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Webinar 3 – Data Collection, Data Entry, and Data Analysis

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Outline



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- ▶ Filling out the data collection form
- ▶ Data entry into PNNL database
- ▶ Overview of how PNNL expects to analyze the data

- ▶ Assign a unique identifier to each home visited per the Guidance Document
- ▶ Deleted town/jurisdiction entry
 - Project Teams can choose to include a code in home ID #
- ▶ Use a separate copy/file of the data collection form for each home visited
- ▶ At each home visited, get all the information you **reasonably** can in the time you have available
 - You may only get a limited number of key items at a home, but try to get as many of the “non-key” items as you can



General Cont'd

- ▶ No take offs required
 - Builder estimates or statements of the gross floor area or number of stories are acceptable
 - Rough estimates of percentage of ducts in conditioned space and unconditioned space are acceptable
 - Rough estimates of area-weighted window U-factor and SHGC are acceptable



General Cont'd

- ▶ No plan review or compliance documentation required
 - Related questions deleted from form
 - Compliance paths used and above code programs in place – can be anecdotal



State-Specific Data Collection Forms

- ▶ PNNL has developed generic 2009 IECC and 2012 IECC forms
- ▶ PNNL has worked with the Project Teams to customize these forms (as necessary) for state-specific requirements
 - Some of the states have requested extensive modification
 - Other states can use the generic form
- ▶ PNNL has “hard-wired” items like
 - State
 - Climate zone (for states with a single climate zone in their sample), and
 - Applicability of warm humid line (for states where sample is all above or below warm humid line)
- ▶ These forms will be available in the online tool as they are finalized



Collect as Much Data as Possible

- ▶ Make sure you achieve the required number of observations of the key items in each selected jurisdiction
 - Don't stop collecting key items that are available for observation just because you have the number you need. The more observations we have, the better the quality of the analyses.
 - Don't stop collecting observable "non-key" items either...the more data, the better
- ▶ See "Using the Tally Sheets" for more information



Air Leakage Testing

▶ Air Leakage Tests

- Make sure you do the required number of air leakage tests in each jurisdiction
- Don't try to do air leakage tests on homes where it does not make sense (like foundations only)
- Use the RESNET test protocol for air leakage



Duct Leakage Testing

- ▶ Make sure you do the required number of duct leakage tests in each jurisdiction
- ▶ Don't try to do duct leakage tests on homes where it does not make sense (like foundations only or homes that don't have ducts)
- ▶ Do run duct leakage tests on homes with ducts entirely in conditioned space, even though the codes do not require testing on those ducts (this is still interesting and useful data)
- ▶ Use the RESNET test protocol for total duct leakage post construction



Data Confidentiality

- ▶ The Project Teams should retain the data collection forms and jurisdictional sampling lists in case questions arise during analysis
- ▶ These forms and lists may contain personally identifiable information such as builder names and house addresses
- ▶ Treat this information confidentially, but do **NOT** send it to DOE or PNNL
 - Be sure people entering project data into the tool know to not include any personally identifiable information in the comments fields
 - Do create a unique identifier for each home as described in the Guidance Document (including encoding of the town/place/jurisdiction name in the identifier if the Project Team wishes)



Using the Tally Sheets

- ▶ There are two key item tally sheets in the data collection form (two of the last three tabs). Only one of these tally sheets needs to be used to keep track of key items. These forms are for Project Team use only. No data entry required.
- ▶ There is also a jurisdiction tally sheet in the data collection form (last tab). This tally sheet replaces the entry of the town/jurisdiction/place in the data Home tab. Again, this form is for Project Team use only. No data entry required.
- ▶ Use a single copy of the tally sheets in the data collection form for each state
 - or have a copy for each field team within the state if there are multiple field teams and synchronize a master list periodically
- ▶ Make sure you have **at least** 63 observations of each key item on the tally sheets at the end of the data collection period
 - The exception is that you do not need 63 observations of each type of foundation. Get what you can.



