

# Power for the future

POWERSMITHS



**Nevada Department of Motor Vehicle**



**Nevada State Library**



**Florence McClure Women's Correctional Center**

## Transformer Baseline Measurement Report

## State of Nevada

Prepared for:  
Powersmiths Representative



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**Powersmiths International Corp.**

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Powersmiths Ref: OP-14-09-4393

## M&V Methodology

ECM Technology Category	Parameter Type	Parameter	Project Phase	
			Baseline	Post-Installation
Transformer Retrofits	Performance	Transformer Loading, Losses & Efficiency	One-time measurement of representative transformer loading, losses & efficiencies	One-time measurement of representative transformer loading, losses & efficiencies
	Operational	Annual operating hours & times	Based on interview data	Same as baseline

### Approach for Establishing Baseline

The steps listed below were used to establish the baseline conditions:

1. Select the baseline transformer inventory based upon discussions with facility personnel.
2. Conduct on-site audit of transformer nameplate and installation information
3. Meter loading, losses and efficiency.
4. Use measured load profile to compare losses and efficiency with proposed Powersmiths E-Saver-2016 transformers.
5. Compare savings with Powersmiths vs. baseline

## Transformer Measurements & Findings

During November 2010, September and October, 2014 baseline measurements were taken on four (4) existing transformer at three locations throughout State of Nevada. The loading, losses, and efficiency of the measured existing transformers are compared with the replacement Powersmiths transformers in the following tables and charts. The losses and efficiency of the Powersmiths transformers are calculated based on the measured load of the existing transformers using Certified ISO17025 Efficiency Test Lab data.



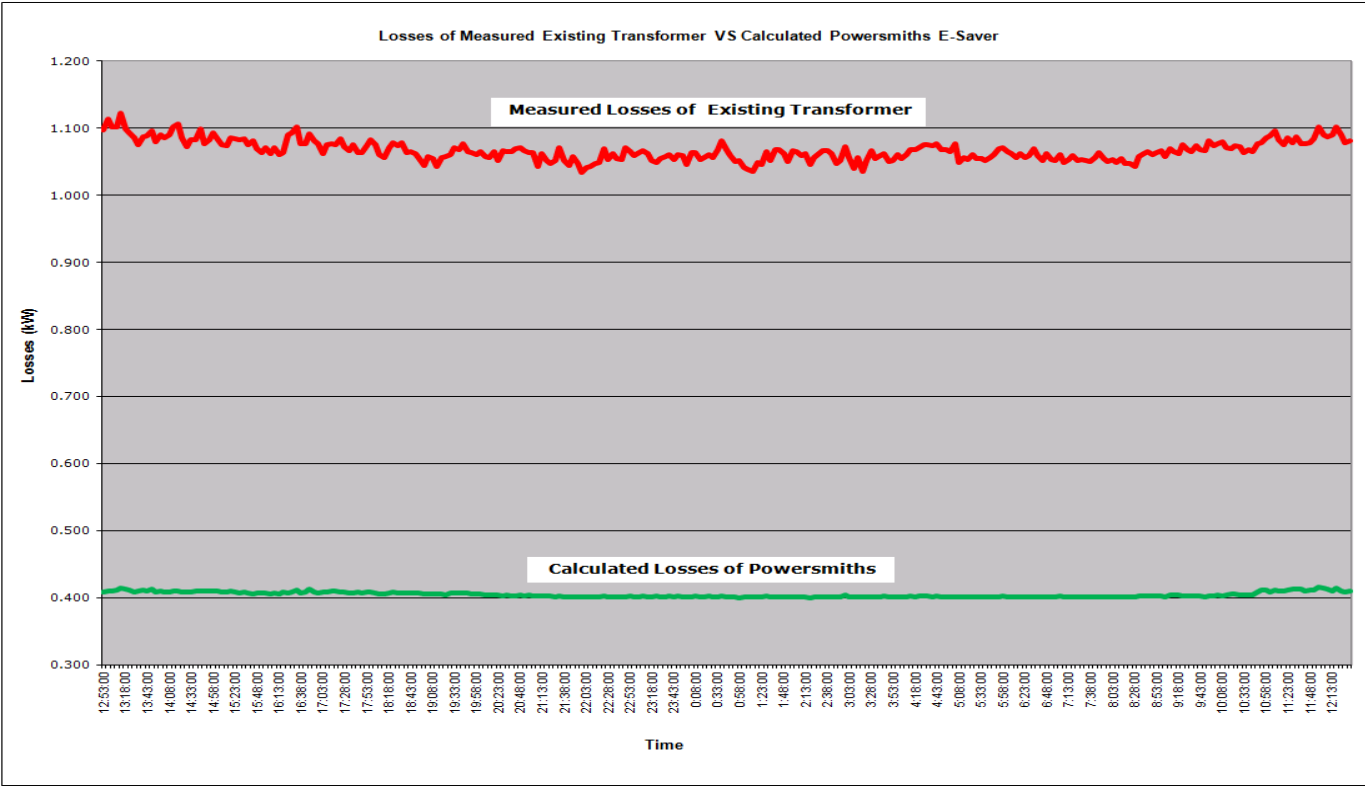
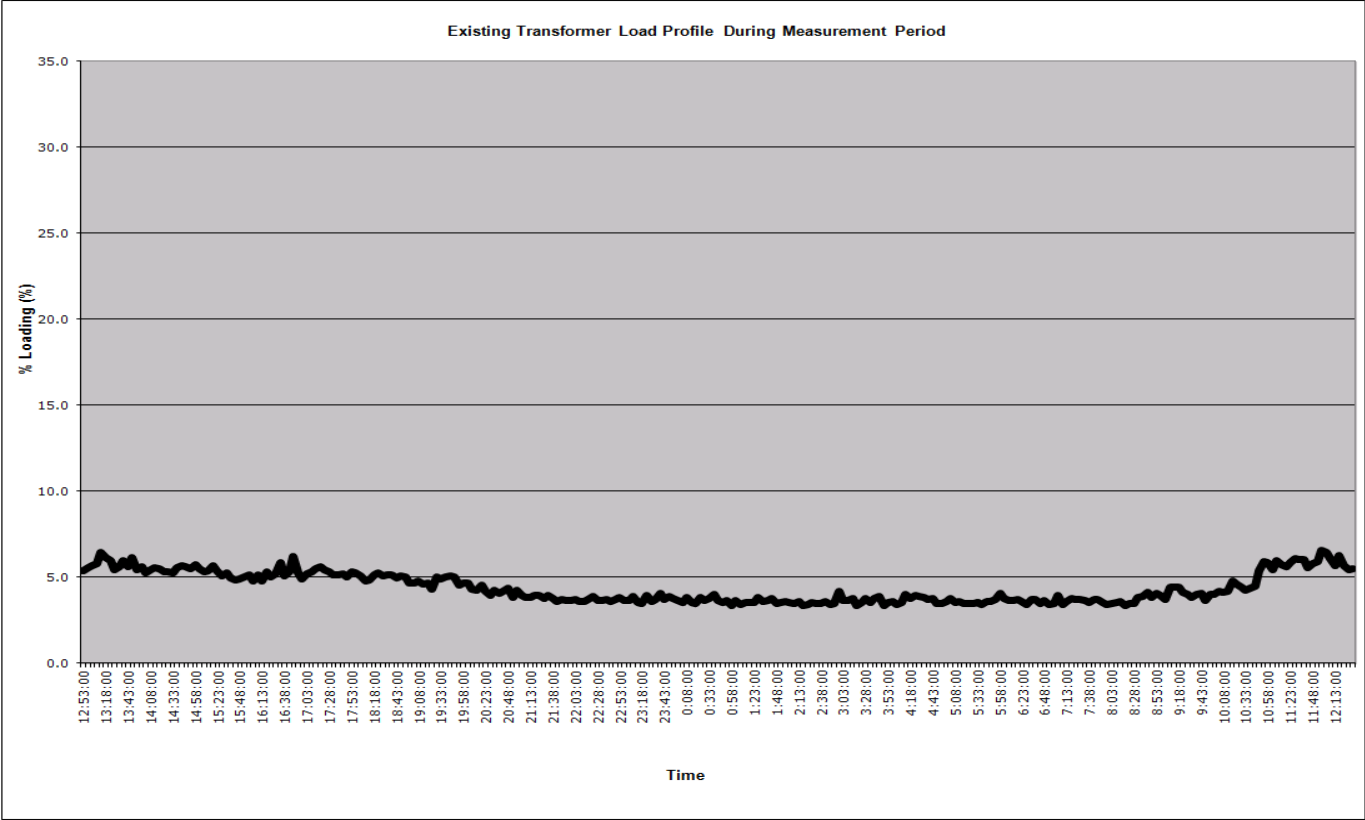
Figure 1: Sylvania\_303-415-3

