



National & Regional Status of Combined Heat and Power

Does CHP Make Sense At My Facility?

*Presentation to
MicroGeneration to Power Parks
Lansing, Michigan
Tuesday, Nov. 18, 2003
John J. Cuttica
Midwest CHP Application Center*

What is CHP?

- Integrated System
- Located At or Near a Building/Facility
- Provides a Portion of the Electrical Load
- Utilizes the Thermal Energy
 - Cooling
 - Heating
 - Dehumidification
 - Process Heat

What To Look For In A CHP Application

- Good Electric & Thermal Load Coincidence

Good Electric & Thermal Load Coincidence

- Simple Questions:

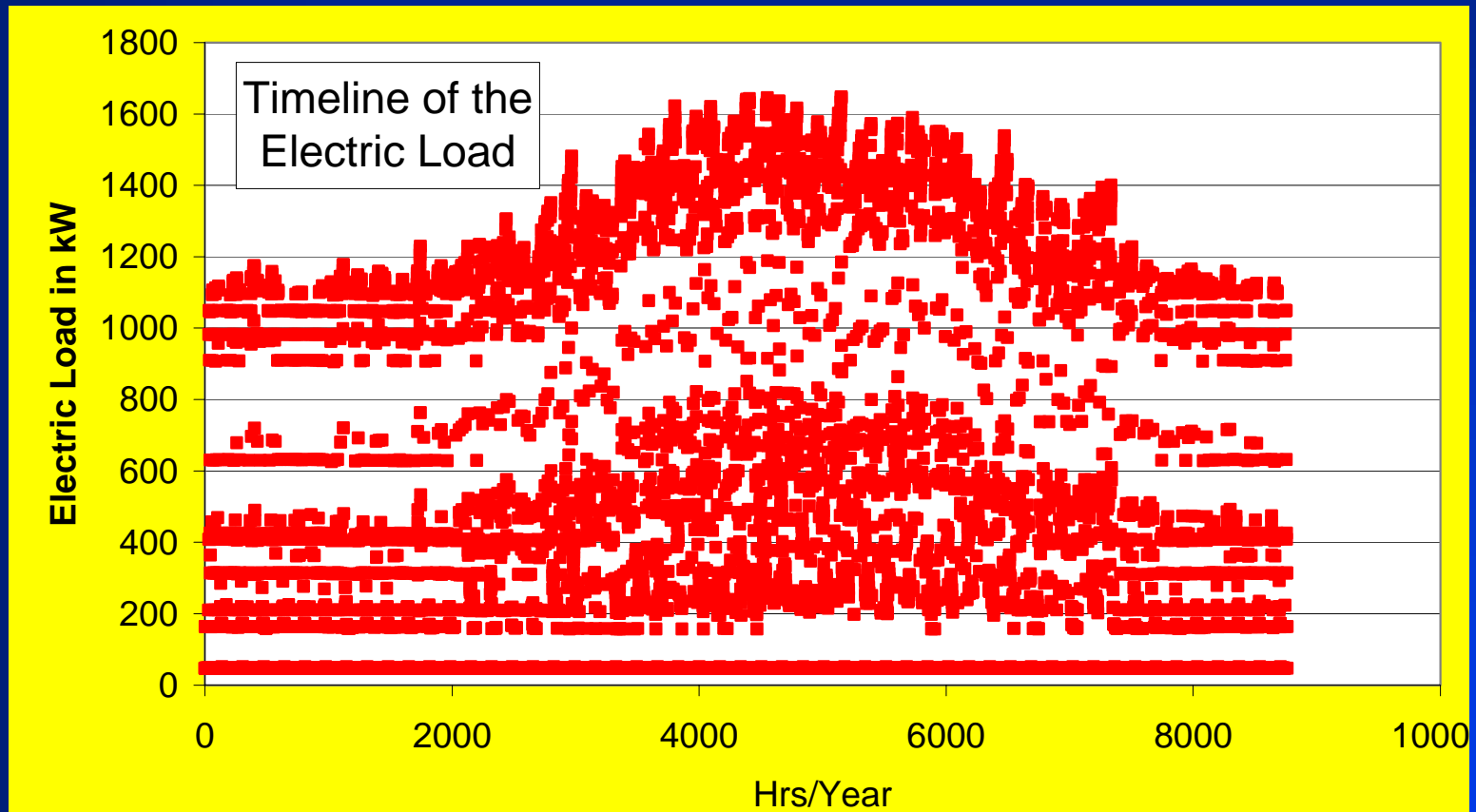
- Does The Application Need Heat At The Same Time That It Needs Electricity?

- Does The Amount of Heat Needed (Btu/hr) Match The Available Heat Based On The Amount Of Electricity (kWh) Required?