Data Entry – Accounts

- ▶ Data entry will occur in the RCD tool at <https://energycode.pnl.gov/RCD>
- ▶ Two roles are identified within the tool: manager and user

Managers

- ▶ Identified by the Project Teams as having overall responsibility to manage the project's data
- ▶ PNNL's point of contact for data questions, issues, etc.
- ▶ PNNL has set up an account for each project's data "manager"

Users

- ▶ Approved by the Managers to have access (view/add/delete/modify) to the project's data in the tool



Data Entry – Managers

Next Steps for Managers when notified accounts are set up:

1. Go to <https://energycode.pnl.gov/RCD/requestPassword>
2. Enter your username (email address)
3. Click *Request Password* button

The screenshot shows a web browser window with the URL <https://energycode.pnl.gov/RCD/requestPassword>. The page title is "Residential Compliance Data (RCD)" and the main heading is "Request or Reset Password". Below the heading, there is a paragraph: "Use this form to request a new password or reset the password for your account." followed by another paragraph: "Enter the email address that was used to create your RCD account in the space below and press the 'Request Password' button. The RCD system will generate a new password for you and send it to your email address." The form consists of a text input field labeled "Email:" and two buttons: "Request Password" and "Cancel".



Data Entry – Managers

You will receive an automated email that contains your new password:

1. Go to <https://energycode.pnl.gov/RCD>
2. Log in using your username and password (from your email)
3. Use the Change Password link in top right to change password if you would like

The image displays three overlapping screenshots of the Pacific Northwest National Laboratory's Residential Compliance Data (RCD) web application. The top-left screenshot shows the main RCD page with a 'Login' form and buttons for 'Login', 'Register', and 'Request or'. The 'Login' button is circled in red. The top-right screenshot shows the RCD page with navigation links 'Configure Team', 'Change Password', and 'Logout'. The 'Change Password' link is circled in red. The bottom screenshot shows the 'Change Password' form with fields for 'Password' and 'Confirm Password', and a 'Change Password' button circled in red. The 'SECURITY' section of the form includes instructions: 'Set the account's password. Must be longer than 4 characters.' and 'Confirm the account password by entering it again here.'

Residential Compliance Data (RCD)

1. Click on the 'Add new record' button to add new buildings to the table.
2. Click on a building row to edit data collection form.

| Home ID | State | Cou |
|---------|-------|------|
| is | GA | asdf |
| 1234 | GA | 1234 |

<< < 1 > >> Go to page: 1 Row count:

Residential Compliance Data (RCD)

Change Password

SECURITY

Password Set the account's password. Must be longer than 4 characters.

Confirm Password Confirm the account password by entering it again here.

Change Password Cancel



Data Entry – Users

1. Go to <https://energycode.pnl.gov/RCD>
2. Click on the *Register* button
3. Enter your email address (username)
4. Enter your first and last names
5. Set a password (at least 6 characters, one letter and one digit)

NOTE: Users will not have access to the data until the Manager grants it

The image displays two screenshots of the Pacific Northwest National Laboratory's Residential Compliance Data (RCD) website. The left screenshot shows the 'Residential Compliance Data (RCD) Login' page, which includes fields for 'Username' and 'Password', and buttons for 'Login', 'Register', and 'Request or Reset Password'. The 'Register' button is circled in red. The right screenshot shows the 'Residential Compliance Data (RCD) RCD Registration' page, which includes fields for 'Email Address', 'First Name', 'Last Name', 'Password', and 'Confirm Password', and buttons for 'Create Account' and 'Cancel'.



Data Entry – Managers

Set up access for users

- ▶ Go to <https://energycode.pnl.gov/RCD>
- ▶ Enter username and password and click the *Login* button
- ▶ Click the *Configure Team* link



Residential Compliance Data (RCD) [Configure Team](#) | [Change Password](#) | [Logout](#)

1. Click on the 'Add new record' button to add new buildings to the table.
2. Click on a building row to edit data collection form.

