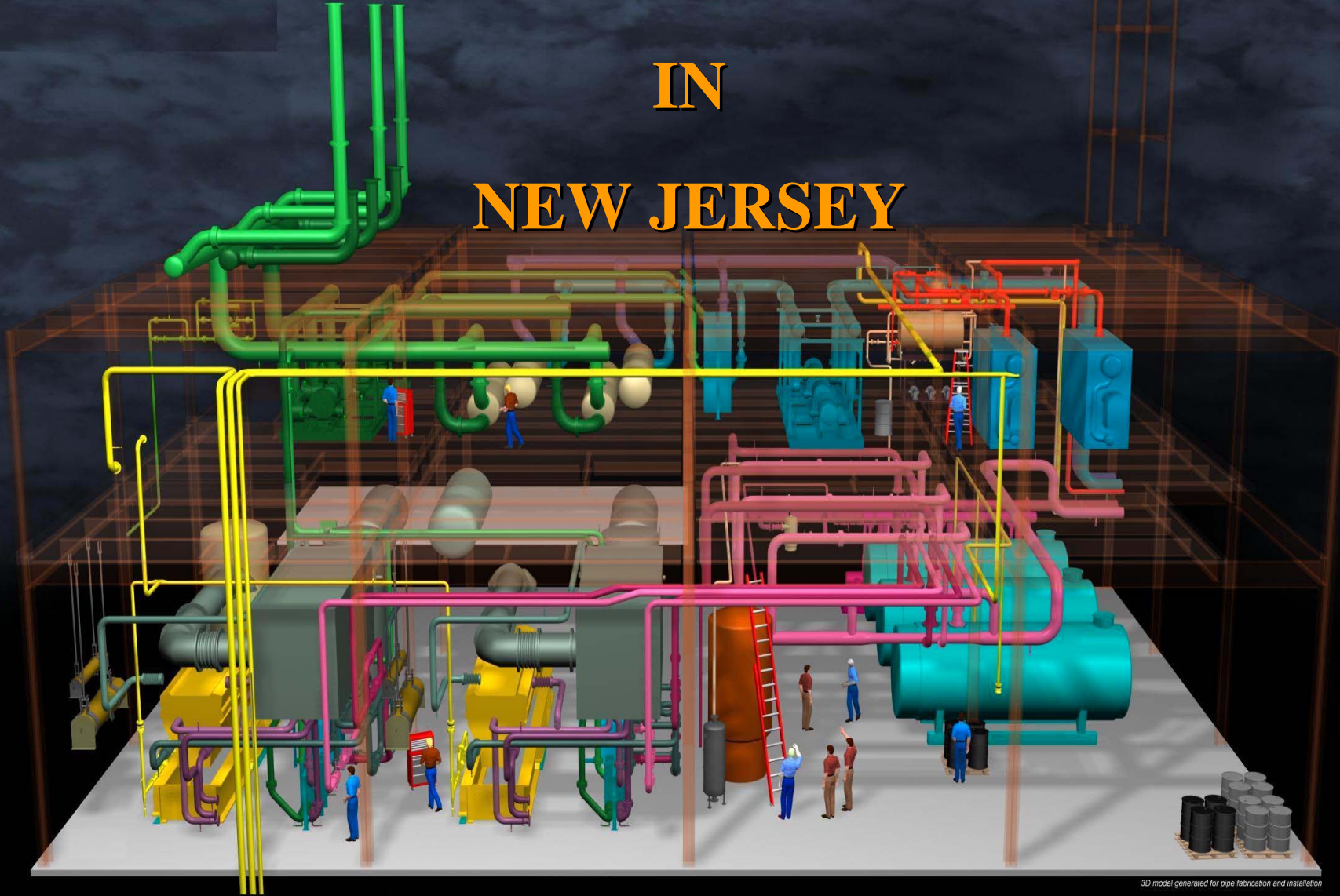


# COMBINED HEAT & POWER PROJECTS

IN

NEW JERSEY



3D model generated for pipe fabrication and installation

The 2007 New Jersey  
Clean Energy Conference  
& Leadership Awards **Clean Energy. Smart Business.**  
Partnering for Climate Change Solutions



