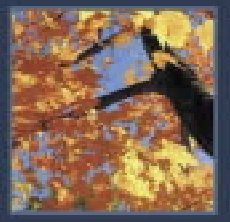
U.S. Department of Energy

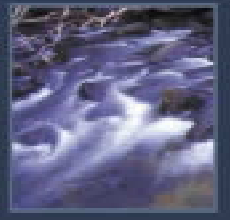
OAK RIDGE NATIONAL LABORATORY

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

CHP Subcontractors Coordination Review Meeting

April 22, 2004
Oak Ridge National Laboratory's
Washington D.C. Office





Winners By Association

An Awareness Campaign to Tailor and Disseminate the CHP Message To End-Use Sectors with High Potential for CHP Utilization

John W. Jimison

Executive Director & General Counsel

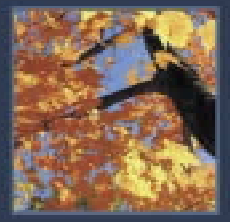
U.S. Combined Heat & Power Association

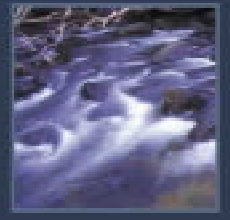
www.uschpa.org

202-544-4565

uschpa-hq@admgt.com








Description of Tasks

Task 1. Select and Profile 3 Industrial Market Sectors with High Potential for CHP Utilization

-- Compare CHP market potential data from EEA, RDC, EIA, etc.

Task 2. Evaluate CHP Technologies

-- CHP technologies for cross-industry applications (focus on prime movers)

-- CHP technologies for industry-specific applications (focus on TAT)

Task 3. Exchange Information With Trade Associations Representing Target Sectors to Promote the Awareness & Deployment of CHP

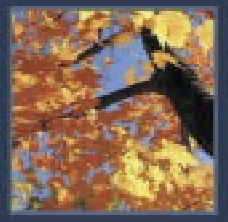
-- Engage stakeholders to get a better understanding of industry energy needs: phone calls, personal meetings, conference attendance

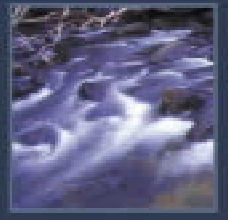
-- Develop targeted information products for industry: brochures and powerpoints

-- Disseminate information: distribute brochures at conferences, meetings, websites, etc.

-- Conference speaking engagements



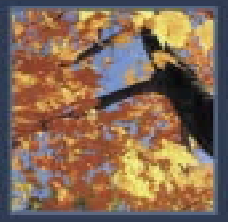


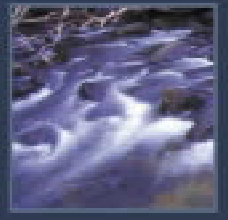



Description of Progress Against Task 1.

Select and Profile Industrial Sectors with High Potential for CHP








Why Industrial?

EIA estimates current CHP use in industrial sector is 11 GW; total potential in 33 GW; market penetration of 33%--huge potential

Which Industrial Market Sectors?

Primary data analysis showed significant potential, under-representation, in:

- **Food processing**
- **Pharmaceuticals**
- **Chemical**
- **Primary metals**

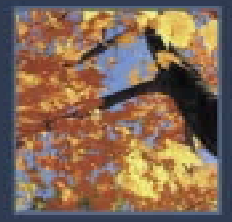
Growing Interest

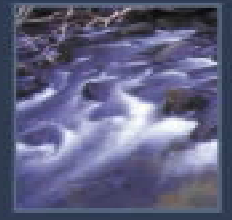
- **Wastewater treatment**

Description of Progress Against Task 1.

Select and Profile Industrial Sectors with High Potential for CHP








Food Industry

- Focus efforts on food processing industry, develop model
- Replicate food model in other sectors
- Considered greenhouses, irrigation, fruit/vegetable/grain/meat processing, refrigeration, freezing, grocery wholesale
- Limited CHP opportunity in food storage
    - Refrigerated warehouses very efficient
    - Absorption chillers not cool enough for freezing
- Processing most promising
    - Steam, hot and chilled water needs

Description of Progress Against Task 1.