Buildings [+ Add new record](#)

| Name | ID Code | Description | State | County | Town or Place | Climate Zone |
|--------------------|---------|-------------|-------|--------|---------------|--------------|
| No data available! | | | | | | |

Row count: 10



Data Entry – Managers

- ▶ Click the *Add New Record* button
- ▶ Enter each user's email address and applicable state

The screenshot shows a web browser window with the URL <https://energycode.pnl.gov/RCD/subordinate/view>. The page title is "Residential Compliance Data (RCD)" and it includes links for "Configure Buildings" and "Logout". A instruction reads: "1. Click on the 'Add new record' button to add new state assignments to team members." Below this is a table titled "Team (State Assignments)" with columns for First Name, Last Name, Email, and State. A red circle highlights the "+ Add new record" button in the top right of the table. A modal form is open over the table, titled "Add new record" with a close button (x). The form contains an "Email" input field, a "State" dropdown menu (currently set to "AR"), and "Cancel" and "Save" buttons. The table contains 12 rows of data, including users like Jared Chase and Mark Halverson with various email addresses and state assignments. At the bottom, there is a pagination bar showing "Go to page: 1", "Row count: 10", and "Showing 1-10 of 10".

| First Name | Last Name | Email | State |
|------------|-----------|-------------------------|-------|
| Jared | Chase | jared.chase@pnl.gov | TX |
| Jared | Chase | jared.chase@pnnl.gov | MD |
| Jared | Chase | jared.chase@pnnl.gov | AL |
| Jared | Chase | jared.chase@pnnl.gov | GA |
| Jared | Chase | jared.chase@pnnl.gov | AR |
| Jared | Chase | jared.chase@pnnl.gov | TX |
| Jared | Chase | jared.chase@pnnl.gov | PA |
| Mark | Halverson | mark.halverson@pnnl.gov | PA |
| Mark | Halverson | mark.halverson@pnnl.gov | MD |
| Mark | Halverson | mark.halverson@pnnl.gov | AL |



Data Entry – Reset Password

- ▶ Go to <https://energycode.pnl.gov/RCD>
- ▶ Click on the *Request or Reset Password* button
- ▶ System will ask for your username (email address).
- ▶ The system will generate a new password and send it to that email address.

Residential Compliance Data (RCD)
Login

Username

Password

Login Register **Request or Reset Password**

Residential Compliance Data (RCD)
Request or Reset Password

Use this form to request a new password or reset the password for your account.

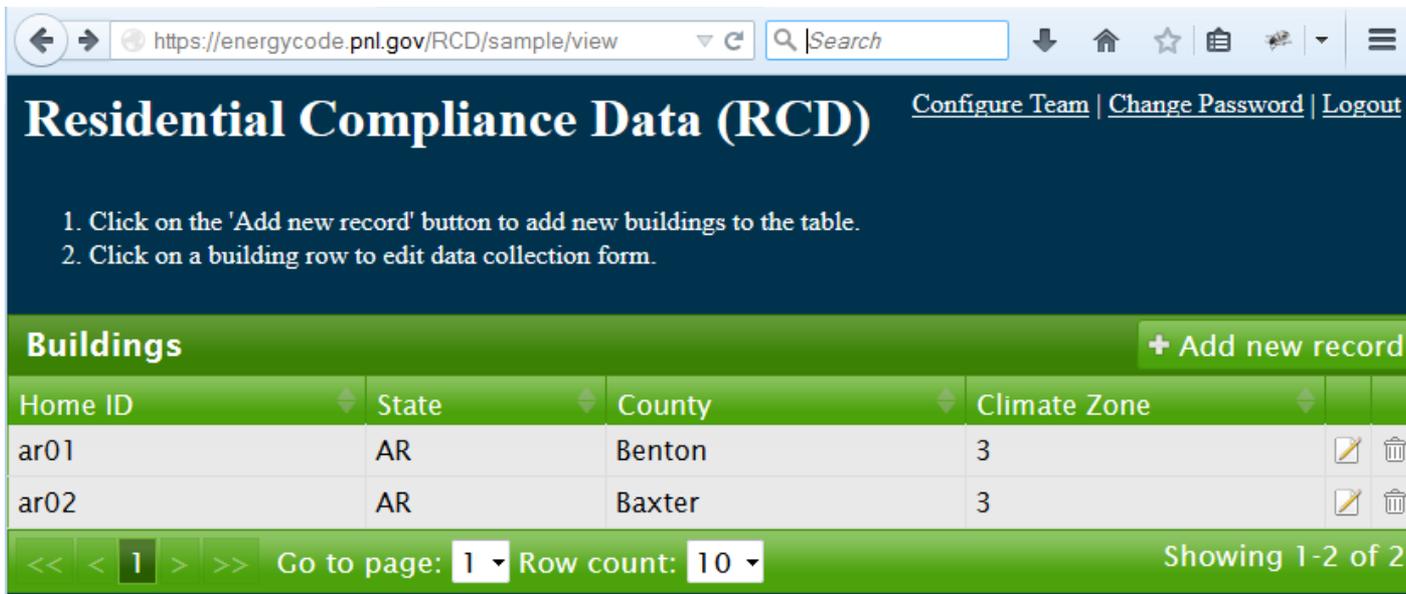
Enter the email address that was used to create your RCD account in the space below and press the 'Request Password' button. The RCD system will generate a new password for you and send it to your email address.