Concord  
Engineering  
Group



# Essex County Correctional Facility, Cogeneration Project – financing plant frees capital dollars

- Public Project
- 20yr thermal contract
  - 6 mW reciprocating engine facility (2 units)
  - Natural gas
  - SCR for NO<sub>x</sub> control
  - Hot water heat recovery
  - Gas compressor
  - 3 – 800 HP hot water generators
  - 3300 tons of chilled water
  - Electric Utility Interconnection PSE&G



# Rowan University Central Utilities Plant – Energy Master Plan allows phased construction

- Public Project
- Fixed Price Public Bid w/\$1 million Clean Energy Grant
- 3 MW and 1.3MW Combustion Turbines
- HRSG
- Steam Turbine Chillers
- Electric Chillers
- 69KV Substation
- Steam Piping upgrade
- New Central Chilled Water Piping distribution



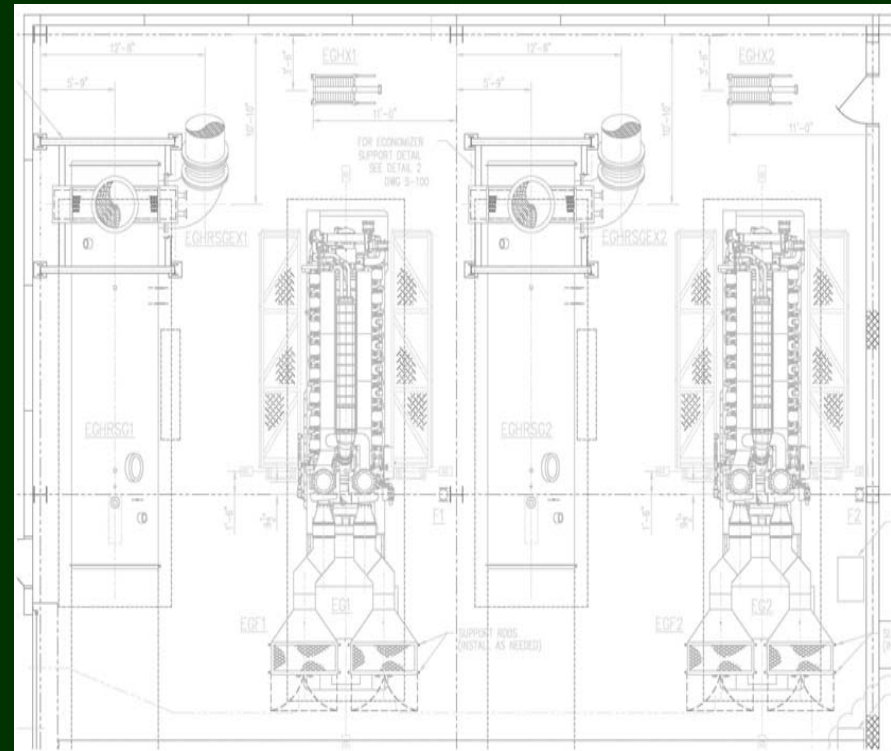
Concord  
Engineering  
Group





# Johnson Matthey Cogeneration Facility – reduced electric risk

- Private Project
- Fixed Price Contract
  - 6 mW reciprocating engine facility (2 units)
  - Natural gas
  - SCR for NO<sub>x</sub> control
  - 4700 # per hour, 125 psig steam
  - Gas compressor
  - Electric Utility interconnection – Atlantic Electric