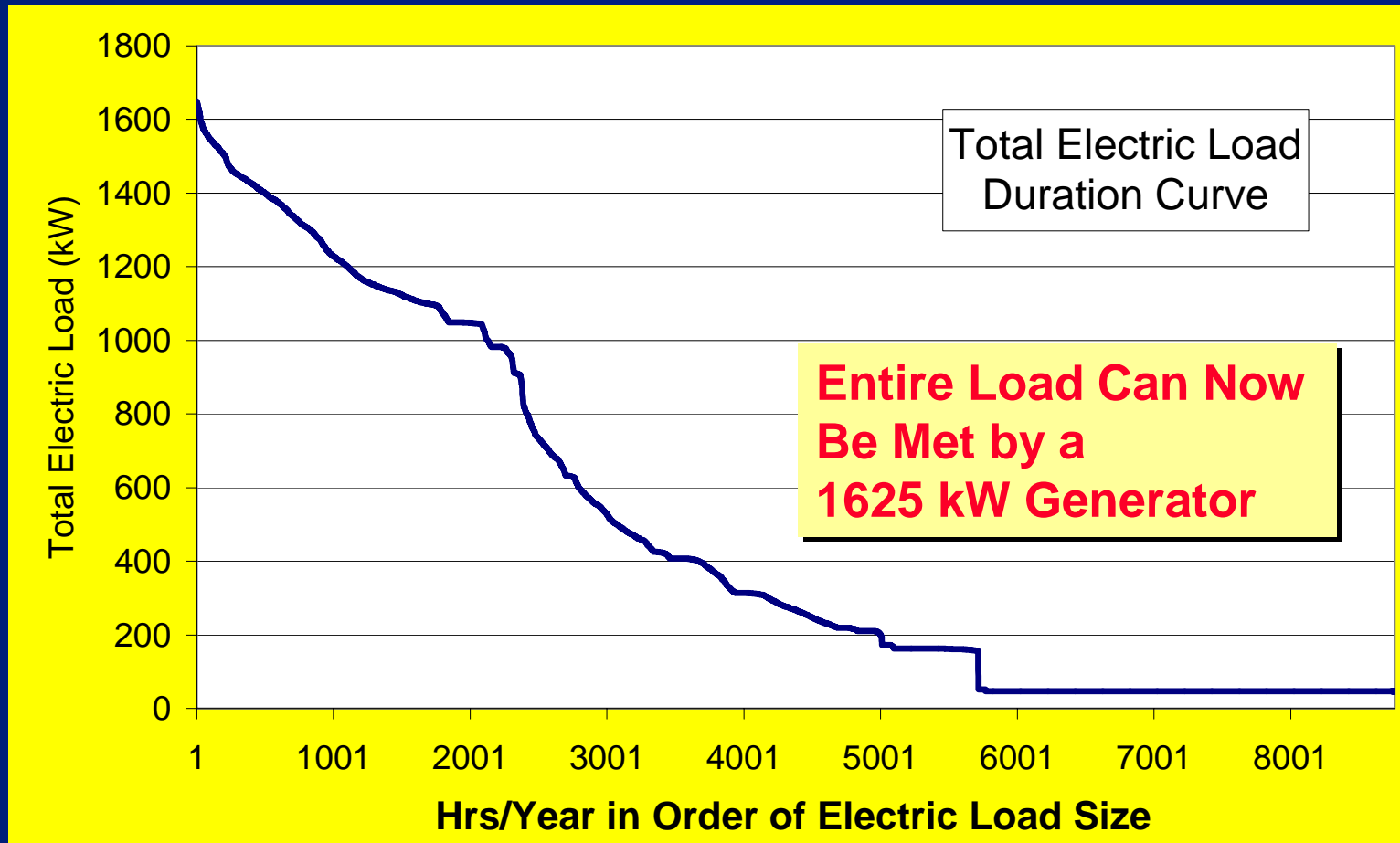


Example, Commercial Building

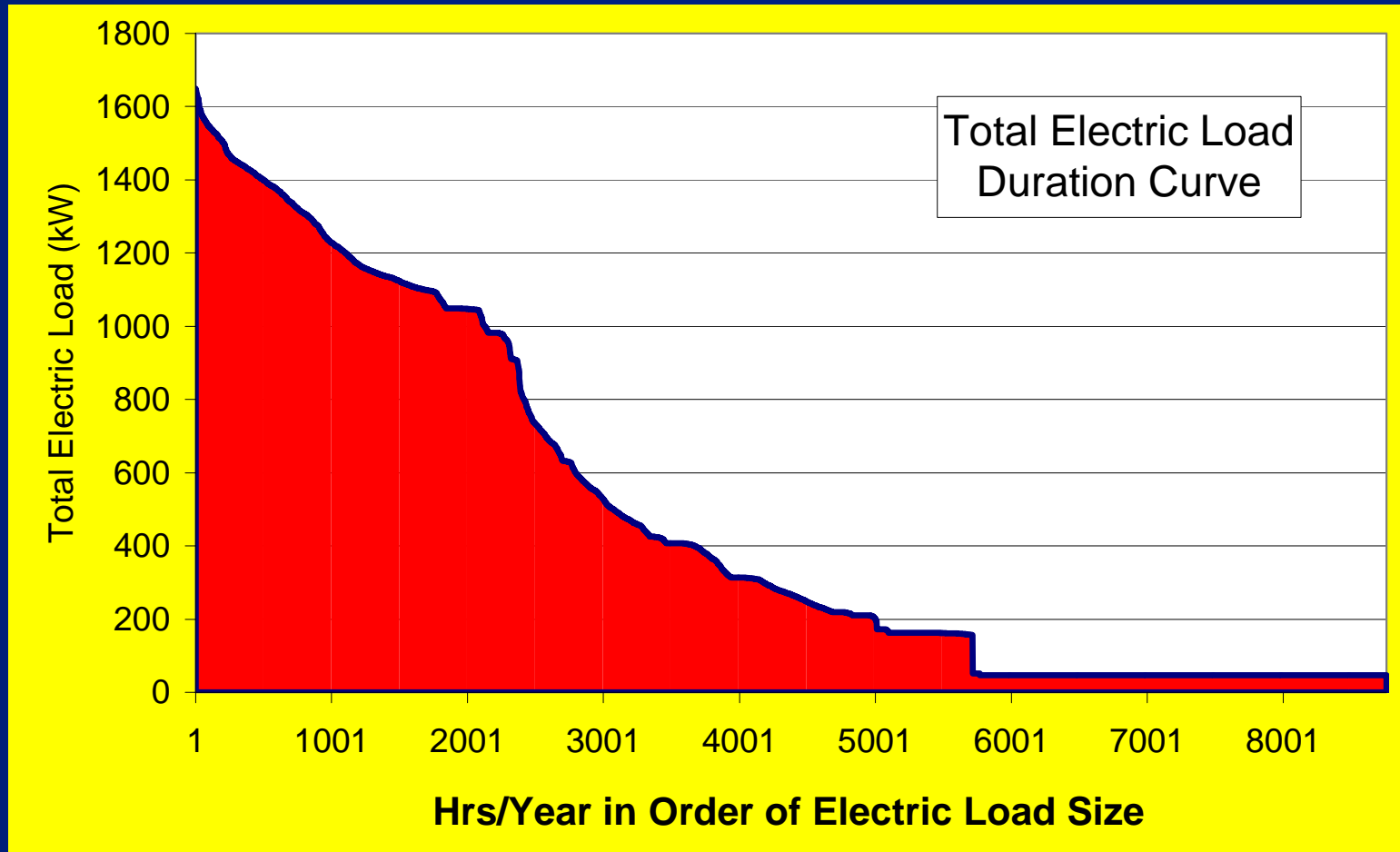
- 300,000 SF Office