

# BUSH POWER GROUP LLC

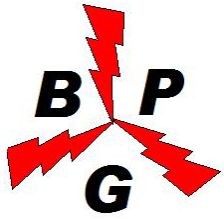
“Power is Our Middle Name”

35 Coralvine Ct., The Woodlands, TX 77380

(O) 281-296-2015 (F) 888-588-9243 (E) [gary.bush@bushpowergroup.com](mailto:gary.bush@bushpowergroup.com)

Website: [www.bushpowergroup.com](http://www.bushpowergroup.com)

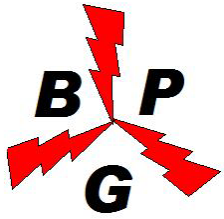
Bank's & Owner's Consultants  
Conceptual Design Consultants  
Contracts & Procurement Support  
Cycle Performance Consultants  
Expertise Witnesses  
Performance Testing Support  
Power Plant Consulting Services  
Synthesis Gas Projects  
Waste to Power, Desalination, Liquids



# Core Skill Set

---

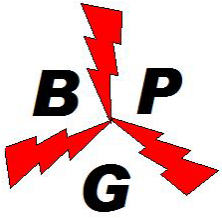
- Conceptual Design of Power Plants
- Contracting Support
- Due Diligence Support
- Major Equipment Procurement
- Owner's Consultants
- Performance Calculations
- Performance Testing Guidelines & Procedures
- Performance Testing
- Performance Monitoring Systems
- Project Development Support
- Proposal Support
- Water Treatment Systems
- Weather Data Analysis



# Capabilities

## ● Project Development Support

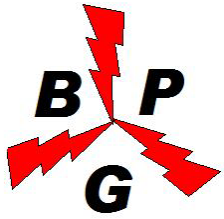
- Feasibility Studies & FEED Development
- Exhibits for Power Purchase Agreements
- Dispatch Modeling
- Cost Estimates
- Project Scheduling
- Support of Licensing Activities
- Prepare NPV Calculations to Compare One Plant Configuration With Another for Specific Proposal Development
- Prepare NPV Calculations to Determine Maximum Installed Cost
- Calculate NPV \$ per BTU/kWh & \$/kW During Screening Process of Potential Cycle Configurations
- Support Liquidated Damage Determination



# Capabilities

- **Due Diligence Support**

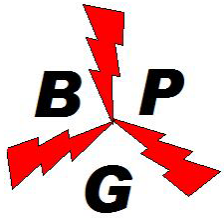
- Equipment Purchase Contracts
- Power Island Purchase Contracts
- Site Visits and Equipment/Performance Evaluation
- Review Performance Guarantees
- PPA (Power Purchase Agreement)
- ECA (Energy Conversion Agreement)
- SSA (Steam Supply Agreement)
- FSA (Fuel Supply Agreement)
- Environmental Impacts
- Calculate Power & Heat Rate Degradations for Plant Performance Guarantees



# Capabilities

---

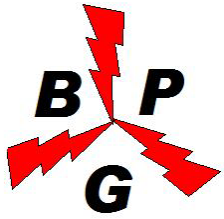
- Due Diligence Support - Review New Technologies:
  - Advanced Gas Turbine Designs
  - Advanced Power Plant Cycle Designs
  - Complex Power Plant Configurations
  - Distributed Generation
  - Review Business Opportunities
  - Production of Syn Gas from Carbonaceous & Waste Fuels



# Capabilities

## ● Conceptual Design

- Gas Turbine Simple Cycle Power Plants
- Gas Turbine Combined Cycle Power Plants
- Gas Turbine Cogeneration Plants for Electricity & Heat
- Rankine Cycle Power Plants
- Re-powering of Inefficient Power Plants
- Reciprocating Gas & Diesel Engine Generator Plants
- Industrial Applications (paper mills, petrochemical, refineries, fertilizer, pharmaceutical, and food processing plants)
- Compressor Station Waste Heat Recovery & Repowering
- Integrated Gasification Power/Process Plants
- Integrated Plasma Gasification Plants

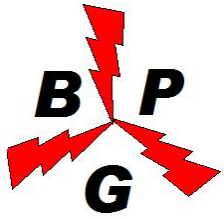


# Capabilities

---

- **Conceptual Design**

- Plant Configuration
- Plant Optimization
- Equipment Selection
- Plant Layout
- Process Flow Drawings
- Electrical One Lines
- Equipment Lists
- EPC Estimates
- Water Balances
- Major Equipment Pricing & Terms and Conditions

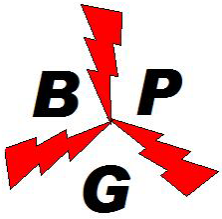


# Capabilities

---

- Power Plant Performance Consulting
  - Performance Calculations
  - Plant Modeling
  - Equipment Modeling
  - Plant Operation Optimization
  - Power & Heat Rate Guarantees
  - Part Load Performance
  - Degradation Predications