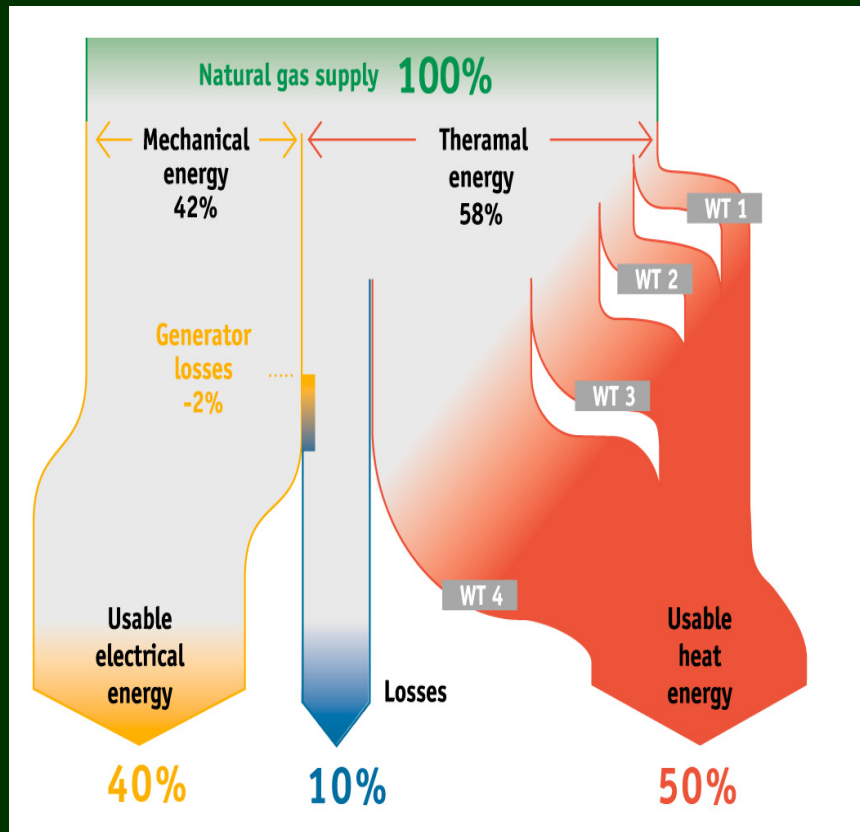
# Raritan Valley Community College – cycling engine during low loads & Demand Response revenue stream

- Public Project
- Fixed Price Public bid w/\$1 million Clean Energy Grant
  - 1.3 mW reciprocating engine
  - Natural gas
  - SCR for NO<sub>x</sub> control
  - Hot water heat recovery to Central plant
  - Hot Water Absorber Chiller
  - Electric Utility interconnection PSE&G



# Energy Efficiency Through CHP Applications

## CHP Energy Balance

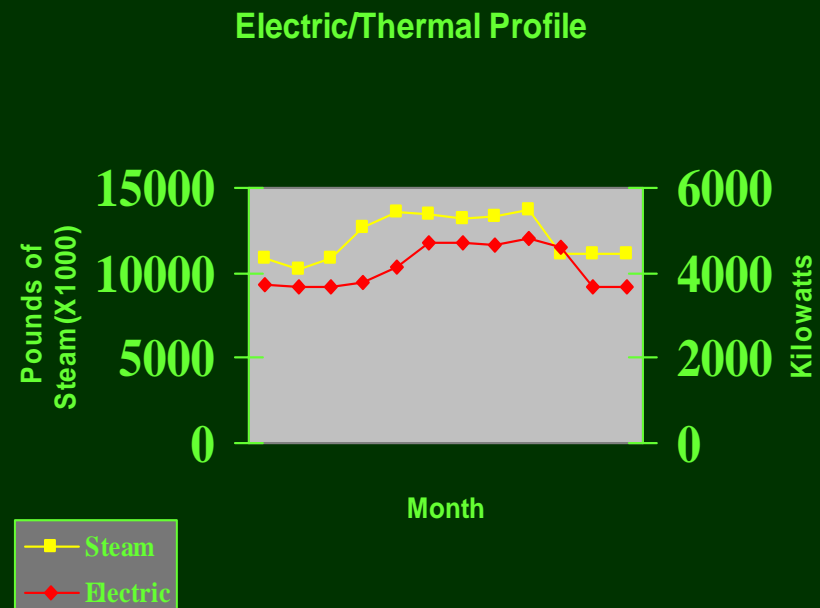


- Conventional power plant averages 35% efficiency
- CHP enables up to 90% efficiency
- WT 1- Intercooler
- WT 2- Oil Cooler
- WT 3- Jacket Water
- WT 4- Exhaust gas

