

QUICK START GUIDE FOR *CBECC-COM 2016.3.0 VRF Beta*

Version CBECC-Com 2016.3.0 VRF Beta

May 2018

Overview

CBECC-COM 2016 is an open-source software program developed by the California Energy Commission for use in complying with the 2016 update to the *Non-Residential Building Energy Efficiency Standards*. This Quick Start Guide for *CBECC-COM 2016* was written to accompany versions of the software released starting in June 2016.

This Quick Start Guide provides brief descriptions of the software program's major features. It is a good idea to review the Quick Start Guide before using the program for the first time or if you have questions while using the program. Additional Help features will be added to future versions of the program.

New in Version 2016.3.0 VRF Beta

The capability of explicitly modeling Variable Refrigerant Flow (VRF) systems has been added. These systems are modeled by adding a new object called 'VariableRefrigerantFlowSystem' (VRFSys) at the Building level, which represents the outdoor unit. The indoor fan coils are then defined as ZoneSystems of Type = 'VRF', each assigned to their respective thermal zones. Each fan coil references its respective VRFSys object. The indoor unit ZoneSystem must have a child heating coil and cooling coil of Type = 'VRF', as well as a fan object. It is recommended that the simulation inputs (capacities, efficiencies etc.) for the VRF systems being designed for the project be specified based on the AHRI rating conditions.

Bugs Fixed in Version 2016.3.0 VRF Beta:

Fixed issue where Residential systems supplying ventilation air via DOAS and/or the Primary Air Conditioning System to have extra ventilation air via the system and infiltration added to the zone (as if it had exhaust based ventilation).

Note:

CBECC-Com 2016 VRF Beta is for research/testing purposes only and is not certified by the California Energy Commission. This version cannot be used to show compliance with the 2016 Title 24 Standards.

Please note that minimum efficiency checks for the outdoor units of the VRF system have not been implemented in this release. Those checks will be included in the final release.

The compliance report (PRF-01) for this beta release will be watermarked and will not have updated tables to report all the VRF components.

Example Input Files: A series of example models are installed along with CBECC-Com in the Projects directory. These models are of various building types and HVAC systems. **Note:** *For the beta version of the software all the example models listed below may or may not be included with the installation.*

CEC Standard Tests

1. 010012-SchSml-CECStd
2. 020012-OffSml-CECStd
3. 020012S-OffSml-CECStd
4. 030012-OffMed-CECStd
5. 030012S-OffMed-CECStd
6. 040012-OffLrg-CECStd
7. 050012-RetlMed-CECStd
8. 060012-RstntSml-CECStd
9. 070012-HotSml-CECStd
10. 080012-Whse-CECStd
11. 090012-RetlLrg-CECStd

Other Tests

1. 010112-SchSml-PSZ16
2. 010212-SchSml-PVAVAirZnSys16
3. 010312-SchSml-VAVFluidZnSys16
4. 040112-OffLrg-AbsorptionChiller16
5. 040112-OffLrg-VAVPriSec16
6. 040112-OffLrg-Waterside Economizer16
7. 050112-RetlMed-SZVAV16
8. 050312-RetlMed-Alterations16
9. OffLrg-PlenumsFPBsData16
10. OffLrg-PrkgExhaust16
11. OffLrg-PrkgLab16
12. OffLrg-PrkgLabKitchen16
13. OffLrg-ThermalEnergyStorage_ChillerPriority
14. OffLrg-ThermalEnergyStorage_StoragePriority
15. OffMed-CoreAndShell
16. OffSml-ActiveBeams
17. OffSml-CombDHWSpcht16
18. OffSml-CommKit_SZVAV16
19. OffSml-Data_SZVAV16
20. OffSml-Lab_SZVAV16
21. OffSml-MiniSplit
22. OffSml-Office_SZVAV16
23. OffSml-PassiveBeams
24. OffSml-PassiveBeams-DOASCV+HtRcvry
25. OffSml-PassiveBeams-DOASVAV
26. OffSml-PSZ-Evap16
27. OffSml-WSHP16
28. RetlMed-PVAV-IndirDirEvap16
29. RetlSml-DOAS+FPFC16
30. RetlSml-DOAS+GravityFurnace_HasNoClg=0
31. RetlSml-DOAS+GravityFurnace_HasNoClg=1

VRF Tests

1. 021013-OffSml-VRFsSys
2. 021015-OffSml-VRFsSys
3. 021016-OffSml-VRFsSys
4. 021113-OffSml-VRFsSysHR
5. 021115-OffSml-VRFsSysHR
6. 021116-OffSml-VRFsSysHR

Tip: Input Units

The input screens show the units for numerical inputs. For example, boiler efficiency is input as a fraction like 0.8, not as a % like 80.