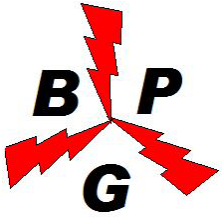




# Capabilities

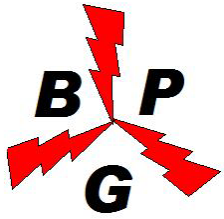
## ● Power Plant Performance Testing

- Preparation of Performance Testing Guidelines in support of PPA's, SSA's, FSA's and ECA's
- Preparation of Performance Testing Procedures, Calculations, and Data Sheets
- Direct Independent Test Support
- Executing Performance Tests on Site - Power and Heat Rate at Full and Part Loads, Emission, Noise, Availability and Reliability
- Preparation of Preliminary and Final Reports
- Calculation of Liquidated Damages
- Diagnostic Testing of Main Components



# Capabilities

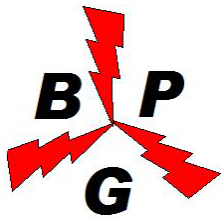
- Performance Monitoring Systems
  - On-site Monitoring
  - Remote Monitoring
  - Ability to compute and trend the performance of individual components and overall plant parameters in real time and compare the degradation to baseline “new and clean” performance.
  - Notify Operations, Engineering and Management of abnormal conditions and/or variances.
  - Installed Monitoring Systems in 485 MW, 780 MW, & 1800 MW World Class Combined Cycle Power Plants where OSI PI Systems are used as the Data Historian.



# Capabilities

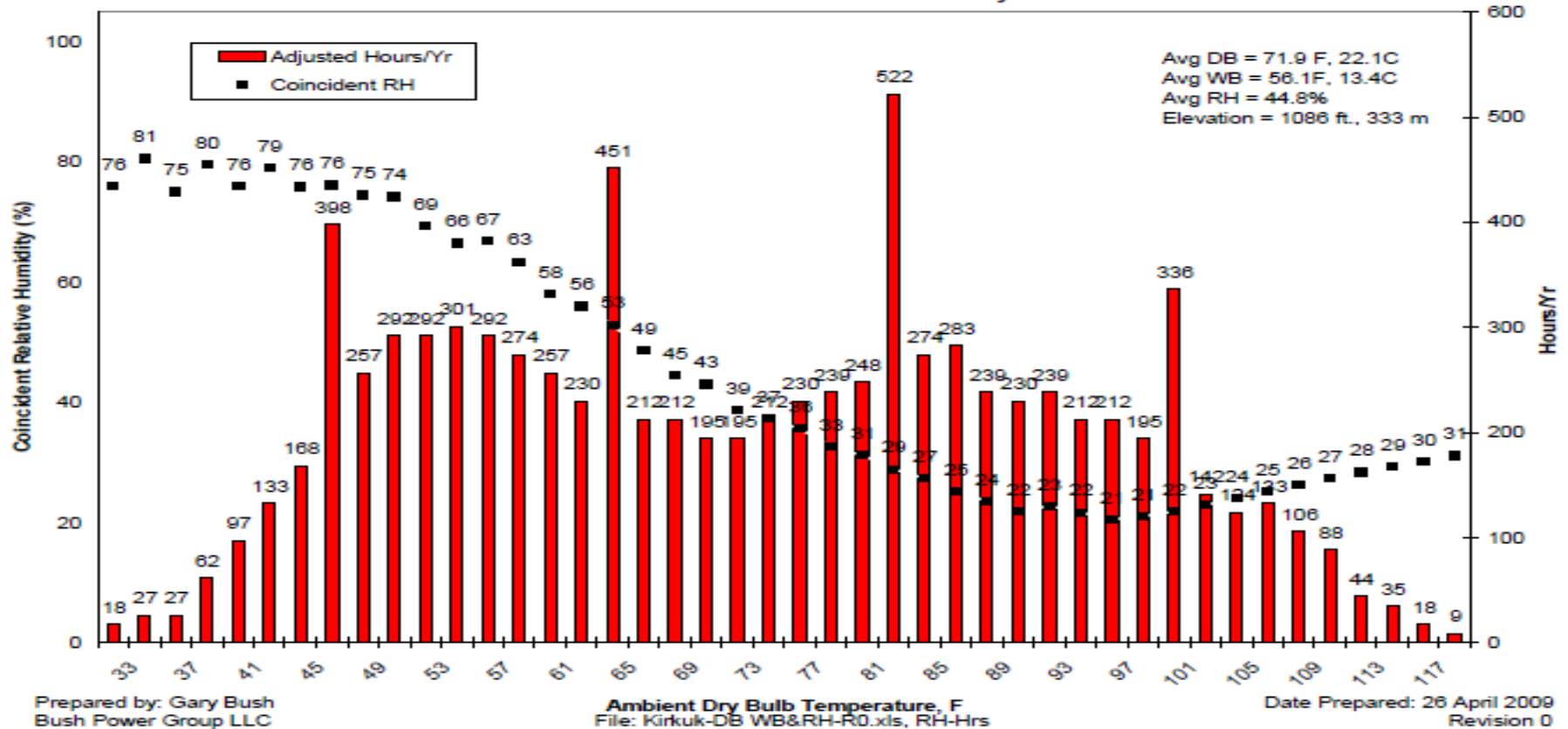
---

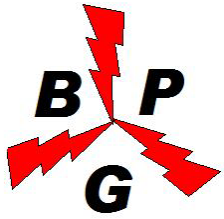
- Weather Data Analysis
  - Establish Plant Operating Temperature Range
  - Selection of Design Temperature and Relative Humidity
  - Determination of the Applicable Maximum/Minimum Temperature Range
  - Determination of the Precipitation Data
  - Prepare Weather Data Profiles