Building in Chicago



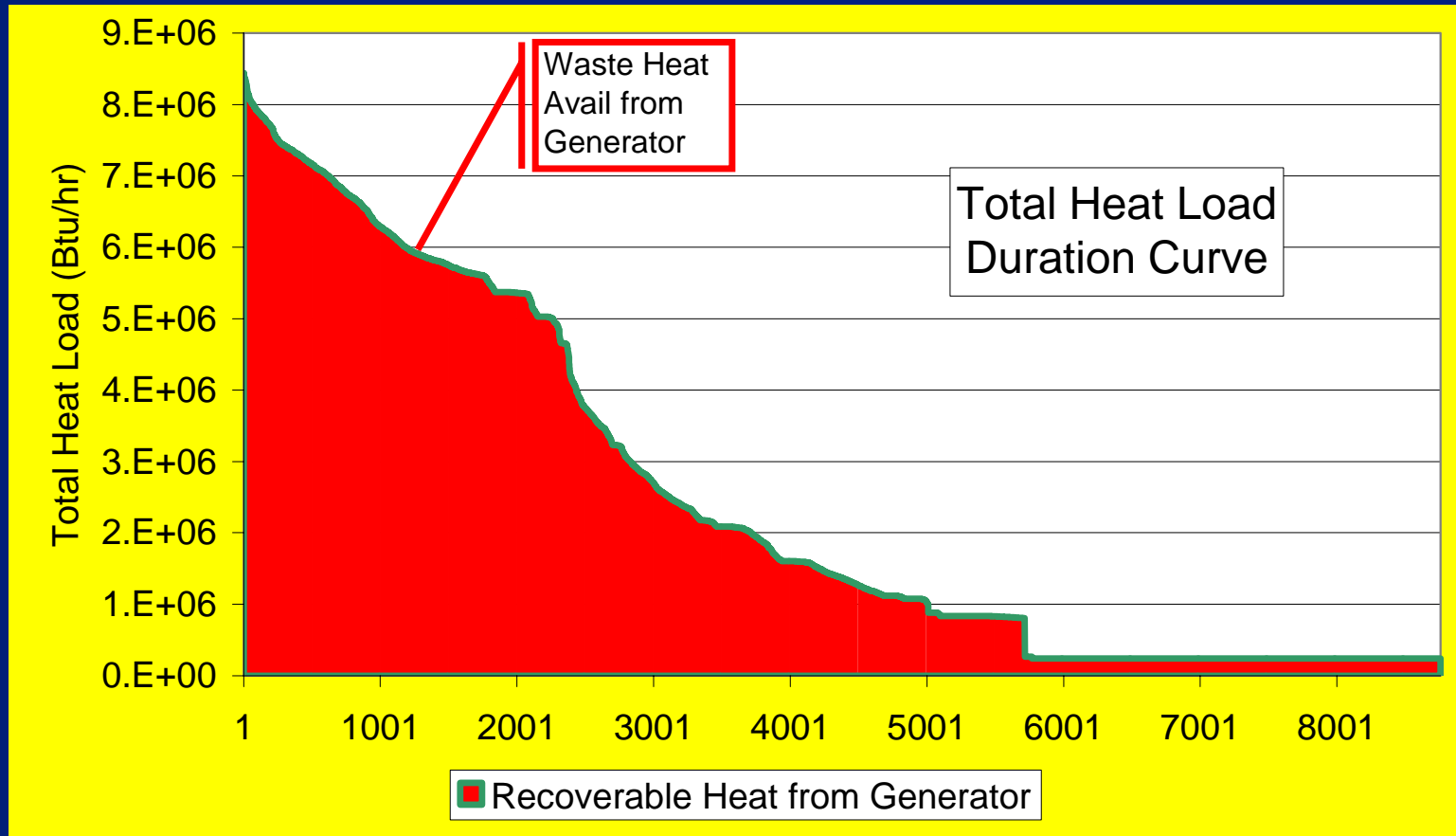
Power Needs are More Easily Viewed by Ordering into a Duration Curve