Email:

Request Password Cancel

Data Entry – State-Specific Data Entry Screens

- ▶ A custom set of data entry screens is set up for each state
- ▶ Data entry follows the structure and content of the state-specific data collection forms



The screenshot shows a web browser window with the URL <https://energycode.pnl.gov/RCD/sample/view>. The page title is "Residential Compliance Data (RCD)". Navigation links include "Configure Team", "Change Password", and "Logout".

Instructions for users:

1. Click on the 'Add new record' button to add new buildings to the table.
2. Click on a building row to edit data collection form.

The main content area features a table of buildings and a navigation bar at the bottom.

| Home ID | State | County | Climate Zone | | |
|---------|-------|--------|--------------|---|---|
| ar01 | AR | Benton | 3 |  |  |
| ar02 | AR | Baxter | 3 |  |  |

Navigation bar: << < 1 > >> Go to page: 1 Row count: 10 Showing 1-2 of 2



Data Entry –Screen Shots

- ▶ Add a new Building Record.
- ▶ Edit an existing Building Record.

The screenshot shows a web browser window with the URL <https://energycode.pnl.gov/RCD/sample/view>. The page title is "Residential Compliance Data (RCD)" and includes links for "Configure Team", "Change Password", and "Logout".

Instructions on the page:

1. Click on the 'Add new record' button to add new buildings to the table.
2. Click on a building row to edit data collection form.

The "Buildings" table has the following columns: Home ID, State, County, Climate Zone, and two action columns (edit and delete). The table contains two rows:

| Home ID | State | County | Climate Zone | | |
|---------|-------|--------|--------------|--|--|
| ar01 | AR | Benton | 3 | | |
| ar02 | AR | Baxter | 3 | | |

The "+ Add new record" button is circled in red. Below the table, the pagination shows "Go to page: 1" and "Row count: 10". The modal form "Add new record" is open, showing input fields for Home ID, State (AR), County, and Climate Zone, with "Cancel" and "Save" buttons at the bottom.



Data Entry –Screen Shots

- ▶ Status Icon shows if the item is complete
- ▶ Place values in the *Entry* field
- ▶ Sort by column value

The screenshot shows a web browser window displaying the "Residential Compliance Data (RCD)" application. The URL is <https://energycode.pnl.gov/RCD/compliance/view?id=32&name=ar01>. The page title is "Residential Compliance Data (RCD)" and the sub-header is "ar01". There are links for "Configure Team", "Change Password", and "Logout". A "Go Back To Buildings ..." link is also present.