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Updates and New Project Website

We plan to issue updates to CBECC-Com often. You can check the new project website (<http://bees.archenergy.com/>) where a link to the latest version will always be posted.

Starting a New Project

When CBECC-Com is first started, a dialog box will appear with the options (No. 2 option may not be available on new CBECC-Com installations):

1. Open Recent Project
2. Select an Existing Project to Open
3. Create a New Simplified Geometry Project

Option 1 and Option 2 are essentially the same, except that the “Open Recent Project” option automatically selects the project that was being worked on the last time CBECC-Com was open. The “Select an Existing Project to Open” option simply requires browsing to the desired project.

If “Select an Existing Project to Open” is selected, the default file type in the browse window is a .cibd16 file. However, this can be changed to .cibd16x or .xml, allowing you to open a SDD XML file. This option should be used when working on a Detailed Geometry project.

Users can take either approach (Detailed or Simplified – see User’s Manual for more information) to modeling their project; however, the preferred workflow is to use the *Detailed Geometry* approach using OpenStudio to create building model geometry using SketchUp with the OpenStudio plug-in. OpenStudio includes an option for exporting an SDD file, which CBECC-Com can then open. The *Simplified Geometry* approach is recommended for simpler buildings since this approach comes with certain limitations that could prevent the project from getting credit for certain efficiency measures included in the design.

For more information on the recommended workflow, please view the tutorials at <http://bees.archenergy.com/faq.html>.

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Analysis Types

Title24ProposedOnly: This will simulate the building input by the user with the 2016 compliance rules.

Title24Compliance: In addition to simulating the Proposed Design, this will simulate the Standard Design building which complies with the 2016 Prescriptive Standards and establishes the energy budget for compliance.

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Analysis Scope Options

The scope of analysis is specified through use of a series of checkboxes. Use of these checkboxes results in specification of Compliance Type, which was input directly in CBECC-Com 2016.2.1 and earlier versions.

New and Existing. One (and only one) of these two boxes must always be selected. In the CBECC-Com UI, checking or unchecking either of these options results in the other option automatically being set the opposite way.

New should be selected when the project involves construction on a site where there is not an existing building or where the sub scope (described below) has not been previously constructed. For example, if a new building has been built with tenant spaces that did not have lighting or mechanical systems, a subsequent analysis addressing the lighting or mechanical systems for those tenant spaces is still *New*, even though the building shell is existing. On the other hand, if that same tenant space is remodeled later, analysis of that project would use *Existing*.

Existing should be selected when the project is an addition to an existing building or when an existing building is being altered, or both.

Addition and Alteration. When *Existing* has been selected, the *Addition* and *Alteration* checkboxes must be used. At least one of these must be selected, and both may be selected. An *Addition* means that new conditioned floor area is being added to the building, and the construction related to that new floor area is treated in the same way as new construction. *Alteration* means that portions of the existing building are being changed in ways that affect the energy performance, but without adding new conditioned floor area. When alterations are analyzed, determining the characteristics of the baseline follows different rules than new construction.

When an *Existing* building is described in CBECC-Com, careful attention must be paid to properly specifying the *Status* of all components to be *New*, *Existing*, *Altered*, or *Future*, in order to achieve a valid analysis.

Envelope, Lighting, Mechanical, DHW. These checkboxes allow analysis of partial compliance options. These options are used when only the specified aspects of the building are included in the building permit and energy performance analysis.

Partial Lighting, Partial Mechanical. These checkboxes allow analysis of core and shell projects, where a portion of the lighting or mechanical systems in the building are included in the building permit and energy performance analysis, but other portions have either already been built or will be built in the future.

Note that if some combinations of *Existing*, *Addition* and *Alteration* are selected, then *Envelope*, *Lighting*, *Mechanical*, *Partial Lighting*, and *Partial Mechanical* may be automatically checked or

unchecked and the user may not be able to change those selections. In this case, the *Status* of individual components in the model will determine how the analysis will proceed.

