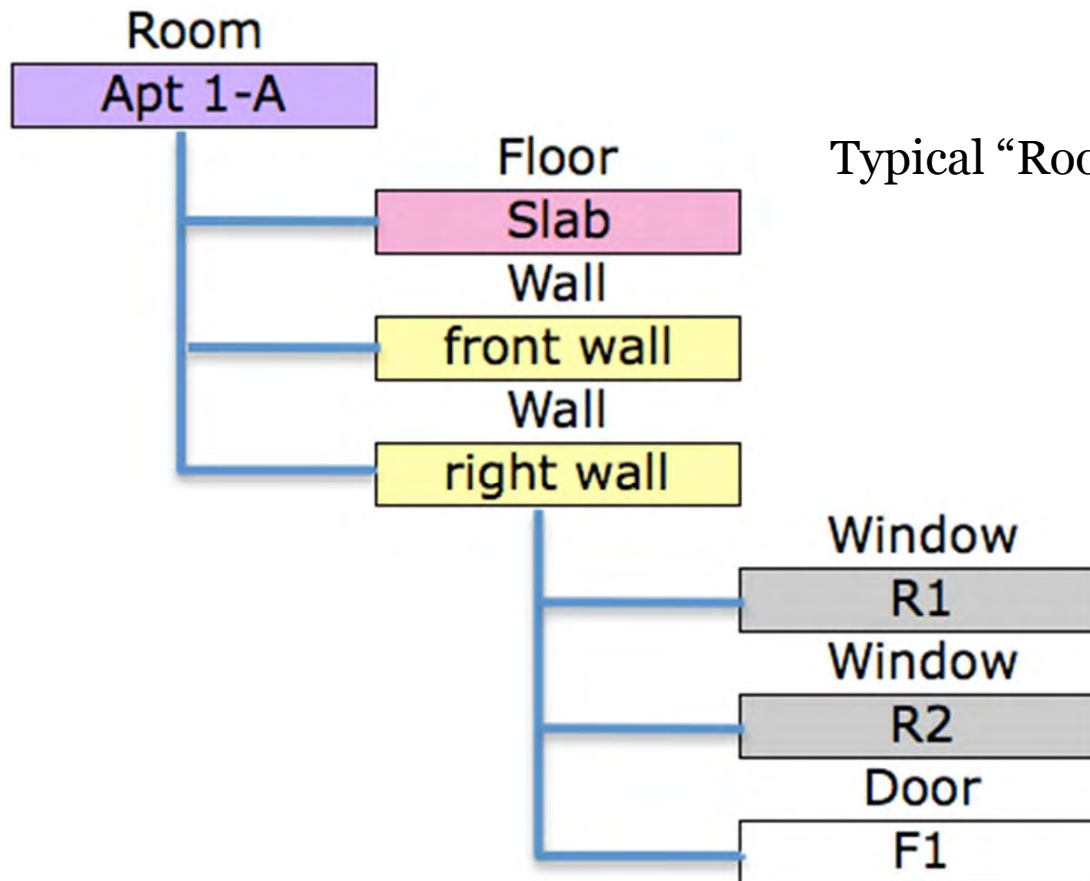- Each tier looks to the tier above it for information.
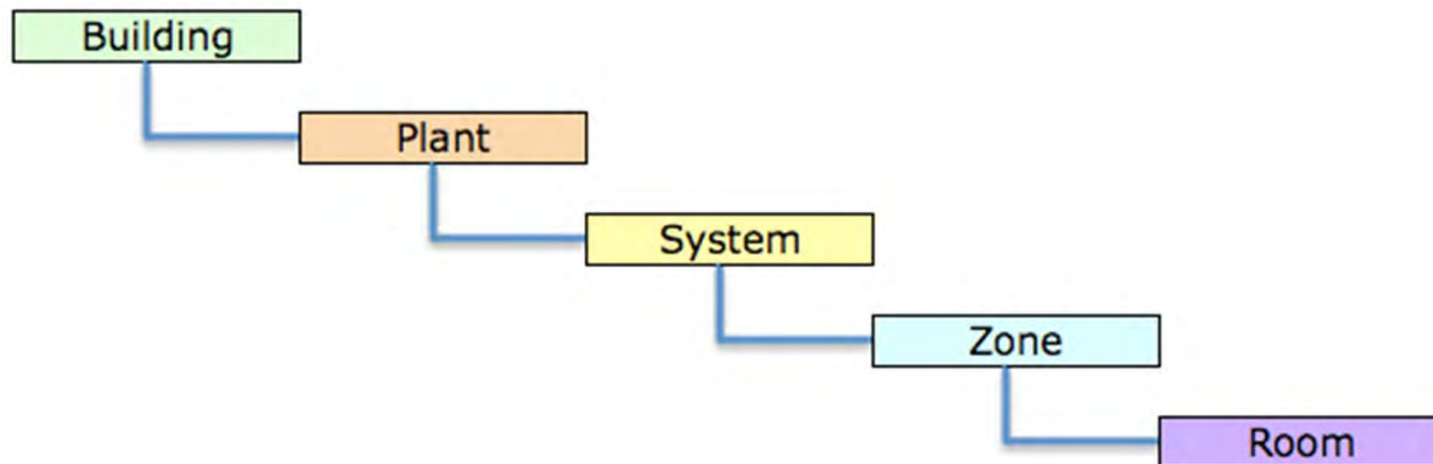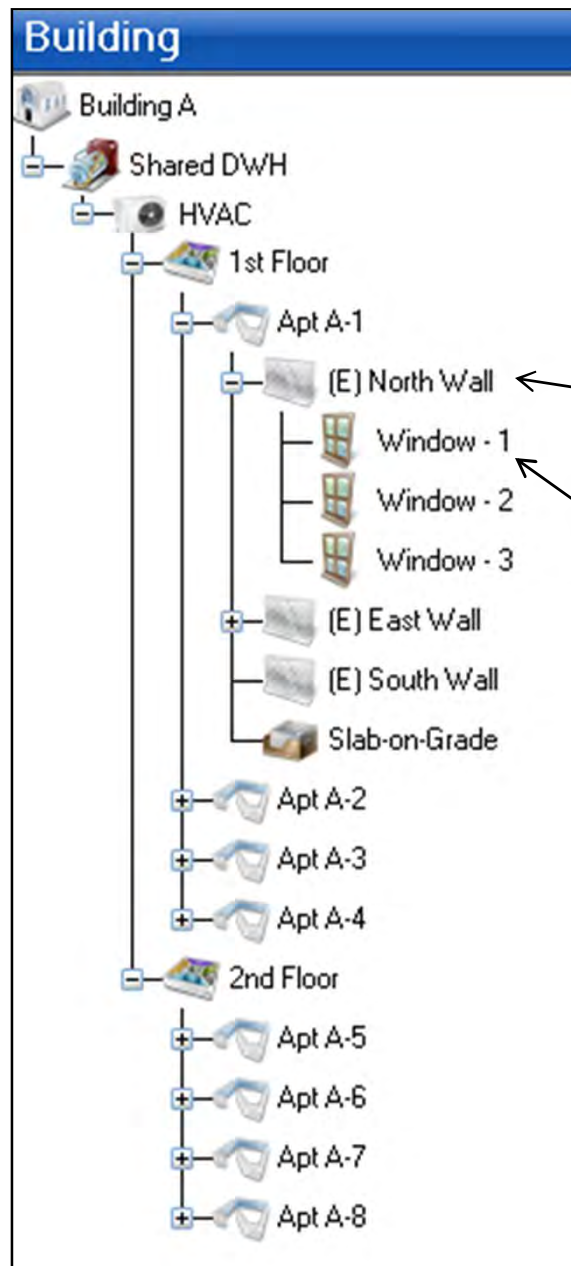
Under each "Room" is where the surfaces are modeled.

Under each surface is where the windows, doors and skylights are modeled.

HERS II Software

Room
Apt 1-A

Floor
Slab

Wall
front wall

Wall
right wall

Window
R1

Window
R2

Door
F1

Typical "Room" section of tree

HERS II Software

- On Screen HERS II Software demonstration.

CA Whole House HERS Raters (HERS II)

- Feel feel to contact me at:

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