**BSR/ASHRAE Addendum a**
**to ANSI/ASHRAE Standard 90.4-2019**

**Public Review Draft**

# Proposed Addendum a to Standard 90.4-2019, *Energy Standard for Data Centers*

**First Public Review (March 2020)**
**(Draft Shows Proposed Changes to Current Standard)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research--technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

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**(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)**

## Foreword

Data centers are always rejecting heat. It very common for a data center to be rejecting heat from the data halls to the atmosphere while heating the loading dock and the office with gas or electric resistance heat. This addendum will encourage recovery of waste heat from data centers for use in space heating and industrial applications and would result in net energy savings on a societal level. This addendum will also encourage siting of data centers in proximity to heat consuming commercial and industrial processes (e.g. food production facilities) in order to take advantage of heat transfer, minimize waste, and reduce overall energy use.

This addendum also improves and clarifies some of the ambiguous and obsolete language in 6.5. For example, 6.5 currently says "In the case of cooling provided by a source other than electricity, the energy consumption shall be converted to kilowatt-hours," but does not say how to perform this conversion. This addendum clarifies how to perform the conversion. Currently 6.5 also says to include chiller and AHU fan energy serving a UPS room, but does not say to include cooling tower or pump energy serving the UPS room, which was clearly the intent. This addendum clarifies that the energy of all mechanical equipment serving UPS rooms is also included.

The other substantive change from the current 6.5 is removal of the language which states, in part:: ". . . . if the data center utilizes mechanical cooling, the calculated rack inlet temperature and dew point must be within Thermal Guidelines for Data Processing Environments recommended thermal envelope for more than 8460 of the hours per year." Many data centers operate outside the ASHRAE Thermal Guidelines for more than 300 hours per year and do not have the capacity to stay within them for 8460 hours. This addendum allows designers to model their data centers as they are truly intended to operate.

***[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and strikethrough (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]***

## Addendum a to 90.4-2019

*Replace existing Section 6.5 with the following. Note that Table 6.5, Maximum Annualized Mechanical Load Component (not shown below) remains unchanged.*

**6.5 Maximum *Annualized Mechanical Load Component (Annualized MLC)***. *Annualized MLC* shall be calculated using Equation 6.5. The resulting value shall be less than or equal to the value in Table 6.5, "Maximum *Annualized Mechanical Load Component (Annualized MLC)*".

Equation 6.5:

$$\text{Annualized MLC} = \frac{\sum_{N=25,50,75,100}(MechE_N - HeatRec_N)}{\sum_{N=25,50,75,100} DataCenterITE_N}$$

where

$MechE_N$ (kWh) = total annual *energy* consumed by all mechanical *equipment* (e.g. fans, pumps, motors, drives, compressors, humidifiers, dehumidifiers, water filtration or treatment equipment) at a constant *ITE* load of *N%* of the design *ITE* load. This includes mechanical *equipment* serving *data center* electrical *equipment* (e.g. *UPS systems* and *transformers*). *Energy* use of shared *systems* that serve both *data center spaces* and non-*data center spaces* must be prorated on an hourly capacity-weighted basis. For example, if 62% of the load on a chiller plant in a given hour comes from *data center spaces*, with the remaining 38% from non-*data center spaces*, then only 62% of the total chiller plant *energy* for that hour can be included in the MechE.

Mechanical *equipment energy* for *equipment* dedicated to *data center spaces* shall be calculated with Typical Meteorological Year Version 3 (TMY3) data with 8760 hourly bins or that is binned by drybulb and wetbulb (or dewpoint) with a resolution $\leq 2^{o}F$ ($1^{o}C$).

$HeatRec_N$ (kWh) = The net increase in *data center* mechanical *equipment energy* caused by transferring waste heat from the *data center*, when the *data center* is operating at a constant *ITE* load of *N%* of the design *ITE* load, to a non-*data center* mechanical *system* (e.g. *space* heating or industrial process *energy*). The net offset is quantified by simulating the *data center* with and without *data center* heat transfer.

***Informative Note:*** The purpose of the HeatRec term is to ensure that, by encouraging the transfer of otherwise wasted heat to a useful purpose, the design is not penalized in the *MLC* calculation by any net *energy* increases incurred by adding heat transfer *equipment* (e.g. transfer fans) or operating *data center* cooling *equipment* at lower *efficiency* in order to facilitate heat recovery (e.g. operating a heat recovery chiller at high lift).

Annual *energy* for shared *systems* and for heat recovery must be calculated using an 8760 hour TMY3 file and accurate heating/cooling load profiles.

Data $CenterITE_N$ (kWh) = total annual *energy* consumed by the *ITE* at a constant *ITE* load of *N%* of the design *ITE* load. For example, $DataCenterITE_{50}$ for a design ITE load of 1,000 *kW* = 1,000 *kW* * 8760 hrs * 0.5 = 4,380,000 kWh. *ITE energy* does not include *UPS energy*, but does include server fan *energy*.

Calculations/simulations must be made using the *control* sequences and setpoints in the Compliance Documentation. For example, if a *data center* includes redundant air handlers but all air handlers will operate at partial speed when the *ITE* load is 100% then calculations shall be made accordingly, and the *design conditions* so noted on the design documents.

Mechanical *equipment energy* not provided by electricity shall be converted to kWh using either actual utility rates for that site or state average *energy* prices published by USDOE's Energy Information Administration (EIA) for commercial *building* customers, but rates from different sources may not be mixed in the same project.

***Informative Note***: An annual *energy* credit may be taken for on-site renewable generation included in the *data center* design.