Zeckendorf Green Power Project

DG Integration and Telecommunications Facility

Project Manager: Doug Peck (Syska & Hennessy)

Sponsor: Department of Energy

ORNL Technical Project Officer: D. Tom Rizy

Oct. 2001

Telecommunications Industry

Overview

End of 2001:

- **137M People Online (Equal to Half US Population)**
- **Current Power Grid Becoming Overtaxed**
- **99.9% Reliable**

Verizon:

- **Merger between Bell Atlantic & GTE**
- **Services 63M domestic telephone lines**
- **In 1999 Verizon experienced 3 power disruptions**

Telecommunications Industry

Energy Needs

- **Highly Reliable (99.9999%)**
- **High Power Quality**
- **Economical Costs**

Concern:

How do we meet the high energy demands while reducing the cost?

Zeckendorf Project

- **Site Selection Process**

  Criteria

  1. **Critical Nature of Facility**
  2. **Ability to Duplicate System at Other Facilities**
  3. **Potential for Environmental and Energy Savings**
  4. **Cost Effectiveness**

- **Because of High Environmental and Economic Costs in New York, Team Selects Zeckendorf Facility in Long Island**

- **High Electrical Costs and Low Natural Gas Costs Coupled with a History of Commercial Power Outages**

Zeckendorf Facility

Zeckendorf Project

Zeckendorf Site

- **330,000+ s.f. Single Story Facility**
  (Combination of 80% Office and 20% Switching)
- **Controls Communication Traffic Throughout**
  Most of Long Island-(4 Million Households & 125,000 Businesses)

Presently has:

- **3 – 500 Ton Electric Chillers**
  (1 New/2 Need Replacement)
- **2 – 200 HP Boilers for Steam Heat**
- **2 – 2.5 mw Combustion Turbines**
  For Energy Stand-by Use

Energy Costs:

$2 Million/Yr.

Zeckendorf Project

Oak Ridge National Labs Subcontract 1/31/01

7 Original Tasks

1. **Analyze Existing Electrical System**
   (completed awaiting ORNL comments)
2. **Plan Task Report Submittal**
   (completed awaiting ORNL comments)
3. **Evaluate Building Heating and Cooling System**
   (completed awaiting ORNL comments)
4. **Evaluate Heat Recovery Options**
   (completed awaiting ORNL comments)
5. **Assess Site Utilities**
   (completed awaiting ORNL comments)
6. **Develop Schematic Design**
   (completed awaiting ORNL comments)
7. **Develop Cost Estimate**
8. **Reliability Study**