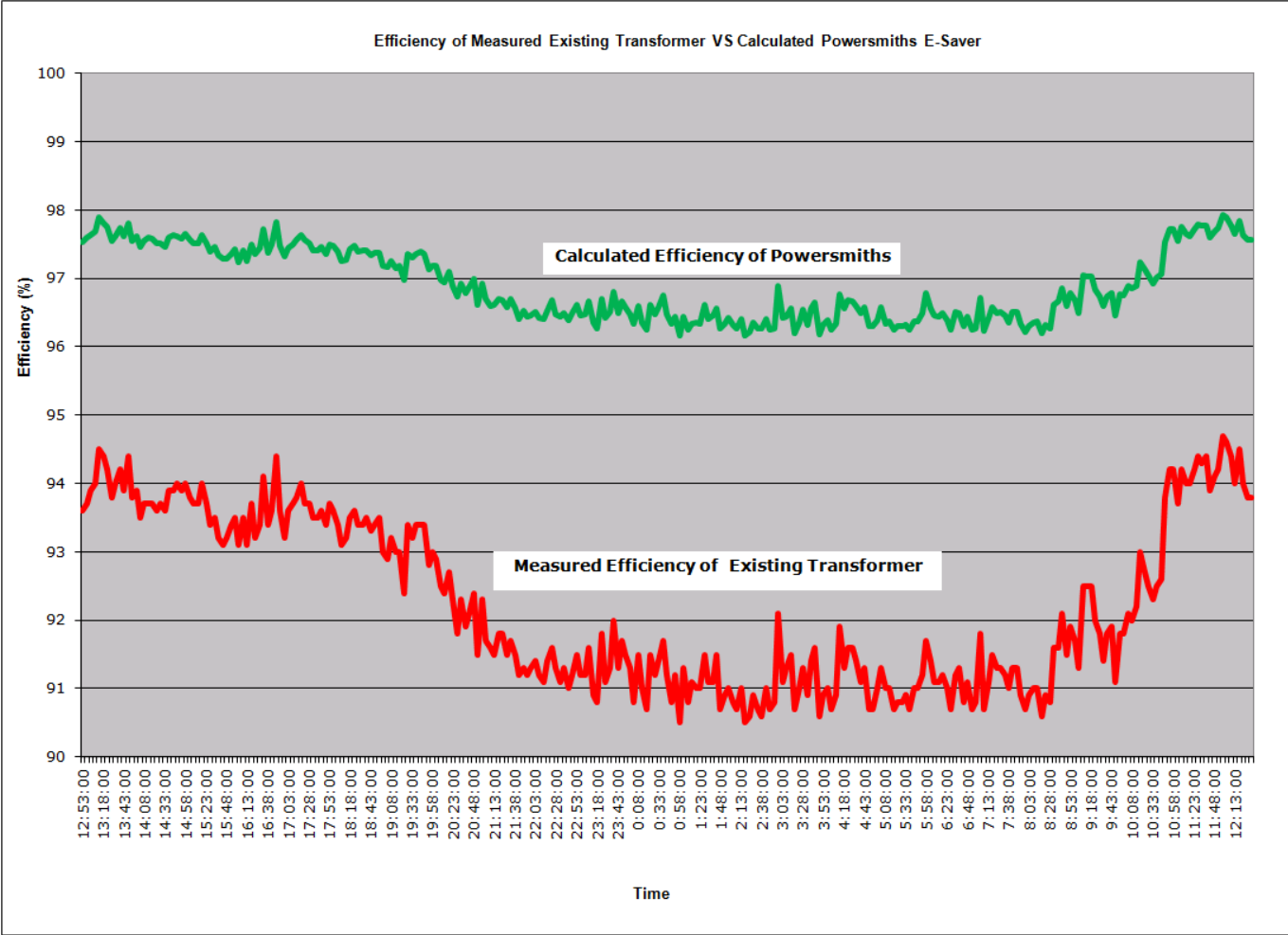


Figure 2: Sylvania\_Nameplate

<b>Building</b>	<b>Nevada Department of Motor Vehicle</b>	
<b>Location</b>	<b>East Wing Penthouse</b>	
<b>Measurement Period (HH:MM)</b>	<b>23 hrs 45 min</b>	<b>Calculated</b>
<b>Sampling Interval</b>	<b>5 min</b>	
<b>Manufacturer</b>	<b>Sylvania</b>	<b>Powersmiths</b>
<b>Model</b>	<b>303-415-3</b>	<b>2016</b>
<b>Nominal kVA</b>	<b>300</b>	<b>300</b>
<b>% Loading - Average</b>	<b>5.63</b>	<b>5.63</b>
<b>% Efficiency - Average</b>	<b>93.90</b>	<b>97.62</b>
<b>Losses (kW) - Average</b>	<b>1.093</b>	<b>0.410</b>
<b>Reduction in Average Losses</b>		<b>62.5%</b>

<b>Ambient Temperature (°C)</b>	<b>16.6</b>
<b>Representative Output Voltage THD (%)</b>	<b>2.0%</b>
<b>Representative Output Current THD (%)</b>	<b>25.0%</b>
<b>Note: Calculations Based on Powersmiths 2016 Transformer with Copper Coils</b>	