Select and Profile Industrial Sectors with High Potential for CHP

Consumer Trends

Increased purchasing of highly-processed, energy-intensive food products:

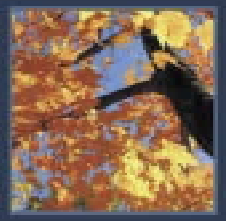
- Pre-cooked meats
- Prepared meals
- Carbonated beverages
- Table spreads
- Candy
- Snack foods

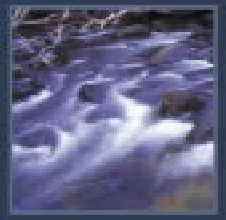
Producer Trend

Atkins/high-protein diets fueling cattle rustling

San Joaquin Valley rancher invested $6,000 in surveillance cameras to prevent theft; calves are a particular target.

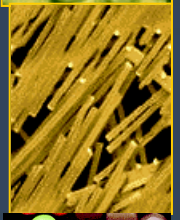
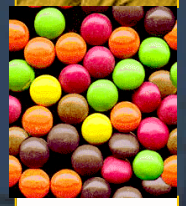
Across the Western Prairie, Bane of Ranchers Resurfaces:High-Protein Diet Craze Makes Cattle Rustling Profitable, **Rene Sanchez, Washington Post, Sunday, April 11, 2004; Page A03**





Description of Progress Against Task 1.

Select and Profile Industrial Sectors with High Potential for CHP


MW of Installed CHP Systems at Food Processing Sites

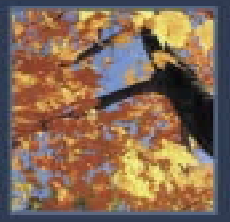
- **Fruits and Vegetables—2767 MW**
- **Grain and Corn Processing—784 MW**
- **Sugar, Candy, Gum, Nuts—699 MW**
- **Seafood, Ice, Prepared Foods—491 MW**

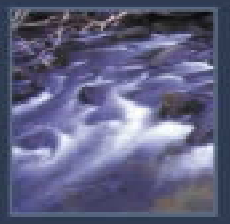
Large Processing Sites by Region

- **West Coast-CA, OR**
- **Northeast-PA, NY, NJ**
- **Midwest-IL, WI, MN, IA, IN, OH**
- **South/Southeast-TX, NC, TN**

(*2003 MIPD Data*)



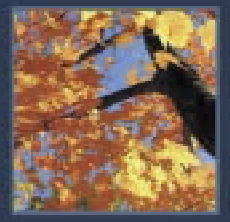


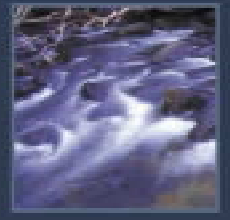



Description of Progress Against Task 1.

Select and Profile Industrial Sectors with High Potential for CHP








CHP Potential in Food Processing

Major Industrial Plant Database Query for Food Processing Sites (2003 MIPD)

- Technical feasibility using reciprocating engine + gas turbine generating power and usable heat
- Economic feasibility considered costs of electricity and CHP costs, payback of less than 5 years

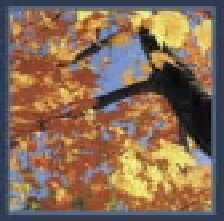

42 Sites with 276 MW of Technical/Economic CHP Potential

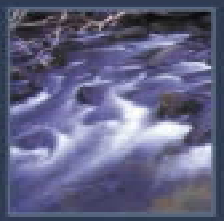
- CA-10 sites
- NJ-10 sites
- PA-6 sites
- NY-4 sites
- TX-3 sites
- CT, FL, GA, IL, MA, MO, NC, SC, UT, WA-1 site each

Description of Progress Against Task 1.

Select and Profile Industrial Sectors with High Potential for CHP








Industry Examples

Magic V alley Foods Potato Processing Plants

South-Central Idaho

- 2 10-MW Solar Turbines supply 24/7 electricity to the Idaho Power grid
- An unfired HRSG recovers thermal energy from turbine exhaust to generate 1310 kPa (190 psig) steam used by potato peelers, washer and dryer equipment

Frito-Lay Plant

Kern County (CA)

- Has used CHP since 1986 to make corn products
- Sells excess power to PG&E

Description of Progress Against Task 2.