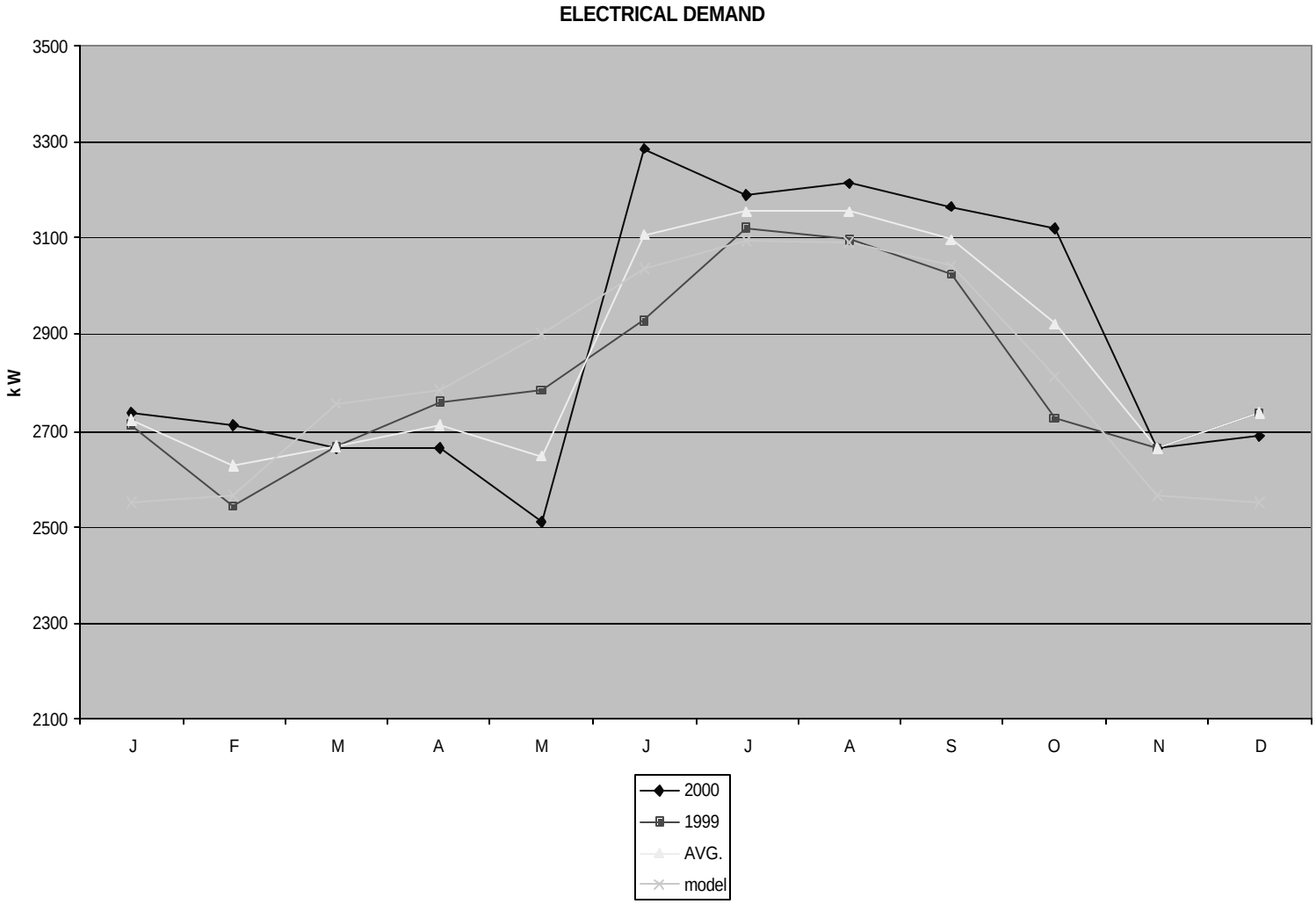
Zeckendorf Project

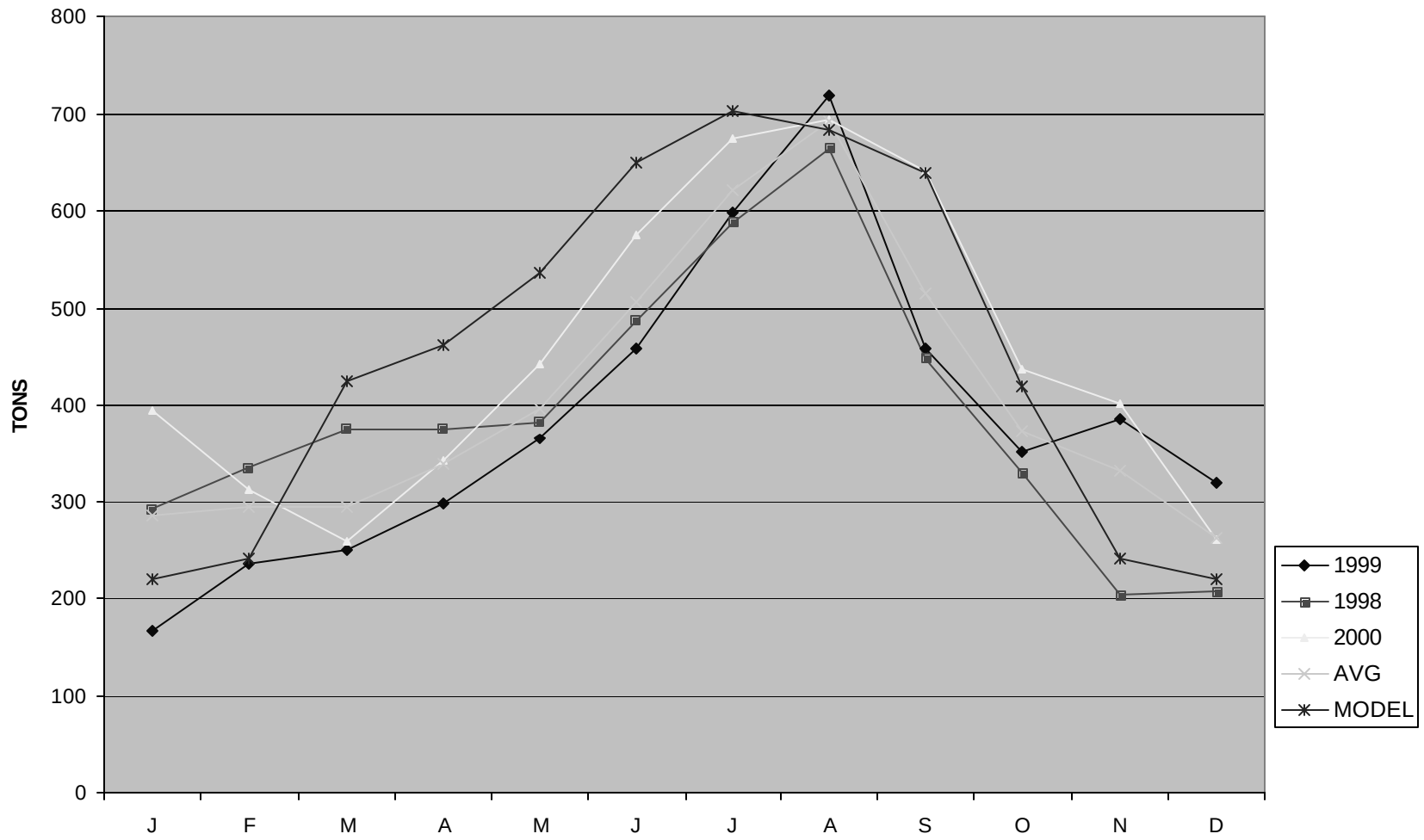
5 Additional Tasks

1. **Permitting**

   (completed awaiting ORNL comments)

2. **Optimization**
3. **Utility Pricing Study**
4. **Emissions**
5. **Business Case Development**


ELECTRICAL DEMAND
3500
3300
3100
2900
2700
2500
2300
2100
kW
J
F
M
A
M
J
J
A
S
O
N
D
2000
1999
AVG.
model


SUMMARY - CENTRAL PLANT - AVERAGE COOLING LOAD
TONS
800
700
600
500
400
300
200
100
0
J
F
M
A
M
J
J
A
S
O
N
D
1999
1998
2000
AVG
MODEL