The Area Under the Curve Represents the kWh Consumed Over the Year



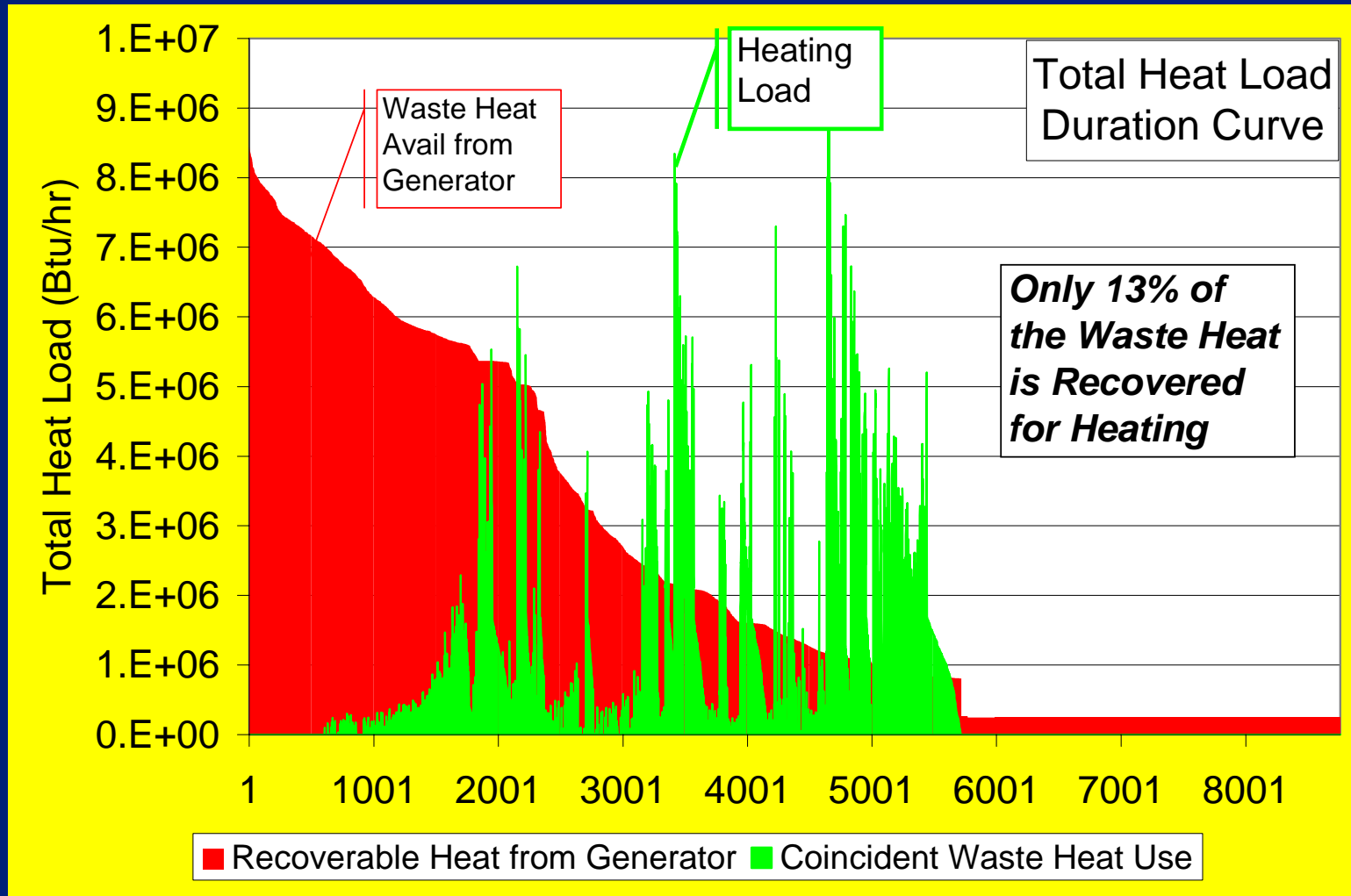
If the Facility has a Generator that Supplies ALL Power Needs, How Much Waste Heat is Available ?