# Capabilities

Kirkuk, Kurdistan, IRAQ Temperature Profile (Annual)  
with Coincident Relative Humidity

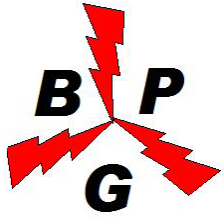




# Capabilities

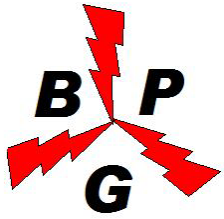
---

- Gas Turbine Simple Cycle Performance
  - GE Cycle Deck for Frame Machines
  - GE APPS Program for Aeroderivative Gas Turbines
  - GT Pro/GT Master “Library Data”
  - Solar Turbines Performance Program
  - Siemens SIPEP Performance Program

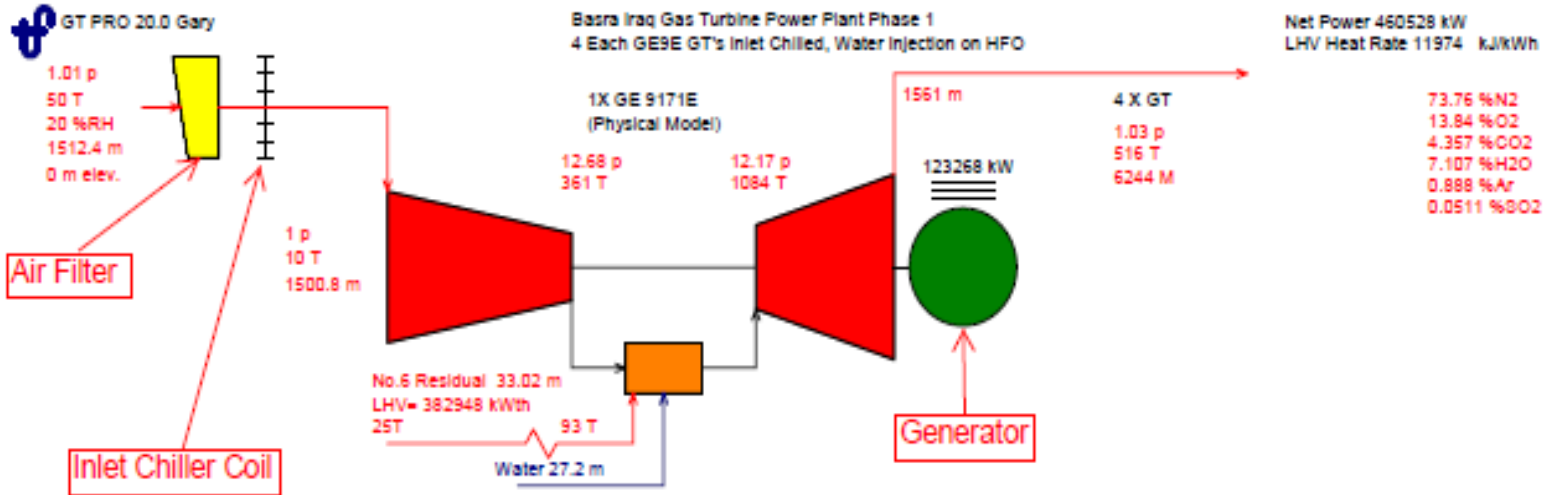


# Capabilities

- Gas Turbine Combined & Cogeneration Cycle Performance
  - GT Pro & GT Master Software Utilized for Cycle Design and Heat & Mass Balances
  - PEACE Project Estimating & Cost Estimating Program
  - Thermoflex System Software for total utility plant modeling