Envelope. For all models, the building envelope, including opaque surfaces and fenestration must be described in the user's input model, which will provide the basis of the proposed model. When Envelope is not checked, it is assumed that the envelope is existing and the envelope in the baseline model will match the proposed model. If the project includes any new or altered envelope components, then *Envelope* must be checked and the status of envelope components will determine how the baseline model is specified.

Lighting and Partial Lighting. If the project includes any new or altered lighting systems, then *Lighting* or *Partial Lighting* must checked. The status of the lighting in each space will be used to determine the characteristics of the lighting in the baseline.

For a *New* project, if lighting will be designed and permitted are some point in the future, *Lighting* must be left unchecked. The *Status* of lighting in all spaces will default to *Future*. In both the proposed and baseline models, lighting will be specified by the rules and will normally be identical. If the lighting in all spaces has been designed and is being permitted, then *Lighting* should be checked. If the lighting for some spaces is designed and included in the permit, but the lighting for other portions of the building will be designed and permitted in the future, such as for a core and shell project, then *Partial Lighting* should be checked.

For an *Existing* project, if *Lighting* is unchecked, then the *Status* of the lighting in each space may be set to either *Existing* or *Future*. If the *Status* of the lighting in a space is set to *Existing*, that same lighting will be used in the baseline. If the *Status* is set to *Future*, then the rules will determine the lighting for both the proposed and baseline (same as for *New* without lighting).

If the *Status* of the lighting in any space will *New* or *Altered*, then either *Lighting* or *Partial Lighting* (but not both) must be checked. In this case, the baseline lighting will be different from the lighting in the proposed model. If a project is *New* or an *Addition* where the *Status* of the lighting in some spaces is *Future* along with other spaces with the *Status* of the lighting being *New* or *Altered*, then *Partial Lighting* should be checked. If all spaces have the *Status* of lighting set to *New*, *Altered* or *Existing*, then *Lighting* should be checked.

Mechanical and Partial Mechanical. If the project includes any new mechanical system components, then *Mechanical* or *Partial Mechanical* must checked. The status of the systems serving each thermal zone will be used to determine the characteristics of the baseline HVAC systems.

For a *New* project, if the HVAC systems will be designed and permitted are some point in the future, *Mechanical* and *Partial Mechanical* must be left unchecked. The HVAC systems in both the proposed and baseline models, will be specified by the rules and will normally be of the same type, with system capacities determined by sizing runs.

If the HVAC systems for the entire building have been designed and are being permitted, then *Mechanical* should be checked. If the systems serving some thermal zones are designed and included in the permit, but for other portions of the building will be designed and permitted in the future, such as for a core and shell project, then *Partial Mechanical* should be checked.

For an *Existing* project, if *Mechanical* is unchecked, then the *Status* of the systems may be set to *Existing* or at the Thermal Zone, “HVAC is unknown” should be checked. This checkbox is used for either existing systems where the details are unknown or for systems that will be designed in the future. In either case, the rules will determine the system configuration for both the proposed and baseline models with sizing determined by sizing runs.

DHW. *DHW* may be checked or unchecked regardless of other analysis scope options. If it is included, then DHW systems must be specified and all spaces assigned to a residential DHW system or a fluid system of type service hot water. If *DHW* is not checked, the rules will create systems for both the proposed and baseline models.

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Menu Bar

This section explains the program features you access by selecting the options on the menu bar at the top of the screen.

File – The *File* menu contains the standard functions for file management, loading recently used files, saving a newly created file, print a file and exiting the program.

Edit – In addition to the standard Windows™ *Cut*, *Copy*, and *Paste* commands, the *Edit* menu contains several commands for editing building descriptions. They are:

- *Edit Component*
- *Create Component*
- *Delete Component*

These menus allow you to edit all building components, including components that are not displayed on the tree control. Use this method to edit components like schedules and performance curves.

Ruleset – *CBECC-Com 2016* is designed to support multiple rulesets that implement the requirements in different codes. However, different codes can require different information, and therefore, compliance projects and model inputs defined using one ruleset will likely need to be revised to work with other rulesets. This function may or may not be enabled in this version of the software.

View – Enables you to toggle the display of the Tool Bar and the Status Bar on and off.

