

ELECTRICAL CO-GENERATION FOR THE FORT BEND COUNTY JAIL

An EECBG Funded Study

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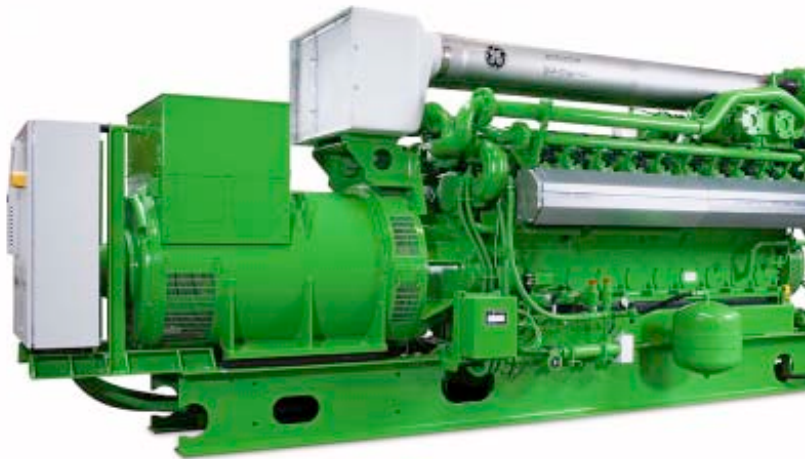
The Challenge

- Provide the County with a highly reliable and cost effective power supply for the jail.



The Response

- Install a natural gas driven combined heat and power plant



The Cases Studied

- 12 Cases were studied involving two different generating technologies and encompassing all of the county buildings surrounding the jail.
- City of Richmond Waste Water Plant included in study as well.
- Technology Vendors Provided Pricing Support

Case	Installed Cost	Annual Savings	Simple Payback (Years)	Description
1	\$ 4,040,000	\$ 258,052	15.7	Gen 100%, Sell Excess - South Side Only - Recip
2	\$ 3,863,493	\$ 444,694	8.7	Gen Demand - South Side Only - Recip
3	\$ 5,673,823	\$ 503,758	11.3	Gen 100%, Sell Excess - North and South Side - Recip
4	\$ 5,673,823	\$ 640,566	8.9	Gen Demand - Jail, Juv, JC - Recip
5	\$ 6,518,500	\$ 148,903	43.8	Gen 100%, Sell Excess - North and South Side - Turbine
6	\$ 6,618,500	\$ 405,246	16.3	Gen Demand - North and South Side - Turbine - Inlet Cool
7	\$ 7,018,500	\$ 511,425	13.7	Gen Demand - All County Buildings - Turbine - Inlet Cool
8	\$ 5,964,643	\$ 746,081	8.0	Gen Demand - All County Buildings - Recip
9	\$ 3,733,000	\$ 417,850	8.9	Generate Demand for Jail Only - Recip
10	\$ 5,810,194	\$ 709,397	8.2	Generate Demand - Jail, Juv, JC, WWTP - Recip
11	\$ 6,968,500	\$ 809,388	8.6	Generate Demand - Jail, Juv, JC, WWTP - Turbine
12	\$ 6,173,014	\$ 801,678	7.7	Generate Demand - All County and WWTP - Recip



The Best Case

- Install a facility large enough to provide
- power and distribute to the following
- buildings:
- The Jail (Both Towers)
- Patrol/CID
- Vehicle Maintenance
- The Juvenile Detention Center
- The New Justice Center
- The Tax Office
- The Precinct 1 Building
- The Gus George Academy
- The Richmond Waste-Water Treatment Plant



The Best Case

- \$800,000 Annual Utility Savings



Cost Components

Proforma	
Avoided Natural Gas Cost	\$ (57,629)
Adjusted Annual Fuel Cost	\$ 1,032,410
Less Revenue	\$ 345,824
Net Annual Operating Cost	\$ 686,586
Annual O&M Cost	\$ 228,653
Total Annual Cost	\$ 915,238
Historical Annual Electricity Costs	\$ 1,716,916
Annual Utility Savings	\$ 801,678
Capital Costs	\$ 6,173,014
Simple Payback (Years)	7.7

Capital Costs	
GenSet	\$ 3,000,000
Aux. Eqpt.	\$ 678,500
Design/Const	\$ 1,590,000
Distribution	\$ 904,514
Total	\$ 6,173,014

