

# Demonstration of a Modular Gas Turbine Cogeneration System

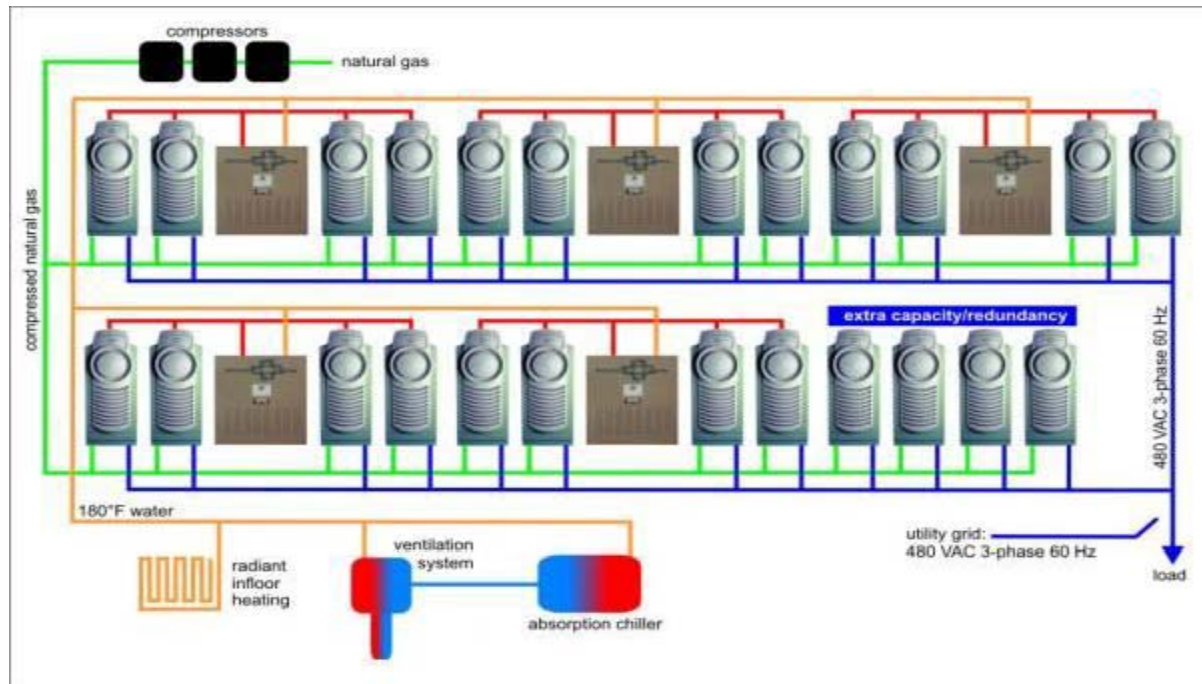
Northern Development  
Modern Energy Technology  
June 20, 2002



# Features

- First of Kind Installation Nationwide
- Plastics Injection Molding Plant
- Industrial Operating Environment
- Multiple Turbine Generators
- Redundancy, Lower Maintenance & Emissions Benefits

