

APPENDIX H
EFFICIENCY CALCULATIONS

GE LMS100 EFFICIENCY CALCULATIONS

ENGINE: (1) GE LMS100PA GAS TURBINE
 FUEL: Natural Gas 21404 Btu/lb (49786 kJ/kg) LHV

DATA FROM GENERAL ELECTRIC SPECIFICATION SHEET

Generator Output	94,289	kilowatts
Fuel Flow	35,765	lb/hr
Fuel LHV	21,404	Btu/lb
Generator Output	97,624	Kilowatts/hr
Maximum Heat Consumption	8084	Btu/kW-hr (Guaranteed)

Calculated Heat Input 765.51 MMBtu/hr, LHV

$$\text{Heat Input (Btu/hr)} = \text{Fuel Input (lb/hr)} * \text{Fuel LHV (Btu/lb)} = 35,765 * 21,404 = 765,514,060$$

$$\text{Heat Input (MMBtu/hr)} = \text{Heat Input (Btu/hr)} / 1,000,000 = 765,514,060 / 1,000,000 = 765.51$$

Conversion Factor 0.293255 watts per Btu/hr

$$\text{Heat Input (watts/hr)} = \text{Heat Input (Btu/hr)} * 0.293255 \text{ (watts/Btu)}$$

$$\text{Heat Input (watts/hr)} = 765,514,060 \text{ (Btu/hr)} * 0.293255 \text{ (watts/Btu)} = 224,490,927$$

$$\text{Heat Input (KWatts/hr)} = \text{Heat Input (Watts/hr)} / 1,000 = 224,490,927 / 1,000 = 224,490$$

Calculated Efficiency

Percent Heat Conversion

$$\text{Efficiency (\%)} = \text{Power Output (KW/hr)} / \text{Heat Input (KW/hr)} * 100$$

$$\text{Efficiency (\%)} = 97,624 \text{ (KW/hr)} / 224,490 \text{ (KW/hr)} * 100 = 43.487 \%$$

Heat Consumption

$$\text{Btu/kW-hr} = \text{Heat Input (Btu/hr)} / \text{Power Output (KW/hr)}$$

$$\text{Btu/kW-hr} = 765,514,060 \text{ (Btu/hr)} / 97,624 \text{ (KW/hr)} = 7841.45$$

Results from GE's Guaranteed Efficiency

Heat Consumption 8084 Btu/kW-hr

$$\text{Heat Input (Btu/hr)} = \text{Heat Consumption (Btu/KW-hr)} * \text{Power Output (KW/hr)}$$

$$\text{Heat Input (Btu/hr)} = 8084 \text{ (Btu/KW-hr)} * 97,624 \text{ (KW/hr)} = 789,192,416$$

$$\text{Heat Input (watts/hr)} = \text{Heat Input (Btu/hr)} * 0.293255 \text{ (watts/Btu)}$$

$$\text{Heat Input (watts/hr)} = 789,192,416 \text{ (Btu/hr)} * 0.293255 \text{ (watts/Btu)} = 231,434,622$$

$$\text{Heat Input (KWatts/hr)} = \text{Heat Input (Watts/hr)} / 1,000 = 231,434,622 / 1,000 = 231,435$$

Guaranteed Efficiency

Percent Heat Conversion

$$\text{Efficiency (\%)} = \text{Power Output (KW/hr)} / \text{Heat Input (KW/hr)} * 100$$

$$\text{Efficiency (\%)} = 97,624 \text{ (KW/hr)} / 231,435 \text{ (KW/hr)} * 100 = 42.182 \%$$