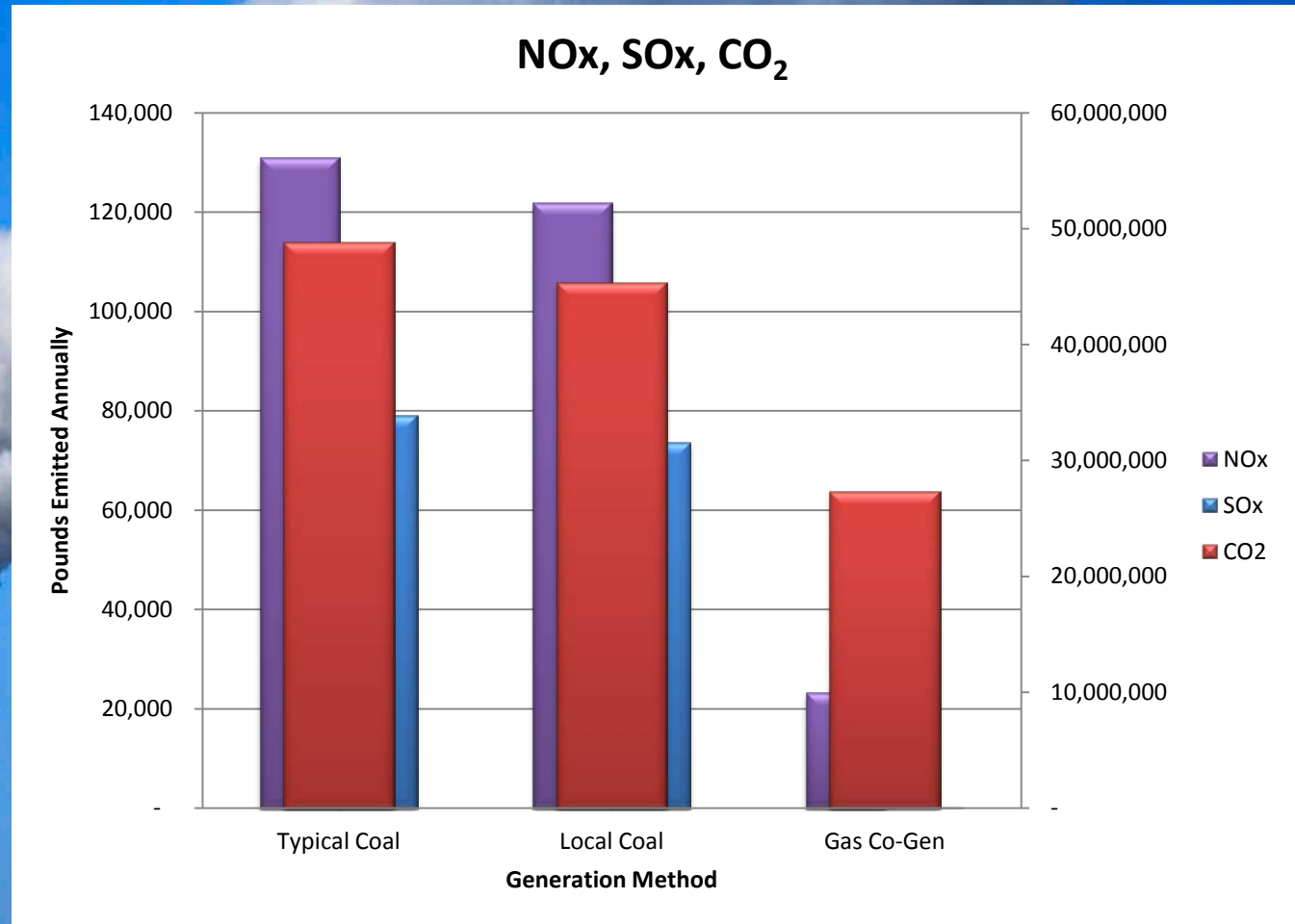
Major Components	
Engine/GenSet	
Waste Heat Recovery Unit	
Exhaust Ducting and Stack	
Switchgear	
Piping	

Major Components	
U/G Distribution	
MV Cable	
Aluminum 1/0	
GND	
Ductbank (Schedule 40 PVC 1@4")	
Excavation/Select Fill	
Manhole	
Transformer(s)	
Jail	
CID/Vehicle Maintenance	
Justice	
WWTP	
Juvenile	
Tax Office	
Precinct 1	
Gus George	
Transfer Switches	
Jail	
CID/Vehicle Maintenance	
Justice	
WWTP	
Juvenile	
Tax Office	
Precinct 1	
Gus George	