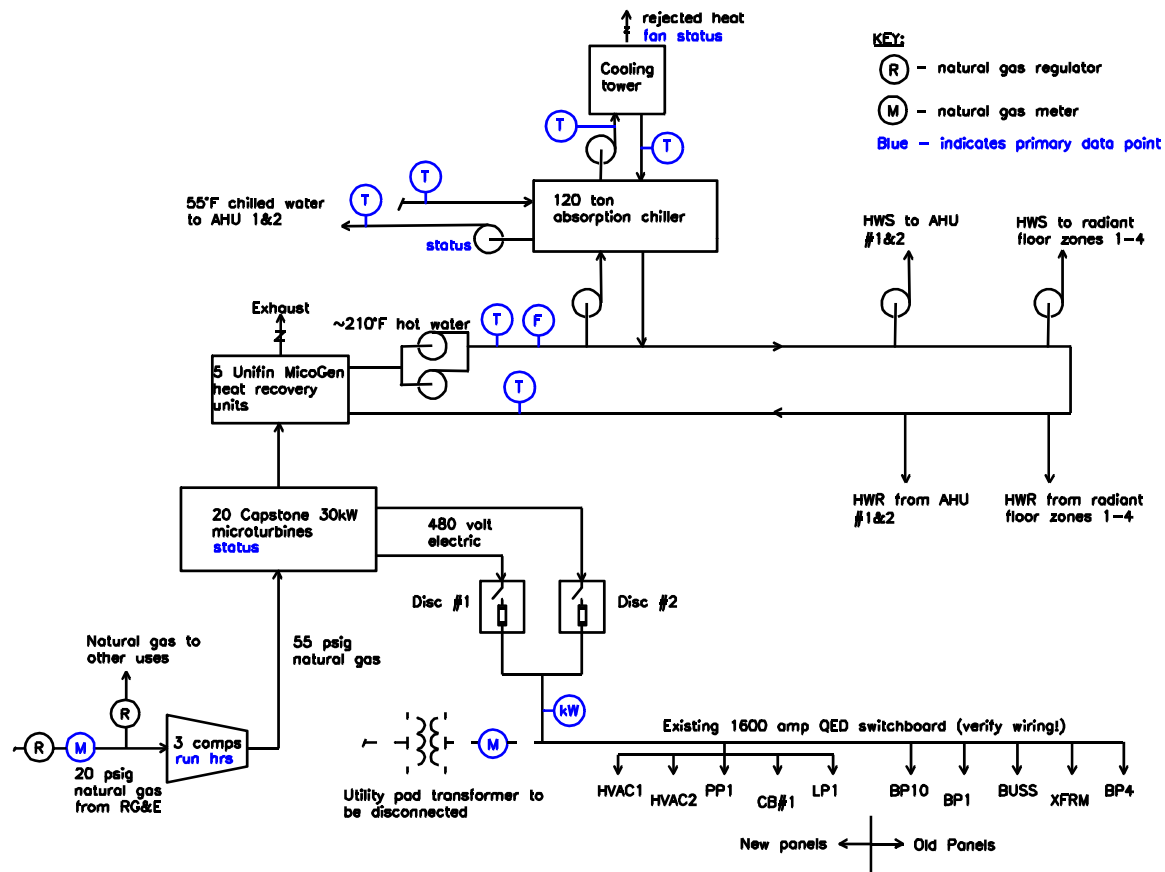
# Cogeneration Plant Schematic



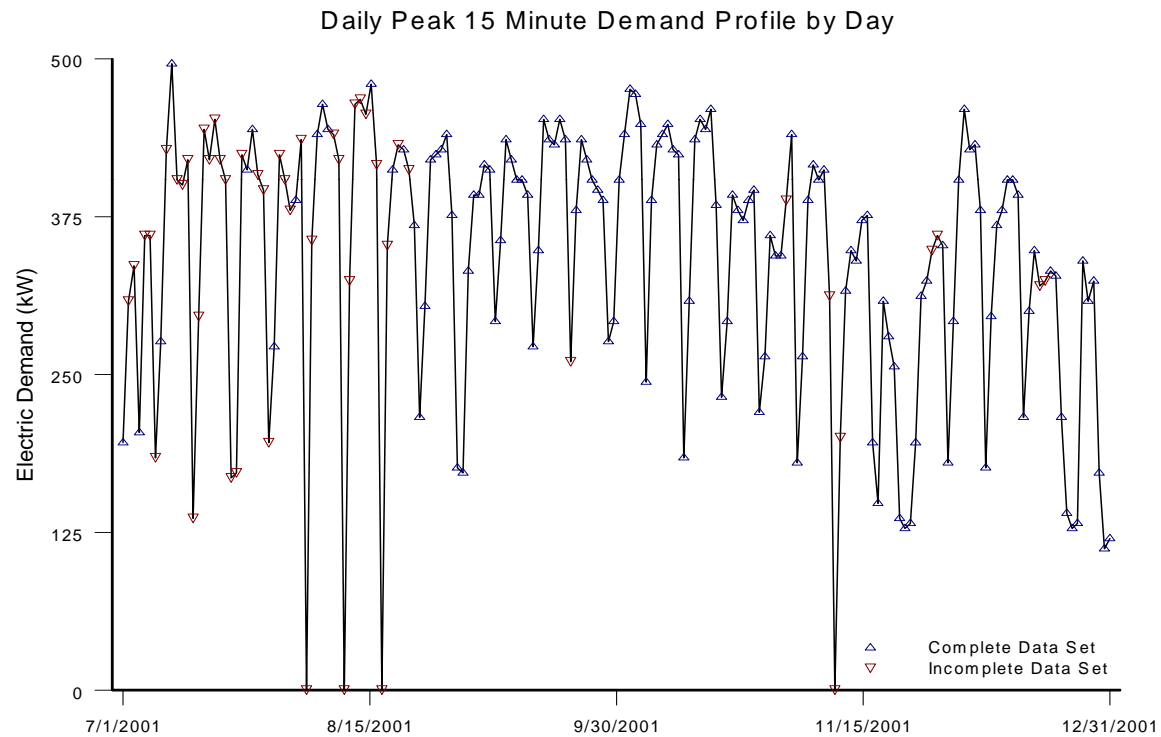
