IOWA ENERGY POLICY COUNCIL
BOILER CO-UTILIZATION STUDY

The financial support of the Iowa Energy Policy Council is acknowledged, but Brown Engineering Company and DeWild Grant Reckert and Associates Company assume complete responsibility for the contents.

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.

Dean Reid, P.E. IOWA REG. NO. 5595
Aug. 21, 1981

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPervision AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.

Arthur B. A. Aug. 21, 1981
IOWA REG. NO. 71554

BROWN ENGINEERING COMPANY
DeWild GRANT RECKERT AND ASSOCIATES COMPANY
August, 1981
August 28, 1981

Iowa Energy Policy Council
State Capitol Complex
Des Moines, IA 50319

Subject: Boiler Co-Utilization Study

Dear Council Members:

This report presents the results of a study of sixteen existing boiler plants in Iowa. The study investigated the feasibility of using excess steam capacity from existing plants to provide energy for new grain ethanol plants or other appropriate applications.

The report indicates that co-utilization of steam would be feasible for five of the plants. For the remaining plants, construction of new coal-fired boilers would be more economically feasible than co-utilization.

The report was prepared by the undersigned of Brown Engineering Company and Mr. Arthur deWit of DeWild Grant Reckert and Associates Company, assisted by other staff members. We wish to thank the Iowa Energy Policy Council staff for valuable assistance in the report preparation.

Respectfully submitted,

BROWN ENGINEERING COMPANY

Jay K. Read, P.E.
Partner

JRR:sp
Enclosure
EXECUTIVE SUMMARY
EXECUTIVE SUMMARY

The Iowa Energy Policy Council (EPC) retained the consulting engineering team of Brown Engineering Company, West Des Moines, Iowa, and DeWild Grant Reckert and Associates Company, Rock Rapids, Iowa, to study sixteen existing steam plants in Iowa. The purpose of the study was to determine the feasibility of using excess steam capacity, from these plants, as an energy source for new grain ethanol plants or for other applications. This report presents the findings of that study. Due to limitations of funding available to EPC, the study did not consider overall economics of ethanol production but only compared energy costs of the co-utilization of existing steam plants with construction of new steam plants.

The study was conducted in two phases. Phase I investigated steam plant condition; steam quantity and availability; availability of land, water and utilities; availability of feedstocks, transportation and storage; availability of product and by-product transportation and utilization; environmental constraints; reduction of energy requirements; and feasibility of other applications. Phase II included an economic evaluation for those facilities not excluded after Phase I evaluation. The economic evaluation included estimates for cost of modification, back-up energy systems, purchased price of steam, operation of steam system, steam cost per gallon of ethanol produced over a ten year period, and comparison of steam cost per gallon for co-utilization versus installation of a coal-fired boiler. In addition, risks to implementation were identified.
The study included investigation of the following existing facilities:

- Boone Valley Cooperative, Eagle Grove, Iowa
- Chemplex Company, Clinton, Iowa
- Corn Belt Power Cooperative, Windom Station, Spencer, Iowa
- Corn Belt Power Cooperative, Humboldt, Iowa
- Eastern Iowa Light and Power Cooperative, Montpelier, Iowa
- Iowa Electric Light and Power Company, Sutherland Station, Marshalltown, Iowa
- Iowa Illinois Gas and Electric Company, Bettendorf, Iowa
- Iowa Power and Light Company, Des Moines Power Station, Des Moines, Iowa
- Iowa Public Service Company, Carroll, Iowa
- Iowa Public Service Company, Neal Station, Sioux City, Iowa
- Iowa Public Service Company, Hawkeye Station, Storm Lake, Iowa
- Iowa Public Service Company, Maynard Station, Waterloo, Iowa
- Iowa Southern Utilities Company, Burlington, Iowa
- Muscatine Power and Water, Muscatine, Iowa
- Northern Natural Gas (Inter North), Ogden Compressor Station, Ogden, Iowa
- Rath Packing Company, Waterloo, Iowa.

The following six facilities were excluded from further study, after Phase I analysis, for the reasons noted:

1. Boone Valley Cooperative, Eagle Grove, Iowa
   - No excess steam is available at this time.

2. Chemplex Company, Clinton, Iowa
   - No excess steam is available at this time.
3. Iowa Illinois Gas and Electric Company, Bettendorf, Iowa
   Remaining useful life is not adequate to support construction of a
   new ethanol plant.

4. Iowa Public Service Company, Carroll, Iowa
   Remaining useful life is not adequate to support construction of a
   new ethanol plant.

5. Iowa Public Service Company, Storm Lake, Iowa
   Two ethanol plants are already planned for this area and useful
   life is questionable.

6. Muscatine Power and Water, Muscatine, Iowa
   Remaining useful life is not adequate to support construction of a
   new ethanol plant.

The remaining ten sites were subjected to Phase II analysis. Economic eva-
   luations indicated that co-utilization of steam would result in lower cost
   than construction of new coal-fired boilers at the following facilities:

1. Corn Belt Power Cooperative, Spencer, Iowa
2. Eastern Iowa Light and Power Cooperative, Montpelier, Iowa
3. Iowa Electric Light and Power Company, Sutherland Station,
   Marshalltown, Iowa
4. Iowa Power and Light Company, Des Moines Power Station, Des
   Moines, Iowa
   Ethanol facilities are planned for this site.
5. Iowa Public Service Company, Neal Station, Sioux City, Iowa.
   Ethanol facilities are planned for this site.
For the remaining five sites, installation of a new coal-fired boiler with
gas-fired back-up boilers would be more economical than co-utilization.

