GUIDELINE

ASHRAE Guideline 14-2014
(Supersedes ASHRAE Guideline 14-2002)

Measurement of Energy, Demand, and Water Savings

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Includes online access to RP-1050 and RP-1093 final reports, as well as downloadable software toolkits for analysis of building energy and environmental data.

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This Guideline was developed under the auspices of ASHRAE. ASHRAE Guidelines are developed under a review process, identifying a Guideline for the design, testing, application, or evaluation of a specific product, concept, or practice. As a Guideline it is not definitive but encompasses areas where there may be a variety of approaches, none of which must be precisely correct. ASHRAE Guidelines are written to assist professionals in the area of concern and expertise of ASHRAE's Technical Committees and Task Groups.

ASHRAE Guidelines are prepared by Project Committees appointed specifically for the purpose of writing Guidelines. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Guideline.

Development of ASHRAE Guidelines follows procedures similar to those for ASHRAE Standards except that (a) committee balance is desired but not required, (b) an effort is made to achieve consensus but consensus is not required, (c) Guidelines are not appealable, and (d) Guidelines are not submitted to ANSI for approval.

The Senior Manager of Standards of ASHRAE should be contacted for

a. interpretation of the contents of this Guideline,
b. participation in the next review of the Guideline,
c. offering constructive criticism for improving the Guideline, or
d. permission to reprint portions of the Guideline.

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ASHRAE Guideline 14-2014, Measurement of Energy, Demand, and Water Savings

NOTE

Approved addenda, errata, or interpretations for this guideline can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.

FOREWORD

Guideline 14 was developed by ASHRAE to fill a need for a standardized set of energy, demand, and water savings calculation procedures. The intent is to provide guidance on minimum acceptable levels of performance for determining energy and demand savings, using measurements, in commercial transactions. It is entirely possible to have a sale/purchase, lease, or other arrangement for energy-efficient equipment that does not involve measurements. Indeed, the vast majority of transactions are of this type. However, if the savings determination is to be based on measurements, certain minimum requirements are necessary to avoid a process that appears to be based on actual savings but might be highly inaccurate, biased, or random.

The anticipated use of ASHRAE Guideline 14 is for transactions between energy service companies (ESCOs) and their customers, and between ESCOs and utilities, where the utilities have elected to purchase energy savings. Guideline 14 is expected to provide savings results sufficiently well specified and reasonably accurate that the parties to the transaction can have adequate assurance for the payment basis. Other applications of Guideline 14 may include documenting energy savings for various credit programs (e.g., emission reduction credits associated with energy efficiency activities).

Determining savings with measurements in accordance with this guideline involves measuring postretrofit energy use and comparing that to the measured preretrofit use, adjusted or normalized, to act as a proxy for the conditions that would have prevailed had the retrofit not been performed. Therefore, determining energy savings through the use of measurements involves more than just verifying that new equipment has been installed and can function as expected, although those tasks are usually a necessary part of determining savings. In addition, energy savings cannot be claimed to be measured if no preretrofit data are available.

Sampling is often used in projects involving end-use monitoring or what is referred to here as the "retrofit isolation approach." Informative Annex B shows procedures to calculate the added uncertainty due to sampling. Guideline 14 may be used to measure the energy savings from a utility-sponsored or contracted multiple-building energy conservation project. Applying Guideline 14 to such a project would allow the use of Annex B to calculate the measurement uncertainty directly. The net impacts of large-scale utility energy conservation programs, such as those that may involve market transformation or standard offers for purchase of conservation energy, are specifically excluded from the scope of Guideline 14, although individual and multiple-building projects within such programs are covered.

Guideline 14 primarily addresses measurements of energy and demand for determining savings. Other tasks are needed in any energy performance contract. These can include determining appropriate utility rates, inspecting and commissioning equipment, etc. Users of Guideline 14 who are interested in learning more about some of the contractual issues and types of performance contracts will find relevant discussion in the Efficiency Valuation Organization's publication International Performance Measurement and Verification Protocol (IPMVP) *available for download at www.evo-world.org.*

Online Supporting Files

This guideline provides online access to supporting files. These files can be downloaded from the ASHRAE website at ***www.ashrae.org/G14_2014****.*

Included among these files are the full text of ASHRAE Research Reports RP-1050 and RP-1093, as well as software toolkits developed by ASHRAE to assist with the analysis of building energy and environmental data as described in Guideline 14.

1. PURPOSE

The purpose of this document is to provide guidelines for reliably measuring the energy, demand, and water savings achieved in conservation projects.

2. SCOPE

This document provides procedures for using measured preretrofit and postretrofit billing data (e.g., kWh, kW, Mcf, kgal) for the calculation of energy, demand, and water savings.

2.1 What Is Included. The procedures

a. include the determination of energy, demand, and water savings from individual facilities or meters;
b. apply to all forms of energy, including electricity, gas, oil, district heating/cooling, renewables, and water and wastewater; and
c. encompass all types of facilities: residential, commercial, institutional, and industrial.

2.2 What Is not Included. The procedures do not include

a. sampling methodologies used in large-scale demand-side management programs,
b. metering standards, or
c. major industrial process loads.

3. DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

3.1 General. The following definitions represent the way each term is used in ASHRAE Guideline 14.

3.2 Definitions

actual energy savings: reductions in energy, demand, or water achieved by energy conservation measures (ECMs) and determined using one of the methods described in this document.

accuracy: the capability of an instrument to indicate the true value of measured quantity. This is often confused with inaccuracy, which is the departure from the true value to which all causes of error (e.g., hysteresis, nonlinearity, drift, temperature effect, and other sources) contribute.