NORTH CAROLINA GLASS INDUSTRY

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Identify the Numbers

The Energy Information Administration conducts a survey for the glass industry related to various energy aspects. Information is published on a national basis, and may serve as an indicator of energy usage by the glass industry in general. In 1998 the United States glass industry consumed 293 trillion BTU's, of which 159 trillion BTU's were attributed to natural gas as shown by Figure 1. Electricity and electrical losses make up the majority of remaining energy consumed[i].

Energy Consumption by Fuel – 1998 (NAICS 3272)
(Trillion Btu)

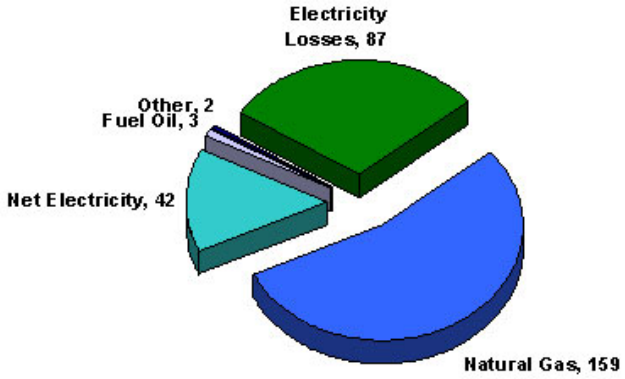

Figure 1: Total Energy Consumed
293 trillion BTU (with electrical losses*)[i]

Why is this market sector a good fit for CHP?

The state of North Carolina is fourth for glass manufacturing in the United States. With 88 glass related facilities and a total value of shipments of $1.7 billion dollars in 2002, the North Carolina glass industry is the largest of any state in the southeast. Approximately 14% of operating costs are associated with energy usage in the glass industry. The fact that the glass industry is regarded as a high-heat, energy-intensive industry has prompted a market assessment of CHP in the North Carolina glass industry.

What is the market potential for this sector?

The glass industry is characterized by its intensive use of energy. The Glass Manufacturing Energy Council reported that 14% of the total operating costs for the glass industry are attributed to energy consumption. Table 22 displays energy costs as a percentage of operating costs for selected Industries of the Future designated by the Department of Energy.

Natural gas contributes up to 80% of the energy consumed in the glass industry[ii]. While this situation may initially appear as a favorable scenario for CHP, the glass manufacturing process hinders conventional CHP applications. Steam is not a heavily employed working fluid in the glass industry. Therefore, CHP installations which utilize waste heat to generate steam for thermal loads are generally unsuitable. However, scenarios exist where waste heat is utilized in alternative fashion.

Table 2: Energy Costs

Energy Costs for Selected Industry	
Industry	**Percentage of Operating Cost**
Glass	14%
Aluminum[iii]	33%
Chemical[iv]	85%
Mining[v]	17%
Steel[vi]	15%

Of all the key process components of glass manufacturing, the melting and refining process offers the greatest opportunity to utilize CHP technologies. Combustion-heated furnaces offer a major opportunity to employ CHP technologies to recover waste heat. As much as 67% of the heat generated by these furnaces is exhausted as waste heat.

What are the benefits and actual behaviors observed?

Based on estimated values for energy consumption and waste heat streams[vii] for the glass industry and the number of glass manufactures in North Carolina, there exists an estimated 15 MW of generation potential from waste heat in the North Carolina glass industry. This estimated value of CHP potential is a high level approximation based on average values for glass producing facilities. If 15 MW of generation potential could be realized, energy savings of 131.4

GWh per year may be possible. With an estimate of 15 MW of potential generation, a Market Analysis serves as a logical first step to investigate the potential integration of CHP technology into the glass industry. The glass industry is an important part of the North Carolinia economy, and as such, may offer an opportunity to increase productivity and economic efficiency through CHP implementation.

Use/Examples/Obstacles

According the Department of Energy's Industrial Technologies Program, the US glass Industry currently consumes 47 GW of CHP generated power, which saves approximately $4.5 Billion/year. These facilities within the industry that have implemented CHP installations have overcome certain barriers which may prohibit the timely and efficient design, installation, and operation of CHP facilities. These barriers include:

- air quality regulations,
- interconnection issues,
- the prohibition of third party sales of electricity, and
- utility rates.

These barriers are not specific to CHP, but apply to most distributed generation projects. In addition, CHP does have a number of specific glass industry related barriers. These include the discontinuous use and production of heat due to batch processing and extensive fouling from flue gas contaminants.

Additional Benefits?

The North Carolina glass industry is a large, energy intensive, multi-billion dollar business that accounts for the employment of nearly 10,000 North Carolinians. North Carolina is home to several flat, fiber, container, and specialty glass operations.

Energy costs account for approximately 14% of the total operating cost in the glass industry. At a national level, the glass industry consumes nearly 160 trillion BTU's of natural gas on an annual basis. Although the limited use of steam and discontinuous production of waste heat inhibits traditional CHP installations, the glass industry still is able to present favorable CHP installations opportunities. Opportunities for CHP installations exist in bottom cycle applications where waste heat from stack gases is captured and employed for the production of steam and power.

[i] Energy Information Administration . Glass Industry Analysis Brief - Energy Consumption. 28 Jan. 2004. 7 May 2008 <http://www.eia.doe.gov/emeu/mecs/iab98/glass/fuel.html>.

[ii] Onsite Energy Corporation. Assessment of on-Site Power Opportunities in the Industrial Sector. Carlsbad, CA:, 2001.

[iii] Energetics. Energy and Environmental Profile of the U.S. Aluminum Industry. July 1997. 19 May 2008. http://www1.eere.energy.gov/industry/aluminum/pdfs/aluminum.pdf.

[iv] Energetics. Energy and Environmental Profile of the U.S. Chemical Industry. May 2000. 19 May 2008. http://www1.eere.energy.gov/indusry/chemicals/pdfs/profile_chapl.pdf.

[v] BCS, Incorporated. Energy and Environmental Profile of the U.S. Mining Industry. Dec. 2002. 20 May 2008. http://www1.eere.energy.gov/industry/mining/pdfs/cover.pdf.

[vi] Energetics. Energy and Environmental Profile of the U.S. Iron and Steel Industry. Aug 2000. 20 May 2008. http://www1.eere.energy.gov/industry/steel/pdfs/steel_profile.pdf

[vii] Energetics. Energy and Environmental Profile of the United States Glass Industry. U.S. Department of Energy Office of Industrial Technologies, 2002. May 5, 2008.