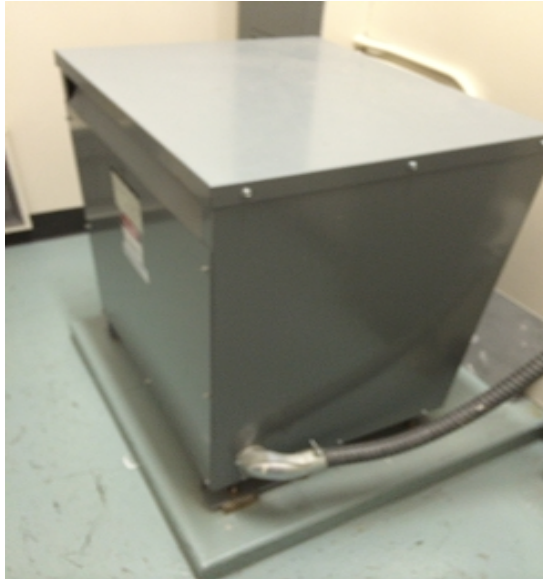


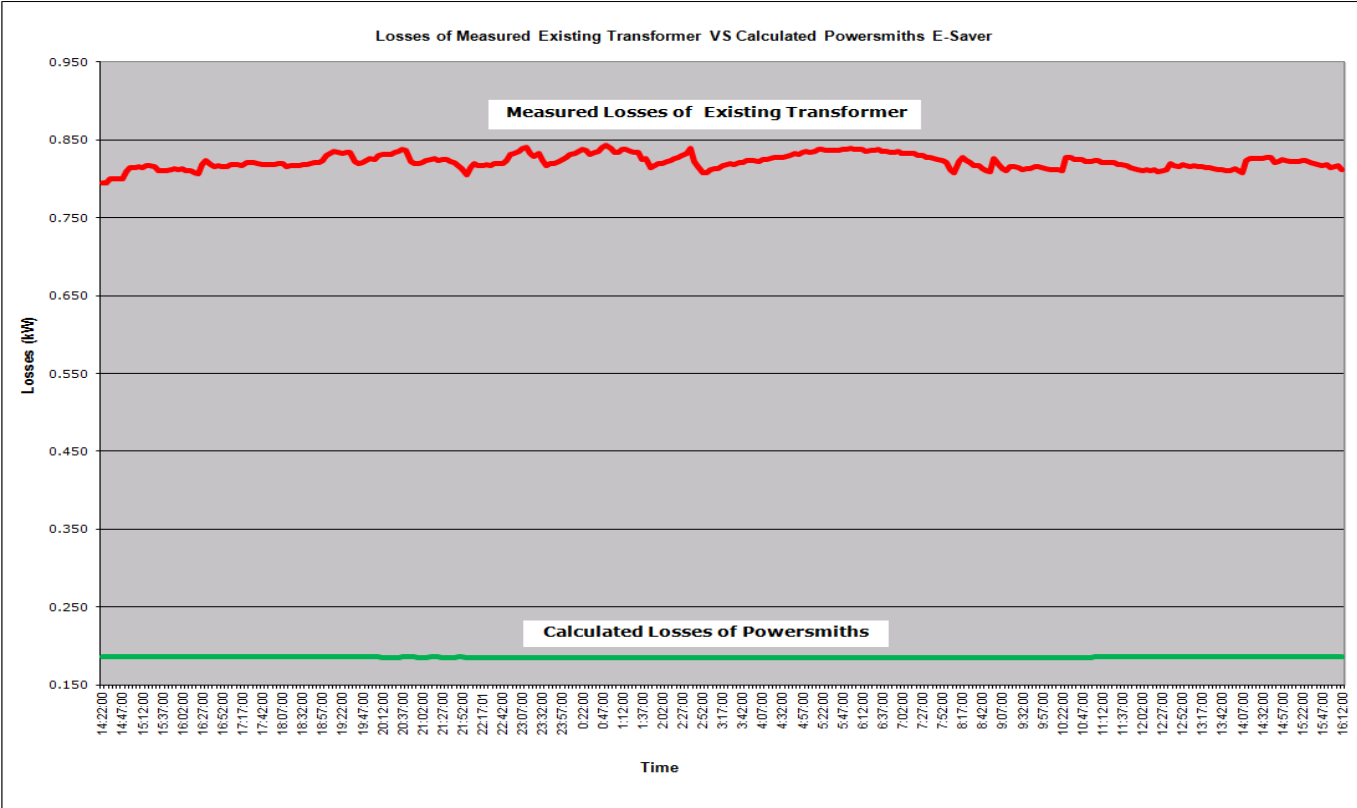
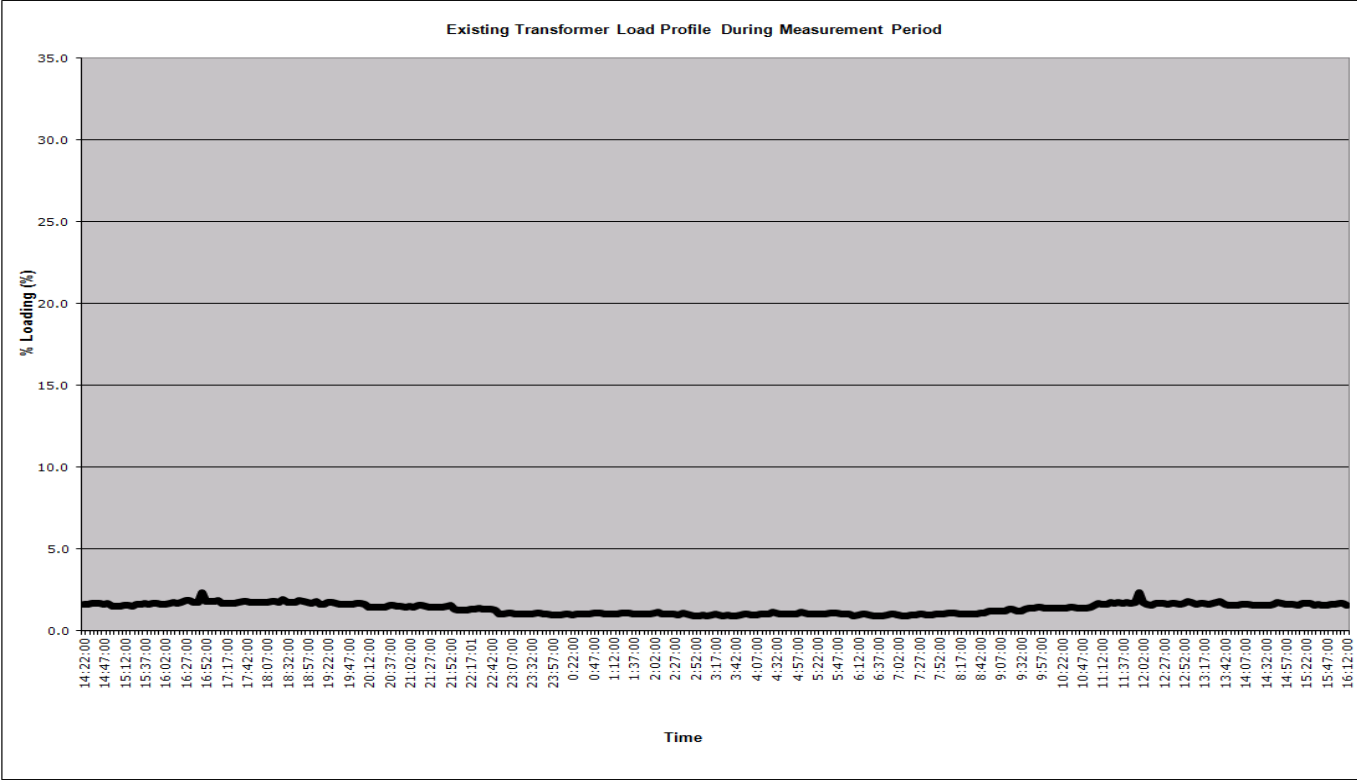
Figure 3: Square D \_112T3H