The facilities in this category include:

1. Corn Belt Power Cooperative, Humboldt, Iowa
2. Iowa Public Service Company, Waterloo, Iowa
3. Iowa Southern Utilities, Burlington, Iowa
4. Northern Natural Gas, Ogden Compressor Station, Ogden, Iowa
STUDY ASSUMPTIONS

(1) Hours of Operation: 340 days per year, 24 hours per day
(2) Feedstock: Yellow Dent Corn, 15.5% moisture, 56 pounds per bushel
(3) Process: Whole Corn Milling (dry) to optimize starch yield.
(4) Products: 2.5 gallons 200· proof ethanol per bushel of corn
   6.7 lb DDG at 10% moisture, per gallon of 200· proof ethanol
   6.0 lb CO₂ per gallon of ethanol
(5) Steam Consumption:
   50,000 Btu per gallon of ethanol
(6) Electric Power Consumption:
   2.0 KWh per gallon of ethanol
(7) Steam Supply:
   Minimum pressure 100 psig, saturated, delivered to ethanol plant.
(8) Distribution of Heat in Process:
   Mashing and Cooking  20%
   Distillation          43%
   DDG Recovery         4%
   Drying of DDG        33%
   100%
(9) Condensate Returned from Alcohol Process: 75%
    25% make-up provided at alcohol plant.
(10) Process Make-up Water for Ethanol Plant:
    5.5 gallon make-up per gallon ethanol
(11) Cooling Water for Ethanol Plant:
   Circulate 150 gpm at 85°F, maximum per million gallon per year of ethanol produced.
   Example for 20 million gallon plant:
   \[(150 \text{ gpm})(20) = 3000 \text{ gpm} @ 85°F \text{ Max.}\]

(12) Wastewater to Treatment:
   5 gallon wastewater per gallon ethanol produced.

(13) Construction Costs (1981):
   Coal fired steam plant, complete: $60/\text{lb steam}
   Gas/oil package boiler plant, complete: $30/\text{lb steam}

(14) Inflation Rates:
   Construction and Labor: 10% per year
   Coal Cost: 12% per year
   Oil Cost: 15% per year
   Natural Gas Cost: 20% per year

(15) Land Area Required for Ethanol Plant Including Grain Storage:
   5 million gal/yr plant = 10 acres
   20 million gal/yr plant = 15 acres
   50 million gal/yr plant = 20 acres

(16) 1981 Fuel
   #2 oil: $7.14 per million Btu.
   Firm Natural Gas: $2.90 per million Btu
   Washed Iowa Coal: $36 per ton + $.08 per ton-mile
   10,500 Btu per pound
   Mine at Centerville, IA
   Mines near Lovilia, IA

(17) Existing plants use boiler steam in reboiler to generate 150 psig, saturated steam for alcohol plant.

(18) Condensate returned from alcohol plant at 100°F.
(19) Steam delivered to alcohol plant at not less than 100 psi saturated.

(20) Steam generated by back-up boilers or new coal fired boilers to be 150 psig saturated using 100°F condensate as feedwater.

(21) Fixed charge rate based on 20 year life and 10% interest.

\[
A = \frac{i}{p} \left( 1 + \frac{1}{1 + i} \right) - n = \frac{.1}{1 + (1.1)^{-20}} = .1175
\]

Add insurance @ 0.005

Annual Fixed charge Rate = .123

(22) Labor, maintenance, supplies, station power costs.

Coal fired boiler: $0.60 per 1000 lb. steam
Gas/oil fired boiler: $0.20 per 1000 lb. steam

(23) Estimated corn supply, potential DDG market, and Potential Alcohol Market are based on the county in which the plant is located with the exception of the Iowa Public Service Company, Sioux City, Iowa plant which is based on both Woodbury and Plymouth counties.

(24) Boilers over 30 years in age rejected for Phase II analysis.

(25) Feed water to existing boilers assumed to be same condition as reboiler condensate; 250 psig, 406°F saturated liquid.

(26) If coal cost at existing plant is less than current Iowa coal cost (item 16) plant coal cost is used for new boiler installations.

(27) Demineralizer backwash water is 10% of demineralized water required.

(28) Cooling towers used at all sites except Montpelier, Burlington and Sioux City which use once through cooling with river water.

(29) Cooling tower make-up is 3% of cooling tower flow.

(30) All plants use steam directly from boiler, not reheat or turbine extraction.
<table>
<thead>
<tr>
<th>SITE</th>
<th>Corn Belt Power Cooperative</th>
<th>Iowa Public Service Co.</th>
<th>Iowa Public Service Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Humbolt, IA</td>
<td>Carroll, IA</td>
<td>Storm Lake, IA</td>
</tr>
<tr>
<td>HOURS OPERATED</td>
<td>300-400/yr Peaking only</td>
<td>0-plant closed in 1980</td>
<td>200/yr peaking only</td>
</tr>
<tr>
<td>STEAM PRESSURE</td>
<td>#1, 2, 3-600 psig #4-850 psig</td>
<td>420 psig</td>
<td>600 psig</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>#1, 2, 3-825°F #4-900°F</td>
<td>750°F</td>
<td>825 psig</td>
</tr>
<tr>
<td>CAPACITY</td>
<td>#1 &amp; 2-50,000 #/hr #3-125,000 #/hr #4-165,000 #/hr</td>
<td>#1-100,000 #/hr #2-125,000 #/hr</td>
<td></td>
</tr>
<tr>
<td>BUILT</td>
<td>#1 &amp; 2-1950 #3-1952 #4-1954</td>
<td>1951</td>
<td>#1-1948 #2-1953</td>
</tr>
<tr>
<td>FIRED BY</td>
<td>Traveling grate stoker</td>
<td>Traveling grate stoker</td>
<td>Traveling grate stoker</td>
</tr>
<tr>
<td>GENERAL CONDITION</td>
<td>Very good</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>WATER TREATMENT</td>
<td>Approximately 20 GPM</td>
<td>Approximately 200 GPM</td>
<td>160 - 170 GPM</td>
</tr>
<tr>
<td>AIR POLLUTION CONTROL &amp; EQUIP.</td>
<td>#1 &amp; 2 - MC* #3 &amp; 4 - MC w/ESP</td>
<td>MC</td>
<td>MC</td>
</tr>
<tr>
<td>OIL STORAGE AVAILABLE</td>
<td>None</td>
<td>On adjoining property</td>
<td>None</td>
</tr>
<tr>
<td>NATURAL GAS AVAILABLE</td>
<td>On site</td>
<td>At site</td>
<td>Near site</td>
</tr>
<tr>
<td>ELECTRICAL SERVICE AVAILABLE</td>
<td>Substation on site</td>
<td>Substation at site</td>
<td>Substation and transformers site</td>
</tr>
<tr>
<td>RAIL SERVICE</td>
<td>Chicago-Northwestern</td>
<td>Chicago-Northwestern</td>
<td>Illinois-Central</td>
</tr>
<tr>
<td>RAIL CONDITION</td>
<td>Excellent-new ribbon rail installed in last two years</td>
<td>Excellent</td>
<td>Good</td>
</tr>
<tr>
<td>ROADS</td>
<td>Excellent-served by State Hwy 3 &amp; 169</td>
<td>Excellent U.S. Hwy 30 &amp; 71</td>
<td>Good-State Hwy 5 &amp; U.S. 71</td>
</tr>
<tr>
<td>AREA UNEMPLOYMENT</td>
<td>3.4%</td>
<td>5.1%</td>
<td>1.8% - 3.5%</td>
</tr>
<tr>
<td>LAND AVAILABLE</td>
<td>Over 20 acres at power plant site</td>
<td>20 acres +, 1 mile + from plant</td>
<td>More than 20 acres</td>
</tr>
<tr>
<td>WATER AVAILABILITY</td>
<td>Large amounts available</td>
<td>1300 GPM</td>
<td>2 wells on site, 1 operable-6&quot; line to Storm Lake</td>
</tr>
<tr>
<td>ESTIMATED SIZE ETHANOL PLANT</td>
<td>30 million gal/yr.</td>
<td>None-plant eliminated due to age</td>
<td>None-Plant eliminated due to age &amp; two alcohol plants already in same area</td>
</tr>
</tbody>
</table>