Tools – The *Tools* menu contains the following options of interest to end-users:

- *Program and Analysis Options* – Allows users to set the various options related to storage of simulation output and analysis files. Also allows users to set the proxy server settings to enable access to the online report generator if the computer is behind a firewall
- *View T-24 Compliance Report* – Allows users to open an approved CBECC-Com2016 compliance report in the local PDF document viewing software; typically Acrobat Reader. If no valid report or results file is found it will prompt the user to perform the compliance analysis before generating and/or viewing the compliance report.
- *View Project Folder* - Allows easy access to users to open the folder where all the project files are stored and/or generated on analysis.
- *View Project Log File* - Allows users to open the project log file in the local text editor software; typically Notepad.
- *Delete Project Log File* - Allows users to delete the project log file generated for the project. Typically the project log file gets appended with information on opening/saving and running the project. So if the user wishes to start with a fresh project log file this option allows the user to delete the old log file.
- *Perform Analysis* – Performs compliance input checks and simulations based on the current building description.
- *Review Analysis Results* – Allows users to review the results of the last simulation analysis that was performed for the project. Please note that if any changes to the project were made after the analysis and the project was not simulated again, the displayed results would not be current.
- *Generate Draft T-24 Compliance Report* – Generates a watermarked compliance report (pdf) for review/printing. This watermarked report cannot be used to submit for compliance.

Help – The *Help* menu contains the following options of interest to end-users:

- *Quick Start Guide* – Opens up the Quick Start Guide for the software in the local PDF document viewing software.
- *User Manual* - Opens up the User's Manual for the software in the local PDF document viewing software.

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Tool Bar

This section explains the program features you access by selecting the icons on the tool bar at the top of the screen.

New File



This button closes the current file (if one is open) and opens a new file.

Open Existing File



This button closes the current file (if one is open) and launches the *Open* dialog to enable you to select an existing file to open.

Save File

This button saves the file under its current name or, if you have not named the file, launches the *Save As* dialog to enable you to provide a new file name.

Cut Selected Item

This button is not currently enabled in *CBECC-Com 2016*.

Copy Selected Item

This button enables you to copy the selected item on the tree control (along with any child components) to the Windows clipboard. The *Copy* button is not available from within program dialogs, but you can use the keyboard equivalent, Ctrl+C, to copy selected text.

Paste Contents of Clipboard

This button enables you to paste components copied from the tree control to the selected location in the tree control (provided that location is compatible with the stored component). The *Paste* button is not available from within program dialogs, but you can use the keyboard equivalent, Ctrl+V, to paste text from the Windows clipboard to the selected input field.

Print

This function is not available in *CBECC-Com 2016*.

Building Creation Wizard

This function is not available in *CBECC-Com 2016*.

Perform Analysis

This button enables you to launch a compliance analysis using the currently loaded building description. The behavior of this button identical to the Tools menu option. You must save the current building description before performing the analysis.

Compliance Reports

This icon opens an approved *CBECC-Com2016 Report* in your local document viewing software; typically Acrobat Reader. The behavior of this button identical to the Tools menu option - "View Compliance Report". You cannot open an approved report unless an analysis has been performed and the model has not been modified since the analysis has been performed. This button may or may not be enabled in this version of the software.

About CBECC-Res 2016

This button enables you to view program license and version information.

Print Preview



This function is not available in CBECC-Com 2016 and will be removed in future versions.

Help



Not yet implemented. For help with the program, please refer to this Quick Start Guide.

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Main Screen

The main screen of the *CBECC-Com 2016* program is used primarily for editing building descriptions. There are two folder tabs at the top of the main screen—Envelope and Mechanical. These tabs provide different views of the building description and provide access to two different subsets of the building description data.

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Right Mouse Button Menu Options

The *CBECC-Com 2016* program makes extensive use of menu accessible by clicking the right mouse button. The functions available through these menus depend on whether you are on the main screen or in an input dialog window.

Main Screen Right Mouse Menu. When clicked over a building component, the following choices are available:

- *Edit* – Opens the input dialog window for the selected component
- *Rename* – Enables you to rename the selected component
- *Delete* – Deletes the selected component
- *Copy* – Copies the selected component with all of its child components
- *Paste* – Adds copied components and their children to the selected component
- *Move Up in list, Move Down in list* – Moves the component up or down in the list of components that share a common parent. The input file is reordered accordingly. HVAC components are reordered and will be simulated with components in the displayed order, except for fans which are ordered based on the Fan Position parameter. For example, an evaporative cooler placed before or after a cooling coil will have different effects in the simulation.
- *View Space Footprint* – Displays in your browser a diagram of the space (available for space components only)
- *Expand/contract* – Expands or contracts the list of children components attached to a selected component
- *Create* – Enables you to create new child components for the selected component

Input Dialog Right Mouse Menu. When clicked over an input value in the window, the following choices are available:

- *Item Help* – Not yet implemented. Accesses Help information applicable to the selected input field.