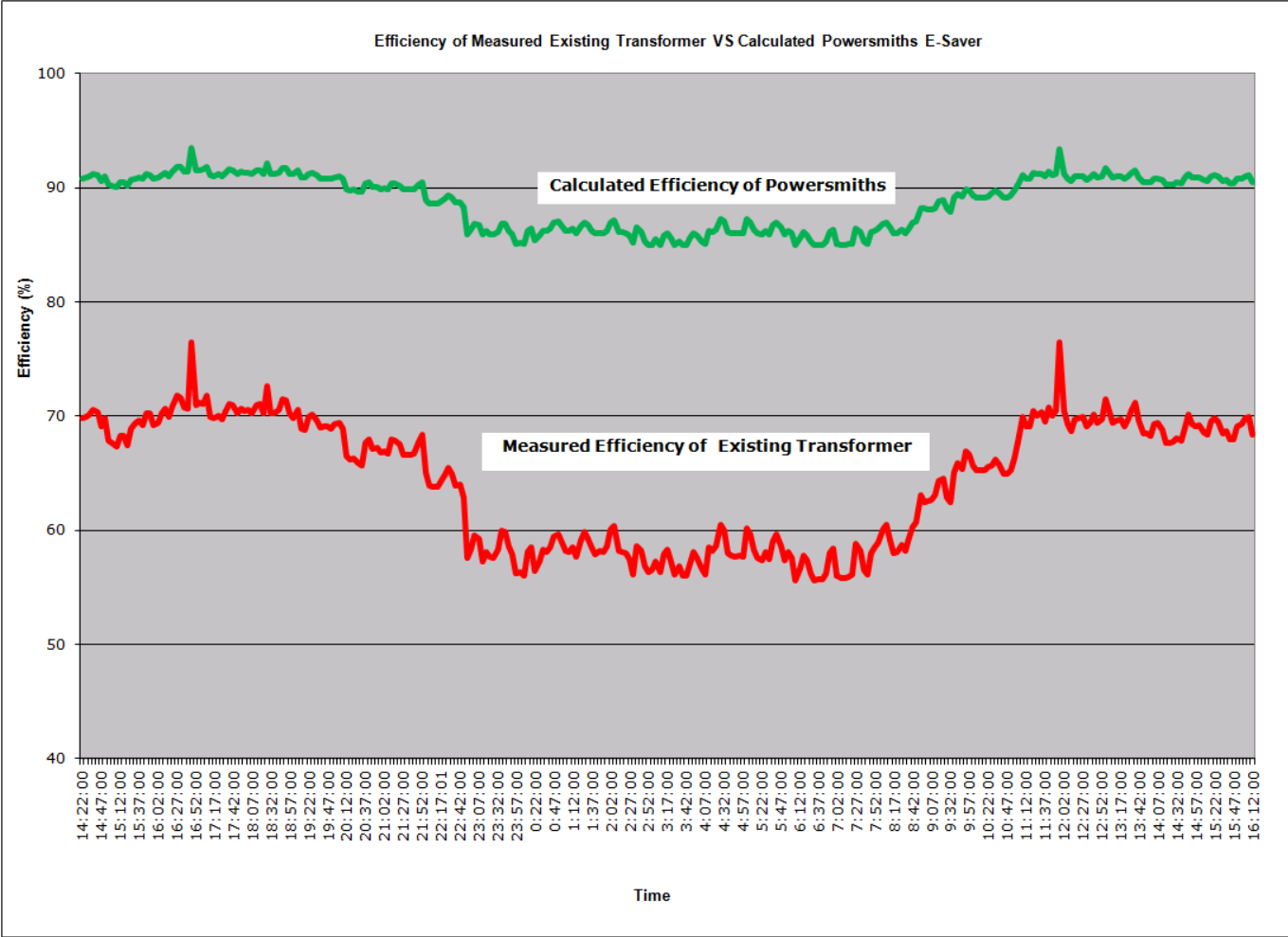


Figure 4: Square D \_Nameplate

<b>Building</b>	<b>Nevada State Library</b>	
<b>Location</b>	<b>Library Main-2nd Floor-T3-009</b>	
<b>Measurement Period (HH:MM)</b>	<b>25 hrs 55 min</b>	<b>Calculated</b>
<b>Sampling Interval</b>	<b>5 min</b>	
<b>Manufacturer</b>	<b>Square D</b>	<b>Powersmiths</b>
<b>Model</b>	<b>112T3H</b>	<b>E-Saver-2016</b>
<b>Nominal kVA</b>	<b>112.5</b>	<b>112.5</b>
<b>% Loading - Average</b>	<b>1.37</b>	<b>1.37</b>
<b>% Efficiency - Average</b>	<b>64.39</b>	<b>88.78</b>
<b>Losses (kW) - Average</b>	<b>0.822</b>	<b>0.185</b>
<b>Reduction in Average Losses</b>		<b>77.4%</b>

<b>Ambient Temperature (°C)</b>	<b>37.0</b>
<b>Representative Output Voltage THD (%)</b>	<b>1.9%</b>
<b>Representative Output Current THD (%)</b>	<b>48.4%</b>
<b>Note: Calculations Based on Powersmiths 2016 Transformer with Copper Coils</b>	