# Cogeneration Plant



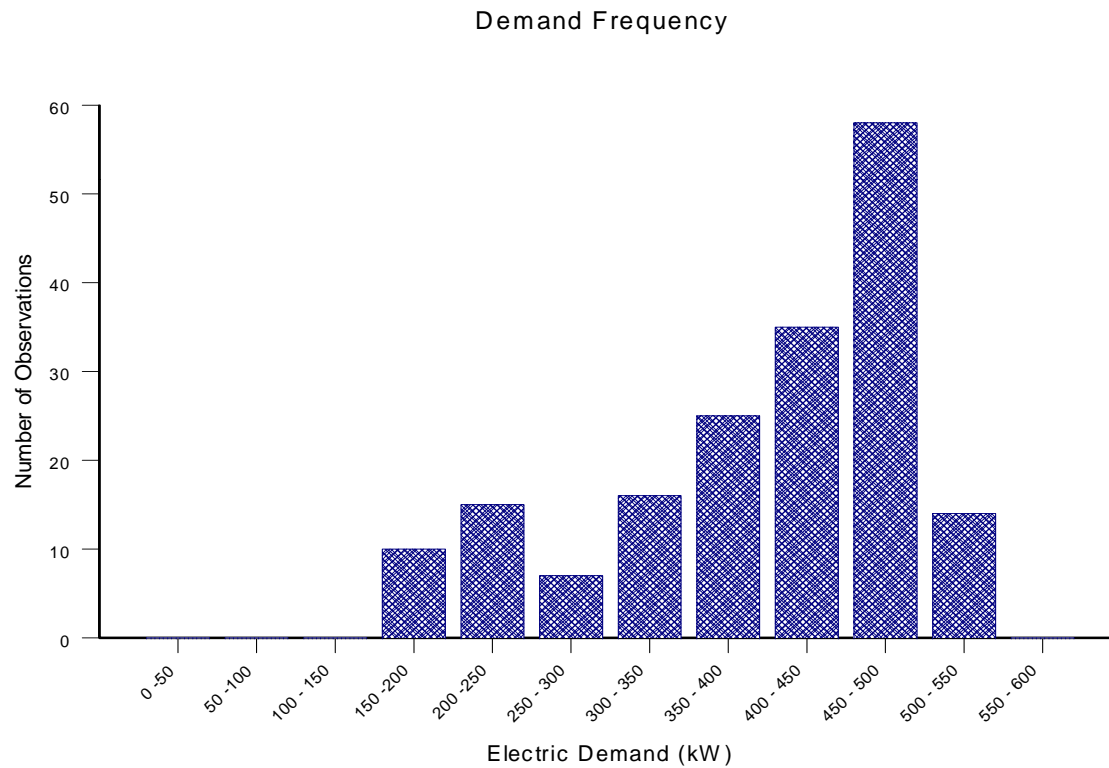
# System Monitoring Points



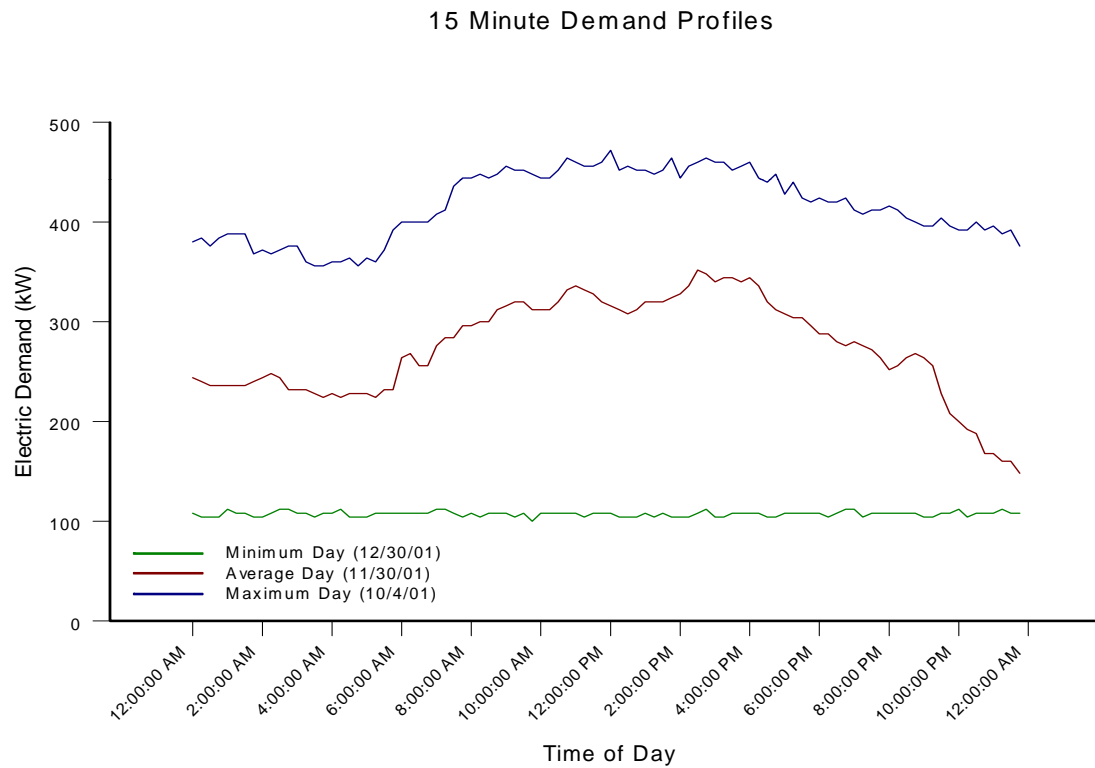
