Accelerated Development & Deployment of CHP in Federal Facilities **ADD CHP**

Report on Screening for CHP Potential at (Site Name)

Date: *(When screening performed)* **SUMMARY: Screening exhibits good merit with waste heat utilization.**

The purpose of the CHP screenings performed by FEMP is to help federal sites determine if their conditions indicate that further study of CHP potential is merited, and if so, to suggest next steps. These quick screenings are based on general site information and assumptions; results should be regarded only as a starting point in the exploration of CHP feasibility for the site. Many technical and organizational factors will impact decisions about implementing CHP technologies, such as future mission needs, equipment replacement plans, utility rate schedules, and the value of energy security. For more information on FEMP services, contact *(e-mail address of FEMP contact)* in the DOE's *(appropriate)* Regional Office. For more information on this report and CHP, contact the ORNL representative noted below.

1. Site Contacts: *(identification of principal point of contact at site)*	**2. ORNL contacts:** Linda Stansberry, Oak Ridge National Laboratory, FEMP CHP team support, (865) 574-0266, stansberryl@ornl.gov; or Mike Gregg @ 865-574-5420, greggml@ornl.gov
3. Description of Current Installation Steam purchased from host site; various types of cooling equipment including centrifugal chillers	**4. CHP Option Assessed** one (1) 6000 KW internal combustion engine/generator coupled with a steam heat recovery generator and an absorption chiller
5. Energy Costs Reported Electricity: $0.082/ kWh Natural Gas: $6.00/ MMBtu Spark Spread: $18.02/ MMBtu	**6. Energy Consumption Reported** Electricity: 52,174 MWh Natural Gas: 56,631 MMbtu (last 3 yr avg) Thermal/Electric (T/E) Ratio: 0.32
7. Economics: Approximate CHP Cost: $6.3 million CHP Savings Factor: $ 0.036/ kWh	Simple payback period using $6.00/MMBtu NG=3 to 4years* Simple payback period if NG is $4.00/MMBtu= 2 to 3years* * Assuming 100% utilization of waste heat

8. General Factors Affecting CHP

Factors favoring CHP Feasibility:	Spark Spread $/MMBtu > 12	Elec. cost $/KWH > 0.05	NG cost $/MMbtu < 4.00	Elec. load Avg/peak > 0.7	Thermal load Avg/peak > 0.7	Payback Period (years)<10
Value for Site	18	0.082	6.00	0.6	Unknown	3 - 4

9. Observations:

a) The annual heating load occurs over a period of ~six months (May – Oct) and consumes only ~32% as much energy as the electrical load,. This ratio suggests that an internal combustion engine would better match the balance between the thermal and electrical usage patterns.

b) Key to the potential for implementing CHP at this site will be beneficial use of the waste heat (see note 10a).

c) The payback period indicated above is predicated on the assumption that natural gas at the current cost of $6/MMbtu would be used to fuel the proposed new CHP system and does not take into account the savings resulting from the difference in the incremental cost of purchased steam from the host site at $25/Klb versus NG costing $6/MMbtu. This differential, amounting to ~$19/MMbtu, would yield additional annual savings of approximately $1million thereby reducing the predicted payback to ~ 2 years.

d) Detailed hourly electrical and thermal load data would be required to perform a more thorough analysis.

e) It is estimated that waste heat would support a ~1100 ton absorption chiller for cooling (a more detailed analysis is needed to confirm capacity).

10. **Assumptions and Definitions**

a) An electrical rate of $0.082 was used for this analysis based on the blended "over-the-fence" unit cost derived when M&O, etc. for distribution costs are deducted from the gross rate.

b) Annual electrical usage was calculated by dividing the site's annual cost, $6M, by the real site rate of $0.115.

c) "Savings Factor" is a measure of the net savings from the CHP plant analyzed. It includes: avoided costs of purchased electricity, increased fuel and O&M costs, standby charges, and the value of recovered heat.

d) CHP installed cost is based on recent industry estimates; federal project costs may be higher.

e) Operating hours assume three weeks for scheduled maintenance and unscheduled outages.