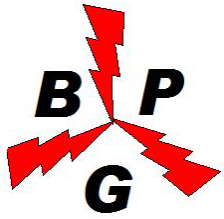
# Gas Turbine Simple Cycle Performance



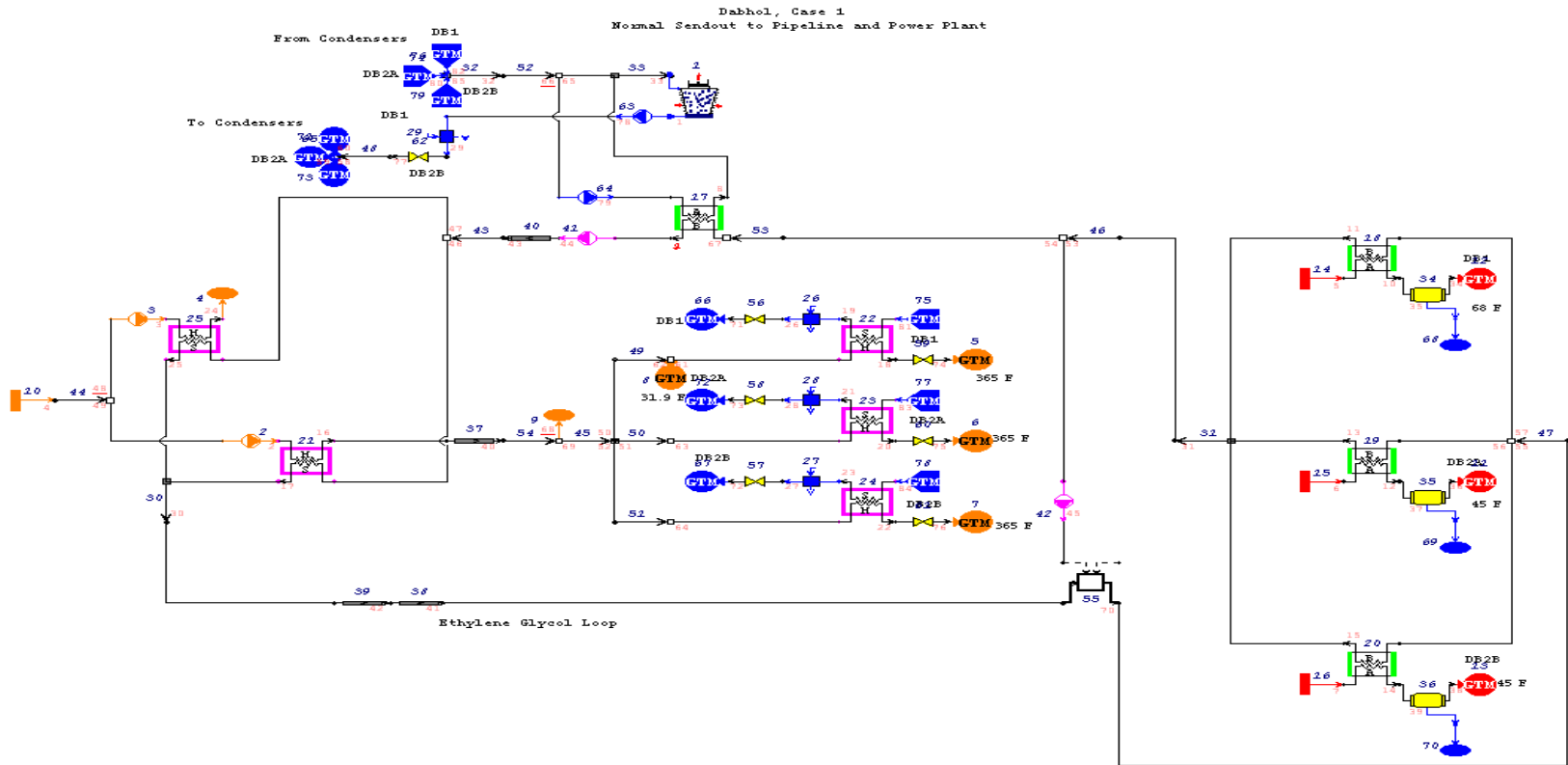
Expected Performance—Not Guaranteed  
 Gross Power = 493,072 Kilowatts  
 Net Power = 460,528 Kilowatts  
 Net Heat Rate = 11974 kJ/kWh LHV  
 Inlet Chilled from 50C to 10C  
 Water Injection to 50 ppmvd NOx  
 Heavy Fuel Oil

