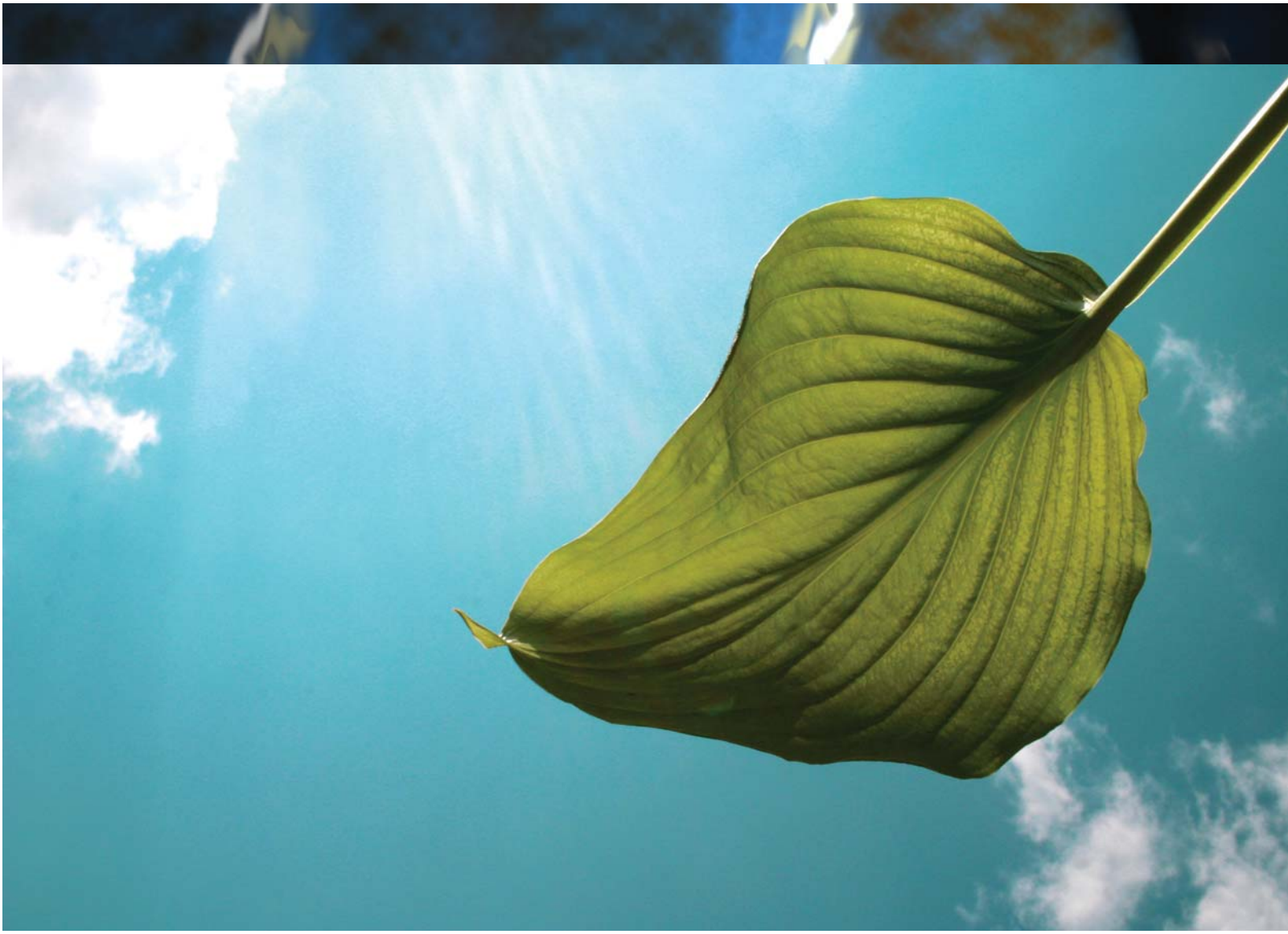
# Metglas®



lighting the world. keeping it cool.

pioneers in amorphous metal technology

*Metglas pioneered the development and commercialization of amorphous metal, a unique alloy that exhibits a structure in which the metal atoms occur in a random pattern. The organized grain structure in conventional silicon steel, although optimized, has higher resistance to magnetization and demagnetization than amorphous metal.*

*The key to Metglas, Inc.'s proprietary rapid-solidification manufacturing process is cooling the molten alloy at a rate of approximately one million degrees Celsius per second.*

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# the path of electricity

From the generating station, electric power is transmitted at high voltages along power lines. Various stages of power and distribution transformers are then needed to "step down" the voltage to usable levels, e.g. 120-480 volts, for residential and industrial users. It is estimated that 2% of all electricity generated is lost due to distribution transformer inefficiency.

