

# HARDEN

## Carbon Footprint Calculation (CY2010)

### • Electrical

- Consumption: Annual kWh = 6,371,209
- Factors: Line Loss = 7%<sup>1</sup>  
NYS Average CO<sub>2</sub> Emission Factor = 0.86 lbs/kWh<sup>2</sup>
- Calculation: Annual lbs CO<sub>2</sub>  
= (Annual Consumption kWh + Line Loss) \* NYS Average CO<sub>2</sub> Emission Factor  
lbs/kWh  
= (6,371,209 \* 1.07) \* 0.86 lbs/kWh  
= 5.86x10<sup>6</sup> lbs

### • Thermal – Wood Fuel

- Consumption: Annual Tons = 11,654
- Factors: Higher Heating Value (HHV) of Wood Fuel = 5.2x10<sup>-3</sup> MMBtu/lb<sup>3</sup>  
Wood Fuel (wet wood/bark) CO<sub>2</sub> Emission Factor = 1.95x10<sup>2</sup> lb/MMBtu<sup>4</sup>  
1.95x10<sup>2</sup> lb/MMBtu \* (5.2x10<sup>-3</sup> MMBtu/lb \* 2000 lbs/ton)  
= 2.03x10<sup>3</sup> lbs/ton
- Calculation: Annual lbs CO<sub>2</sub>  
= Wood Fuel CO<sub>2</sub> Emission Factor (lbs/ton) \* Annual Consumption (tons)  
= 2.03x10<sup>3</sup> lbs/ton \* 11,654 tons  
= 2.37x10<sup>7</sup> lbs

### • Thermal – Natural Gas

- Consumption: Annual therms = 12,568
- Factors: 1 therm = 100,000 Btu  
Average Gross Heating Value = 1,020 Btu/cf<sup>5</sup>  
1 therm = 100,000 Btu / 1,020 Btu/cf = 98 cf  
Natural Gas CO<sub>2</sub> Emission Factor = 120,000 lbs/10<sup>6</sup> cf<sup>6</sup>  
120,000 lbs/10<sup>6</sup> cf \* 98 cf/therm / 10<sup>6</sup>  
= 11.8 lbs/therm
- Calculation: Annual lbs CO<sub>2</sub>  
= Natural Gas CO<sub>2</sub> Emission Factor (lbs/therm) \* Annual Consumption (therms)  
= 11.8 lbs/therm \* 12,568 therms  
= 1.48 x10<sup>5</sup> lbs

- **Carbon Footprint (Total Electrical and Thermal)**

**Total Annual lbs. CO<sub>2</sub>**

= Electrical lbs + Thermal Wood Fuel lbs + Thermal Natural Gas lbs

=  $5.86 \times 10^6$  lbs +  $2.37 \times 10^7$  lbs +  $1.48 \times 10^5$  lbs

=  **$2.97 \times 10^7$  lbs or 14,854 tons**

(Endnotes)

- 1 Conservative estimate for line loss when electricity is transmitted through the system.
- 2 From the U.S. Department of Energy and U.S. Energy Information Administration Form EIA-1605 (March 2006, data through 2005), Voluntary Reporting of Greenhouse Gases, Appendix C: Adjusted Electricity Emission Factors by State.
- 3 Estimate of the average Higher Heating Value (HHV) of all wood fuel combusted.
- 4 From AP-42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 1: External Combustion Sources, Section 1.6: Wood Residue Combustion in Boilers, Table 1.6-3.
- 5 From AP-42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 1: External Combustion Sources, Section 1.4.1: Natural Gas Combustion, General.
- 6 From AP-42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 1: External Combustion Sources, Section 1.4: Natural Gas Combustion, Table 1.4-2.