Southwest Gas Corporation

Nevada Specific Applications and Opportunities for CHP

Legislative Committee on Energy - June 17, 2016

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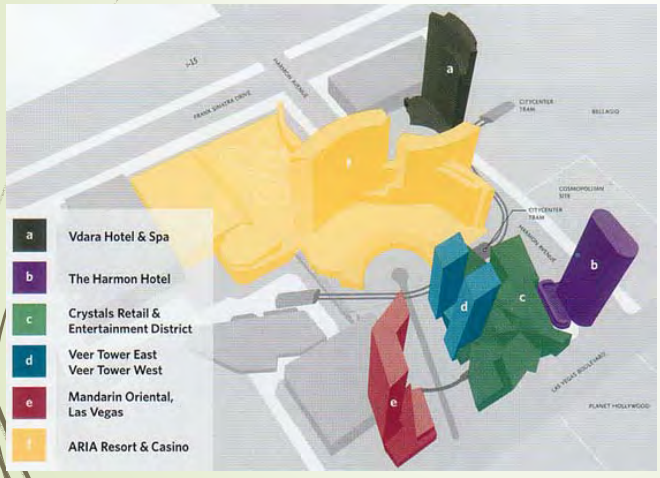
MGM Resort's : City Center



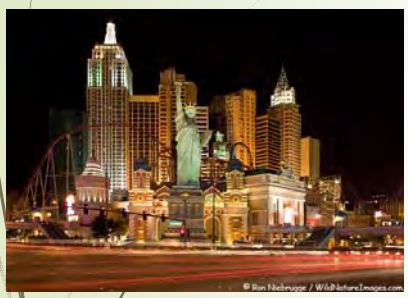
- 18-million-square-foot mixed use resort on the Las Vegas Strip
- Unprecedented urban metropolis of 67 acres
- Features 61-story luxury non-gaming hotel tower

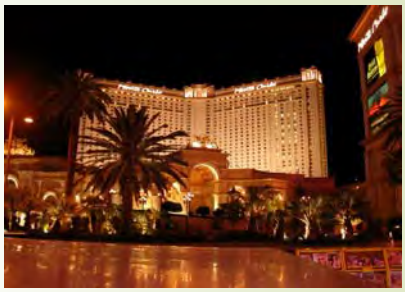
Agenda Item X - ENERGY
Meeting Date: 06-17-16

What CHP system was installed?

- State-of-the-art, 8.2-megawatt CHP system
- Natural Gas used to generate electricity through two twin turbines (Mercury 50)
- Captured waste heat to warm domestic water for campus use

How do they use the waste heat?





- Tied their water loop system into adjacent properties
  - Monte Carlo
  - New York New York Casino
  - T-Mobile Arena

Results

- Air emissions reduced due to avoiding much of the boiler heating required by other developments
- System contributes to City Center's increased energy efficiency - 37% more efficient than comparable resorts
- CHP plant provides more then 10% of the annual electricity used on the City Center campus
- Plant contributed to City Center being one of the largest sustainable developments in the world
- City Center was awarded six Gold LEED certification from the U.S. Green Building Council, in part due to its superior energy performance

Other Notable CHP Applications

- Nevada Cogen Associates #1
  - Operational since 1992
  - Rated at 90 megawatts (MW)
  - Natural Gas fires 3 combustion turbines
  - Waste heat recovered in a steam generator
  - Thermal energy supplied to offsite gypsum production facility
- Nevada Cogen Associates #2
  - Operational since 1993
  - Rated at 85 megawatts (MW)
  - Natural Gas fires 3 combustion turbines
  - Waste heat recovered in a steam generator
  - Thermal energy & chilled water supplied to offsite gypsum production facility

Other Notable CHP Applications

- Barton Memorial Hospital CHP
  - Planned commissioning during June 2016
  - Rated at 335 kilowatts (kW)
  - Caterpillar reciprocating engine based system
  - System will provide baseload on-site power
  - Waste heat recovered to offset demand of domestic hot water boilers

Potential Market Opportunities

- Commercial
  - Hotels-Casinos-Resorts
  - Data Centers
  - Laundries
  - Refrigerated Warehouses
  - Supermarkets
  - Office Buildings
  - Health Clubs
  - Agricultural greenhouses
- Agricultural
  - Concentrated animal feeding operations
  - Dairies
  - Crop drying and curing

Potential Market Opportunities

- Industrial
  - Food processing
  - Rubber and Plastics
  - Chemical manufacturing
  - Metals and mineral procession
  - Commercial printing
  - Pulp and paper
- Institutional
  - Hospitals
  - Schools
  - Universities & Colleges
  - Correctional Centers

Summary

- Combined Heat & Power can benefit certain businesses
  - Long-term energy savings
  - Systems configured to generate electricity or mechanical power
    - Recapturing the heat produced and repurposed to
      - Space heating
      - Water heating
      - Industrial steam loads
      - Air conditioning
      - Humidity Control
      - Refrigeration
      - Boiler feedwater preheating
      - Other Thermal Needs