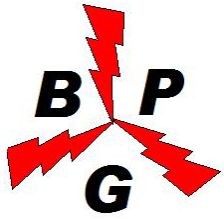




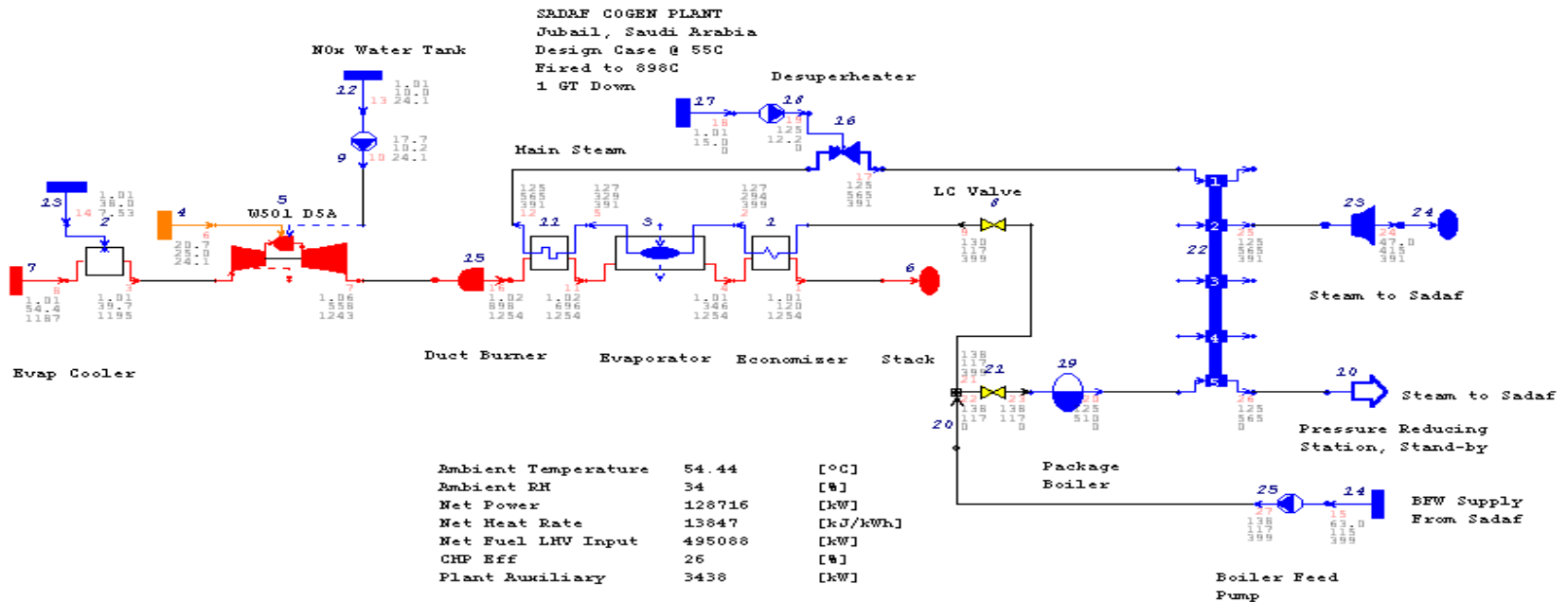


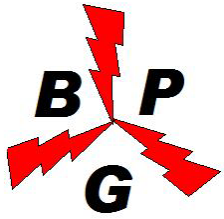
# Thermoflex Thermal System Software Power Plant Integration w/LNG Regas Terminal





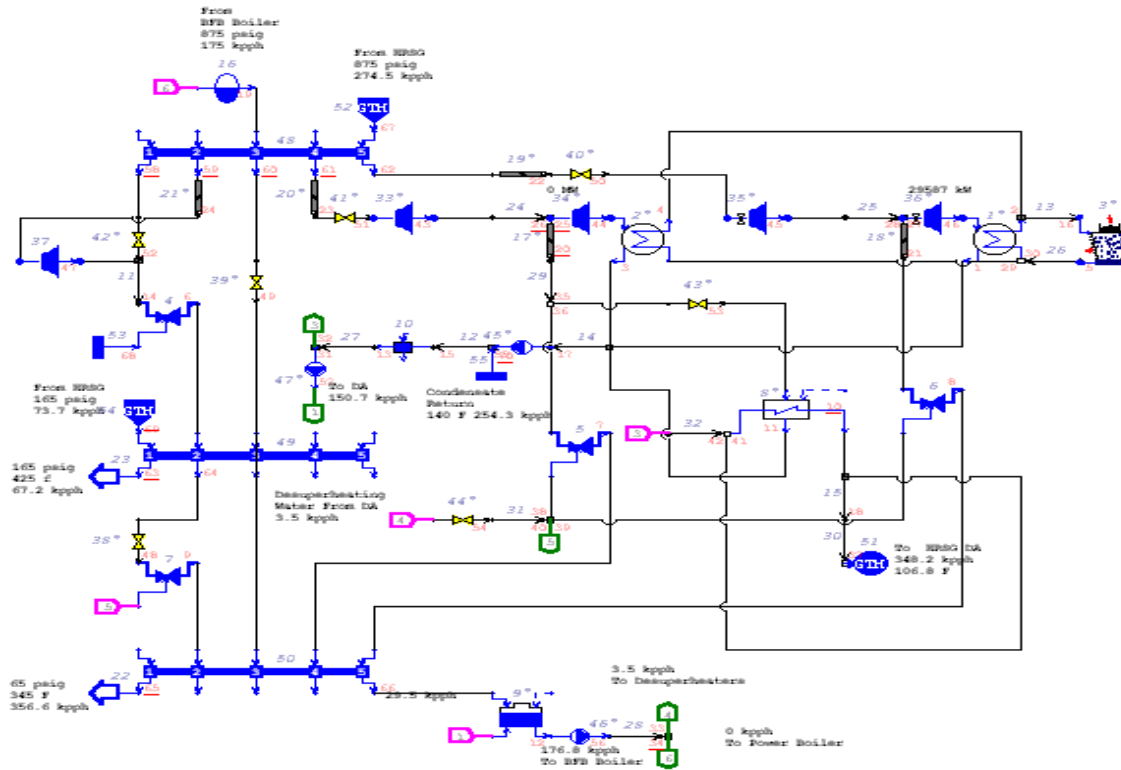
# Thermoflex Thermal System Software Cogeneration Power Plant

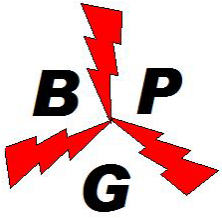




# Thermoflex Thermal System Software Paper Mill

DONOHUE INDUSTRIES SHELDON PAPER MILL  
2 GE 6561B's with Existing Equipment  
175 kpph from BFB Boiler  
69 F 79.3 3RH, Normal Steam Demand