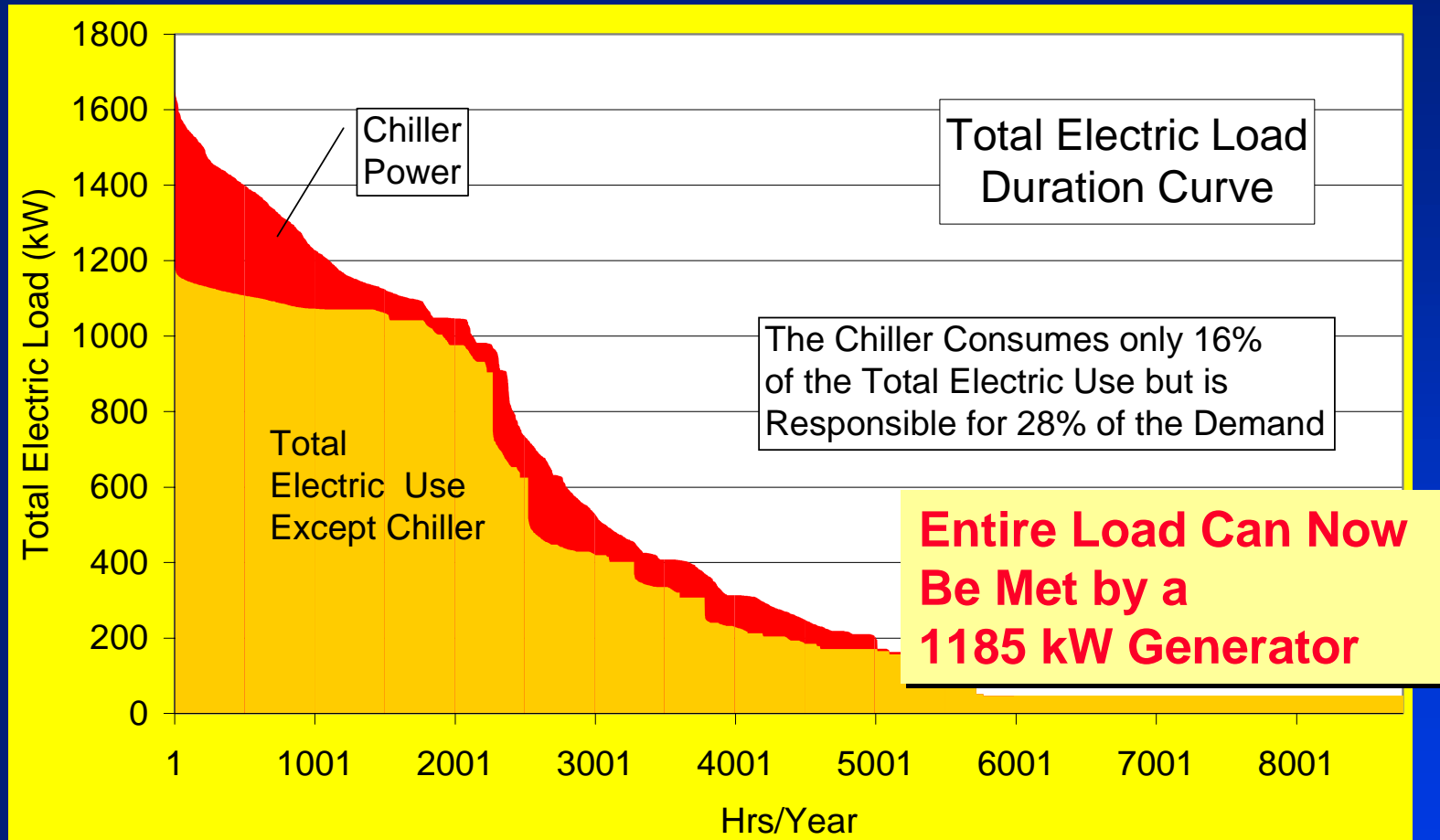
Note: For Simplicity, the Engine is Assumed to Be Capable of Running Down to Zero Load at a Constant Efficiency and Heat Rejection Rate. This is Not True of Actual Engines



