CHP Integration with Fluid Heating Processes in the Chemical and Refining Sectors

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CHP Integration with Fluid Heating in Chemical and Refining Sectors

- Objective
  - Estimate the MW Potential of a Larger CHP Market as Compared to Traditional Steam CHP
  - Evaluate Technical Issues Including Temperature Requirements and Process Integration
  - Industrial Survey to Augment Field Findings
  - Recommendations to Overcome Economic and Technical Hurdles

Impact to CHP Opportunity in Chemical and Refining Sectors

- Based on Initial MIPD Screening
- 18 GW of Remaining New Steam CHP Potential
  - Based on previous studies conducted by Onsite Energy
- 28 GW of New Fluid Heating CHP Potential
  - Based on estimates for fluid heating energy consumption

- 46 GW of Total New CHP Potential

Scope of Work

- **Task 1: Market Assessment**
  - Profile SICs, processes, equipment types, temperatures
  - Estimate MW potential, develop economic criteria for U.S.
- **Task 2: Technical Feasibility**
  - Detailed evaluation of a fluid heating application at a representative site
  - Investigate issues affecting feasibility of CHP integration
- **Task 3: Industrial Survey**
  - Recommendations and Discussion Paper
  - Perform Industrial Survey
- **Task 4: Final Report**

Schedule

	Description	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02
TASK 1	FLUID HEATING CHP MARKET								
TASK 2	SITE EVALUATION OF FLUID HEATING CHP								
TASK 3	INDUSTRIAL SURVEY								
TASK 4	FINAL REPORT								

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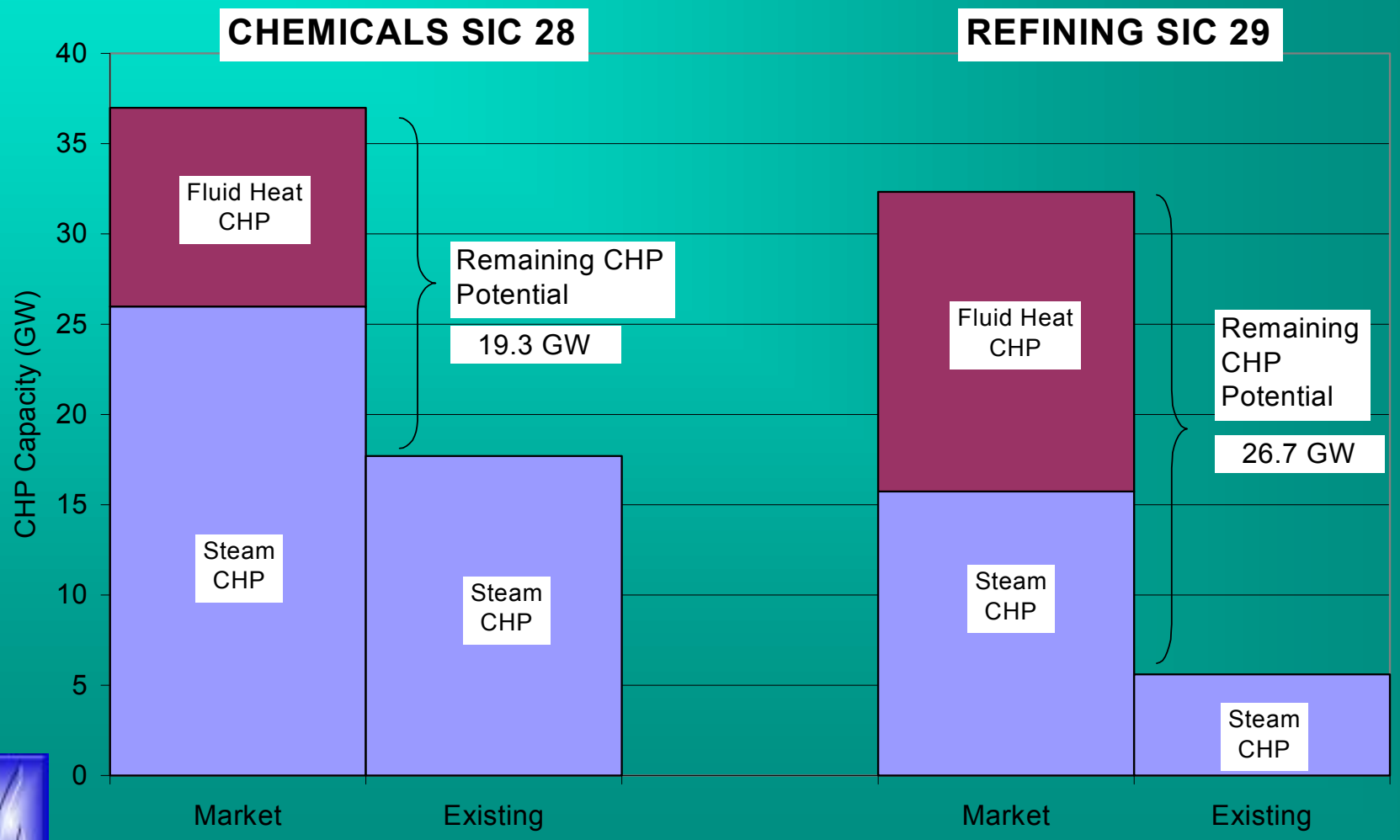
Progress to Date