*MC - Mechanical Collector  
ESP - Electrostatic Precipitator
<table>
<thead>
<tr>
<th>SITE</th>
<th>Corn Belt Power Cooperative</th>
<th>Iowa Public Service Co.</th>
<th>Boone Valley Power Cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Spencer, IA</td>
<td>Sioux City, IA</td>
<td>Eagle Grove, IA</td>
</tr>
<tr>
<td>HOURS OPERATED</td>
<td>200 or less</td>
<td>#1-Peaking</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Peaking only</td>
<td>#2 &amp; 3-Continuous</td>
<td></td>
</tr>
<tr>
<td>STEAM PRESSURE</td>
<td>875 psig</td>
<td>#1-1,850 psig</td>
<td>650 psig to turbine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#2 &amp; 3-2400 psig</td>
<td>150 to process</td>
</tr>
<tr>
<td>STEAM TEMPERATURE</td>
<td>900°F</td>
<td>Superheated</td>
<td>850°F to turbine</td>
</tr>
<tr>
<td>CAPACITY</td>
<td>370,000 #/hr</td>
<td>#1-1,050,000 #/hr</td>
<td>200,000 #/hr with new boiler being installed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#2-2,330,000 #/hr</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#3-3,805,000 #/hr</td>
<td></td>
</tr>
<tr>
<td>BUILT</td>
<td>1959</td>
<td>1963 &amp; 1972</td>
<td>1949, new boiler under construction</td>
</tr>
<tr>
<td>FIRED BY</td>
<td>Pulverized coal</td>
<td>#1-Cyclone</td>
<td>Traveling Grate Stoker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#2 &amp; 3 Pulv. Coal</td>
<td></td>
</tr>
<tr>
<td>GENERAL CONDITION</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Currently being rebuilt</td>
</tr>
<tr>
<td>WATER TREATMENT CAPACITY</td>
<td>25-30 GPM, treated to 0 calcium &amp; hardness</td>
<td>Operating at full capacity</td>
<td>Will have 465 GPM capacity</td>
</tr>
<tr>
<td>AIR POLLUTION CONTROL &amp; EQUIP.</td>
<td>ESP</td>
<td>ESP</td>
<td>Baghouse</td>
</tr>
<tr>
<td>OIL STORAGE AVAILABLE</td>
<td>Very limited amount</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>NATURAL GAS AVAILABLE</td>
<td>Gas line to Storm Lake at north end of site</td>
<td>Available nearby</td>
<td>Nearby in limited amounts</td>
</tr>
<tr>
<td>ELECTRICAL SERVICE AVAILABLE</td>
<td>Substation at site</td>
<td>Substation at site</td>
<td>Substation at site</td>
</tr>
<tr>
<td>RAIL SERVICE</td>
<td>Chicago-Milwaukee St. Paul &amp; Pacific</td>
<td>Chicago-Northwestern</td>
<td>Chicago-Northwestern</td>
</tr>
<tr>
<td>RAIL CONDITION</td>
<td>Good</td>
<td>Excellent</td>
<td>Excellent-new ribbon rail installed</td>
</tr>
<tr>
<td>ROADS</td>
<td>Good - U.S. Hwy. 71 &amp; 18</td>
<td>Excellent 1-29, U.S. 75, 20, 73</td>
<td>Excellent State Hwy. 17, 3 I-35 nearby</td>
</tr>
<tr>
<td>AREA UNEMPLOYMENT</td>
<td>4.2%</td>
<td>Not known at this time</td>
<td>3.3%</td>
</tr>
<tr>
<td>LAND AVAILABLE</td>
<td>Over 20 acres nearby on site</td>
<td>Sufficient for 50 mill gal/yr plant nearby</td>
<td>Limited-less than 10 acres at site</td>
</tr>
<tr>
<td>WATER</td>
<td>1 well at plant, 3 others nearby-600 GPM capacity</td>
<td>Sufficient available for large plant</td>
<td>1300 GPM</td>
</tr>
<tr>
<td>ESTIMATED ETHANOL PLANT SIZE</td>
<td>50 million gal/yr</td>
<td>50 million gal/yr</td>
<td>None-excess steam not available at this time</td>
</tr>
</tbody>
</table>

