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March 23, 2006

Solid-State Meters at Three Utilities

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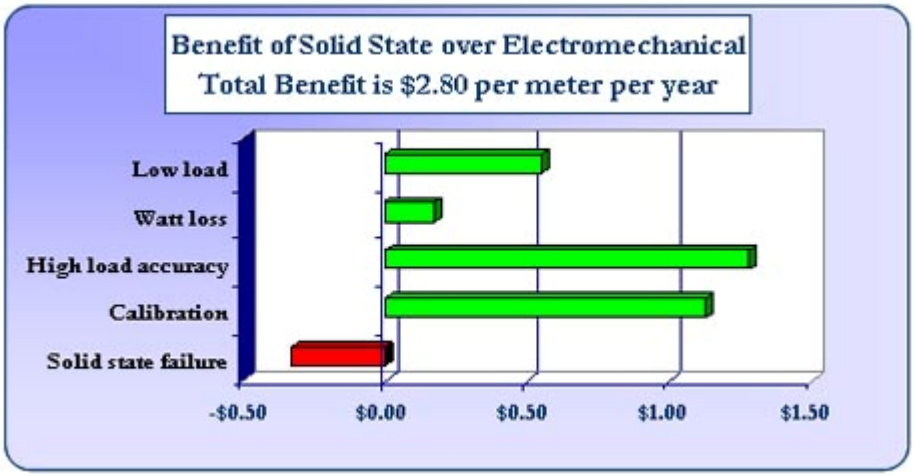
After some early stumbles and miscalculations, the five leaders in the residential electric meter industry (Elster, General Electric, Itron, Landis + Gyr, and Sensus) now offer utilities electronic residential meters that provide value over and above that of traditional electromechanical meters. The newer solid-state meters provide more accurate measurement of residential energy use and are designed to work with AMR and advanced metering networks. Tony Pini, Senior Vice President of Customer Service of National Grid sums it up by saying "Solid-state meters are the gift that keeps on giving." UtiliPoint interviewed three utilities (Entergy, National Grid, and Northeast Utilities) that evaluated the use of solid-state meter using a total life cycle cost analysis, and all three opted to purchase only solid-state meters from that point on.

Key elements in doing a total life cycle cost analysis for replacing electromechanical meters with solid-state the important factors are:

- Frequency and cost of calibration of electromechanical meters
- Accuracy of measurement at full loads
- Accuracy of measurement at low loads (< 24 watts)
- Energy use of meter itself
- Energy theft
- Compatibility with AMR
- Failure rate of solid-state meters, and manufacturer policy for dealing with failed meters
- Tax depreciation rules

Using these key elements, Dave Mundorff, Staff Customer Service Analyst for Entergy Arkansas, estimated that every seven years, the benefits of a solid-state meter pays for the equivalent of an electromechanical meter in benefits. He estimates the useful life of a solid-state meter to be 15 years.

Chart 1
Contribution of Key Elements to Business Case for Solid-state Metering



Solid-state meters measure energy use very reliably at low and full loads. Their accuracy at full load levels has been measured at 99.9 percent with a standard deviation of 0.21. In comparison, the standard deviation for electromechanical at full load is 0.92. In addition, Mundorff found that 1 out of every 4 electromechanical meters is significantly slow. Dave Scott, Manager—Meter Engineering & Systems of Northeast Utilities, found that across the board, Northeast Utilities gained .3 percent in measured kWh with the installation of new solid-state meters.

Calibration requirements are also different between electromechanical and solid-state meters. Electromechanical meters require a two point calibration: at full load and at light load, and should be recalibrated every five to eight years according to Mundorff. In contrast, solid-state meters only require a one-time one-point calibration. This leads to significant savings for the utilities since it costs $9 to ship, test, and repair the electromechanical meters.

Looking at *Chart 1 Contribution of Key Elements to Business Case for Solid-state Metering* above, the ability of the solid-state meters to measure load at very low levels compensates for the cost of the expected failure rate of solid-state meters. Residential customer loads are estimated to be less than 24 watts approximately five percent of the time. The solid-state meters are able to measure loads as low as five watts while electromechanical meters typically do not register energy usage unless it is over 24 watts. Thus, solid-state meters measure light loads that electromechanical meters can't see, and more accurately measure loads that both types of meters register. Mundorff also noted that it is very easy to tamper with electromechanical meters, and the techniques are fairly well known among those who might wish to tamper with the meter. The solid-state meters are harder to tamper with, and the old techniques fail to work on solid-state meters.

The three utilities were quite frank that solid-state meters do fail occasionally while electromechanical meters rarely fail completely. But even so, all three utilities were adamant that solid-state meters were preferable. Scott noted that he spends less time on

maintenance and more time tracking, although the meter manufacturers do most of the tracking. Scott makes it a point to buy from most of the major meter manufacturers, while Pini decided to buy all of their meters from one manufacturer, Itron. “We lost several nights sleep worrying about catastrophic failures, but it was worth the risk” according to Pini. The benefits of working with one manufacturer accrue from needing a smaller inventory of meters, carrying fewer meters in the trucks, and considerably less testing. The number of meters required to be tested each year is directly related to the number of meter types in use. With only one residential 2S meter, for example, their testing requirement is significantly reduced.

Both National Grid and Northeast Utilities rolled out a mobile RF AMR system with the new solid-state meters, but according to Mundorff of Entergy, the improved interface between the AMR system and the solid-state meter was an important consideration for Entergy as well even though Entergy has not rolled out AMR across its territories. Scott of Northeast Utilities noted that with the solid-state meter, the kWh measured by the meter and reported to the AMR system was one and the same, whereas with the electromechanical meters, it could be different. Scott reports a higher confidence in their meter readings with the solid-state meters.

Many utilities, however, have decided to refurbish the electromechanical meters during a system wide rollout of AMR partly because of the depreciation rules. The issues of reliability and useful life have largely diminished in importance. Once you put the communication module into a meter, the expected life of that combination (meter plus AMR module) drops to the shortest expected life of the two components. The three utilities suggested that an appropriate depreciation time today is 10 to 15 years due to the pace of technological innovation. A new generation of meters and AMR is emerging every three years, and the pace is not expected to slow down for the foreseeable future.

However, the depreciation rules still treat metering as having a useful life of 25 to 30 years. For a time, utilities were able to take advantage of faster depreciation provided by special legislation to encourage investment after 9/11, but that has now lapsed. Scott noted that in their last rate case, the depreciation rules accepted by the commission reduced the useful life from 30 to 25 years, which was a start, but more is needed. Keeping the depreciation rules based on the useful life of meters of the last decade may provide the wrong signal to utilities considering how to go forward. UtiliPoint recommends that the depreciation rules for metering reflect the shorter expected useful life of the new metering products (10 to 15 years).

Overall, the three utilities were very pleased with the solid-state meter purchases from the five leading meter manufacturers. Mundorff suggested that if utilities are basing their decisions on trials several years past, then it's time to take another look. Based on UtiliPoint's research in the fall of 2004, (see *Chart 2 NA Utilities Plans for Solid-state Meters for Residential below*), many utilities are planning to use solid-state meters for residential premises. The continuing trend toward using AMR or AMI, and the increasing use of solid-state meters should result in significantly increased solid-state metering sales for meter manufacturers while lowering costs to provide better customer service.

Chart 2
NA Utilities Plans for Solid-state Meters for Residential