

## CHP Opportunities for Las Vegas Casinos



Rio All-Suites Hotel & Casino

**HARRAH'S**  
ENTERTAINMENT

*September 11, 2006*

## Project Overview

- Six reciprocating, spark-ignition, gas engines totaling ~4.9 MW of generating capacity
- Two distinct generating locations:
  - Ipanema:
    - Four generators
    - 820 kW each
    - 480 volts stepped up to 12,470 volts & tied to common bus with utility
    - Two heat recovery units used to displace internal heating load
    - Catalytic emission reduction
  - Masquerade:
    - Two generators
    - 820 kW each
    - 480 volts stepped up to 12,470 volts & tied to common bus with utility
    - One heat recovery units used to displace internal heating load
    - Catalytic emission reduction



**Ipanema CHP Station (~3.2 MW)**  
**Rio All-Suites Hotel & Casino, Las Vegas**



## Why CHP?

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- **Guest Comfort/Experience**
  - No negative impact on guest comfort or experience.
- **Economic**
  - Reduce fuel & electricity costs.
- **Reliability**
  - Provide reliable electricity and thermal energy.
- **Environment**
  - Low emissions of pollutants and greenhouse gases through improved efficiency.
- **Local Benefits**
  - Reduce grid congestion by increasing capacity within load pocket.



## Why Chosen Configuration?

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- Load Characteristics (heating and electric) considered
- Acceptable generator size for load & redundancy
- Reliable track record with generators
- Fast Start-up
- High part-load efficiency
- Low emissions with exhaust catalyst system (reduces NO<sub>x</sub> to 1/6 avg. lean burn; reduces CO ¼ avg. lean burn; reduces VOCs to ¼ avg. lean burn)
- Black-start Capability (minimal auxiliary power)
- Opportunity to utilize waste heat
- Readily available parts
- Turbocharger for fuel efficiency
- Ability to train existing staff for routine maintenance



## Lessons Learned

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- Plan early
- Get expert advice from experienced parties when needed
- Start discussions with utilities early regarding interconnection
- Size system appropriately for conditions (electric and heat loads)
- Consider enclosed building versus self-contained units
- Consider on-site crane for maintenance
- Factor in staffing considerations for operations & maintenance
- Investigate service contracts from reputable firms
- Develop fuel hedging strategy
- Don't forget training



## Is System Meeting Expectations?

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- Initial start-up kinks worked out
- Systems performing reliably
  - Good system availability 95%
  - Good system capacity factors
- Routine maintenance performed
- Operating data collected and available via web-based system
- Working on plans to utilize additional available heat

## What You'll See Today

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- Touring Ipanema Station
- Four self-contained, 820 kW, generating units
- Two heat recovery units
- Switchgear/Inter-tie to Nevada Power Service
- Controls panel
- Operations "hut"
- Operations data and schematics



**820 kW Ipanema Generator**  
**Rio All-Suites Hotel & Casino, Las Vegas**



**THANK YOU  
&  
ENJOY THE TOUR!**