*MC - Mechanical Collector
ESP - Electrostatic Precipitator
| SITE                        | LOCATION              | HOURS OPERATED | STEAM PRESSURE | STEAM TEMPERATURE | CAPACITY | BUILT | FIRED BY | GENERAL CONDITION | WATER TREATMENT | WATER POLLUTION CONTROL & EQUIP. | OIL STORAGE AVAILABLE | ELECTRICAL SERVICE AVAILABLE | RAIL SERVICE | RAIL CONDITION | ROADS                      | AREA UNEMPLOYMENT | LAND AVAILABLE | WATER AVAILABILITY | ESTIMATED SIZE ETHANOL |
|-----------------------------|-----------------------|----------------|----------------|------------------|----------|-------|----------|-------------------|----------------|-----------------------------|----------------------|------------------------|----------------|----------------|-----------------------|-----------------|----------------|----------------------|----------------|----------------|------------------|
| Iowa Electric Light and Power | Marshalltown, IA      | Continuous     | #1 & 2: 980 psig | #1 & 2: 910°F    | #1 & 2: 300,000 #/hr | #1 & 2: 1955 | #1 & 2: Pulverized coal | Good              | Unknown-not at full capacity | None              | Available on site           | Chicago-Northwestern | Excellent           | U.S. Highway 30 | 4.2%                | 220 acres 3600 ft. from power plant | 6" line-650 gpm future 12" line to west side of ethanol site | 53 million gal/yr | 111 |
| Rath Packing Company       | Waterloo, IA          | Continuous     | 410 psig       | 675°F            | #6-75,000 #/hr       | #6-1940 | #6 & 7: Cyclone | Good             | None              | #6 & 7: None | Available on site           | Chicago-Northwestern | Excellent           | U.S. Hwy 63, 20, 218 | 5.5%              | 25 acres 3800 ft. from plant | 6" line | 3950 GPM | 111 |
| Iowa Public Service Company | Waterloo, IA          | Peaking only   | #1-900 psig    | 1000°F           | #7 & 8: 125,000 #/hr  | #7-1945 | #8: Stoker | Good             | None              | #8: ESP    | Available on site           | Waterloo-Cedar Falls | Excellent           | U.S. Hwy 63, 20, 218 | 5.5%              | Greater than 15 acres-3.3 miles from plant | 12" line | 980 GPM | 311 |

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ESP - Electrostatic Precipitator
<table>
<thead>
<tr>
<th>SITE</th>
<th>Eastern Iowa Light &amp; Power Cooperative</th>
<th>Iowa Power and Light</th>
<th>Iowa Southern Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Montpelier, IA</td>
<td>Des Moines, IA</td>
<td>Burlington, IA</td>
</tr>
<tr>
<td>HOURS OPERATED</td>
<td>Continuous</td>
<td>Continuous</td>
<td>Continuous</td>
</tr>
<tr>
<td>STEAM PRESSURE</td>
<td>850 psig</td>
<td>#6 &amp; #9-1250 psig</td>
<td>#6-1450 psig #11-1000 psig</td>
</tr>
<tr>
<td>STEAM TEMPERATURE</td>
<td>900°F</td>
<td>950°F</td>
<td>1005°F</td>
</tr>
<tr>
<td>PRESSURE #1-230,000 #2-300,000 #9-300,000 #10-425,000 #11-790,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPACITY</td>
<td>1,425,000 #/hr</td>
<td>1,365,000 #/hr</td>
<td>1,255,000 #/hr</td>
</tr>
<tr>
<td>FIRED BY</td>
<td>Pulverized coal</td>
<td>#9-gas/PC #9-gas was PC</td>
<td>Pulverized coal</td>
</tr>
<tr>
<td>GENERAL CONDITION</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>WATER TREATMENT</td>
<td>Unknown</td>
<td>60 GPM</td>
<td>Unknown</td>
</tr>
<tr>
<td>AIR POLLUTION CONTROL &amp; EQUIP.</td>
<td>MC &amp; ESP</td>
<td>ESP on #10 &amp; #11</td>
<td>ESP</td>
</tr>
<tr>
<td>OIL STORAGE AVAILABLE</td>
<td>Approximately 18,000 Gal.</td>
<td>Available on site</td>
<td>Available on site</td>
</tr>
<tr>
<td>NATURAL GAS AVAILABLE</td>
<td>Available on site</td>
<td>Available on site</td>
<td>None</td>
</tr>
<tr>
<td>ELECTRICAL SERVICE AVAILABLE</td>
<td>Substation on site</td>
<td>Substation on site</td>
<td>Substation on site</td>
</tr>
<tr>
<td>RAIL SERVICE</td>
<td>Chicago-Rock Island &amp; Pacific</td>
<td>Burlington-Northern</td>
<td>Burlington-Northern</td>
</tr>
<tr>
<td>RAIL CONDITION</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>ROADS</td>
<td>Good-State Hwy 22</td>
<td>Excellent-State Hwy 61</td>
<td>Good-US. Hwy 34, 34, 61 nearby-County rds. to ethanol site</td>
</tr>
<tr>
<td>AREA UNEMPLOYMENT</td>
<td>Draw employees from Muscatine &amp; Quad Cities. 5.8% average</td>
<td>4.4%</td>
<td>6.9%</td>
</tr>
<tr>
<td>LAND AVAILABLE</td>
<td>150 acres 2000 ft. from power plant-zoned agricultural</td>
<td>168 acres 4000 ft. from power plant</td>
<td>500+ acres 3000 ft. from power plant</td>
</tr>
<tr>
<td>WATER AVAILABILITY</td>
<td>Mississippi River available</td>
<td>8&quot; north &amp; 8&quot; east on ethanol site 1200 GPM Future 28&quot; line</td>
<td>Mississippi River available</td>
</tr>
<tr>
<td>ESTIMATED SIZE ETHANOL PLANT</td>
<td>17 million gal/yr</td>
<td>137 million gal/yr</td>
<td>76 million gal/yr</td>
</tr>
</tbody>
</table>