Generation Costs			
Capacity	50%	75%	100%
Power Generated (kW)	2163	3269	4375
Fuel Flow (MMBTU/Hr)	17.36	24.80	32.25
LHV->HHV (10%)	19.10	27.28	35.48
Avg. Monthly Fuel Cost (\$)	\$ 78,352	\$ 111,932	\$ 145,556
Monthly kWh Available	1557360	2353680	3150000
Avg. Cost to Generate \$/kWh	\$ 0.050	\$ 0.048	\$ 0.046

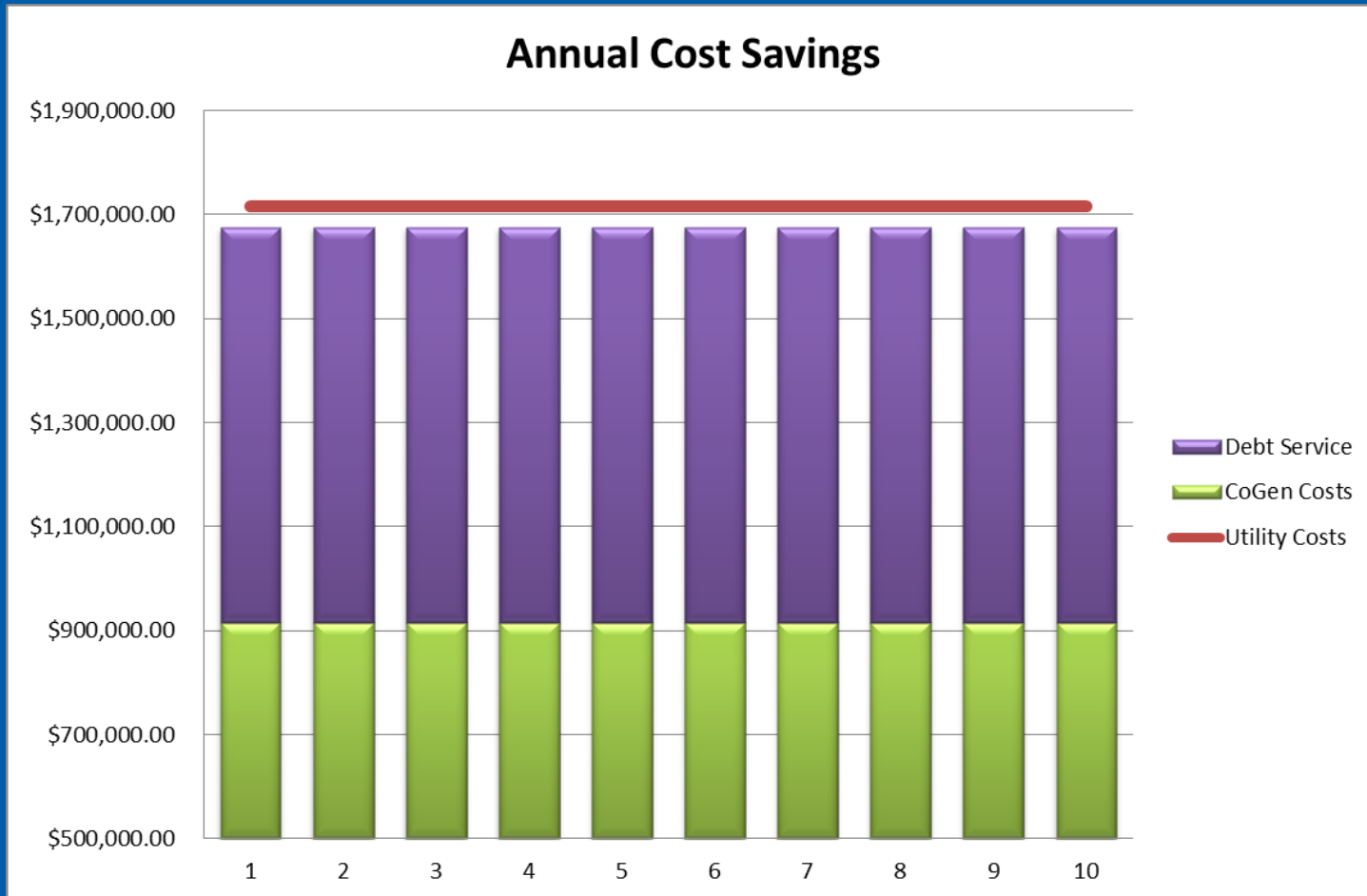
The Best Case

15,000,000 lbs. of CO₂ Avoided



The Best Case

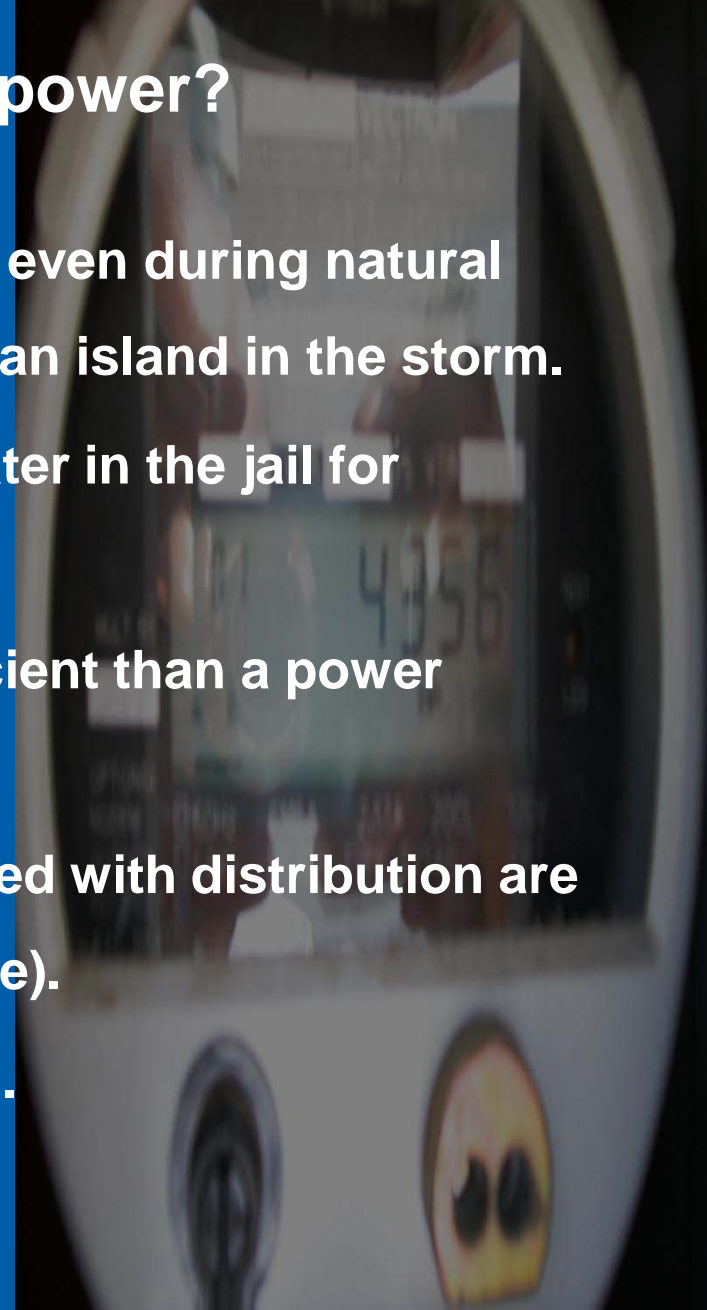
\$40K Annual Savings after Debt Service



Debt Service Assumes 4% Interest Rate with annual payments.

How is this better than conventional power?

- The natural gas supply is highly reliable even during natural disaster events making the jail complex an island in the storm.
- CHP Captures waste heat for heating water in the jail for laundry, cooking and building heating.
- The CHP engine is equal to or more efficient than a power plant .
- The plant is local so the losses associated with distribution are eliminated (typically 7% - 10% nationwide).
- Natural Gas is cleaner burning than coal.



Can We Generate More and Sell the Excess?

- GEXA will buy excess power based on ERCOT's LMP.
- It costs about \$0.048/kWh to generate.
- The County can sell power based on ERCOT's Locational Marginal Price (LMP) for the Houston Zone (HZ) which historically exceeds \$0.048/kWh only in February and August.
- Potential Revenue = \$345,000 annually