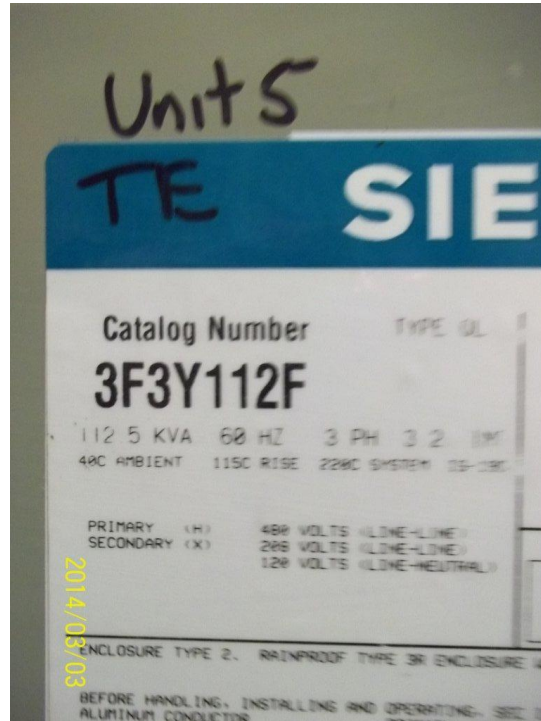
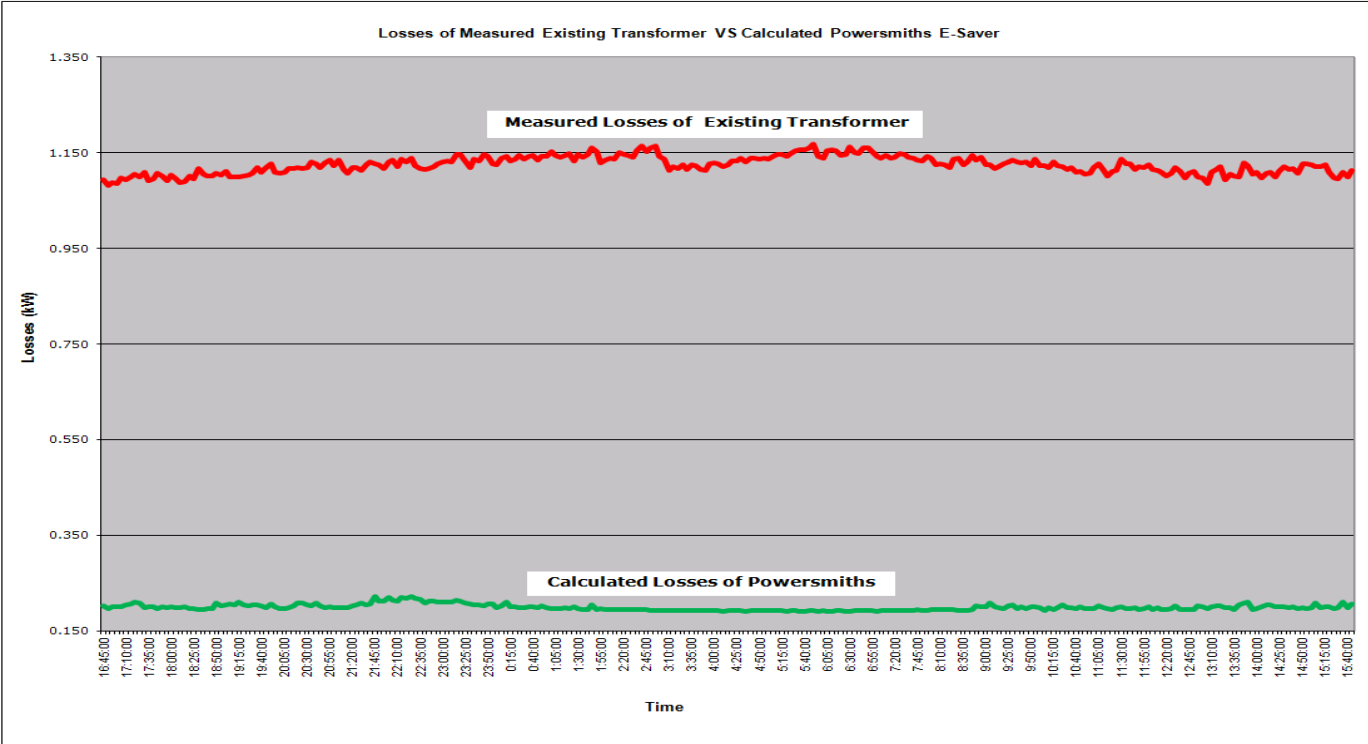
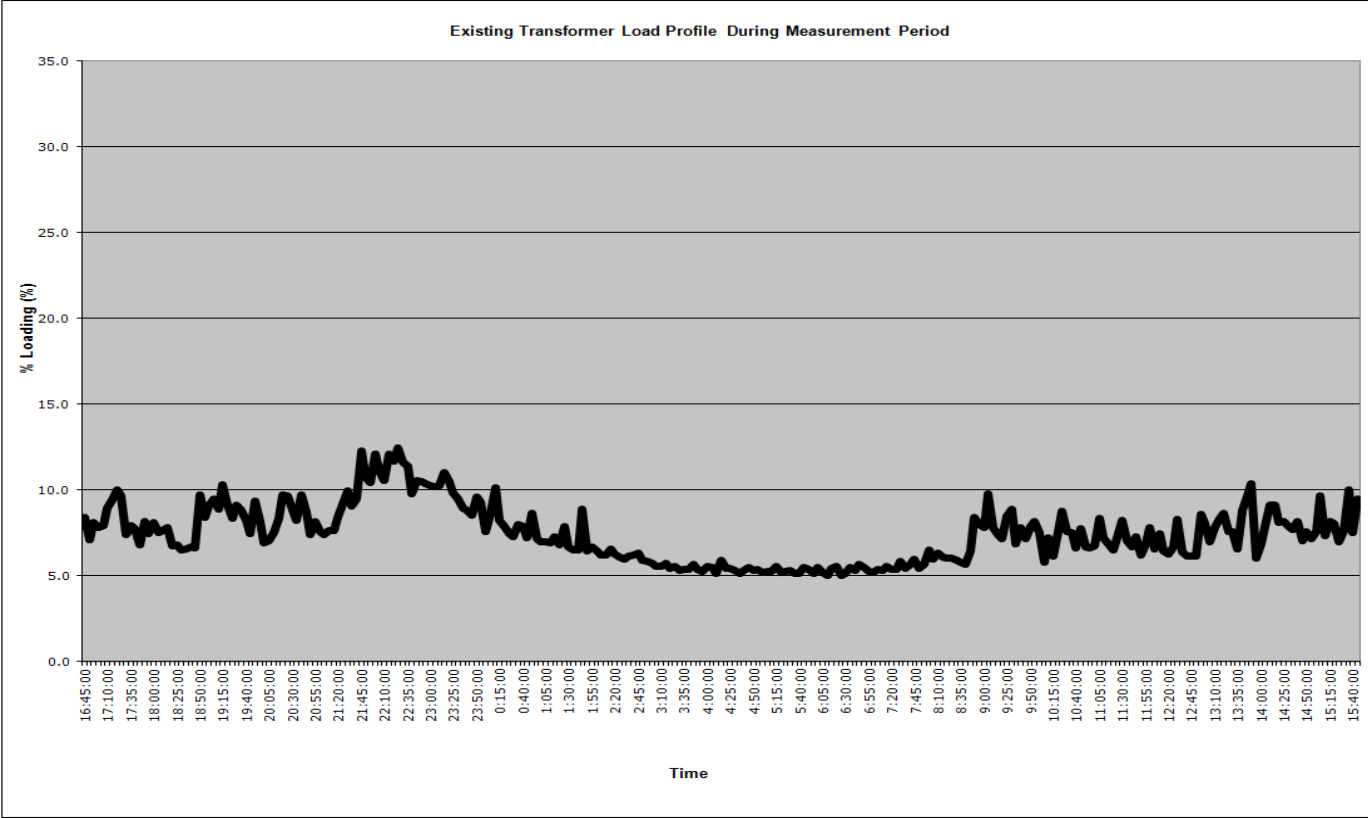