Evaluate CHP Technologies

Traditional CHP Technologies Applicability

Process Heating
- 29% of total energy in the food industry
- Hot water
- Changes raw materials into food products
- Helps ensure sanitation and food safety

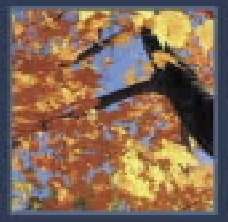
Process Cooling
- 16% of total energy inputs
- Refrigerated warehouse storage of unfrozen foods
- Frozen food storage
- Refrigeration to change the chemical structure
- Freeze-drying for food storage

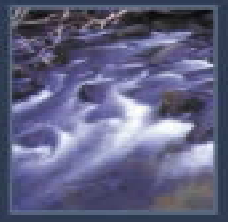
Other Process Uses
- Wastewater treatment
- Machine drives
- Aseptic food packaging techniques
- Electro-chemical processes

Reciprocating engines

Absorption chiller

Desiccant dehumidifier

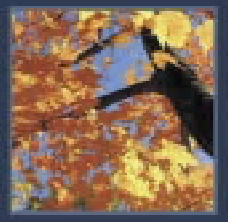


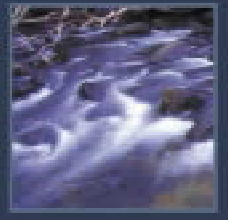


Description of Progress Against Task 2.

Evaluate CHP Technologies








Developing CHP Technologies

- Waste heat/CO_2 into greenhouses
- Organic Rankine Cycle engines for low-grade heat utilization
- Solar drying of biomass prior to combustion
- Anaerobic digester for abiogenic methane production
- Compressed air to store energy, decompressed air for power and cooling
- Flash steam meat cooking
- Adsorption chiller using waste heat from process stacks

Adsorption chiller

- Chilled water temperatures from 5-38°F
  - Can now freeze food, cool loading docks
- Hot water temperatures ranging from 122-194°F
- Uses low-grade waste heat
- Water refrigerant
- 30-year silica gel as an adsorbent
- Electrical load of 0.4KW for the 100-ton model
- No compressor

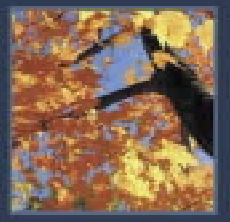
Description of Progress Against Task 3.

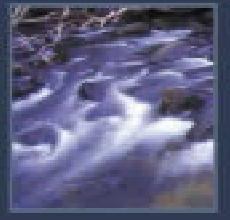
Exchange Information With Trade Associations and other Stakeholder Groups to Promote the Awareness & Deployment of CHP

Stakeholder Meetings, Conferences, Phone Contacts

- National Food Processing Association
- Snack Food Association
- American Association of Meat Processors
- American Meat Institute
- California League of Food Processors
- Northwest Food Processors Association
- American Frozen Food Institute
- Food Industry Environmental Council
- International Association of Refrigerated Warehouses
- Industry representatives



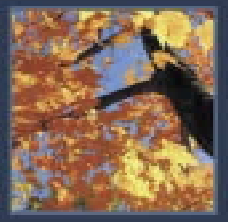


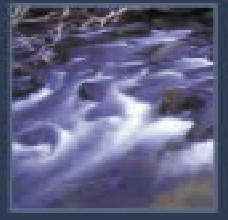



Description of Progress Against Task 3.