# Peak Demand Profile



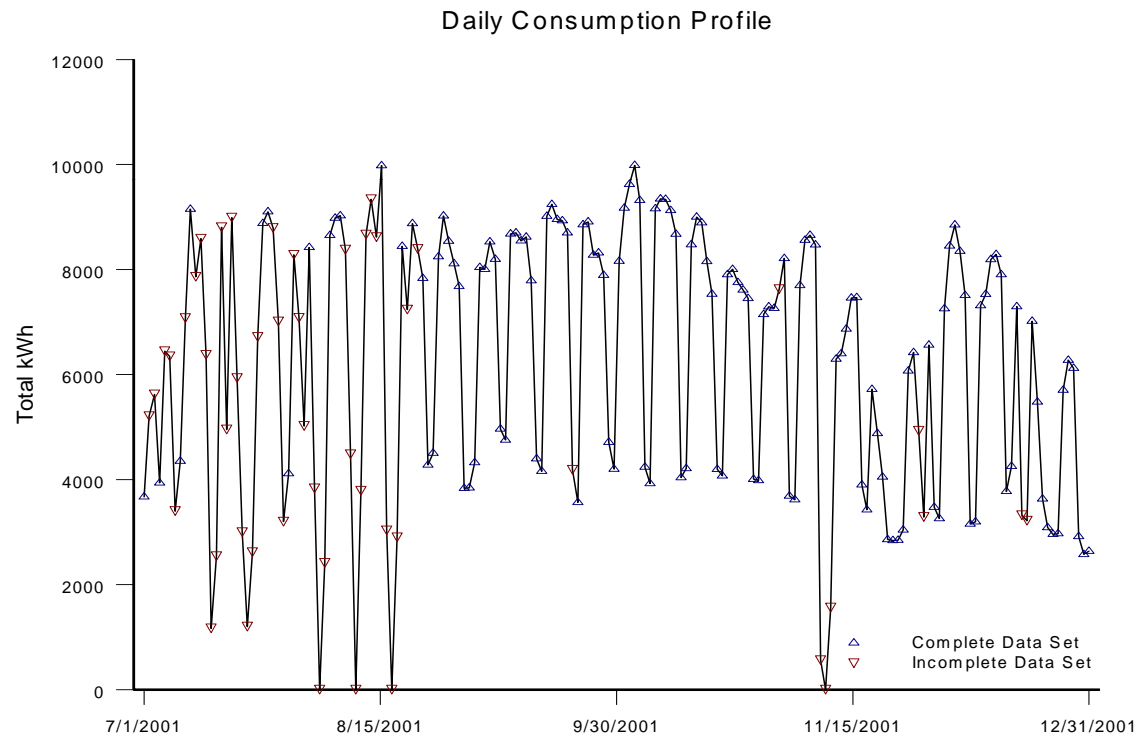
# Peak Demand Profile