*MC - Mechanical Collector  
ESP - Electrostatic Precipitator
<table>
<thead>
<tr>
<th>SITE</th>
<th>Chemplex Company</th>
<th>Iowa-Illinois Gas &amp; Electric</th>
<th>Muscatine Power &amp; Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Clinton, IA</td>
<td>Bettendorf, IA</td>
<td>Muscatine, IA</td>
</tr>
<tr>
<td>HOURS OPERATED</td>
<td>Continuous</td>
<td>Peaking Unit</td>
<td>#7 &amp; 8 Continuous</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>#5-1500 hr/yr</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>#6-3000 hr/yr</td>
</tr>
<tr>
<td>STEAM PRESSURE</td>
<td>600 psig</td>
<td>800 psig</td>
<td>650 psig</td>
</tr>
<tr>
<td>STEAM TEMPERATURE</td>
<td>Superheated</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPACITY</td>
<td>1,292,360 #/hr</td>
<td>Total about 1,000,000 #/hr</td>
<td>65-85,000 #/hr</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6-125,000 #/hr</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7-214,000 #/hr</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-680,000 #/hr</td>
</tr>
<tr>
<td>BUILT</td>
<td>14 units-1969</td>
<td>1937, 1942</td>
<td>#5-1943</td>
</tr>
<tr>
<td></td>
<td>2-1980</td>
<td>1949, 1949</td>
<td>#6-1948</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>#7-1958</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>#8-1969</td>
</tr>
<tr>
<td>FIRED BY</td>
<td>Gas/Oil</td>
<td>Pulverized Coal</td>
<td>Stokers #5 &amp; 6</td>
</tr>
<tr>
<td>GENERAL CONDITION</td>
<td>Good</td>
<td>Fair-Showing Age</td>
<td>Good</td>
</tr>
<tr>
<td>WATER TREATMENT</td>
<td>Unknown</td>
<td>100 GPM per train</td>
<td>Unknown</td>
</tr>
<tr>
<td>AIR POLLUTION</td>
<td>None</td>
<td>ESP</td>
<td>#5 &amp; 6 - MC</td>
</tr>
<tr>
<td>CONTROL &amp; EQUIP.</td>
<td></td>
<td></td>
<td>#7 &amp; 8 - ESP</td>
</tr>
<tr>
<td>OIL STORAGE</td>
<td>Available on site</td>
<td>5,000,000 Gal.</td>
<td>200,000 Gal. at new plant</td>
</tr>
<tr>
<td>AVAILABLE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NATURAL GAS</td>
<td>Available on site</td>
<td>Available on site</td>
<td>Available on site</td>
</tr>
<tr>
<td>AVAILABLE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELECTRICAL SERVICE</td>
<td>Substation on site</td>
<td>Substation on site</td>
<td>Substation on site</td>
</tr>
<tr>
<td>AVAILABLE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAIL SERVICE</td>
<td>Chicago-Northwestern</td>
<td>Davenport-Rock</td>
<td>Chicago-Milwaukee Island &amp; Northwestern</td>
</tr>
<tr>
<td>RAIL CONDITION</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>ROADS</td>
<td>Good-U.S. Hwy 30, 67 State Hwy 291</td>
<td>Excellent-U.S. Hwy 67, 6 1-80 &amp; 1-74 Nearby</td>
<td>Excellent-U.S. Hwy 61 State Hwy 92, 22 38</td>
</tr>
<tr>
<td>AREA UNEMPLOYMENT</td>
<td>5.0%</td>
<td>7.4%</td>
<td>4.2%</td>
</tr>
<tr>
<td>LAND AVAILABLE</td>
<td>Possible 700 acre site south of plant or agricultural land nearby</td>
<td>Approx. 12 acres 3600 ft. from power plant</td>
<td>70 acres 4.5 miles from power plant</td>
</tr>
<tr>
<td>WATER AVAILABILITY</td>
<td>8&quot; line 2 miles east of plant, wells on Chemplex property</td>
<td>12&quot; line in Hwy 67 R.O.W. 5MGO avail.</td>
<td>Wells supply 8&quot; or 6&quot; line on ethanol site and 30&quot; city line</td>
</tr>
<tr>
<td>ETHANOL PLANT</td>
<td>None-Plant presently steam limited</td>
<td>None-Plant eliminated due to age</td>
<td>None-Plant eliminated due to age #5 &amp; #6</td>
</tr>
</tbody>
</table>

MC - Mechanical Collector
ESP - Electrostatic Precipitator
<table>
<thead>
<tr>
<th>SITE</th>
<th>Location</th>
<th>Site Survey Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Natural Gas</td>
<td>Ogden, LA</td>
<td></td>
</tr>
</tbody>
</table>

| Hours Operated               | Continuous        |                  |
| Steam Pressure               | 150 psig          |                  |
| Steam Temperature            | 335°F             |                  |
| Capacity                     | 50,000 kW/hr- NNG | Estimate         |
| Built                        | Not available     |                  |
| Fired by                     | Natural gas engine| One V-16 One V-20|
| General Condition            | Excellent         |                  |
| Water Treatment Capacity     | None              |                  |
| Air Pollution Control & Equip.| None             |                  |
| Oil Storage Available        | None              |                  |
| Natural Gas Available        | On site           |                  |
| Electrical Service Available | 161 KV, 115KV near site |                  |
| Rail Service                 | Chicago-Northwestern |                |
| Rail Condition               | Excellent         |                  |
| Roads                        | Excellent-U.S. Hwy 30, 169, I-35 - 30 miles away | |
| Area Unemployment            | Not available     |                  |
| Land Available               | More than 20 acres|                  |
| Water Availability           | Wells would have to be drilled | |
| Estimated Size Ethanol Plant | 10 million gal/yr. |                  |