Exchange Information With Stakeholder Groups to Promote the Awareness & Deployment of CHP



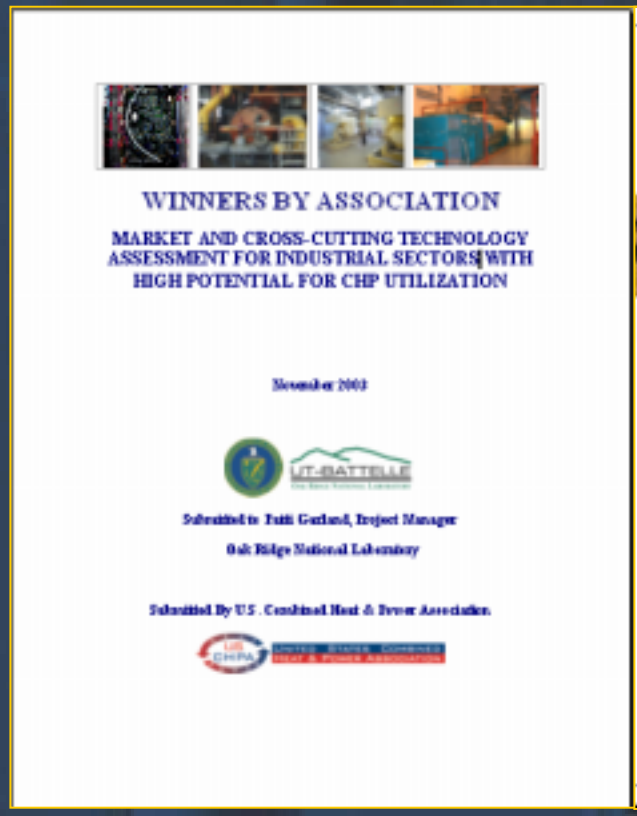


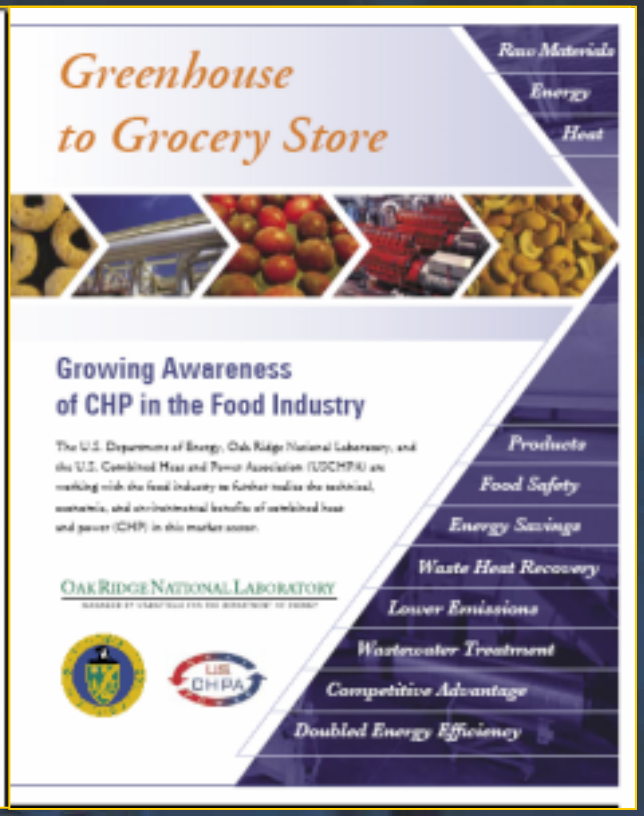



Information Gained

- Limited awareness of CHP in industry, eager to learn more
- Power "self-sufficiency" stronger driver than power reliability
- Food safety, related to hot water needs for sterilization, is key driver
- Ammonia cooling systems dominate food storage systems, adsorption chiller may displace
- Fruits and vegetable processing only online 90 days/year—not a good application
- Meat processing demands huge amounts of hot water—promising year-round application
- Growing interest in more efficient water usage
- Industry demands 2-3 year payback
- In assessing payback of CHP, some project developers misrepresent costs of residual power, i.e. grid power to supplement onsite generator—costs/kWh could ***double*** with reduced load