- *Topic Help* – Not yet implemented. Accesses Help information applicable to the selected component.
- *Restore Default* – Returns the value of the field to its default value (if applicable)
- *Critical Default Comment* –Not yet implemented. Opens a dialog enabling you to enter a justification for overriding values designated by the Code as critical defaults, i.e., a value that should only be overridden with special justification.

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Building Tree Controls (Parent/Child Relationships)

In order to analyze a building's energy use, it is necessary to track relationships among building components. *CBECC-Com 2016* displays these relationships using the familiar tree control, found in Windows™ Explorer and many other applications. For example, under the Envelope tab, exterior walls are shown as parents to windows (windows are connected to exterior walls and appear underneath walls) and children to spaces. The tree controls vary in the components they display and depend on which folder tab is currently selected.

Use the Tree Control for Rapid Editing

The tree control can be used to move and copy components or groups of components. To move a component, just drag and drop. If an association isn't allowed, the program will prevent the move from being carried out. To copy a component, select the component, copy, and paste. It is advisable to rename copied components to maintain readability. Whenever parents are moved, copied, or deleted, all related child components are also moved, copied, or deleted.

Components shown on the tree can be moved using a drag-and-drop technique to other components provided it results in a compatible parent-child relationship. For example, you can drag a window onto a different wall, but not vice versa. Re-ordering of child objects assigned to the same parent is currently not supported.

A set of right mouse menu edit commands can be used with the tree control. These are described in the [Right Mouse Button Menu Options](#) section. Double-clicking on any component on the tree opens its input dialog window.

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Input Dialog Windows

The attributes of each building component can be edited by opening the input dialog window for the component. The dialog can be opened by double-clicking on the component on the tree control, using the *Edit* option on the right mouse menu, or using the *Edit Component* option on the *Edit* menu. (The tree control does not appear until you have created a project description using the wizard or loaded an existing project file [Ctrl+O]).

In keeping with good practice for use of any software, we recommend that you save your building description often and revise the file name once you have substantial effort invested in editing the description under the current file name.

Background Colors

The following background color convention has been used in displaying data on the dialogs:

- White background = available for user input
- Gray background = not user editable

Text Colors

The following text color convention has been used in displaying data on the dialogs:

- Dark blue or cyan text = default values as defined by the current ruleset
- Red text = values that have been changed from their default values

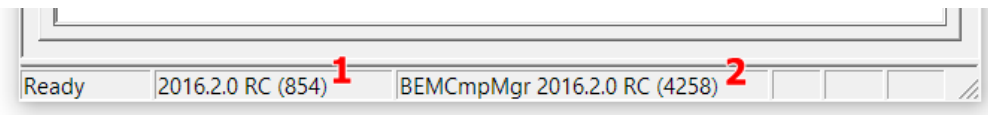
For information on editing features available from the input dialog windows, see the [Right Mouse Button Menu Options](#) section.

To understand what information you are required to enter, see the [Status Bar](#) section.

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Status Bar

The second and third panes of the program status bar now report detailed version IDs of (1) the software and (2) the ruleset that is referenced by the project currently loaded into the program:



Note: The following features of the Status Bar have not been implemented in this version of CBECC-Com.

The status bar at the bottom of the screen provides useful information about each input field you select. There are three panes on the status bar that provide context-sensitive information. This same information is displayed in the ToolTips if you allow your mouse pointer to linger over an input field.

1. Input Description Pane – Concise descriptions of the selected input field are displayed at the far left of the status bar.
2. Input Classification Pane – The next pane to the right on the status bar displays a set of labels that indicates which inputs you are required to provide, which are optional, and which are unavailable for input. The [input classification](#) labels are explained in the table below.
3. Data Source Pane – The pane at the far right of the status bar displays a set of labels that identify the source of the information (if any) contained in the field. This can help you distinguish between information that is dictated by the compliance checking process and the information you have entered and for which you are responsible. The [data source](#) labels are explained below.