*MC - Mechanical Collector
ESP - Electrostatic Precipitator
### Table 2

**Purchased Steam Cost**

| Location          | Iowa Electric Light and Power Company | Rath Packing Company | Iowa Public Service Company | Eastern Iowa REC. | Iowa Power and Light Company | Iowa Southern Utilities | Corn Belt Power Cooperative | Corn Belt Power Cooperative | Iowa Public Service Company | Northern Natural Gas |
|-------------------|---------------------------------------|----------------------|-----------------------------|-------------------|-------------------------------|------------------------|---------------------------|----------------------------|---------------------------|
| Marshalltown, IA  | Marshalltown, IA                       | Waterloo, IA         | Waterloo, IA                | Waterloo, IA      | Des Moines, IA                | Burlington, IA         | Humboldt, IA              | Spencer, IA               | Sioux City, IA             | Ogden, IA                 |
| Fixed Costs $/1000 lb. Steam | .31                                   | 2.58                 | 1.69                        | .36               | .20                           | .56                    |                           |                           |                           |
| Operating Costs $/1000 lb. Steam | .60                                   | .60                  | .60                         | .60               | .60                           | .60                    |                           |                           |                           |
| Fuel Costs $/1000 lb. Steam    | 2.40                                  | 3.28                 | 2.60                        | 1.85              | 2.40                          | 2.02                   |                           |                           |                           |
| Water Costs $/1000 lb. Steam   | .003                                  | .002                 | .002                        | .002              | .003                          | .002                   |                           |                           |                           |
| Total Cost $/1000 lb. Steam    | 3.31                                  | 6.46                 | 4.89                        | 2.81              | 3.20                          | 3.18                   |                           |                           |                           |
EXPLANATION FOR TABLE 2 - PURCHASED STEAM COST

All calculations are based on the Study Assumptions, shown previously. Fixed costs are based on the annual fixed charge rate of 0.123 and the estimated plant modification costs shown in Table 3, following. The fixed cost per thousand pounds of steam is based on the estimated annual purchased steam.

Operating costs are assumed to be a constant $0.60 per thousand pounds of steam for coal-firing. This figure includes labor, maintenance, supplies and station power.

Fuel costs per thousand pounds of steam is based on actual fuel cost at the facilities, where available. Where fuel price is not available an assumption of coal cost is made. In all cases, it is assumed that a reboiler would be installed between the steam plant and the ethanol plant, to separate the steam and condensate systems. This may not be a requirement in all cases, but is considered to be good design to avoid contamination of power plant systems. The resulting fuel cost takes into account the efficiencies of the steam generators and the reboilers, as well as steam line losses.

Water costs include the cost of water and chemicals to provide make-up in the amount of 25% of the steam purchased. Make-up water and treatment could be provided at either the ethanol plant or power plant site.

The total cost per thousand pounds is the sum of the items shown above. It should be noted that the total does not include the cost of land acquisition or easements for constructing steam lines. Also it does not include any mark-up or profit that may be required by the steam plant owner. All cost items have been estimated at incremental cost rates, and may not reflect the actual cost charged by the steam plant.
<table>
<thead>
<tr>
<th>SITE</th>
<th>IOWA ELECTRIC LIGHT AND POWER COMPANY</th>
<th>RATH PACKING COMPANY</th>
<th>IOWA PUBLIC SERVICE COMPANY</th>
<th>EASTERN IOWA REC</th>
<th>IOWA POWER AND LIGHT COMPANY</th>
<th>IOWA SOUTHERN UTILITIES</th>
<th>CORN BELT POWER COOPERATIVE</th>
<th>CORN BELT POWER COOPERATIVE</th>
<th>IOWA PUBLIC SERVICE COMPANY</th>
<th>NORTHERN NATURAL GAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Marshalltown, IA</td>
<td>Waterloo, IA</td>
<td>Waterloo, IA</td>
<td>Montpelier, IA</td>
<td>Des Moines, IA</td>
<td>Burlington, IA</td>
<td>Humboldt, IA</td>
<td>Spencer, IA</td>
<td>Sioux City, IA</td>
<td>Ogden, IA</td>
</tr>
<tr>
<td>MODIFICATION COSTS</td>
<td>$5,440,410</td>
<td>$1,977,741</td>
<td>$11,244,877</td>
<td>$2,291,804</td>
<td>$10,006,179</td>
<td>$8,212,187</td>
<td>$1,153,672</td>
<td>$3,615,780</td>
<td>$6,588,325</td>
<td>$7,073,521</td>
</tr>
<tr>
<td>BACK-UP ENERGY PRODUCTION SYSTEM</td>
<td>Note 1</td>
<td>$74,000</td>
<td>Note 1</td>
<td>Note 1</td>
<td>Note 1</td>
<td>Note 1</td>
<td>$6,723,280</td>
<td>Note 1</td>
<td>$1,200,000</td>
<td></td>
</tr>
<tr>
<td>PURCHASE PRICE OF STEAM</td>
<td>15¢/gal.</td>
<td>22¢/gal.</td>
<td>12¢/gal.</td>
<td>16¢/gal.</td>
<td>14¢/gal.</td>
<td>21¢/gal.</td>
<td>13¢/gal.</td>
<td>17¢/gal.</td>
<td>28¢/gal.</td>
<td></td>
</tr>
<tr>
<td>BACK-UP SYSTEM OPERATION COST</td>
<td>25¢/gal.</td>
<td>29¢/gal.</td>
<td>21¢/gal.</td>
<td>22¢/gal.</td>
<td>27¢/gal.</td>
<td>27¢/gal.</td>
<td>19¢/gal.</td>
<td>17¢/gal.</td>
<td>21¢/gal.</td>
<td></td>
</tr>
<tr>
<td>AVERAGE STEAM COST OVER 10 YR PERIOD</td>
<td>24.0¢/gal.</td>
<td>47.4¢/gal.</td>
<td>31.7¢/gal.</td>
<td>19.9¢/gal.</td>
<td>39.9¢/gal.</td>
<td>45¢/gal.</td>
<td>37¢/gal.</td>
<td>28¢/gal.</td>
<td>49¢/gal.</td>
<td></td>
</tr>
<tr>
<td>NEW COAL FIRED BOILER CONSTRUCTION COST WITH BACK-UP</td>
<td>$26,079,000</td>
<td>$2,356,800</td>
<td>$9,120,500</td>
<td>$8,684,000</td>
<td>$68,154,000</td>
<td>$38,036,200</td>
<td>$13,908,420</td>
<td>$23,180,760</td>
<td>$23,180,760</td>
<td>$4,500,000</td>
</tr>
<tr>
<td>NEW COAL FIRED BOILER STEAM COST</td>
<td>20¢/gal.</td>
<td>22¢/gal.</td>
<td>20¢/gal.</td>
<td>20¢/gal.</td>
<td>18¢/gal.</td>
<td>24¢/gal.</td>
<td>22¢/gal.</td>
<td>25¢/gal.</td>
<td>25¢/gal.</td>
<td>20¢/gal.</td>
</tr>
<tr>
<td>AVERAGE STEAM COST OVER 10 YR PERIOD</td>
<td>25.0¢/gal.</td>
<td>37.3¢/gal.</td>
<td>29.8¢/gal.</td>
<td>24.6¢/gal.</td>
<td>28.0¢/gal.</td>
<td>28.5¢/gal.</td>
<td>32.0¢/gal.</td>
<td>28.0¢/gal.</td>
<td>28.0¢/gal.</td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1. Second boiler at plant is available for back-up steam. Therefore, no additional back-up is required.
2. Back-up boiler would be fired with natural gas rather than coal.
EXPLANATION FOR TABLE 3 - COST ESTIMATES