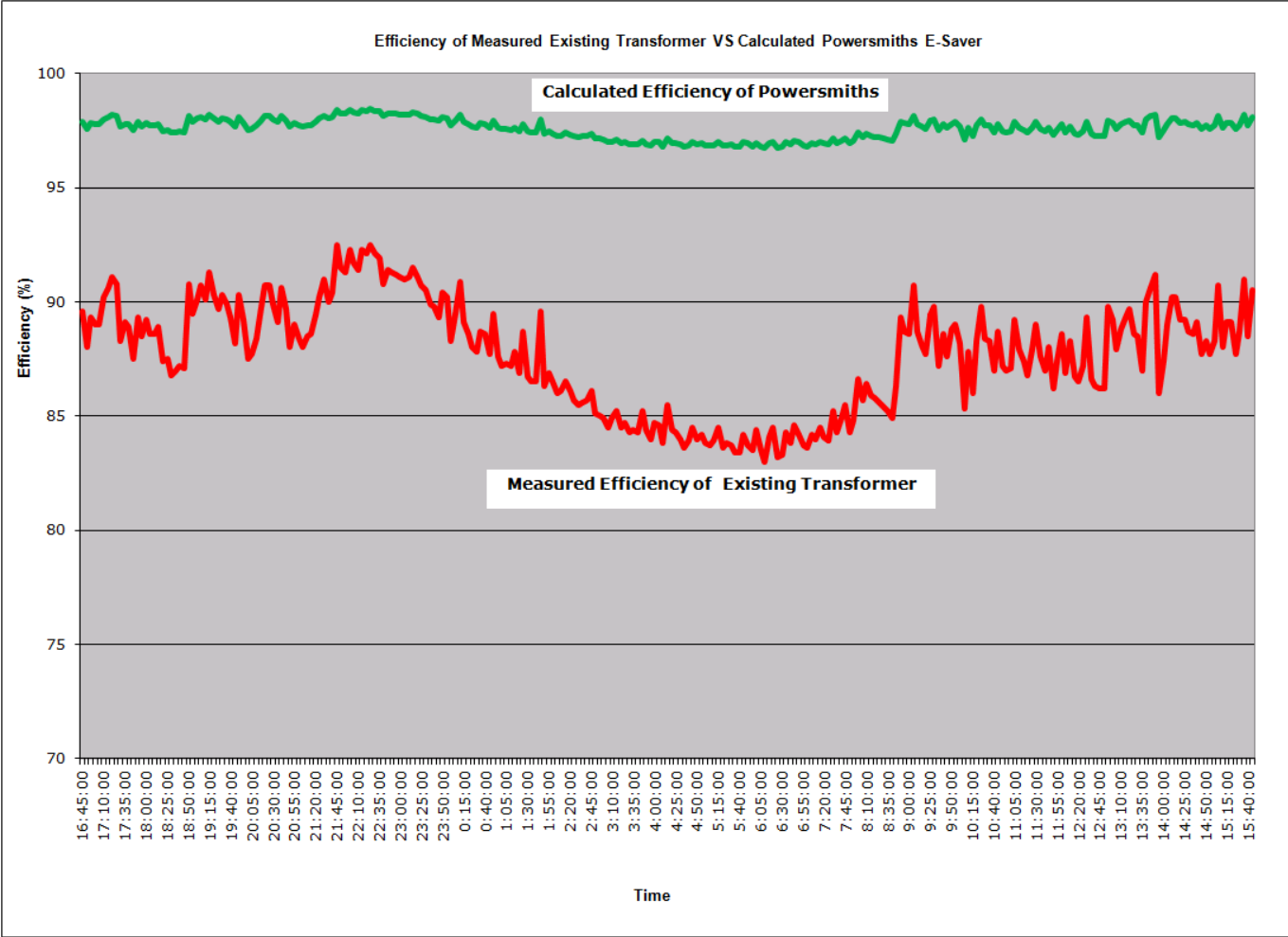
Figure 5: Siemens \_Nameplate

<b>Building</b>	<b>Florence McClure Women's Correctional Centre</b>	
<b>Location</b>	<b>Unit5</b>	
<b>Measurement Period (HH:MM)</b>	<b>23 hrs 10 min</b>	<b>Calculated</b>
<b>Sampling Interval</b>	<b>5 min</b>	
<b>Manufacturer</b>	<b>Siemens</b>	<b>Powersmiths</b>
<b>Model</b>	<b>3F3Y112F</b>	<b>E-Saver-2016</b>
<b>Nominal kVA</b>	<b>112.5</b>	<b>112.5</b>
<b>% Loading - Average</b>	<b>7.43</b>	<b>7.43</b>
<b>% Efficiency - Average</b>	<b>87.67</b>	<b>97.58</b>
<b>Losses (kW) - Average</b>	<b>1.125</b>	<b>0.199</b>
<b>Reduction in Average Losses</b>		<b>82.3%</b>

<b>Ambient Temperature (°C)</b>	<b>27.7</b>
<b>Representative Output Voltage THD (%)</b>	<b>4.1%</b>
<b>Representative Output Current THD (%)</b>	<b>16.4%</b>