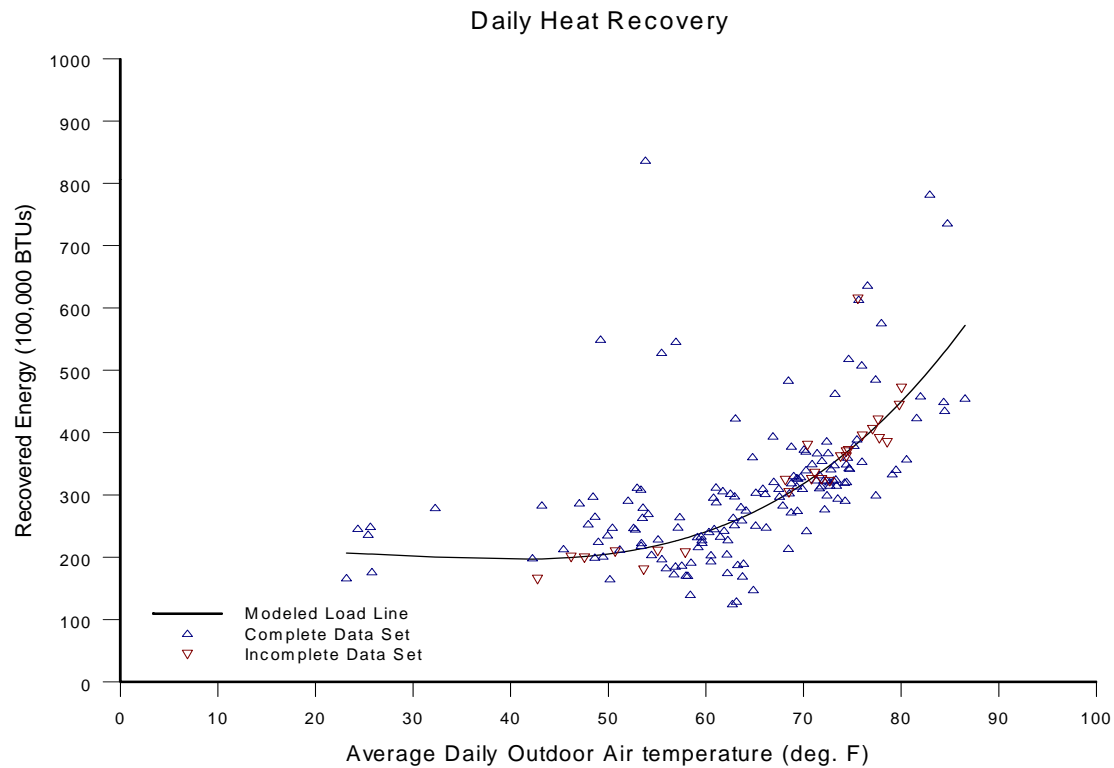
# Daily Demand Profile



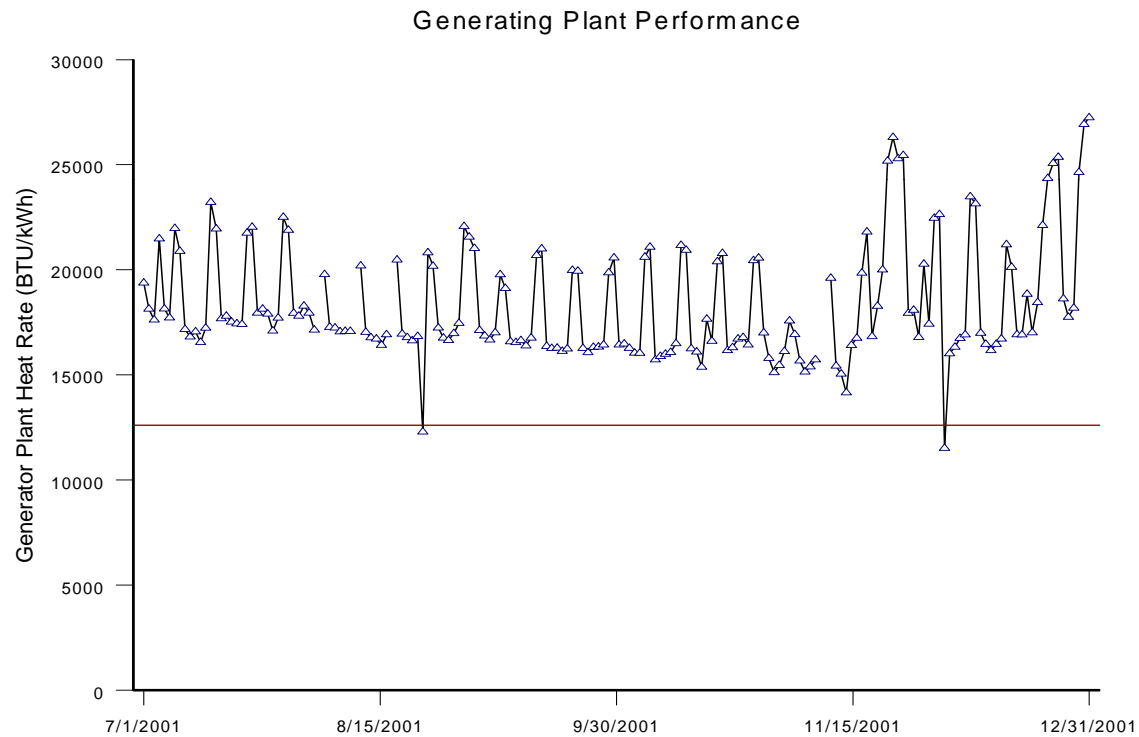
# Electricity Consumption