Input Classification Explanations

No field selected	No building data field is currently selected.
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Input is compulsory	You are required to enter data in the selected field; the program cannot perform a compliance analysis unless you do.
Input is required	You are required to enter data in the selected field if the field is applicable to your project.
Input is optional	You may enter data in the selected field if the field is applicable to your project, but you are not required to do so. If the field contains a default value, you are permitted to simply use that value without considering its suitability for your project.
Input is critical default	You may overwrite the data in the selected field with an entry more appropriate for your project than the default. However, if you do overwrite this "critical default" value, you must be prepared to provide documentation substantiating the value you have chosen.
Field is not editable	You cannot enter data in the selected field. The data in this field are defined by the compliance rule set or a supporting process. In some cases, the field may also be an intermediate calculated parameter or one that is not applicable to the currently selected compliance rule set.
Navigation input	The purpose of the selected field is to enable you to select a component for editing without having to exit the current component and choose the next component from the tree

Data Source Explanations

No field selected	No building data field is currently selected.
Value from user	The data shown have been defined by the user either directly through a user input or indirectly through wizard selections.
Value from simulation	The data shown have been defined by an energy simulation.
Value undefined	No data have yet been defined for the field.
Value from program	The data in this field have been defined by the program either to implement requirements and procedures specified in the energy code or to conform to building energy modeling conventions.

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Defining New Components

There are two main ways to define new components (e.g., walls or equipment) in the main program interface.

Define a New Physical Component

To define a new physical component, follow these steps from the Main Program Screen:

- Right-click on the component on the tree control to which you want to add the new component.
- Select *Create*, then the type of object you want to add. (Only applicable component types will appear on the list.)
- Accept the default name, parent, and existing component to copy from or edit these fields and click OK.
- Edit the input fields with white backgrounds to describe the new component and click OK.

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Deleting Project Files

If you have created multiple projects under different project names, you may want to delete project files to free up hard disk space on your computer. By default, project files are stored in the C:\Users\\My Documents\CBECC-Com 2016 Projects\ directory, although where the files are stored may differ on your computer depending upon where you installed the program and if you selected a different location for storing files.

In the Projects folder, you will find several files with the same project name you used but with differing file extensions. If you have no further use for information on a project, delete all files using the primary file name. If you would like to retain a project but store it as efficiently as possible, delete all files using the primary file name EXCEPT the one having a .cibd (input building design) file name extension. The other project files are recreated when an analysis is performed, with the exception of the project .log file. The log file lists compliance analysis warnings and errors shown in the UI, as well as other information related to processing/simulating models. Each time analysis is performed; new messages are appended to the end of this file, and should be reviewed when troubleshooting your compliance analysis.

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How to Report a Problem

This software is released for testing purposes and we anticipate the user running into errors and problems. We appreciate your willingness to help us make progress by taking the extra time to document and report issues in a way that will help us fix them quickly.

When you come across an issue, please log an issue at the CBECC-COM website at:

<http://bees.archenergy.com/issue.html>

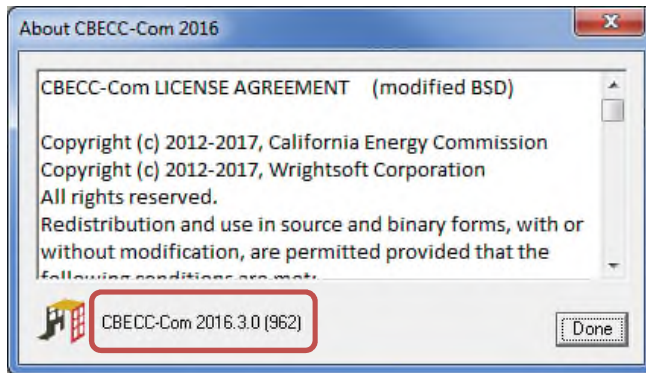
If you experience any issues submitting an issue through the website, please send an email to:

CBECC-COM Support <cbec.com@gmail.com>

And include as much of the following as possible (copy and paste this template into your email):

Type of Issue

CBECC-COM version (Version can be found in the Help-> About menu) and is represented as show below: CBECC-COM 2016



Describe the error, using as much detail as possible.

List the steps taken to produce the error, using as much detail as possible.

1. Step 1
2. Step 2 etc.

If there is an error message, what is the message? If possible, take a screenshot of the error message and attach it to the email as a file.

Please attach your <ProjectName>.cibd16 file. This is the file you open and save from inside CBECC-Com. By default, this file is located in the following directory, **C:\Users\<your username>\My Documents\CBECC-Com 2016 Projects**.

If you include your name and phone number, we may call you to clarify the problem or ask for more details. We will not share your name, phone number or email address with anyone outside the CBECC-Com development team or use it for any purpose other than responding to your report.

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