**Note: Calculations Based on Powersmiths 2016 Transformer with Copper Coils**





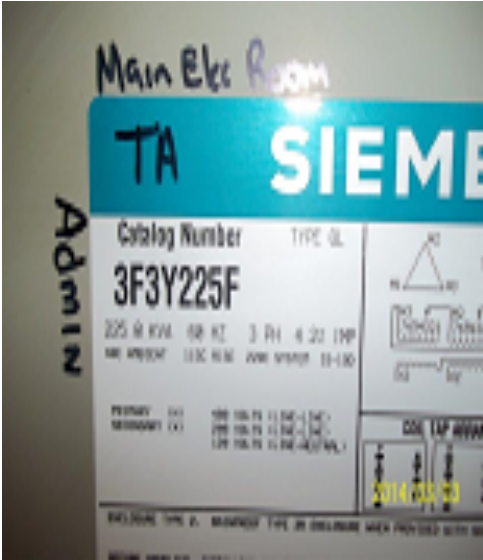
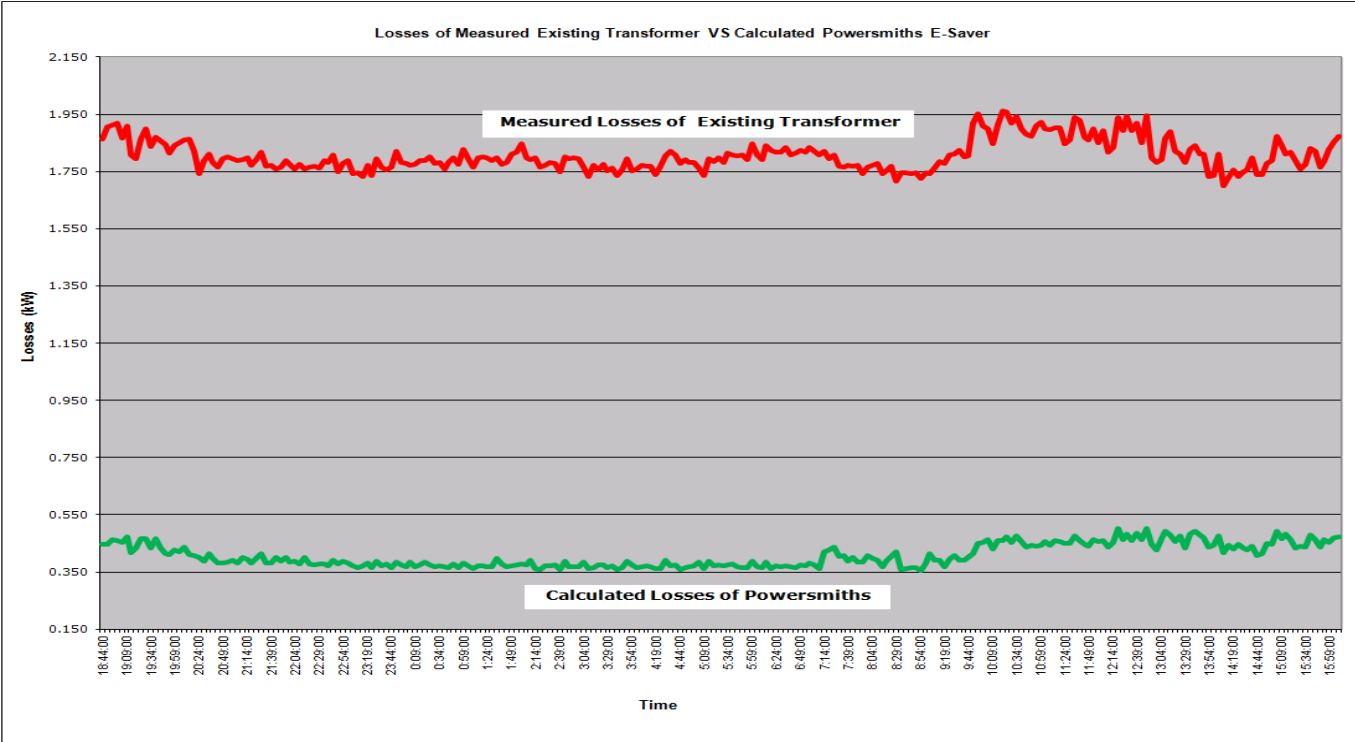
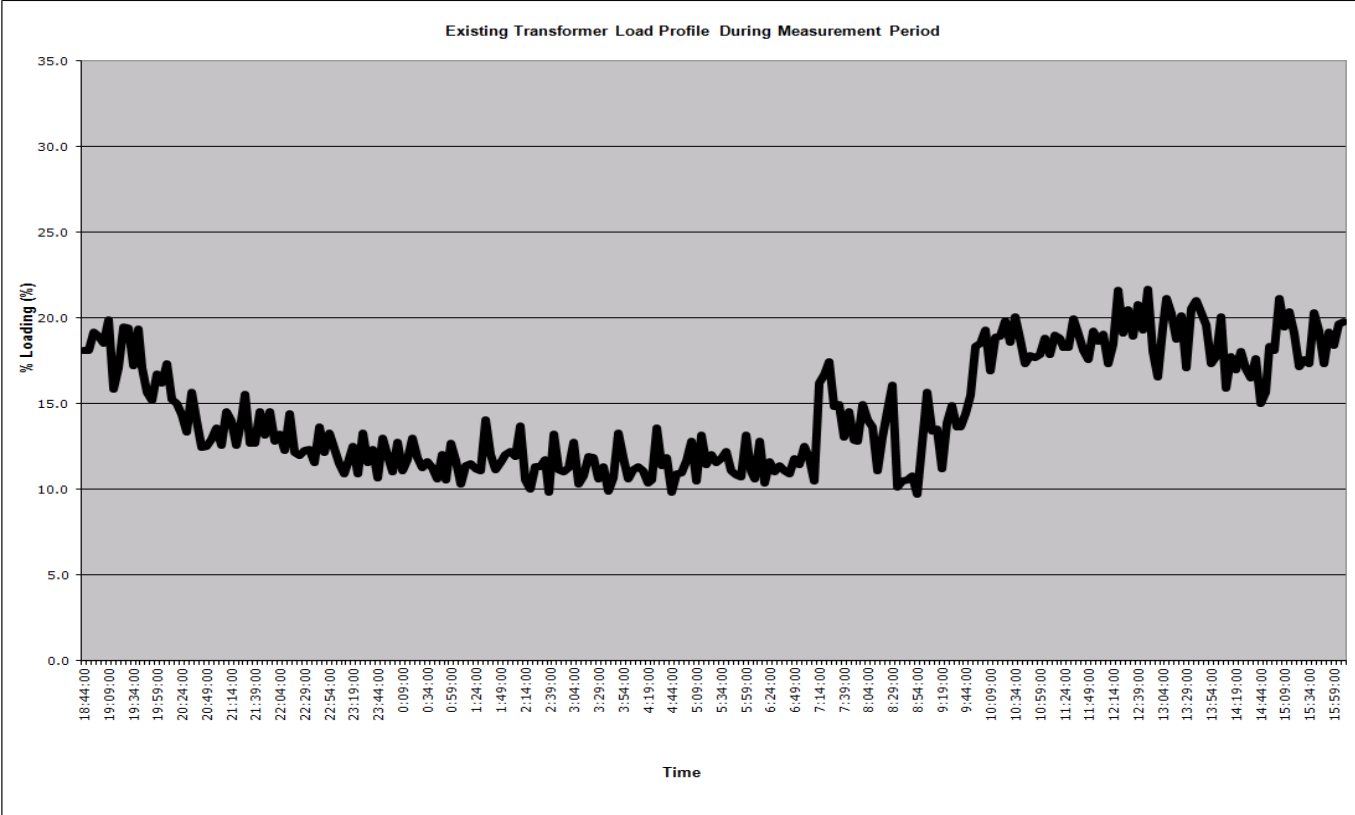
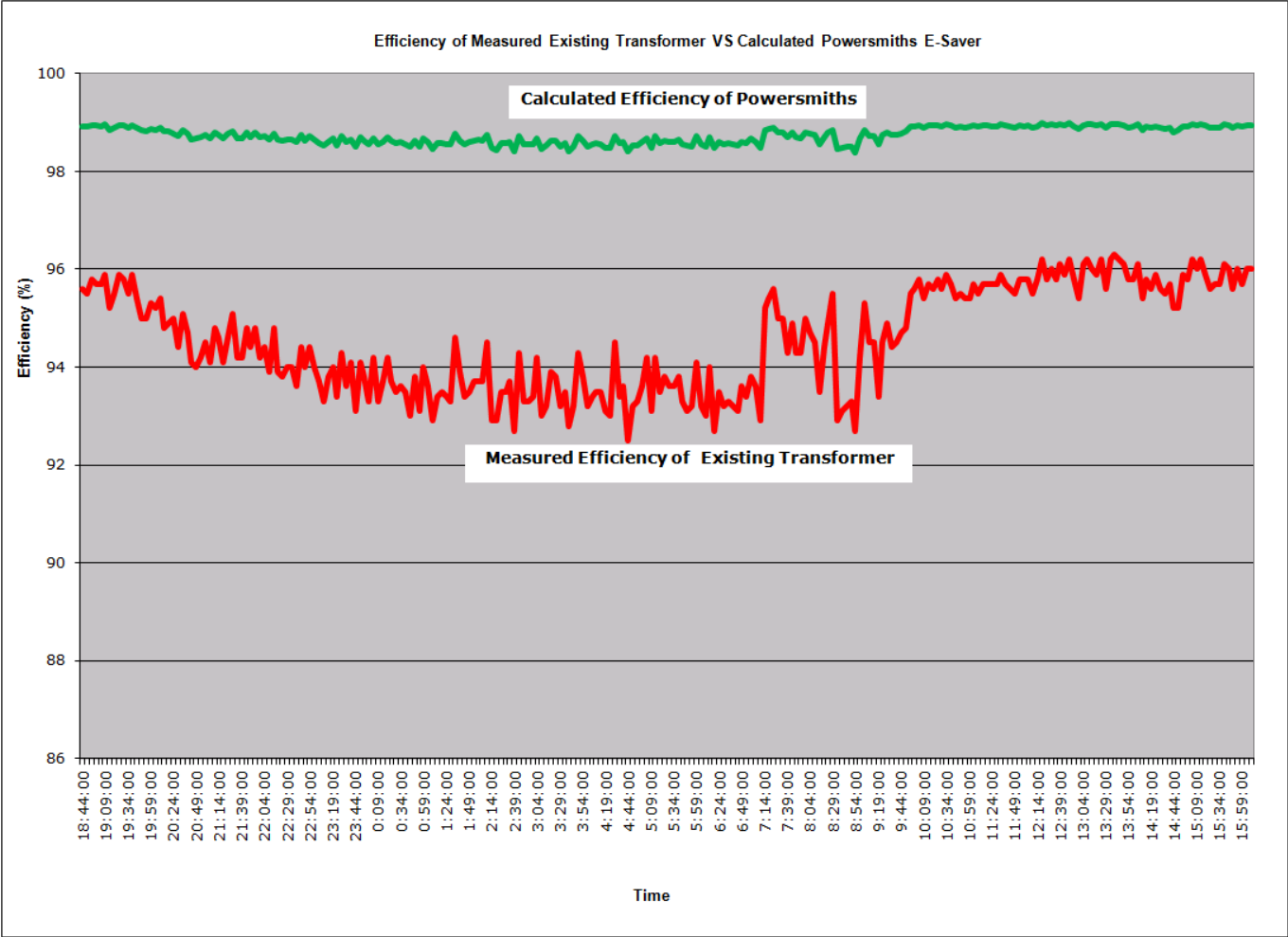