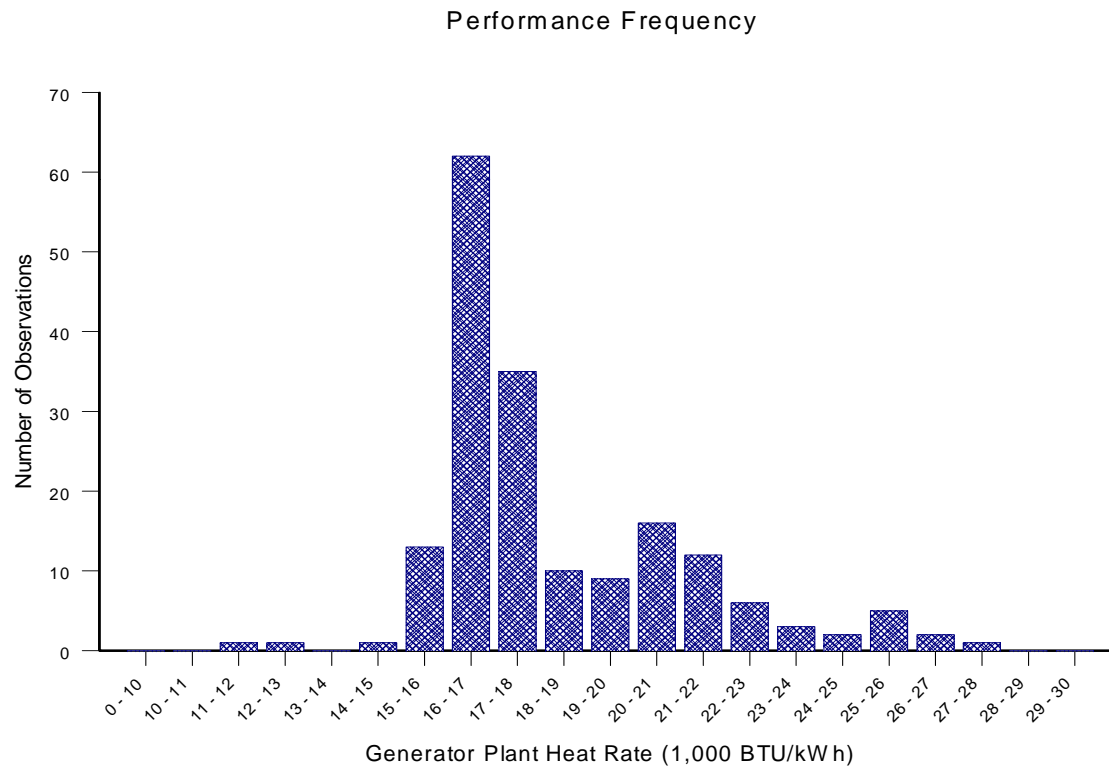
# Thermal Energy Requirements



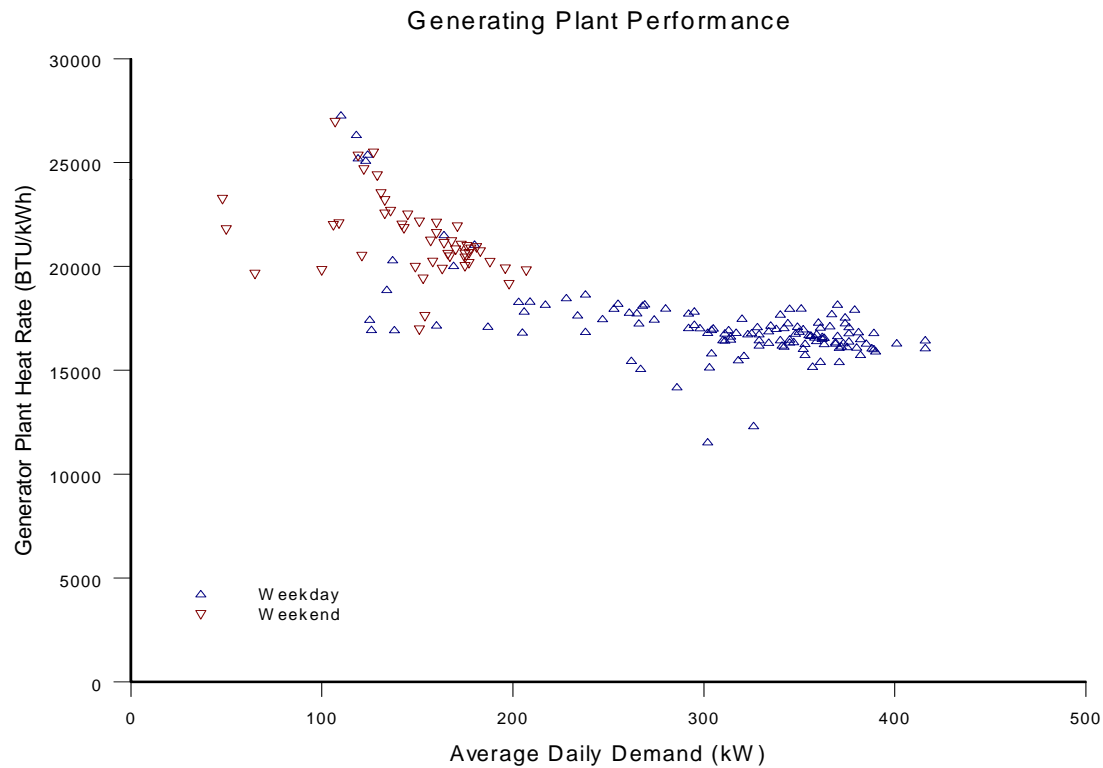