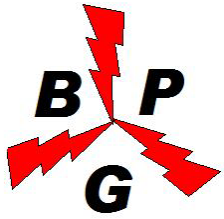


# Capabilities

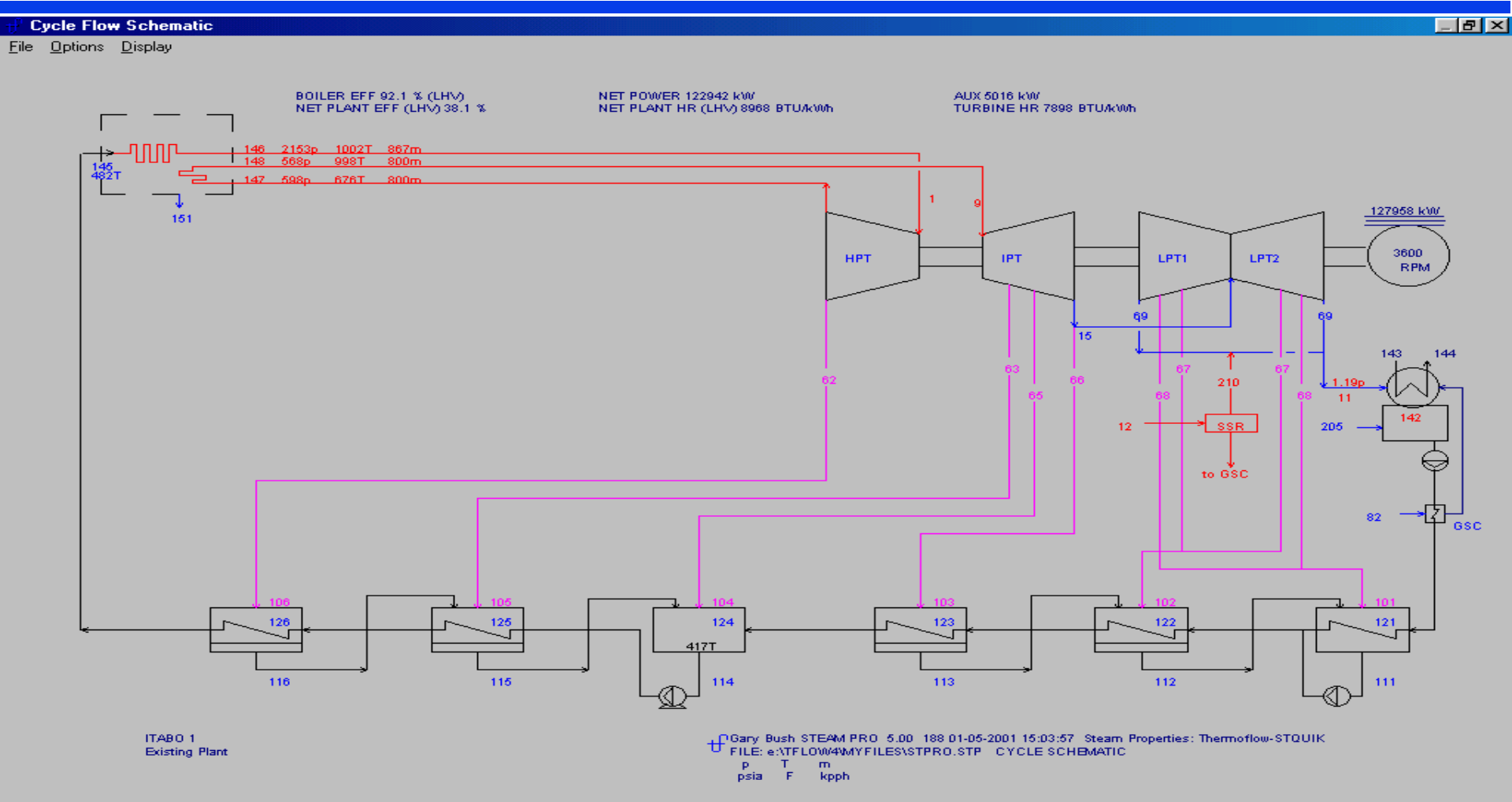
---

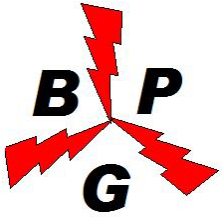
- Rankine Cycle Performance

- Steam Pro Software Utilized for Cycle Design and Heat & Mass Balances
- Steam Master Software Utilized for Cycle Off-Design and Heat & Mass Balances



# Rankine Cycle Plant Design

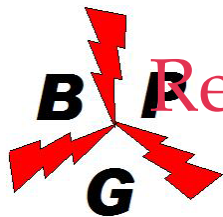





# Capabilities

---

- Repowering Cycle Analysis
  - ReMaster Software Utilized for Cycle Design and Heat & Mass Balances
  - Repowering with a new gas turbine exhausting in the existing Rankine boiler windbox to reduce fuel
  - Repowering with a new gas turbine exhausting in a new HRSG providing steam to existing steam turbine to replace existing Rankine Cycle boiler
  - Combinations of the above

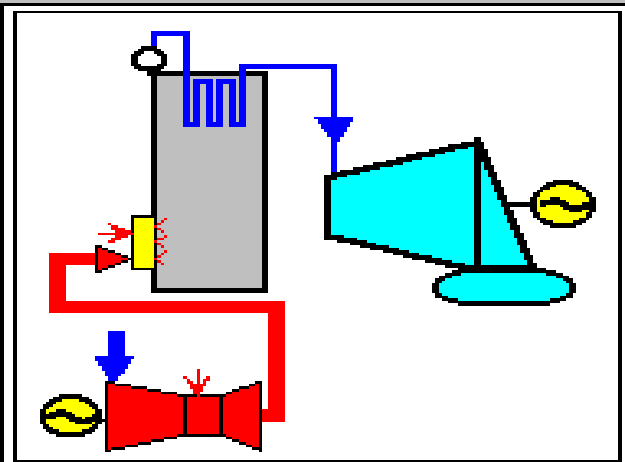


# Repowering Cycle Analysis With the Existing Boiler

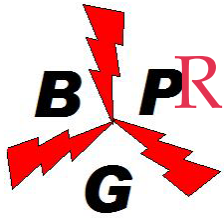
***RE-MASTER***  
Version 5.0  
Copyright © 1991-2000  
Thermoflow Inc. 