Figure 6: Siemens \_Nameplate

<b>Building</b>	<b>Florence McClure Women's Correctional Centre</b>			
<b>Location</b>	<b>Main Elec Room</b>			
<b>Measurement Period (HH:MM)</b>	<b>21 hrs 30 min</b>		<b>Powersmiths</b>	
<b>Sampling Interval</b>	<b>5 min</b>			
<b>Manufacturer</b>	<b>Siemens</b>			
<b>Model</b>	<b>3F3Y225F</b>		<b>E-Saver-2016</b>	
<b>Nominal kVA</b>	<b>225</b>		<b>225</b>	
<b>Loading Period</b>	<b>On Load</b>	<b>Off Load</b>	<b>On Load</b>	<b>Off Load</b>
<b>% Loading (kVA) - Average</b>	<b>20.4%</b>	<b>11.6%</b>	<b>20.4%</b>	<b>11.6%</b>
<b>% Efficiency - Average</b>	<b>96.2%</b>	<b>93.8%</b>	<b>99.0%</b>	<b>98.6%</b>
<b>Losses (kW) - Average</b>	<b>1.811</b>	<b>1.732</b>	<b>0.481</b>	<b>0.372</b>
<b>Reduction in Avg Losses</b>			<b>73.4%</b>	<b>78.5%</b>

<b>Ambient Temperature (°C)</b>	<b>23.0</b>
<b>Representative Output Voltage THD (%)</b>	<b>1.0%</b>
<b>Representative Output Current THD (%)</b>	<b>7.2%</b>
<b>Note: Calculations Based on Powersmiths 2016 Transformer with Copper Coils</b>	





## Conclusions

- Replacement of the existing transformers with Powersmiths E-Saver-2016 transformers would result in an approximate reduction in Average Losses of **84.8% on average**, paying for themselves many times over during the decades of expected service life.
- Voltage distortion levels measured are below the IEEE recommended limit of 5% for general purpose and electronic equipment loads. This is checked because excessive voltage distortion can impact the operating reliability of connected equipment.
- Current THD levels are greater than 5% and therefore general purpose transformers would not be UL listed for this application. Powersmiths E-Saver Transformers carry the required K rating to supply the measured load profile.
- Upgrading to Powersmiths transformers provides significant environmental benefits. Reduced transformer losses result in reductions in greenhouse gas emissions and carbon footprint due to reductions in fossil-fuel consumption at the power-generating station feeding transformer losses.
- See the complete description of Powersmiths E-Saver transformer benefits in Appendix 1.

### IMPORTANT NOTE ON TRANSFORMERS REACHING END OF LIFE

- The transformers in this building are aging and therefore pose an end of life risk. Unlike many other energy conservation measures, transformers directly impact the operational reliability of an organization as they power the plug loads which enable organizations to function. Therefore it is important to include an assessment of the cost of downtime associated with series of end-of-life failures as they approach and go beyond the DOE's 32 year mean-time-to-failure.
- Unlike installing new transformers, replacing existing transformers involves addressing challenges such as access, footprint constraints, terminal and lug configurations that create conductor re-use or splicing challenges, as well as impedance-related fault and arc flash level management. Furthermore, only off-the-shelf minimum legal efficiency transformer products would be available in a rush would then which would embed another generation of losses, in addition to the physical and electrical challenges.
- Pro-active replacement enables addressing all these issues in a calm prescribed and controlled manner with ultra efficient replacements, avoiding all the costs and disruption associated with a failure.
- Replacing the old transformers with Powersmiths transformers can therefore deliver meaningful quantifiable energy savings while removing an important operational risk.

## Appendix 1

### **Powersmiths E-Saver-2016 Transformer Benefits**

The E-Saver-2016 transformer is the ideal transformer for environments where embedding energy savings over the 30+ year lifecycle is a priority.

#### Characteristics

The E-Saver sets new benchmarks for environmental protection, energy efficiency and reliability. Optimized to save the most energy while balancing first cost and lifecycle cost, the E-Saver-2016 goes beyond US DOE 2016 efficiency requirements ensuring lower operating losses than standard off-the-shelf transformers. To provide superior performance and reduce environmental impact, the E-Saver comes with a superior Nomex based insulation system impregnated with an organic epoxy adhesive.

#### Customization

E-Saver transformers are designed and manufactured to fit within the existing footprint or constraints and are provided with custom lug termination configurations. Custom design and manufacturing allows for faster installation and lower installation costs.

#### Quiet Operation

Working or learning environments can be degraded or disrupted when noisy transformers are located close to people. To meet this challenge, the E-Saver has embedded structural and acoustic treatments that combine to reduce ambient noise generated by the transformer. To ensure quiet operation, noise tests are part of our ISO 9001 procedures for every transformer.

#### Environmental

The E-Saver is built in an ISO 9001 (quality management) and ISO 14001 (environmental management) certified facility. Throughout the manufacturing process, Powersmiths takes steps to ensure that waste is eliminated and hazardous materials are avoided. Because Powersmiths transformers generate lower losses, they reduce power drawn from generating stations resulting in less smog and lower greenhouse gas emissions.

#### Testing

E-Saver transformers are subjected to rigorous testing to ensure efficiency under various load profiles and loading conditions, quiet operation, and insulation integrity and production tests with actual computer power loading. Powersmiths' test facility has been certified to ISO 17025 for efficiency testing by Canadian Standards Association International (CSA).

#### Warranty

The E-Saver's long life and dependable performance is backed up by Powersmiths' industry leading 25 year pro-rated warranty.