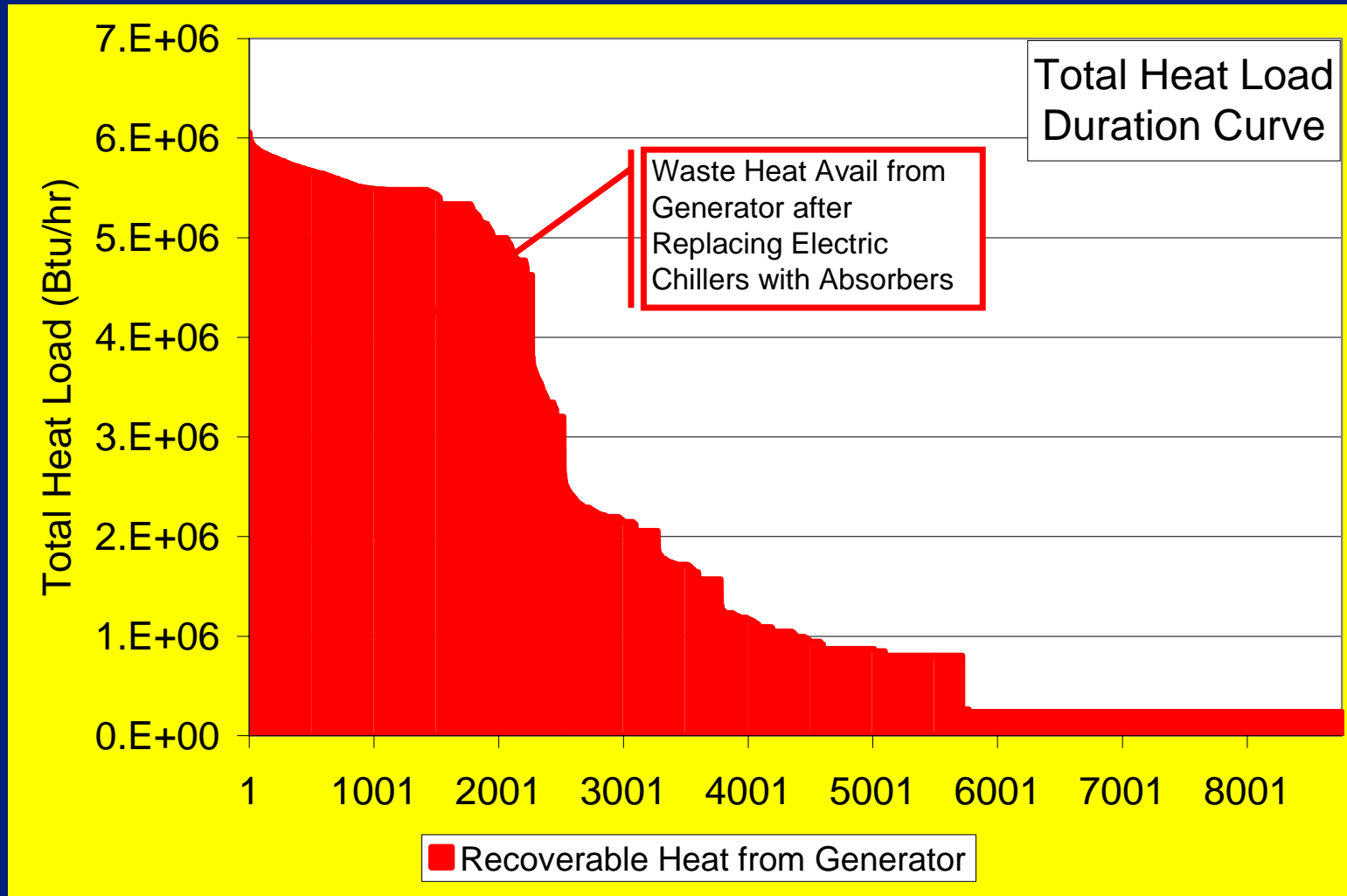
How Much of This Waste Heat Can be Used for the Space Heating?