- **Task 1: Fluid Heating Market**
  - Identfying SICs, processes
  - MIPD Screening
- **Task 2: Site Evaluation**
  - Schedule site visit

Results of Initial Database Screen



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Fluid Heating Processes for Refining

Processing Component	Process Temperature
Thermal Cracking	900°F ± 50°F
Catalytic Cracking	680°F to 750°F ± 50°F
Catalytic Reforming	900°F to 1000°F ± 50°F
Hydrogen	1400°F to 1600°F
Vacuum Distillation	750°F to 800°F
Hydrotreating and Hydrocracking	750°F ± 50°F

Fluid Heating Processes for Chemicals

Chemical	Firebox Temperature
Ammonia	1500°F to 1600°F
Benzene	900°F to 1300°F
Ethylene/Propylene	1550°F ± 100°F
Methanol	1000°F to 2000°F
Styrene	1500°F to 1600°F
Butadiene	1100°F

DOE Distributed Power and Industrial DG Quarterly Review Meeting

CHP Installation at 29 Palms Marine Air Ground Combat Center

ORNL Technical Monitor – Patrick Hughes

Henry Mak

July 27, 2001

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Marine Corps Air-Ground combat Center (MCAGCC) at 29 Palms

- The largest Marine Corps base in the world – ¾ the size of Rhode island, occupies about 932 miles of the Majave Dessert, located 60 miles NE of Palm Springs, Ca.,
- Home to over 10,000 military personnel, 10,200 family members, and 600 civilian employees.
- Includes over 1,400 structures
- Fastest growing base in the marine Corps

Marine Corps Air-Ground combat Center (MCAGCC) at 29 Palms

- Peak demand – 16.4 MW
- Avg. demand – 8.9 MW
- Annual electric usage ~ 78 MW-hr. -- $6,500,000
- Thermal usages provided by 3 x 900 HP boilers
  - 2.9 million therms annually
  - $780,000

CHP Project for (MCAGCC) at 29 Palms

- **DOE-OPT/ORNL solicitation**
- **SoCalGas preliminary site-specific economic cost feasibility study of a CHP system**
- **Included costs for electricity, natural gas, capital equipment, a maintenance contract, and financing**
  - **7 MW CHP**
  - **Estimated $6.8 million**
  - **Annual saving > $1.8 million, 3.8 years payback**
- **MCAGCC approval to proceed with the project is contingent on verifying cost estimates from detailed application engineering**

CHP Project for (MCAGCC) at 29 Palms

- **Reduces the power being supplied by the electric utility**
- **Reduces the natural gas required to supply HTHW to the base**
- **Supply critical electrical loads during outages**
- **Provide power and HTHW during natural gas interruptions**
- **Lower energy cost**
- **Reduces overall air emissions (CO_2 & NO_x)**
- **To create a "living model" for the other federal facilities**

CHP Project Team

- **Marine Corps Air Ground Task Force Training Command (MAGTFTC)**
- **Naval Facilities Command, Port Hueneme (NAVFACCO)**
- **U.S. Naval Facilities Engineering Command, Southwest Division**
- **Oak Ridge National Laboratory**
- **Southern California Gas**
  - **C&H Engineering**
- **Johnson Controls Inc. – Super ESPC**
  - **Emcor**

Project Status

- Task 1: Project plan and schedule, kickoff meeting with DOE -- Completed
- Task 2: Site survey -- Competed
- Task 3: Load study and analysis -- Completed
- Task 4: Schematic design – Completed
- Task 5: Design development – 35% Engineering Design Complete
- Remaining design and construction to be financed by ESPC

Upcoming Activities

- Only Had to Carry Design to 35% Completion to Achieve Objective of Site Committing to Implement CHP
- Propose No-Cost Scope Modification to Motive Additional CHP Projects
  - VA Hospital – Loma Lina
  - Post Office – City of Commerce
  - Federal Prison – Lompoc
  - Air Force Base -- March

VA Hospital – Loma Lina

- Peak demand – 4 MW
- Avg. demand – 3 MW
- Annual electric usage ~ 21 MW-hr. -- $2,613,000
- Proposed system
  - 3 x 600kW
  - $2.8 million
  - Pay back 3.5 yrs.