Concept

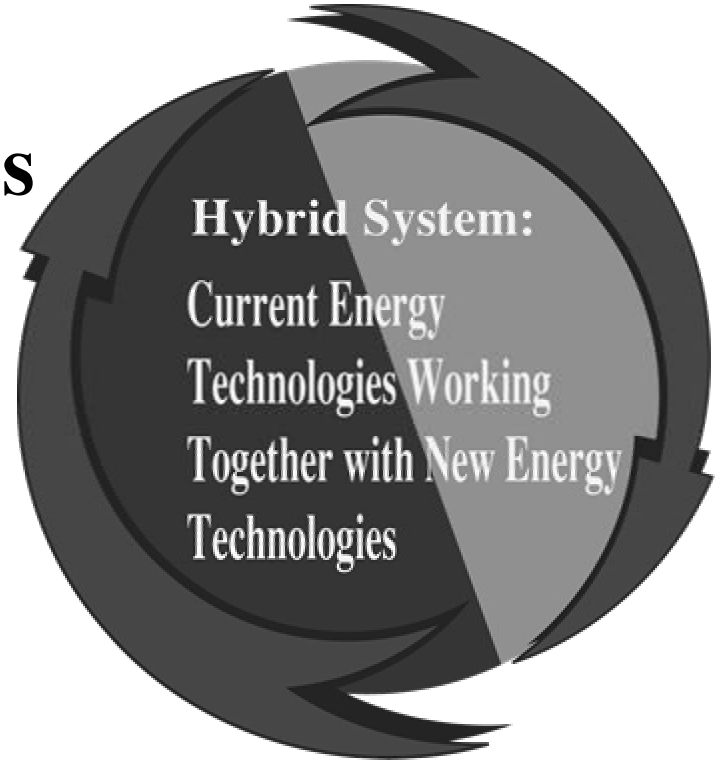
Create a Hybrid System

New Energy Technologies

✓PAFC Fuel Cells

Current Technologies

✓Reciprocal Natural Gas Fired Engine Generators



Concept

ONSI PC25

The 200kW PAFC manufactured by ONSI is 10'W x 18'L x 10'H. This consists of the fuel processor, cell stack, inverter, transformer, heat recovery, controls and diagnostics. Supplemental cooling module is 4'W x 14'L x 4'H.

Concept

Current Technology

Gas Fired Reciprocating Engine Generators

✓Highly Reliable

✓Low Emissions

✓Utilize Rejected Heat

✓Simple Design

Concept

How Do We Use This Hybrid System?