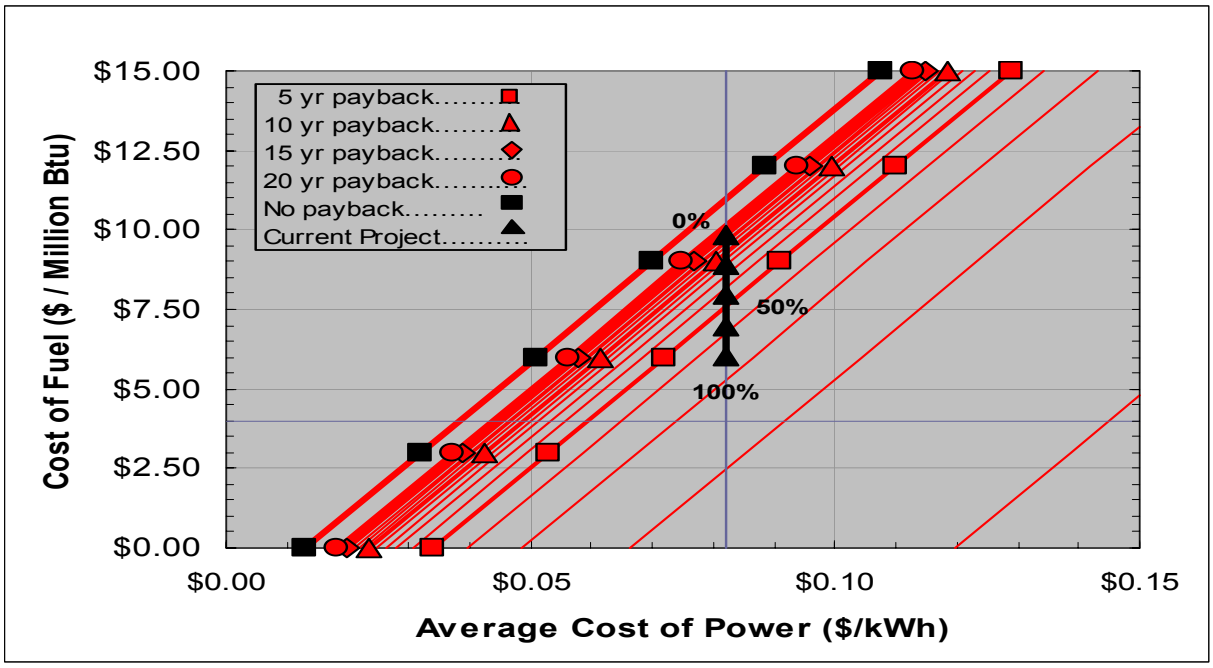
f) A $25/kW-year standby charge is assumed for the full rated capacity of the CHP equipment.

g) "Spark Spread:" $/MMBtu difference between electricity and fuel (gas) rates – a higher spread favors CHP.

h) T/E Ratio: Thermal to Electric ratio reflects the relative balance of thermal and electric loads and can be a factor in determining the most appropriate type of equipment for a site.

i) Avg/Peak ratio: measures base load relative to peak. Ratios approaching 1.0 indicate flat electrical loads without high peaks that are desirable for the economical sizing and control of CHP systems. Low ratios are indicative of high peak demands in which case a CHP system designed for peak shaving combined with utility DSM incentives might be viable - requires more rigorous analysis beyond this screening level.

11. Economics & Payback



Graph illustrates the sensitivity of "simple payback period" to variations in energy costs (fuel on vertical axis and electricity on horizontal) and % waste heat utilization (heavy black vertical line representing different levels of heat utilization). The best payback will occur when all recoverable heat can be utilized (bottom triangle on vertical line). In this case, the simple payback is between 3-4 years at 100% utilization. Payback increases by ~25% to over 4 years at 75% waste heat use. The analysis is based on the reported $6 gas rate. For comparison, $4.00 per MMBtu gas rate yields a simple payback of between 2-3 years assuming 100% waste heat utilization. Simple payback at different electric and fuel rates may be estimated with this graph.

12. Next Steps and Issues

a) Site demonstrates good potential for CHP – a more detailed "investment quality" analysis is warranted to define economic feasibility, determine the best potential uses of waste heat and examine the most optimal type of CHP system to match site electrical and thermal loads.

b) To facilitate a more accurate CHP assessment, consider special conditions impacting CHP potential – such as: additional loads, energy security, equipment replacement, etc. If considering on-site energy generation for security or other reasons, examine all potential thermal applications for the waste heat.

c) Private sector partners are available to help you verify CHP opportunities and alternate project financing options. If you need a partner, FEMP can assist in identifying potential candidates.

d) Identify state and local emission requirements related to permitting a CHP plant - this is a key factor affecting equipment type, schedules and project costs.

e) Favorable utility rates are key to CHP feasibility. Identify potential impacts on energy rates under a CHP scenario (Consider: prospects for negotiating better gas rates, standby rates for on-site generation, exit fees, etc. Evaluate if site load profile and CHP offers potential for DSM or other incentive programs.)

f) Detailed data from the gas and electric utilities, logs for boiler and/or chiller operation would be required for a more thorough analysis and to improve sizing of CHP plant for maximum efficiency and use of recovered waste heat

g) Call FEMP if you need help with next steps or have questions about this assessment.