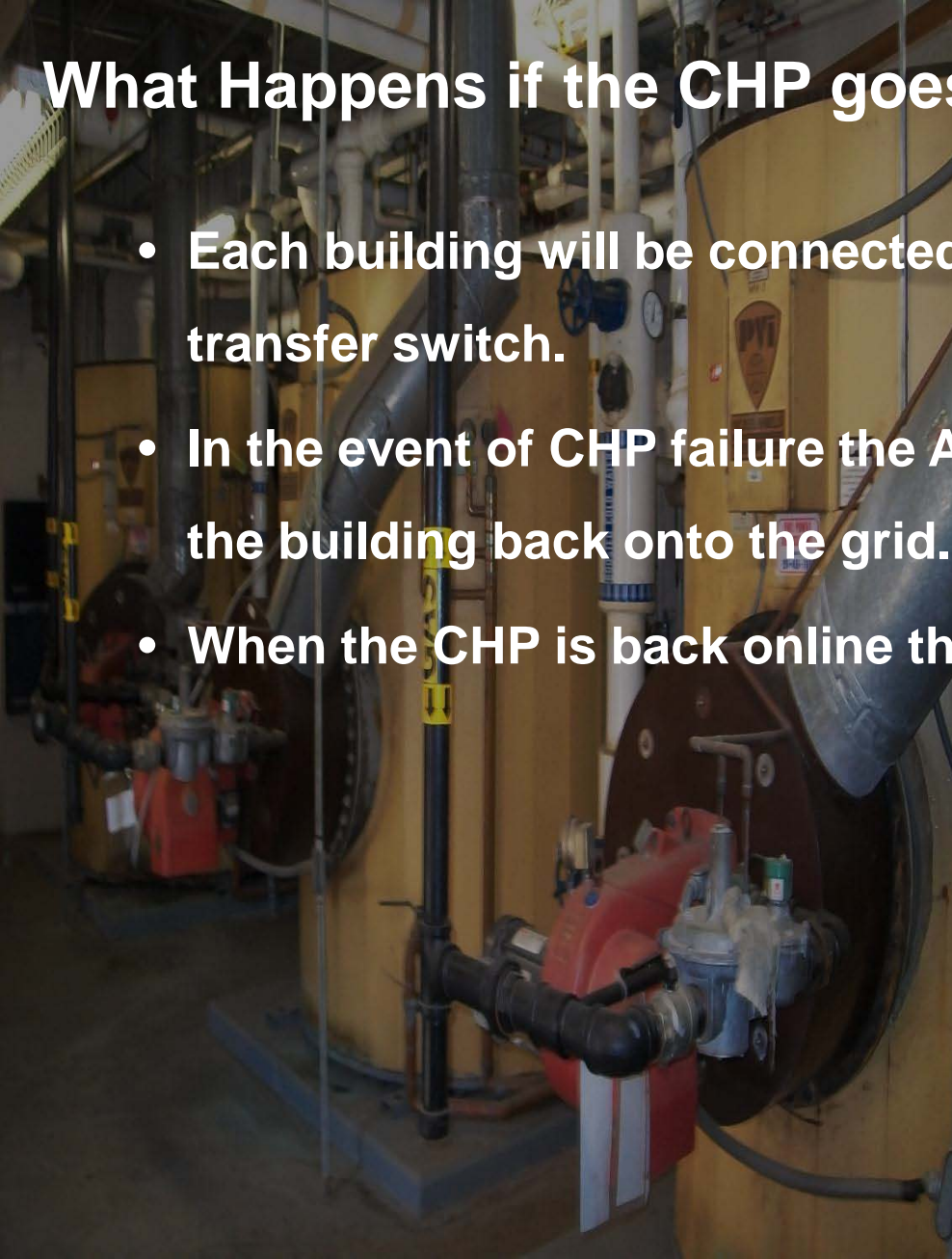
How Reliable is the CHP?

- Both Turbines and Reciprocating Engines are Highly Reliable.
- Manufacturers claim 95% - 97% availability.
- Downtime is attributed to scheduled maintenance.



What Happens if the CHP goes offline?

- Each building will be connected to the grid via an automatic transfer switch.
- In the event of CHP failure the ATS will automatically switch the building back onto the grid.
- When the CHP is back online the ATS will switch back.



What is the cost to go back on the grid?

- The County will pay for power based on ERCOT's Locational Marginal Price (LMP) for the Houston Zone (HZ) plus normal distribution charges.
- **There is no 'standby' charge from CenterPoint**
- Scheduled maintenance should coincide with non-peak periods to minimize these costs.

Reiterating the Advantages

- Lower Overall Utility Cost
- Reduced Carbon Footprint
- Protection from Power Outage Events



Next Steps

- Go Green and Save Money!
- Authorize Design Phase
Design Estimate \$385,000.00

