POWER QUALITY INTERNATIONAL

e-News

Q2, 2015

US DOE 2016 Efficiency Requirements

For those who may not be aware, on April 18th, 2013, the United States Department of Energy (U.S. DOE) released the official Federal Register version of its Final Rule regarding Distribution Transformer minimum energy efficiency standards, formally referred to as, *'10 CFR Part 431 Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule'*. To quote the notice, 'The effective date of this rule is June 17, 2013. Compliance with the amended standards established for distribution transformers in this final rule is required as of January 1, 2016'.

What exactly does this mean to the transformer industry? In summary, it means that the current NEMA TP 1 - 2002 standard for transformer efficiency will remain in effect until December 31, 2015. On January 1, 2016, higher minimum levels for transformer efficiencies will go into effect, requiring that all transformer manufacturers meet or exceed new minimum levels. Although the new U.S. DOE 2016 levels are higher than the previous NEMA TP 1 levels, they still don't quite meet some minimum efficiency levels previously proposed by the U.S. DOE in 2004, specifically DOE CSL 3, CSL 4 and CSL 5.

PQI Already Exceeds US DOE 2016 Requirements

Despite the fact that minimum efficiency levels that meet or exceed the new DOE 2016 legislation won't be mandated until January 1, 2016, PQI has been designing and manufacturing ultra-efficient transformers that exceed the new minimum levels for nearly a decade, specifically DOE CSL 3 efficient transformers. As part of our continuous efforts to stay ahead of our competitors and the transformer industry in general, PQI is proud to announce that even higher efficiencies beyond DOE CSL 3 levels are now also available.

As of January 1, 2015, PQI's Type EY distribution transformers and Types DV, DY, SY and DD harmonic mitigating transformers, with an ***e-Rated***® option, were available with a Z3 (DOE CSL 3), Z3+ (slightly higher than DOE CSL 3) or Z4 (DOE CSL 4) efficiency. All PQI transformers with a Z3, Z3+ or Z4 option exceed the DOE 2016 efficiency requirement. These levels are unprecedented in the industry.

Table 1, entitled the 'Required vs. PQI e-Rated® Energy Efficiencies', provides a comparison between NEMA TP 1, NEMA Premium, DOE 2016 vs. PQI Z3, PQI Z3+ and PQI Z4 efficiency levels.

Required vs. PQI Energy Efficiencies [1]

kVA Rating	NEMA TP 1 2002 [2] CSA C802.2	NEMA Premium [2]	DOE 2016 [3]	PQI Z3 exceeds CSL 3 [4]	PQI Z3+	PQI Z4 exceeds CSL 4 [4]
15	97.00	97.90	97.89	97.97	98.25	98.43
30	97.50	98.25	98.23	98.29	98.52	98.68
45	97.70	98.39	98.40	98.45	98.66	98.81
75	98.00	98.60	98.60	98.64	98.82	98.95
112.5	98.20	98.74	98.74	98.77	98.93	99.05
150	98.30	98.81	98.83	98.86	99.01	99.12
225	98.50	98.95	98.94	98.97	99.10	99.20
300	98.60	99.02	99.02	99.04	99.16	99.26
500	98.70	99.09	99.14	99.16	99.26	99.35
750	98.80	99.16	99.23	99.24	99.33	99.41
1000	98.90	99.23	99.28	99.29	99.38	99.45

Table 1

Notes: [1] Efficiency values are measured at 35% of nameplate rating.

[2] The efficiency of transformers manufactured after January 1, 2007, but before January 1, 2016 must meet the efficiency requirements of NEMA TP 1-2002 (US) or CSA C802.2-12 (Canada).

[3] The efficiency of transformers manufactured after January 1, 2016 must meet the US DOE 2016 efficiency requirements.

[4] PQI Z3 & Z4 efficiencies exceed the requirements of DOE Candidate Standard Levels 3 & 4 (CSL 3 & CSL 4) respectively.

In order to reduce Excitation (No Load) Losses, the PQI Z3, PQI Z3+ and PQI Z4 energy efficiencies, detailed in *Table 1,* were achieved by selecting higher grade, grain oriented magnetic core steels and by improving core architectures. Impedance (Load) Losses were reduced by improving winding architectures.

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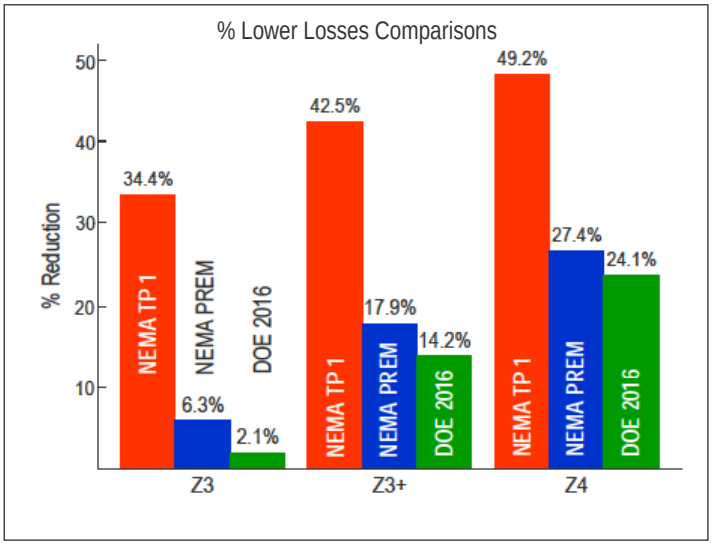

Transformers with Z3, Z3+ & Z4 Efficiencies
vs.
NEMA TP 1, NEMA Premium™ & US DOE 2016 Efficiencies
Figure 1

The Reduction in Total Losses (No Load + Load Losses), required to achieve the results given in *Table 1,* are detailed in *Figure 1.*

The Measurement of Total Losses & Efficiencies under Linear & Nonlinear Loading

Please contact PQI for application recommendations and costs for the various efficiencies offered.