Impact of Fixed Efficiency Standards on the Cost of Distribution Transformers

DRAFT: August 11, 2006

The attached spreadsheets have been developed to evaluate the efficiency of transformers that the District has been purchasing, relative to the proposed DOE standards. Presently the District exceeds the DOE efficiency standard only for one category of transformer, 10KVA – 167kVA, single phase, round can. These are "pole-type" transformers. The DOE efficiency requirement for this category of transformers is lower than for any other. In all other categories, 1-phase pads, 3-phase pads, and 3-phase vaults and network transformers the District falls short of the DOE proposal. Of note, the District adopted a much higher loss evaluation formula for transformers bid after 2005. So far this has only affected a few very large transformers: vault-type, network and 2500 kVA 3-phase pad-mounts. Even though these transformers are some of the most efficient in the nation, they still fall somewhat short of the DOE proposed efficiency requirement.

The District's present evaluation methodology is designed to optimize value to our customers, considering equally the assembled material costs and the cost of all anticipated losses, as forecast in the year of purchase. This is the "lowest total owning cost" methodology. It would be quite difficult to evaluate the impact of the DOE proposal on the cost to our customers without considerable input from the transformer manufacturers. The evaluation will depend on the vagaries of commodity markets that have been extremely volatile of late (e.g., core steel, copper, aluminum and oil) reflecting limited supply and increased demand for materials across the world market. It is also dependent on the accuracy of energy forecasts, which have been dynamic in recent years.

The attached report from SAP reflects the District's purchases of transformers within one DOE category and size, a 1000kVA, 3-phase vault-type transformers over the period of several years. During the past three years two significant events have occurred:

1. Beginning 2005 Distribution Standards adopted much higher cost of losses for the evaluation of transformers (more than double those in previous years). This reflects recent energy forecasts. As a result, the efficiency of these transformers has increased, and so has the price.

2. The cost of materials for transformer construction has skyrocketed due to worldwide changes in demand and supply.

In combination, these two factors have resulted in an alarming increase in the cost of transformers. In May 2003, this vault-type design was purchased for $18,495. Our next purchase was March 2005 and the price was $26,252. As of June 2006 the price has escalated to $31,143.

In just three years the cost of this transformer has risen by $12,648 or 46%. Some other transformers prices have increased by even greater amounts. The District is presently spending about $7 million annually for our most common pole-type and pad-mount transformers. If this

same pricing trend applies, we would anticipate the District's annual expenses for distribution pad-mount and pole-type transformers to exceed $10.5 million on the forthcoming bid. This would result in an annual increase from present expenditures of more than $3.5 million, beginning in 2007.

It is not appropriate to attribute the entire price increase to improved equipment efficiency. I have requested our Transformer Alliance partner, Cooper Power Systems, to forecast the change in transformer costs for our most ordered transformers, using present material costs. Cooper has evaluated two single-phase pads and two pole-type transformers. They have performed the analysis for our present design as well as a design that approaches the efficiencies proposed by the DOE.

To perform this analysis, Cooper has used their transformer design software that provides the optimum low cost design within specified parameters. The attached spreadsheet summarizes the analysis. It is interesting to see how a minor improvement in the efficiency of an already efficient transformer can radically affect the cost. Furthermore, to reduce the impact of no-load losses, the load losses have been increased in some cases. A larger transformer results in longer windings and greater losses.

The Cooper data suggests that the DOE proposal would affect the first cost of our transformers by approximately 15%-20%, or $1.1 –$1.4 million annually. If there is no change to our cost of losses, then the increases in material costs alone will result in a 30% -35% increase in transformer costs, or $2.1-$2.5 million annually. The total, cost increase of 50% should be expected in our next transformer contract. This is quite close to what the District has experienced when buying 1000kVA 3-phase vault-type transformers.

In addition, the Cooper analysis suggests the total owning cost of our transformers, initial price plus the lifelong cost of losses, will increase if the District is required to adopts the proposed DOE standard. In other words, the increased cost of the improved design to meet the DOE requirements is greater than the value of the resulting savings in transformer losses. As one example the total owning cost of a 75kVA single-phase pad-mount transformer would increase by 37%, or about $1200 per unit.

Respectfully submitted by:

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Attachments:

Efficiency of District Transformers Relative to DOE Proposal
Design and Cost Analysis by Cooper Power Systems