The modification cost estimates include the installation of a reboiler at the power plant plus the piping, control valves, metering and other modifications required for a co-utilization system. The costs also include steam transmission lines from the power plant to the proposed ethanol plant site, based on the peak steam demand the power plant can provide. Also included in this cost is the condensate return and make-up water treatment system.

The back-up energy production system includes gas and oil-fired package boilers, where required. In some cases no back-up boilers are needed. It has been assumed that the back-up boilers would be located at the ethanol plant site. No land acquisition costs are included in the cost estimate.

The purchased price of steam per gallon of ethanol production is based on the total steam costs shown in Table 2. The cost per gallon is for the ethanol production that can be obtained using power plant steam.

The cost per gallon of ethanol using the back-up system, reflects the difference in cost for construction and the gas and oil-fired fuel costs of back-up boilers, compared to the power plant steam. The cost per gallon for both the purchased steam and the back-up system is for present day cost, therefore the differences are not great. In one case, Rath Packing Company, the back-up system is actually cheaper due to the high coal cost at this plant.

The average steam cost over a ten year period, per gallon of ethanol produced, reflects the mixed operation of purchased steam and back-up systems.
The inflation factors, shown previously, have been used to project these costs over the ten year period.

The estimates for new coal fired boilers have been made for comparison with the purchased steam option. In all cases it has been assumed that the new boilers would be constructed at the ethanol plant site, avoiding the cost of steam transmission lines. These costs do not include land acquisition cost or easements. The estimates are based on coal-fired installations for the base load requirements, with gas and oil-fired package boilers for back-up steam.

The steam cost per gallon of ethanol using new coal-fired boilers is based on burning Iowa coal, trucked to the respective sites. Although the fixed charges for the gas and oil-fired back-up is included, the fuel cost is based on coal-firing only.

The bottom line on Table 3 shows the average steam cost over a ten year period, using new coal-fired boilers rather than purchased steam. Inflation factors have applied to all costs to project the ten year average. These figures may be compared with the average purchased steam cost over ten years to determine where co-utilization is feasible. In some cases, it is less expensive to construct new boilers than to purchase steam using co-utilization.

Sample calculations for the estimates shown in Table 3 are included in the Appendix.
<table>
<thead>
<tr>
<th>SITE</th>
<th>IOWA ELECTRIC LIGHT AND POWER COMPANY</th>
<th>RATH PACKING COMPANY</th>
<th>IOWA PUBLIC SERVICE COMPANY</th>
<th>EASTERN IOWA REC</th>
<th>IOWA POWER AND LIGHT COMPANY</th>
<th>IOWA SOUTHERN UTILITIES</th>
<th>CORN BELT POWER COOPERATIVE</th>
<th>CORN BELT POWER COOPERATIVE</th>
<th>IOWA PUBLIC SERVICE COMPANY</th>
<th>NORTHERN NATURAL GAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Marshallton, IA</td>
<td>Waterloo, IA</td>
<td>Waterloo, IA</td>
<td>Montpelier, IA</td>
<td>Des Moines, IA</td>
<td>Burlington, IA</td>
<td>Humbolt, IA</td>
<td>Spencer, IA</td>
<td>Sioux City, IA</td>
<td>Ogdan, IA</td>
</tr>
<tr>
<td>ALCOHOL PLANT CAPACITY (MILLION GAL/YEAR)</td>
<td>53</td>
<td>4.7</td>
<td>18</td>
<td>17</td>
<td>137</td>
<td>76</td>
<td>30</td>
<td>50</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>DEG GENERATED (MILLION POUND/YEAR)</td>
<td>315.1</td>
<td>31.49</td>
<td>120.6</td>
<td>113.9</td>
<td>917.9</td>
<td>509.2</td>
<td>201</td>
<td>335</td>
<td>335</td>
<td>67</td>
</tr>
<tr>
<td>CORN REQUIRED (MILLION BU/YR)</td>
<td>21.2</td>
<td>1.88</td>
<td>7.2</td>
<td>6.8</td>
<td>54.8</td>
<td>30.4</td>
<td>12</td>
<td>20</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>POTENTIAL LOCAL ALCOHOL MARKET (MILLION GAL/YEAR)</td>
<td>2.3</td>
<td>7.0</td>
<td>7.0</td>
<td>2.2</td>
<td>1.5</td>
<td>2.5</td>
<td>0.0</td>
<td>1.1</td>
<td>6.0</td>
<td>1.5</td>
</tr>
<tr>
<td>POTENTIAL LOCAL DEG MARKET (MILLION LSB/YR)</td>
<td>227</td>
<td>190</td>
<td>190</td>
<td>169</td>
<td>72</td>
<td>125</td>
<td>122</td>
<td>231</td>
<td>1,109</td>
<td>188</td>
</tr>
<tr>
<td>ESTIMATED LOCAL CORN AVAILABLE (MILLION BU/YEAR)</td>
<td>15.6</td>
<td>11.6</td>
<td>11.6</td>
<td>6.1</td>
<td>9.9</td>
<td>8.2</td>
<td>11.6</td>
<td>9.2</td>
<td>12.3</td>
<td>14.2</td>
</tr>
</tbody>
</table>
EXPLANATION FOR TABLE 4 - RESOURCES AND PRODUCTS

For each of the facilities subjected to Phase II analysis, the alcohol plant capacity shown is based on the size that could be supported by the steam plant. For five of the facilities this size is based on using back-up boilers at the existing facilities. For these cases, the ethanol plant size could obviously be larger by constructing new back-up boilers. The sizes selected are considered to be the most reasonable approach for each facility.