# Observed Heat Rate



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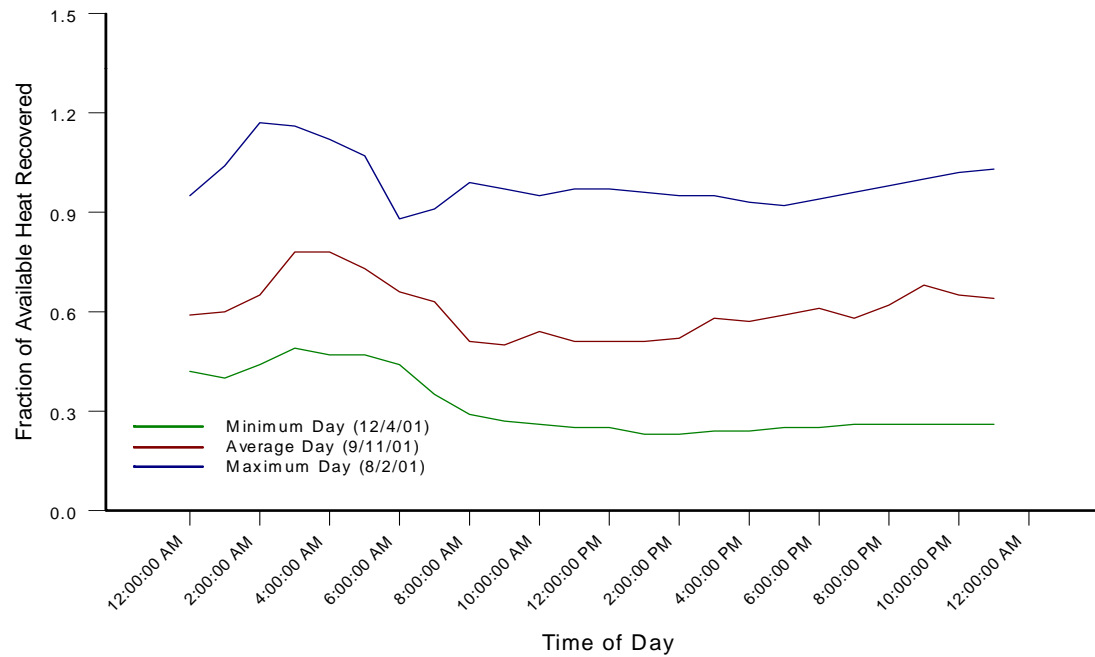