**RE-MASTER Options**

- RE-MASTER X**  
Repowering with the existing boiler
- RE-MASTER N**  
Repowering with a new heat recovery boiler
- RE-MASTER NX**  
Repowering with the existing boiler and a new heat recovery boiler



The diagram shows a schematic of a power cycle. On the left is a grey boiler with a red lightning bolt symbol on its side. A blue line representing a steam line goes from the top of the boiler to a blue turbine. The turbine is connected to a yellow condenser. A red line representing a cooling water line goes from the condenser back to the boiler. A red lightning bolt symbol is also present on the condenser. A yellow lightning bolt symbol is on the condenser's cooling water inlet. A blue lightning bolt symbol is on the boiler's cooling water inlet.



# Repowering Cycle Analysis With New Heat Recovery Boiler

## *RE-MASTER*

Version 5.0

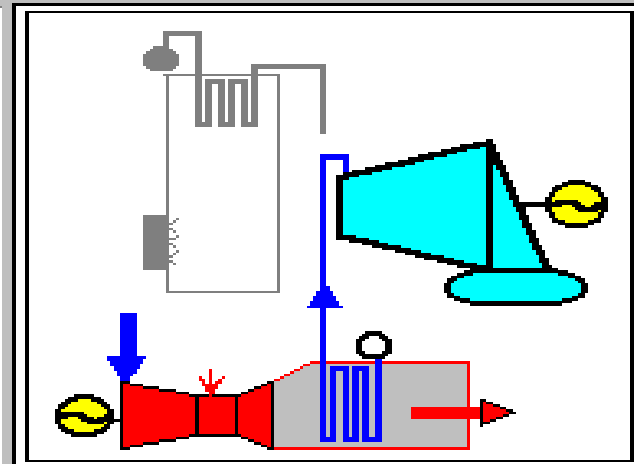
Copyright © 1991-2000

Thermoflow Inc.



### RE-MASTER Options

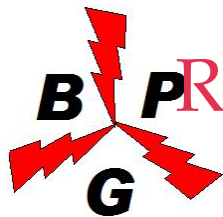
- RE-MASTER X  
Repowering with the existing boiler
- RE-MASTER N  
Repowering with a new heat recovery boiler
- RE-MASTER NX  
Repowering with the existing boiler and  
a new heat recovery boiler



OK

Quit





# Repowering Cycle Analysis With New Heat Recovery Boiler

## *RE-MASTER*

Version 5.0

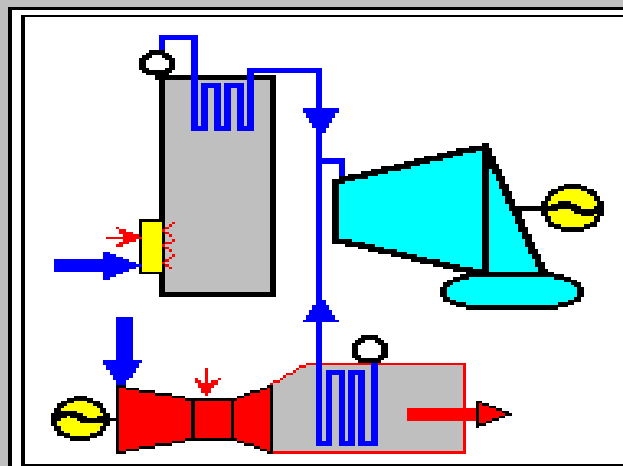
Copyright © 1991-2000

Thermoflow Inc.



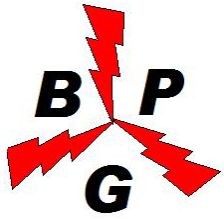
### RE-MASTER Options

- RE-MASTER X  
Repowering with the existing boiler
- RE-MASTER N  
Repowering with a new heat recovery boiler
- RE-MASTER NX  
Repowering with the existing boiler and  
a new heat recovery boiler



OK

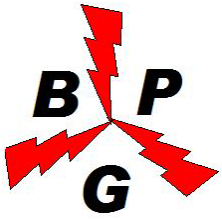
Quit



# Capabilities

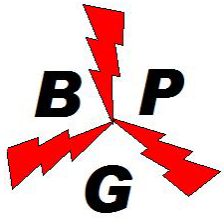
## Process Design Models

- Fuel Gas Analysis & Fuel Gas Heating (Calculate the Gas Dew Point, Hydrate Point and Water Dew Point to Determine the Amount of Fuel Gas Heating Required)
- Fuel Oil Properties
- Inlet Chilling of Gas Turbines with “Chill” from LNG Vaporization
- Fuel Gas Pipeline Pressure Drop Calculations
- Electric Power Generation Using Turbo Expander Generators (Calculate Electric Power Generation when High Pressure Fuel Gas in a Pipeline Is Reduced to Required Gas Turbine Inlet Pressure Conditions)



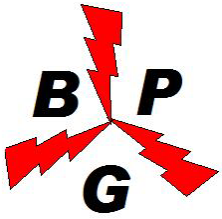
# Capabilities

- **Evaluation of Power Island Bids**
  - Utilize GT Pro, GT Master & Thermoflex to Analyze Power Island, Gas Turbine, HRSG, and STG Bids
  - Prepare Comparison Spread Sheets of Each Power Island Gas Turbine, HRSG, and STG Bids
- **Balance of Plant Equipment Sizing**
  - Utilize Computer Models to Size BOP Process and Mechanical Equipment
  - Provide Process Flow Conditions to Detail Engineering
  - Provide Auxiliary Loads to Electrical Engineering
  - Provide Equipment Weights & Dimensions to Civil Engineers