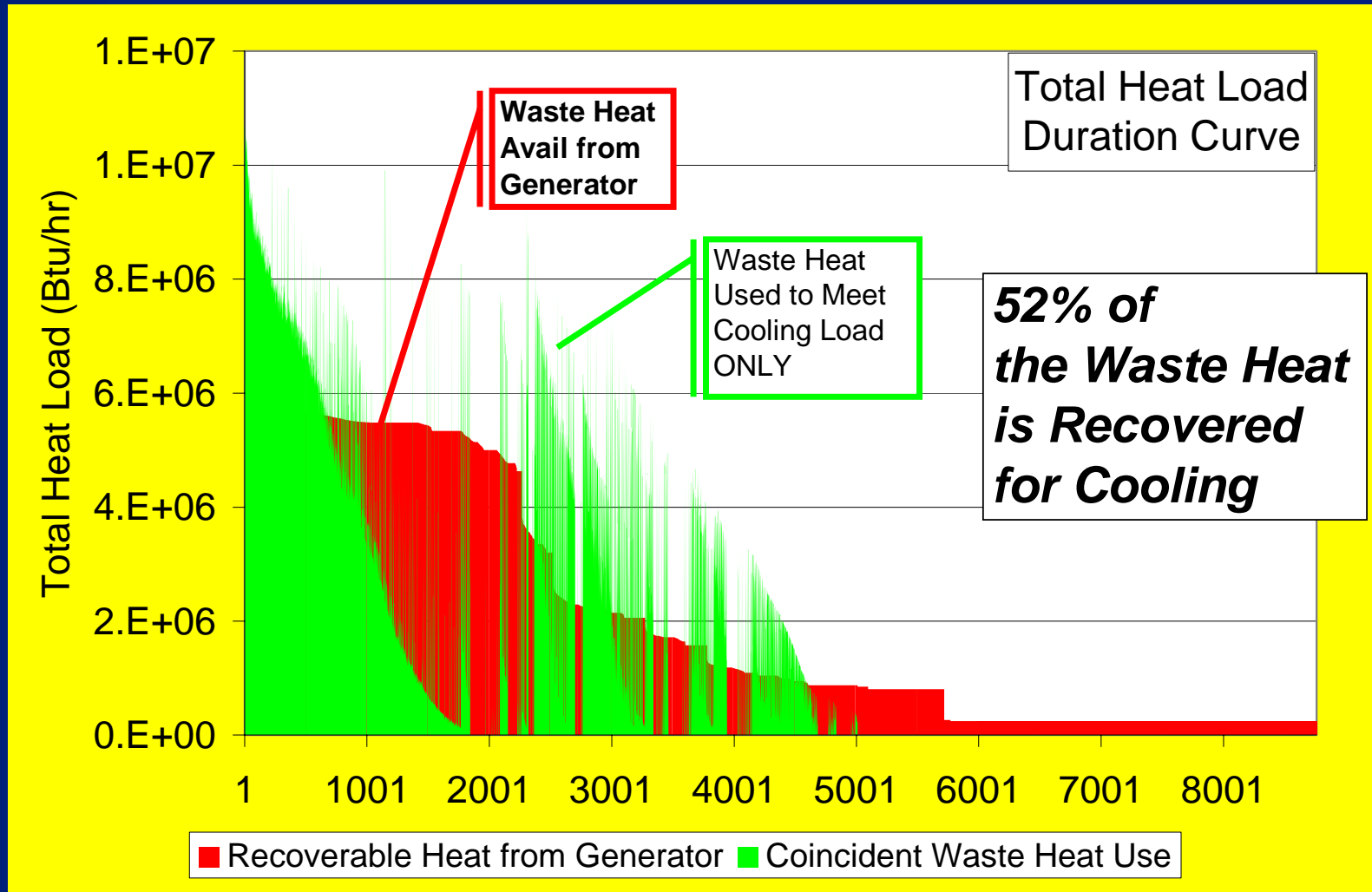
If the Cooling Load is Now Also Operated by Waste Heat – The Electric Load is Changed



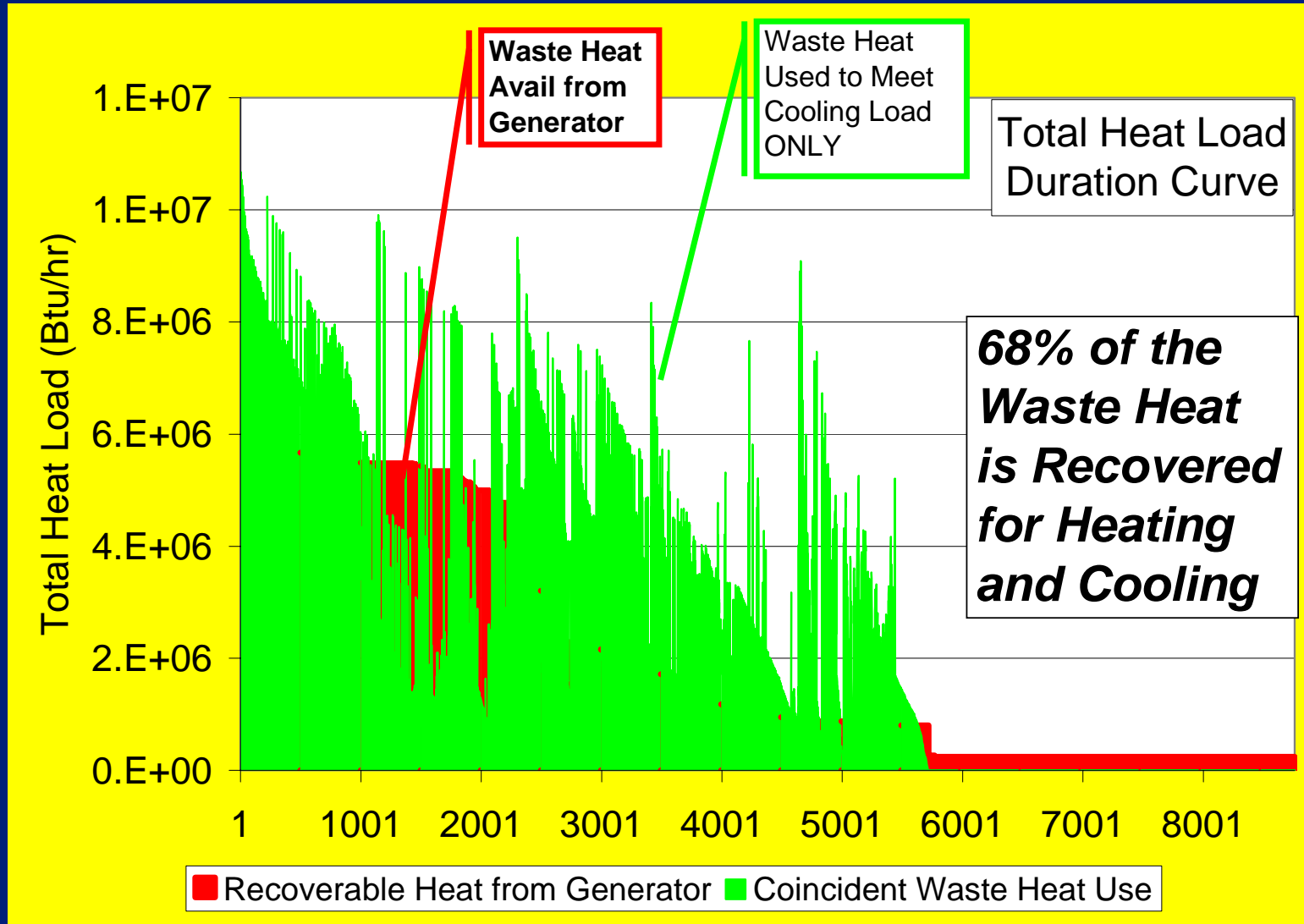
After Downsizing the Load and the Generator