# Effect of Average Electric Load

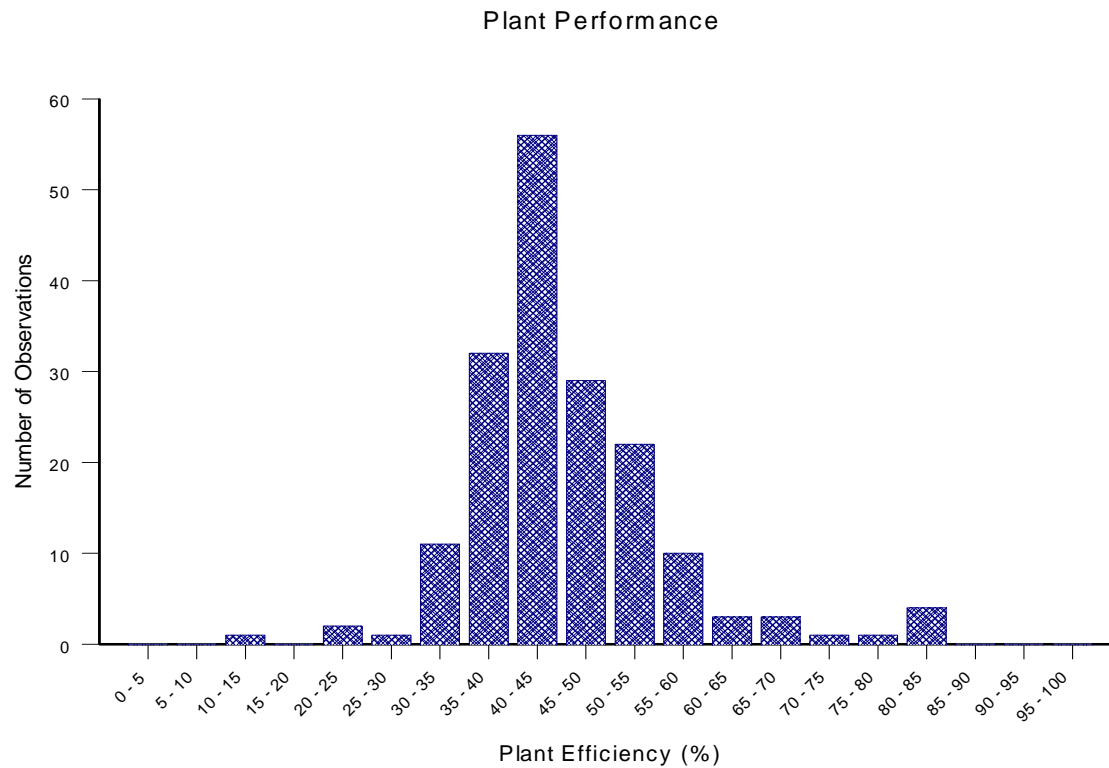


# Daily Heat Recovery

Heat Recovery Profiles



# Overall Cogeneration Efficiency





# Micro-Turbine Performance

- Average 40% Load Factor
- NO<sub>x</sub> Emissions Reduction of 40%
- Observed Heat Rate of 17,490 BTU/kWh
- On Specification (16,800 BTU/kWh)



# Cogeneration Performance

- Overall Efficiency 47%
- Payback Exceeding 10 Year Target
- Improve Operating Strategy (Dispatch)
- Increase Heat Utilization