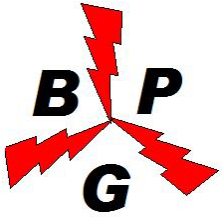
# Capabilities

- **Gas Pipeline Energy Recovery**
  - Developed design to recover heat from the existing gas turbine at several compressor stations to generate steam for steam sales. Excess steam is supplied to a steam turbine to generate revenue from power sales.
  - Recovered energy can also be used for steam or electric driven compressors without additional fuel consumption
- **District Heating & Cooling Systems**
  - Prepare evaluations of campus chilled water systems.
  - Prepare evaluations of campus heating systems.
  - Integrate chilled water and heating system with cogeneration systems.



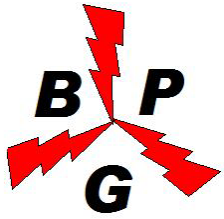
# Capabilities

- Refinery Utility System Upgrades
  - Model Existing Steam & Electric System
  - Model Existing Water Treatment System
  - Design New Gas Turbine Generator & HRSG to Produce Steam & Electricity
    - Shut Down Old, Inefficient Boilers
    - Mothball Inefficient Steam Turbine Generators and/or Steam Turbine Drives
    - Provide Dedicated Electricity to Critical Refinery Loads
    - Export Power to Grid During Peak Demands
    - Burn Refinery Off-Gases in GT & HRSG
    - Integrate Syn Gasification Plant for hydrogen, power, and steam production with existing refinery



# Capabilities

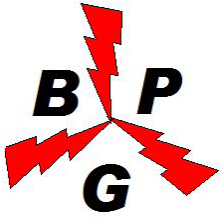
- Paper Mill Utility System Upgrades
  - Model Existing Steam System
  - Model Existing Electrical System
  - Model Existing Water Treatment System
  - Design New Gas Turbine Generator & HRSG to Produce Steam & Electricity
    - Shut Down Old, Inefficient Boilers
    - Mothball Inefficient Steam Turbine Generators and/or Steam Turbine Drives
    - Provide Dedicated Electrical Power to Critical Paper Mill Loads
    - Export Power to Grid During Peak Demands



# Capabilities

---

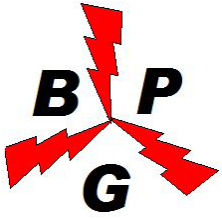
- Produce Power from Gas Wells
  - Install Produced Gas Separating Equipment
  - Install Skid Mounted Reciprocating Engine Generator Sets
  - Install Gas Turbine Generators
  - Generate Electricity for Sale to Local Utilities and/or Electrical Cooperatives
  - Operate Generators as Peaking Units or Base Load Simple Cycle Units
  - Operate Generators as Base Load Combined Cycle Units with Peaking Capability



# Capabilities

- Water Treatment System Design
  - Industrial Water Treatment Process Design
  - Industrial Wastewater Treatment Process Design
  - Equipment Specifications
  - Startup, Commissioning and Operator Training
  - Troubleshooting
  - Desalination Systems
  - Boiler Feedwater Treatment Systems
  - Cooling Water Treatment Systems

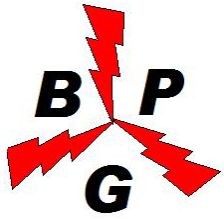




# Capabilities

---

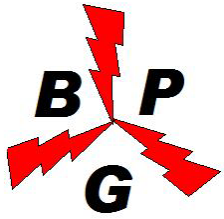
- Industrial Water Treatment System Design
  - Pretreatment
  - Clarifiers
  - Filters
  - Sludge Dewatering
  - Reverse Osmosis
  - Ion Exchange
  - Electrodeionization



# Capabilities

---

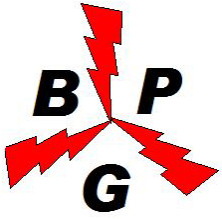
- Industrial Wastewater Treatment Design
  - Oil - Water Separators
  - Clarifiers
  - Filters
  - Sludge Dewatering
  - Waste Neutralization
  - Near Zero Liquid Discharge



# Capabilities

---

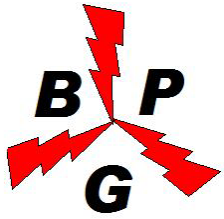
- Water Treatment Equipment Specifications
  - Pretreatment Equipment
  - Reverse Osmosis Equipment
  - Ion Exchange Equipment
  - Electrodeionization Equipment
  - Regeneration Equipment
  - Chemical Feed Equipment
  - Water & Steam Sampling Equipment



# Capabilities

---

- **Desalination Systems**
  - Multistage Flash (MSF)
  - Multiple Effect Distillation (MED)
  - Thermal Vapor Compression MED (TVC-MED)
  - Mechanical Vapor Compression (MVC)
  - Reverse Osmosis
  
- **Zero Liquid Discharge Systems**
  - Brine Concentrators
  - Spray Dryers
  - Crystallizers
  - Hybrid Designs



# Water Balance