FY03 Deliverables and Availability

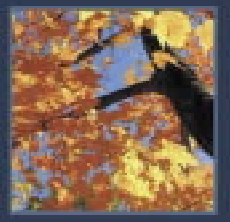


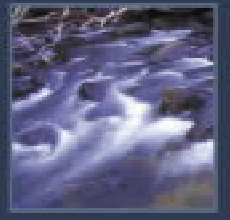


- **Market and Cross-Cutting Technology Assessment for Industrial Sectors with High Potential for CHP Utilization Report—November ’03**
- **Greenhouse to Grocery Store: Growing Awareness of CHP in the Food Industry Flyer—Drafted in late ’03, printed in ’04**

Available on Request

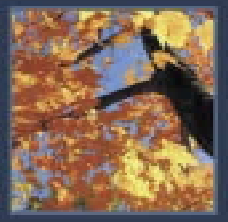


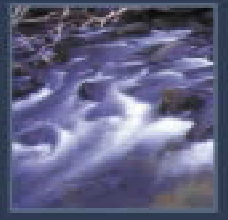





Coordination with Stakeholder Groups and Other Project Teams








ORNL Subcontractor Team Members

- EEA—MIPD data analysis
- RDC—technology assessment

Non-profits

- ACEEE—food processing trends
- Energy Solutions Center—utility and ratepayer outreach, opportunity identification
- San Diego Regional Energy Office—incentives, outreach
- Denver Regional Energy Office—assessment tools, outreach

Public Agencies

- Oak Ridge National Laboratory—assessment tools
- Industrial Technologies Program—assessment tools, PWAs
- NYSERDA—outreach, opportunity identification
- Seattle Regional Energy Office—outreach

FY04-05 Timeline

April ’04 – December ’04

• Continue to exchange information with Food Industry stakeholders

• Provide resources to, gain value from, *Western States Food Processing Efficiency Initiative* with CEC, Seattle Regional Energy Office, Northwest Food Processors Association, CA League of Food Processors, DelMonte Foods, ID Dept. of Water Resources, OR Office of Energy, and WSU

• Peer review, disseminate *Greenhouse to Grocery Store* flyer to interested parties using established communication channels through NYSERDA, ESC, etc.

• Collaborate with EEA to assess CHP potential in Chemical/Pharmaceutical Industry

• Replicate Food Processing model to Chemical/Pharmaceutical Industry

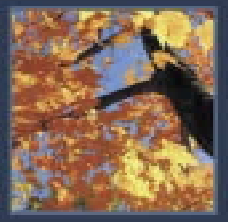
• Give presentation to *ESC Food Consortium*, ESC Annual Conference, Los Angeles, June 16

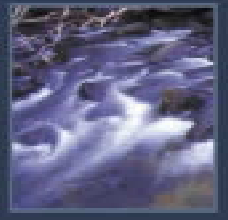
• Conduct workshop on *CHP Opportunities in the Chemical Industry* with the American Chemical Council, Austin, September 22

• Participate in *NFPA Fall Education Conference*, Miami Beach, November 13-17

• Participate in *Food Industry Environmental Council Multi-Sector Show*, Chicago, December








FY04-05 Timeline

January ’05 – December ’05

• Continue to provide resources to, gain value from, *Western States Food Processing Efficiency Initiative* with CEC, Seattle Regional Energy Office, Northwest Food Processors Association, CA League of Food Processors, DelMonte Foods, ID Dept. of Water Resources, OR Office of Energy, and WSU

• Conduct workshops on CHP Opportunities in the Pharmaceutical Industry with NYSERDA, SDREO and industry representatives

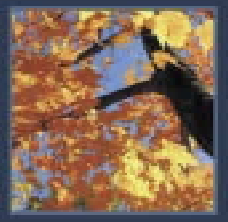
• Collaborate with EEA to assess CHP potential in Primary Metal Industry

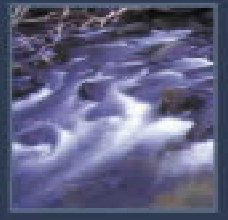
• Replicate Food Industry model to Primary Metal Industry

• Assess CHP potential with Wastewater Treatment associations

• Replicate Food Industry model to Wastewater Treatment Industry








Questions?

John Jimison
USCHPA
uschpa-hq@admgt.com
202-544-4565

Doug Hinrichs
SENTECH, Inc.
dhinrichs@sentech.org
240-223-5532