INTERPRETATION IC 90.4-2016-1 OF
ANSI/ASHRAE STANDARD 90.4-2016
Energy Standard for Data Centers

Approved: 1/8/2020

Request from: Colin Laisure-Pool, MPSW, Inc., 18310 N. Clemmer Lane, Phoenix, AZ 85022.

Reference: This request for interpretation refers to the requirements presented in ANSI/ASHRAE Standard 90.4-2016, Informative Appendix C, Figure C-1, regarding demarcation of scope covered by ASHRAE Standard 90.4-2016.

Background: Generators are shown on this graph as not being covered by ASHRAE Standard 90.4-2016. However, some data centers may utilize DRUPS systems (Diesel-Rotary UPS), which is a combination of the backup generator and UPS system.

Interpretation: In this case, the DRUPS system may be considered as two separate systems, as far as this standard is concerned. The operational efficiency of the normally-operating UPS/rotary system should be considered as part of the UPS system loses when calculation the ELC, and not the operation when the diesel generator is running. IT would be helpful if future informative references would clarify this demarcation.

Question: Is this interpretation correct?

Answer: Yes.

Comments: The interpretation is correct. It is intended that Standard 90.4 be applied only to Normal Operation, which is when the vast majority of energy is consumed. Therefore, the DRUPS should be treated like any other system which is meant to maintain continuous, clean power to the ITE. Losses should be calculated without the diesel engine running, in the same manner as for any other UPS; namely, the difference between Input and Output Power when operating at the appropriate load points based on redundancy as set forth in the Standard. (Refer to Figures 1 and 2 for examples of a typical DRUPS system topology in a data center application.)

The Committee believes that the Standard already addresses this in three ways:

> **The Definition of *Uninterruptable Power Supply (UPS)*** can also be interpreted to cover DRUPS. It presently reads, in part: *". . . and (b) "rotary," in which incoming AC power drives a propulsion unit that turns a generating device, with a heavy flywheel storing kinetic energy that continues to turn the generating portion when incoming power fails or anomalies occur. Either type can be made up of one or more modules. . .."*
>
> ***Paragraph 8.3.1.8 Alternate Designs,*** presently reads: *"In the event that a UPS is not used in the design, the incoming and distribution segments shall meet at the point(s) where a UPS*

would logically be inserted. Where another device, such as a rectifier, voltage regulator, or harmonic neutralizing transfer, is used in place of the UPS, the efficiency and loss for that device shall be used in the efficiency calculation in the same manner as that defined for a UPS."

Paragraph 8.3.1.4 Incoming Electrical Service Segment – Exception presently reads: *"Emergency or stand-by power systems are not considered a part of the incoming electrical service, with the exception of individual elements such as associated transfer switches, transformers, or other devices that are also included between the Design ELC demarcation and the UPS."*

The Committee constructed Standard 90.4 in this way because Emergency situations are expected to be relatively short-term, with continued, reliable operation often trumping efficiency under these circumstances. In fact, the Forward (although it is not part of the enforceable Standard), states in the last sentence of the first paragraph the very important premise that drove much of the development of the Standard: "*It is critically important to note that data centers are mission-critical facilities where risk management is the primary concern."*

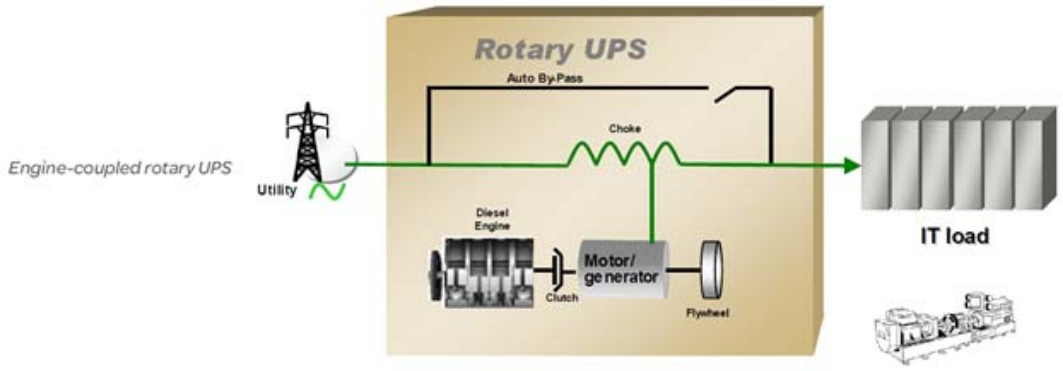

Figure 1 – Typical Diesel Rotary Uninterruptible Power Supply (DRUPS) – Block Diagram

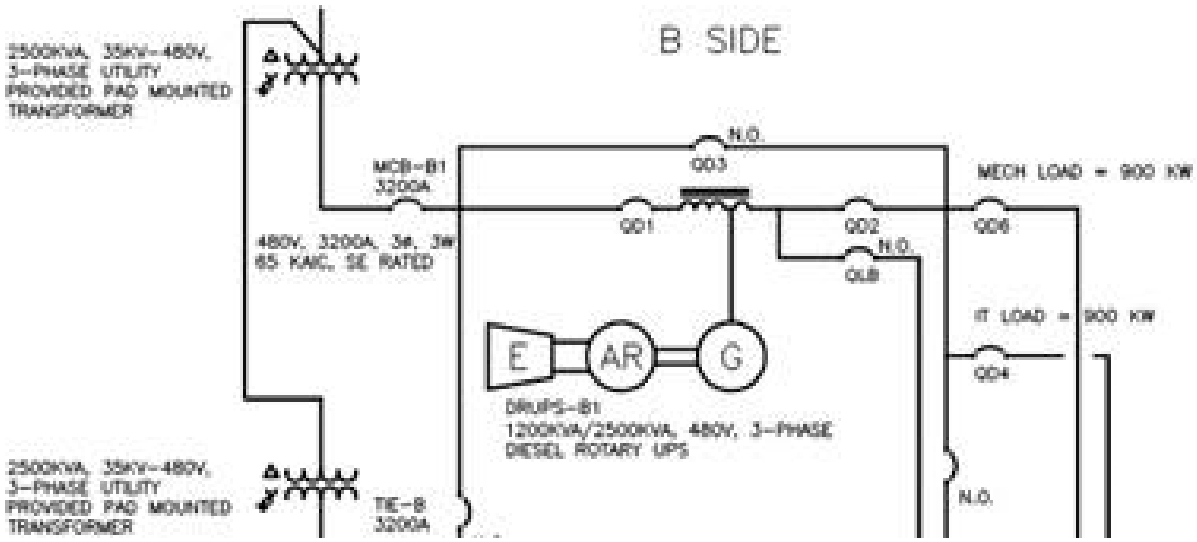

Figure 2 – Typical Diesel Rotary Uninterruptible Power Supply (DRUPS) Topology – One-Line Diagram Depiction