# Energy Efficiency Through CHP Applications

## Project Evaluation

- Evaluate applicable technologies
  - Electric/Thermal proportions
  - Cyclic operation
  - Size of base load
  - Consideration of peaks



# Energy Efficiency Through CHP Applications Screening Model

## CHP SCREENING MODEL

### PARAMETERS

Unit Size (Gross kW)	2990
Unit Size (Net kW)	2840.5
Fuel Input (mmBTU/hr)	24.55
Thermal (mmBTU/hr)	8.34
Hours/Year:	8760
Availability:	96%
Operating Hours/Year	8410
Gas Price (\$/mmbtu):	\$7.75
Variable O&M (\$/kWh)	\$0.010

### ENERGY BASELINE

Base Year Thermal (mmBTU):	186,808
Base Year Electric (kWh)	28,384,200
Base Year Electric Cost (\$)	\$2,511,054
Boiler Efficiency (%)	75%
Fuel to Generate Thermal (mmBTU)	276,476
Cost to Generate Thermal (\$/yr)	\$2,142,688
Cost of Electricity	\$0.0885





# Energy Efficiency through CHP Applications Screening Model

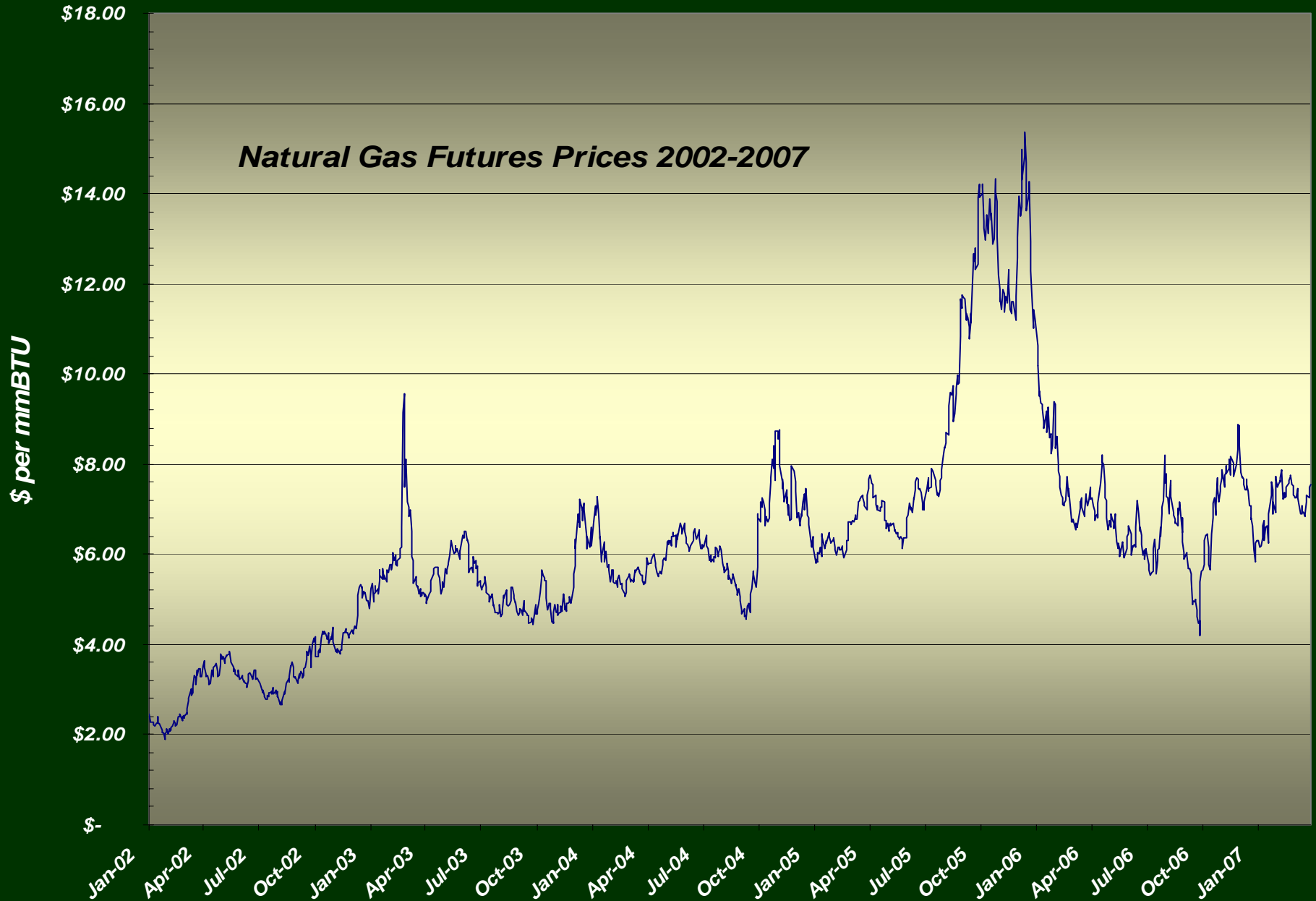
## CHP SCREENING MODEL

Results	
Output (kW)(ISO):	2,841
Heat Rate (btu/kwh) - HHV	9,114
Fuel Input (mmbtu/hr) - HHV	27.25
Thermal Production (mmBTU/hr)	8.34
Total kWh	23,887,469
Fuel burned -HHV (mmbtu)	229,166
Fuel Cost	\$1,776,035
Variable O&M Cost (\$)	\$238,875
CHP Thermal Production (#)	70,136
Additional Thermal Required (#):	116,672
Additional Fuel Required (btu)-HHV	172,674
Additional Fuel Cost	\$1,338,227
Total Cost	\$3,353,137
Purchased Electricity (kWh)	4,496,731
Additional Electric Capacity Req'd (kW)	513
Cost of Purchased Electricity	\$397,811
Net Cost of Power	\$3,750,947

Capital Cost (\$/kW)	Capital Cost (\$)	Savings (\$)	Payback (years)
\$900	\$2,691,000	\$902,794	3.0
\$1,000	\$2,990,000	\$902,794	3.3
\$1,100	\$3,289,000	\$902,794	3.6
\$1,200	\$3,588,000	\$902,794	4.0
\$1,300	\$3,887,000	\$902,794	4.3



