



**ADVANCED ENERGY MODELING FOR LEED
ONLINE TRAINING COURSE**

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**ENERGY PERFORMANCE COMPLIANCE PATH
DOCUMENTATION - ENERGY TYPE SUMMARY
FOR ENERGY PROFESSIONALS**

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WHAT SHOULD YOU LEARN





Energy Performance
Compliance Path:
documentation Checklist -
Energy Type Summary

ENERGY PERFORMANCE COMPLIANCE PATH: DOCUMENTATION CHECKLIST

Most of the problems in EA Credit 1 applications that follow the simulation compliance path come from the incorrect use of referenced standards, inconsistencies between the energy model inputs and outputs, and lack of validation of energy savings demonstrated. This section includes three checklists to help both applicant and reviewer determine whether the energy modeling accurately demonstrates the project's potential energy savings.

Input quality Control Checklist

The first step in verifying the accuracy of the energy savings is to confirm that the modeling inputs comply with the requirements of the referenced standard. Table 3.1 presents a checklist for reviewing the energy modeling inputs and identifies the common errors found in LEED applications. Projects following ASHRAE 90.1-2016+ can use the table as a guide to perform quality assurance for completeness and accuracy. The inputs are found in the LEED Online credit form and energy modeling summary reports.

The most common errors are for projects using ASHRAE 90.1-2016+, Appendix G. For projects using California Title 24, the baseline input is automatically generated by the simulation software and is therefore not separately included in this section.



OUTPUT QUALITY CONTROL CHECKLIST

The next step is to determine whether the outputs comply with the referenced standard's requirements and LEED requirements, such as unmet load hours, process energy use, and exceptional calculations. Table 3.2 presents a checklist to help teams and reviewers confirm that the requirements have been met and the output values reported in the LEED credit form are consistent with the simulation output reports. The checklist applies to projects using ASHRAE 90.1-2016+ and California Title 24-2005, Part 6.

Output-Input Consistency Checklist

The last step for verifying the accuracy of the energy savings is to check for consistency between outputs and inputs. Table 3.3 is a checklist for reviewing the consistency of energy modeling outputs and inputs and provides calculation methods and rules of thumb to predict rough order-of-magnitude results. It can assist with quality assurance on projects using ASHRAE 90.1-2016+ and California Title 24.



Table 3.2. Input Quality Control Checklist			
Energy type summary			
TOPIC	CHECK	ERRORS	RESOURCES
Energy rates	Check that actual rates of purchased energy or state average energy prices are reported.	Both actual rates and state average energy prices are used.	ASHRAE 90.1-2016+, G2.4
Unmet load hours	Verify that unmet load hours of both baseline and proposed buildings meet requirements. (Projects using Title 24 and EnergyPro need not report unmet load hours in EA Prerequisite 2 form.)	<p>Proposed and/or baseline cases have more than maximum 100 hours of unmet load.</p> <p>Unmet load hours of proposed case exceed unmet load hours of baseline case by more than 50 hours.</p> <p>Worst-case zone instead of entire building is used to comply with these requirements.</p> <p>Typical causes for high unmet load hours:</p> <ul style="list-style-type: none">Zones are inappropriately modeled, resulting in lack of separation between perimeter and core zones or between perimeter zones facing different directions.Internal heat construction properties are modeled incorrectly for adjacent spaces with varying temperature regimes or temperature setback schedules.High thermal mass and moderating capacity.Spaces with high loads are not modeled with correct system modeling capacity.Supply air temperature limits are modeled incorrectly.Shading controls are modeled inappropriately.Climate air conditions are not set to zero when fans cycle on at night.Multiple thermal zones are modeled under single-zone system.Summer air zone load is modeled incorrectly.Chilled and flow rates from central plant equipment are modeled incorrectly.Central plant loops are off during calls for heating and/or cooling.Electric resistance heating is not modeled for heat pump units when outdoor temperature drops below 60°F.	ASHRAE 90.1-2016+, G3.1.2.2

Table 3.2. Input Quality Control Checklist			
Energy type summary			
TOPIC	CHECK	ERRORS	RESOURCES
Renewable energy	☐ Verify that renewable energy reported in Section 1.8 of EA Prerequisite 2 form is consistent with EA Credit 2.	☐ Renewable energy reported is inconsistent with EA Credit 2. ☐ Renewable energy does not include backup calculations or narrative describing calculation methodology.	NA
	☑ Verify that amount of renewable energy generated is reasonable, cross-checking information provided by EA Credit 2.	☐ Renewable energy generated is inconsistent with power input. ☐ Calculations to verify renewable energy generation are omitted	☑ National Renewable Energy Laboratory (NREL), PV Watts Calculator

Table 3.2. Input Quality Control Checklist			
Energy type summary			
TOPIC	CHECK	ERRORS	RESOURCES
Exceptional calculation method	☐ Verify validity of exceptional calculation methodology (general).	☐ Defensible baseline is not established. ☐ Narrative describing baseline and proposed case assumptions for energy efficiency measure is not provided. ☐ Calculations and theoretical or empirical information supporting accuracy of methodology are omitted. ☐ Methodology for exceptional calculations for measures, such as refrigeration, heat recovery, and process load savings, is incorrect.	ASHRAE 90.1-2016+, G2.5
	☑ Verify validity of exceptional calculation methodology for manufacturing facilities	☐ The baseline case description does not verify that manufacturing equipment is standard practice for similar newly constructed facility.	
	☐ Verify validity of exceptional calculation methodology for demand controlled ventilation and garage ventilation.	☐ The baseline case description does not provide evidence that garage demand control ventilation is not standard practice for similar newly constructed facilities where project is located. ☐ Information regarding ventilation rates, fan power, operating schedules of proposed, and baseline case garage fans is not provided. ☐ Baseline fan volume exceeds minimum ventilation rates of 0.75 cfm/sf for parking garage as required by ASHRAE 62.1-2016+.	ASHRAE 62.1-2016+, Table 6-4

Table 3.2. Input Quality Control Checklist			
Energy type summary			
TOPIC	CHECK	ERRORS	RESOURCES
Simulation output	☐ Verify consistency between energy consumption and cost simulation outputs and values reported in EA Prerequisite 2 form.	☐ Energy use and/or cost values reported in Tables G2-2-4 and G2-2-5 of EA Prerequisite 2 form are inconsistent with simulation output. ☐ Consumption and cost values for electricity or natural gas vary by more than 10%, and narrative providing demand and utility tariff is not provided.	NA
	☑ Verify that process energy costs are not less than 25% of baseline total energy cost.	☐ Process energy cost represents less than 25% of baseline total energy cost, and supporting documentation substantiating low process energy inputs is missing. ☐ Process energy is arbitrarily set to 25% of total baseline cost.	LEED v2009 EA Credit 1 requirements
	If building load output reports are provided, verify envelope loads to confirm reasonable heat gains and losses from walls, windows, skylights, slabs, floors, and roofs. If one element seems to have unreasonably high heat gains or losses, check total exterior surface area and construction assembly to confirm accuracy.	☐ Envelope elements are not correctly modeled.	NA
	If California Title 24-2005 is referenced, check UTLI-1 report to verify that EnergyPro was run in compliance mode.	☐ EnergyPro is not run in compliance mode, and narrative with sufficient supporting documentation to verify that baseline case system type and parameters match Table 24 requirements is omitted.	