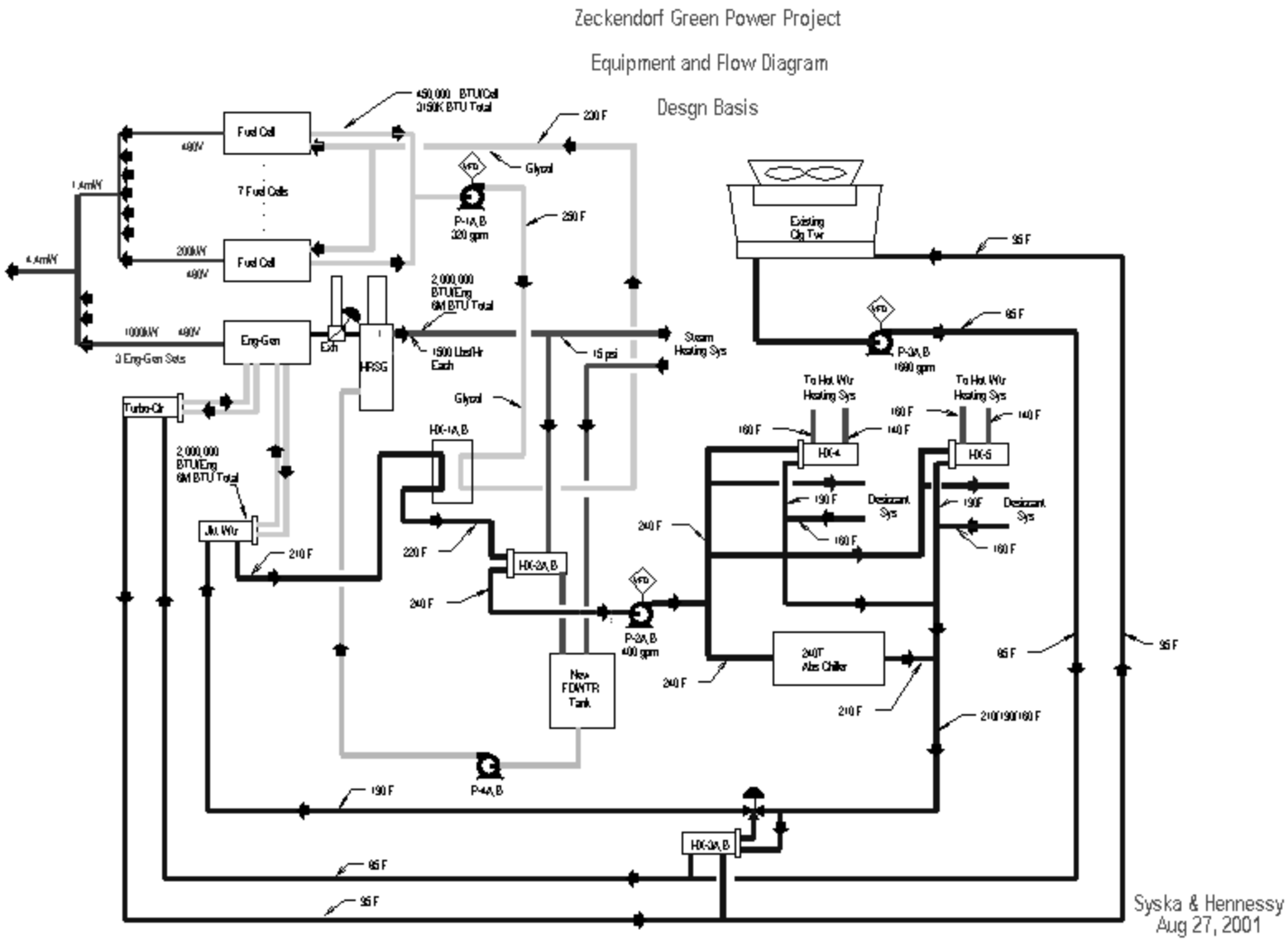
7 Fuel Cells

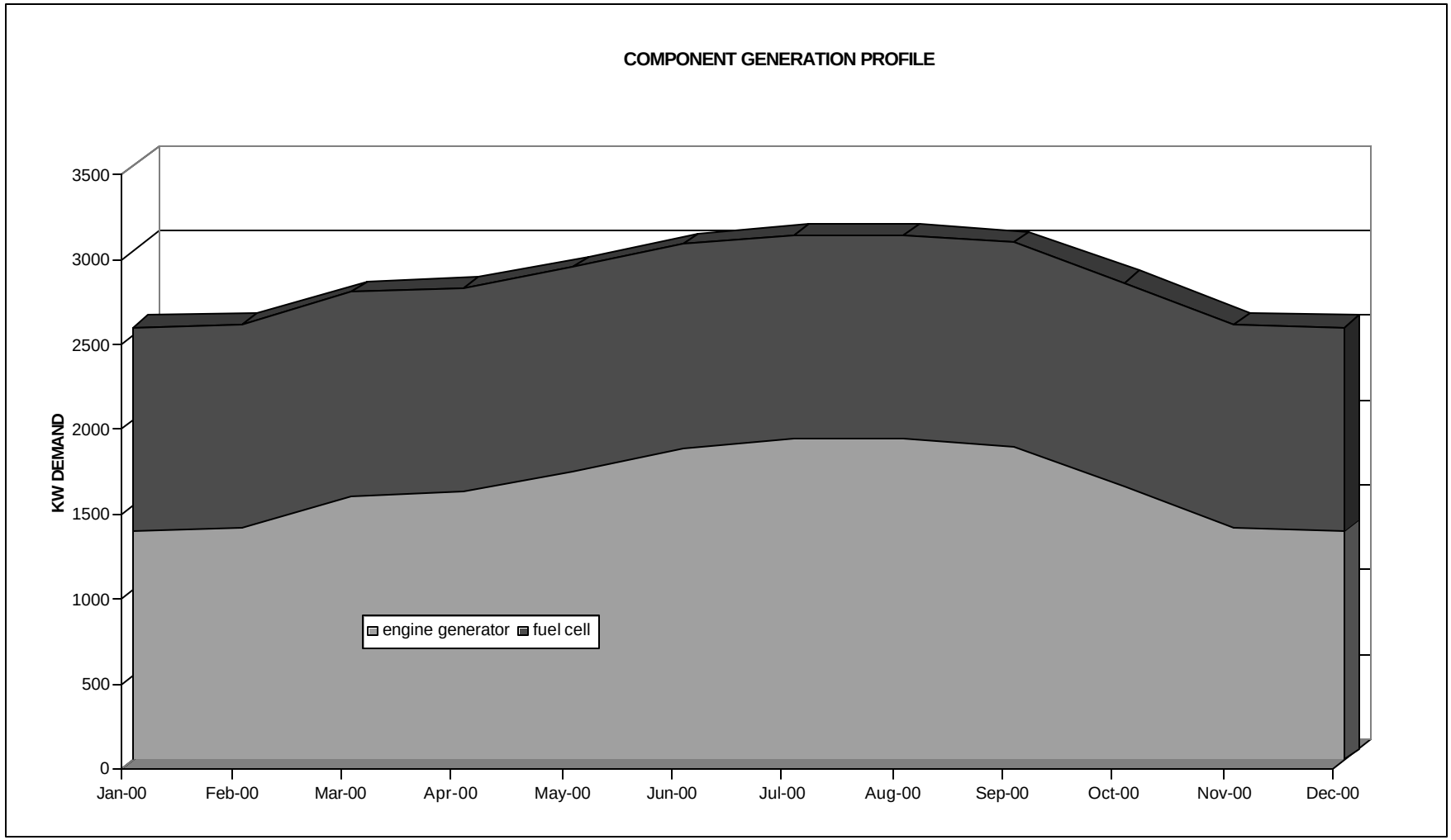
3 Engine Generators → **Generates Power at:** **4.4 MW Max**