### Natural Gas Futures Prices 2002-2007



# Obstacles

- CHP is not my core business.
  - *Solution: Outsourced thermal contract reduces risk.*
- No Correlation b/w short term Natural Gas and Electric Pricing (sparkspread unfavorable).
  - *Solution: Long term price models will always correlate.*
- Campus/City locations require large thermal piping investments.
  - *Solution: Provide low interest loans and public financing assistance. Also, extend Life Cycle Analysis beyond 25 years.*
- CHP Electric Sales beyond a “contiguous” lot line.  
*Solution: “CHP Micro-grid”- follow lead from Conn. and soon Pa.*



# Obstacles

- CHP Natural Gas Rates is not favorable.
  - Post 1996 Sales & Use Tax +7%, Post 2003 CHP rates not available. Ex. PSE&G CIG rate +10%
- *Solution: Reinstate CHP natural gas rates*
- Payback is not favorable.
- *Solution: Develop other revenue streams such as;*
  - *CHP REC's, White Tag markets with floor pricing.*
  - *Expand Demand Response programs to fit CHP more favorably.*
  - *Provide better parity b/w CHP grants/rebates and DSM and Renewable rebates.*





# Trump Properties Reaps Immediate Benefits from Guaranteed Energy Savings Projects

**TRUMP**  
MARINA



**TRUMP**  
TAJ MAHAL

**Mike Fischette, P.E., C.G.D**  
Corporate Principal  
Concord Atlantic Engineers, Inc,

**Joseph S. Polisano**  
Vice President of Project  
Development  
Trump Entertainment Resorts, Inc.



Concord  
Engineering  
Group



## • **The Big Picture...**

- 1. \$ 23 Million Investment yields Savings \$11.35 Million in Savings.**
- 2. Extended Equipment Life, Reduced Maintenance Increased Comfort and Reliability ...**
- 3. Saved 90,000,000 Kwh annually in Electric Usage.**

***This is more than 3x the power generated by the Atlantic City Wind Farm***