How Much of This Waste Heat Can be Used for the Space Cooling?



How Much of This Waste Heat Can be Used for the Space Heating AND Cooling?



What To Look For In A CHP Application

- Good Electric & Thermal Load Coincidence
- Good Financial Benefits



Good Financial Benefits

- For Accurate Financial Analysis:
 - Develop Hr/Hr Electric & Thermal Load Profiles
 - Apply Actual Electric & Gas Rates to the Profiles
 - Identify & Quantify Other Benefits
 - » Avoid Instantaneous Outages
 - » Avoid Blackouts / Brownouts
 - » Increase Power Quality
 - » Lower Emissions
- Rules of Thumb Exist For Initial Screening, Capital Investments Made On Accurate Financial Analyses



What To Look For In A CHP Application

- Good Electric & Thermal Load Coincidence
- Good Financial Benefits
- Long Operating Hours For The CHP System

Long Operating Hours

- Operating Strategy Is Rather Simple:
 - Operate When You Can Generate Electricity At A Lower Cost Than You Would Pay If Purchasing From the Grid, Considering Both
 - » Energy (kWh)
 - » Demand (kW)
- Minimum Hours of Operation Normally 3000+ Hrs/Yr ---- (12 hrs/day, 5 days/wk)

What To Look For In A CHP Application

- Good Electric & Thermal Coincidence
- Good Financial Benefits
- Long Operating Hours For The CHP System
- Need For Power Reliability & Power Quality



Power Reliability & Power Quality

- Most CHP Systems Are Paralleled To The Grid:
 - Grid Perturbations Mitigated By The CHP System
 - Major Site Perturbations Mitigated By The Grid
- CHP Systems:
 - Increase System Reliability
 - Improve Power Quality
- What Value Can You Place On These Attributes?

CHP Is A Low Technical Risk

- Utilize Proven Technologies
 - Reciprocating Engines (Industrial Grade)
 - Turbines (Aero-derivative, Micro, Steam)
 - Absorption Chillers & Desiccant Dehumidifiers
- Employ Standard Design Practices
 - Thousands of Installations Nation Wide
 - Newer Technologies Are Integrated & Highly Automated
- Incorporate Good Maintenance Practices



Candidate Applications for CHP

- Hospitals
- Colleges / Universities
- High Schools
- Residential Confinement
- High Rise Hotels
- Fitness Centers
- Food Processing
- Paper / Lumber Mills
- Chemical Plants
- Metal Fabrication
- Ethanol Plants
- Landfill / Water Treatment Plants

Summary Messages

- CHP Is Not Right For Every Application In Every Location
- Where CHP Makes Sense, It Can & Will:
 - Lower Energy Costs
 - Increase Reliability
 - Improve Power Quality
 - Provide Standby Power
 - Lower Emissions
- Each Application Must Be Evaluated:
 - Initial Screening: Averages / Rules of Thumb
 - Capital Investments Require Detail Analyses



Summary Messages

- CHP Is A Low Technology Risk
 - Utilize Proven Technologies
 - Employ Standard Design Practices
 - Incorporate Good Maintenance Practices
- Involve Your Local Gas & Electric Companies Early In The Process

For Further Information

Contact:

Midwest CHP Application Center

John Cuttica

cuttica@uic.edu

(312) 996-4382

or

Leslie Farrar

Lfarrar@uic.edu

(312) 413-3835

Visit Our Website At:

www.chpcentermw.org