3.2 MW@N+1

- ✓**Captured Waste Heat To Run 1 - 240 Ton Absorption Chiller**
- ✓**Additional Electric Centrifugal Fired Chiller (500 Ton)**

Concept


Zeckendorf Green Power Project
Equipment and Flow Diagram
Desgn Basis
Fuel Cell
7 Fuel Cells
Fuel Cell
Eng-Gen
3 Eng-Gen Sets
HRSG
Exh
Turbo-Clr
Jkt. Wtr
Glycol
P-1A,B
320 gpm
220 F
250 F
Steam
Heating Sys
15 psi
HX-1A,B
HX-2A,B
P-2A,B
400 gpm
New
FDNTR
Tank
P-4A,B
Existing
Clg Twr
P-3A,B
1600 gpm
95 F
85 F
To Hot Wtr
Heating Sys
HX-4
HX-5
Desiccant
Sys
240T
Abs Chiller
210 F
190 F
160 F
140 F
240 F
Syska & Hennessy
Aug 27, 2001


COMPONENT GENERATION PROFILE
KW DEMAND
3500
3000
2500
2000
1500
1000
500
0
engine generator
fuel cell
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00
Jul-00
Aug-00
Sep-00
Oct-00
Nov-00
Dec-00

Economics

Cost = $17 Million

Fixed Cost

- Chillers
- Engines
- Fuel Cells
- Construction

Variables

- Reduced Energy Cost From Captured and Reused Waste Heat

Emissions

Existing Design Configuration

Will not Exceed a PTE of 25 Tons/Yr of NOx

State Facility Permit will be Required

SEQR will be Required

Appears to Be No Barriers

Preliminary Utility Study

Electric

	SC-2 Rate	SC-12 Rate
0 PWR Used	$60K/yr	$90K/yr
3000 KW for 3 Hrs	$61K/yr	$91K/yr
3000 KW for 48Hrs	$72.6KW/yr	$124K/yr

(SC-12 May Be Discounted)

Gas Rate =$5.64/DTH

=$1.284 M/yr

Simplified Business Case

Estimated Cost	**= $17.5M**
Avoided Cost	**= $6.0M**
State and Fed Grants	**= $3.3 M**
Verizon Net Funding	**$8.2M**

Energy Expense Decrease	**= $1.25M/yr**
Maint Cost Savings	**= $0.625M/yr**
Savings	**= $1.875M/yr**
Payback	**< 5 Years**