| Status | ID | Description | Code | Complies? | Comments |
|--------|------|--|------|-----------|----------|
| | LOC1 | State where home is located | NA | | |
| Entry: | | <input type="text" value="AR"/> | | | |
| | LOC2 | Climate zone where home is located | NA | | |
| Entry: | | <input type="text" value="3"/> | | | |
| | LOC3 | Does the home fall in the Warm-Humid Zone (question applicable only to zone 3) | NA | | |
| Entry: | | <input type="text"/> | | | |



Data Entry –Screen Shots

- ▶ HERS or Other Compliance Value
- ▶ Units next to the entry field
- ▶ Paging at the bottom of the table

| | | | | | |
|--|-------|--|---------------------------------|--|--|
| ✓ | CSIQ1 | What is the crawl space wall cavity insulation quality? (I,II,III) - see INFO - Insulation Grading tab | NA | <input type="radio"/> Not applicable <input checked="" type="radio"/> Not observable | |
| Entry: | | | HERS or Other Compliance Value: | | |
| ✓ | FO9 | Unvented crawl space continuous vapor retarder installed over exposed earth, joints overlapped by 6 in. and sealed, extending at least 6 in. up and attached to the wall | 402.2.9 | <input type="radio"/> Complies <input type="radio"/> Does not comply <input checked="" type="radio"/> Not applicable <input type="radio"/> Not observable | |
| ✓ | FO10 | Unvented crawl space wall insulation depth of burial or distance from top of wall. | 402.2.9 | <input checked="" type="radio"/> Not applicable <input type="radio"/> Not observable | |
| Entry (Feet): | | | HERS or Other Compliance Value: | | |
| ◀◀ < 1 2 ... 7 8 9 ... 15 16 > ▶▶ Go to page: 8 Row count: 10 Showing 71-80 of 152 | | | | | |



Data Entry – Data Quality Checking

- ▶ PNNL will perform simple data quality checking once data is in the database, but will not be able to identify all possible errors that involve data being incorrectly entered into the database from the forms
- ▶ Only the Project Team will have copies of the data collection forms from the field. Therefore, only the Project Team can do data quality checking on the data entry.
- ▶ Project Teams should consider use of a simple double entry approach – one person enters the data into RCD and another person checks the data entered against the form



Overview of Data Analysis

- ▶ Calculation of Energy Metric for State
- ▶ Analysis of Data Distributions to Inform Project Team Education, Training, and Outreach
- ▶ Reporting Back to Project Teams



Calculation of Energy Metric

- ▶ The Energy Metric will be calculated and reported at the State level

- ▶ Based on a pre- and post-training evaluation using PNNL's single-family prototype building model:
 - **Step 1:** Collected data will be used to create ranges of observed efficiency levels for the key items
 - **Step 2:** These ranges will be randomly sampled repeatedly to generate complete building configurations through a *bootstrap* process
 - **Step 3:** Each generated building configuration will be simulated using *EnergyPlus* to capture energy use
 - **Step 4:** Energy use estimates for the entire population of building configurations will be used to determine the average energy use for a new home in the state

- ▶ The shift in the mean energy usage, combined with the distributional differences between the pre-and post-training evaluations will be used to draw conclusions about the impact of training programs

Analysis of Data Distributions to Inform Project Team Education, Training, and Outreach



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- ▶ Data collected by the Project Team will be analyzed to determine the distribution of responses. For entries that ask:
 - if a requirement is met or not, the possible responses are “Yes”, “No”, “Not Applicable” and “Not Observable”
 - for a numerical value, the possible responses are a number, “Not Applicable”, and “Not Observable”
 - for a text input, the possible responses are text, “Not Applicable”, and “Not Observable”



Reporting Back to the Project Teams

- ▶ Data will reported back to the Project Teams **as quickly as possible** to facilitate the education, training, and outreach activities
- ▶ The report will include:
 - Distributions of responses to questions on the data collection form, with data in tables, charts, or graphs as appropriate
 - Identification of questions where the responses seem to be indicative of a problem
 - Observations on possible reasons the distribution of responses looks the way it does
 - Energy metric(s) calculated at the state level

Questions?



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