Inherent in the operation of distribution transformers are two types of energy loss: load losses that vary depending on transformer loading, and no-load losses that occur in the magnetic cores and take place over the life of the transformer regardless of load. No-load losses represent a significant portion of the energy lost during power distribution.

*generation*

*transmission*

*typical single phase-core type*

*typical three phase-5 leg or Evans*

*residential distribution*

*commercial distribution*

# our core focus is efficiency

Photo courtesy of Santee Cooper and photographer Jim Huff

*More than ever, electric utilities are searching for technologies that will reduce their operating costs and improve energy savings throughout their systems. Amorphous metal distribution transformers (AMDT's) are a globally accepted method utilized to improve utility economics and enhance energy conservation efforts.*

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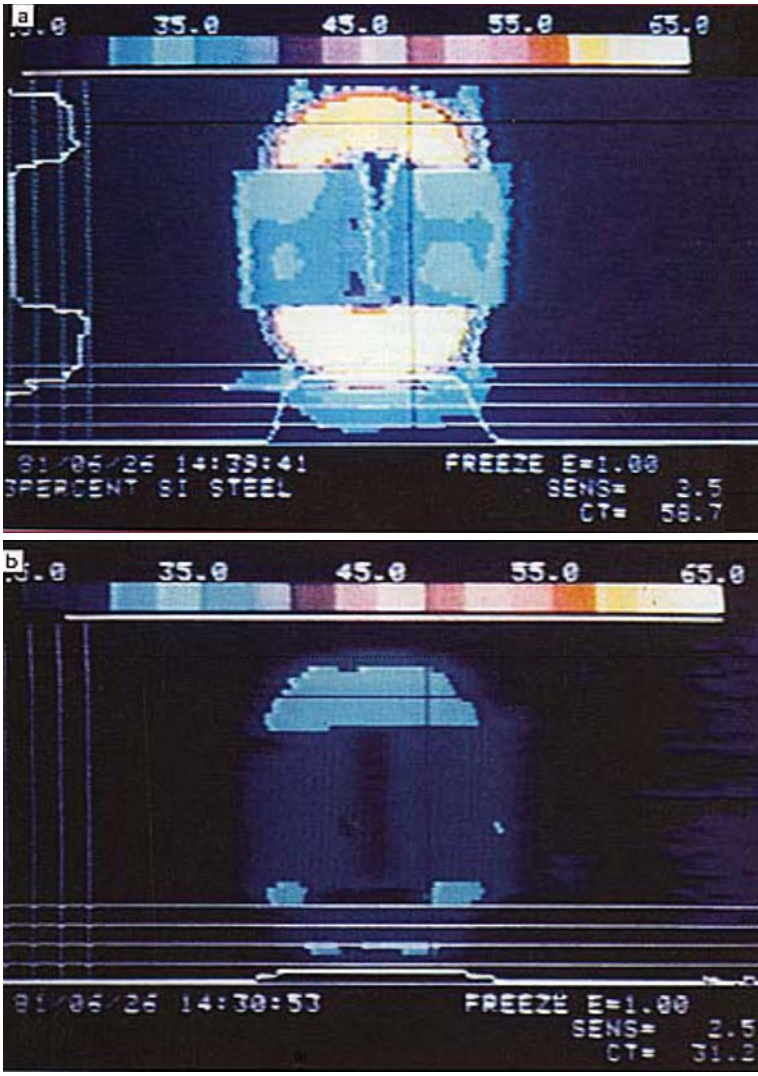
## running cool for lower energy costs

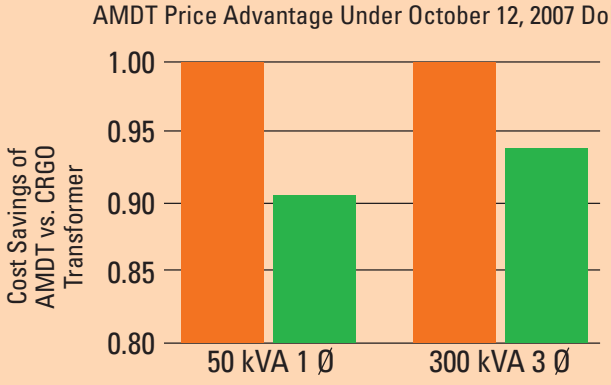
Today, hundreds of utilities are benefiting from the use of AMDT's in their power distribution systems. Many more utilities can benefit from a strategic program of replacing conventional distribution transformers with AMDT's. This could result in annual savings of approximately 27 terawatt-hours (TWh) of core losses in the U. S. A. alone. These savings enable utilities to cost-effectively accommodate long-term growth in demand for power.


*Infrared pictures of operating transformers using M4 (top) and Metglas (bottom) as core materials under no-load conditions. The 70% lower no-load losses of the Metglas core cause the core to run much cooler.*

## setting the standard for low cost solutions

AMDT's often provide the lowest price method for distribution under the new United States Department of Energy efficiency regulation.

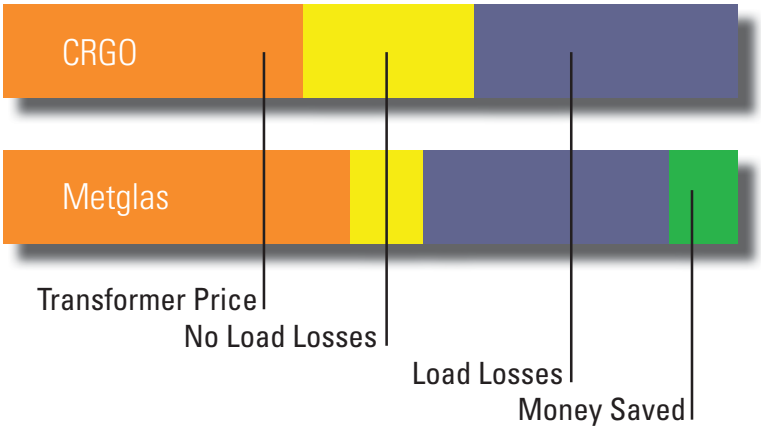



*Department of Energy assumes 50% transformer load factor. At lower load factors, AMDT's are also more efficient.*

**Department of Energy**
10 CRF Part 431
Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards: Final Rule

CRGO Cost from DOE Core Steel Analysis 2005 - App 3A

# examining TOC




*When using a Minimum Efficiency Performance Standard, CRGO and Metglas transformers are designed to the same efficiency at a given loading. Alternately, in most Total Ownership Cost optimizations, AMDT's will be designed to a higher efficiency than CRGO and can have a higher first cost. However, the much lower losses of the AMDT result in significant energy and monetary savings over the lifetime of the transformer. In cases where loss evaluation factors (A-Factors) are sufficiently high, AMDT first cost can still be below CRGO.*

*TOC = Initial Purchase Price+Cost of Future Energy Losses*

One method of illustrating how AMDT's provide economic savings is by evaluating on a Total Owning Cost (TOC) basis. TOC encompasses both the initial cost of the transformer, plus the future cost of energy losses over the life of the equipment. The essence of transformer loss evaluation is to recognize that there is a cost of losses associated with the distribution transformer purchase decision that is just as important as the initial price. A user who saves money on the initial purchase price of the transformer may in fact be losing money by not properly considering the value of energy losses over the transformer's active life.


Photos this page courtesy of Santee Cooper and photographer Jim Huff

*Metglas' process and controls ensure the highest quality of any amorphous metal supplier in the world.*

## projecting energy savings with Metglas

*In the year 2004, it was estimated that total savings for the regions listed would amount to 81 TWh of core loss reduction per year, or the equivalent of US $6.1 billion dollars annually. The reduction in the production of $CO_2$, a major contributor to global warming, would be 51 million tons yearly.*

| Region/Country | Electricity Consumption 2004 (TWh)[1] | Distribution Transformer Core Losses 2004 (TWh)[2] | Potential Annual Savings with AMDT's Year 2004 (TWh)[3] | Potential Annual Savings with AMDT's (millions, US$)[4] | Annual $CO_2$ Reduction in Millions of Tons[5] |
|---|---|---|---|---|---|
| USA | 3974 | 33.8 | 27.0 | 2027 | 16.6 |
| EU25 | 2982 | 25.3 | 20.3 | 1521 | 10.5 |
| China | 2080 | 17.7 | 14.1 | 1061 | 12.3 |
| Japan | 974 | 8.3 | 6.6 | 497 | 3.5 |
| Russia | 882 | 7.5 | 6.0 | 450 | 4.2 |
| India | 631 | 5.4 | 4.3 | 322 | 3.8 |
| Brazil | 381 | 3.2 | 2.6 | 194 | 0.2 |

[1]Energy Information Agency-International Energy Outlook 2004 [2]SEEDT Report EIE-05-056 and Metglas estimates [3]Based on Metglas experience [4]$0.075/kwhr Energy costs [5]Based on percentage and efficiency of thermal generation

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