The remaining estimates of DDG generated, corn required, local ethanol market, local DDG market and local corn available are based on the Study Assumptions, shown previously, plus the sample calculations shown in the Appendix. In each case "local" means the county area in which the plant is located, with the exception of Sioux City, which is based on both Woodbury and Plymouth Counties.

Consumption of DDG is based on 1979 statistics for cattle, poultry and swine feeding. Ethanol market consumption is based 10% of gasoline sales, which is somewhat less than the current average of 13%.

Estimated local corn available is based on 1980 statistics on corn available for transport, by county.

The potential of local feedstock supply and local absorption of product may be determined by comparing the bottom three lines on the table with the three lines above. In most cases, the alcohol plant capacity would greatly exceed the local market.
SUMMARY AND CONCLUSIONS
SUMMARY AND CONCLUSIONS

Chemplex Company, Clinton, Iowa

This plant is currently steam limited and has no excess steam for sale. The facility has no immediate plans to increase steam capacity, therefore, the facility was rejected after Phase I analysis.

Eastern Iowa Light and Power Cooperative, Montpelier, Iowa

This facility is in good condition and is operated continuously. A supply of steam is available all of the time and could support an ethanol plant of approximately seventeen million gallons per year. One drawback of this plant is that a potential ethanol plant site is located across the highway and railroad from the boiler plant. This would create additional problem and expense in the construction of a steam line. The highway is located between the railroad and plant site, which would require a highway crossing for new rail siding. In addition, the Chicago, Rock Island and Pacific Railway is out of service, leaving future rail service in doubt.

The corn required is fairly well matched with corn locally available and the potential DDG market should absorb the grains generated. Local market use of ethanol is not adequate for the plant capacity, but consumption in the Quad Cities would be much greater.

It is estimated that plant modification costs would be approximately $2.3 million.
Iowa Electric Light and Power Company, Marshalltown, Iowa

This plant is in excellent condition and is operated continuously. Upon completion of several major power plants, this plant will go on stand-by operation and most of the steam capacity will be available for sale. Co-utilization appears to be feasible for this facility. The estimated ethanol plant size of 53 million gallons per year is based on using one of the older boilers for ethanol steam supply, the second old boiler as back-up and reserving the newest boiler for power plant use.

One disadvantage to this site is the presently full loading of the city wastewater treatment plant. This would require construction of a wastewater plant along with the ethanol plant.

The area is served by the Chicago and Northwestern Railroad. Local corn production is slightly less than that required by the ethanol facility and local consumption of DDG would be less than that generated. Ethanol production would be far in excess of local market absorption. Overall, the facility offers excellent opportunities for ethanol plant siting.

Iowa Illinois Gas and Electric Company, Bettendorf, Iowa

This plant is quite old with four boilers ranging from 32 to 44 years in age. It is used as a peaking facility but also operates continuously in supplying steam to a nearby Alcoa plant. Discussions have been held to determine the feasibility of installing a solid waste burning plant at this site. A new ethanol plant would be a potential user of excess steam gener-
ated from solid waste combustion. Under the present conditions, the remaining life of the existing boilers is not adequate to support construction of a new ethanol plant.

Approximately twelve acres of land is available at a distance of 3600' from the power plant.

**Iowa Power and Light Company, Des Moines Power Station, Des Moines, Iowa**

Co-utilization of steam from this facility would be feasible. Ethanol plant capacity would be 137 million gallons per year for more, depending on the usable percentage of steam generated by oil-firing. Supply of corn required and local absorption of grains and ethanol are not matched to ethanol plant requirements; however, excellent transportation opportunities exist for shipment in and out of the facility.

**Iowa Light and Power Company** has been negotiating with Archer Daniels Midland for sale of steam for ethanol production. Discussions have also taken place previously for the Agri Grain Power project. Therefore, opportunities for additional ethanol plants, at this location, may not exist.

**Iowa Public Service Company, Waterloo, Iowa**

This plant is used as a peaking facility, is in good condition and has excess steam available. The major disadvantage for co-utilization is the 3.3 mile distance to the nearest potential alcohol plant site. Steam line routing would be through residential and industrial areas and parks and would
have to cross Highway U.S. #20. If land closer to the plant could be pur-
chased, co-utilization would be feasible. Some space exists in an existing
building owned by IPS, but space is not adequate to support the eighteen
million gallon ethanol plant size.

Local supply and consumption of corn, DDG and ethanol are reasonably match-
ed. Approximately 60% of ethanol production would require shipment away
from the local area.

**Iowa Southern Utilities Company, Burlington, Iowa**

This plant is fairly new and is excellent condition. Another firm has pur-
chased land in this area and is planning a barge loading facility which would
greatly aid grain, ethanol and by-product shipments.

The boiler plant could support ethanol production of approximately 76 million
gallons per year; however, only one boiler is available and excess steam is
available only 40% of the time. The cost of back-up steam, firing gas and
oil, is therefore expensive compared to a new coal-fired boiler installation.
For this reason, co-utilization does not appear feasible. The initial cost
for plant modification and for back-up boilers is far less than for new coal-
fired boilers; however, new boilers would provide a much lower cost per gal-
lon over the life of the plant.

**Muscatine Power and Water, Muscatine, Iowa**

This plant will be replaced by a new power plant presently under construc-
tion. After completion of the new plant, the two newest boilers at the
existing plant will be placed on stand-by and the two older boilers will be retired. The older boilers were built in 1943 and 1948 and their remaining useful life will not be compatible with the life of a new ethanol facility. Also, the City of Muscatine is negotiating terms to sell steam from the older boilers to a local grain processing company.

The nearest available ethanol plant site is over four miles away and this area is served by the Chicago, Rock Island and Pacific Railroad plus the Chicago, Milwaukee, St. Paul and Pacific Railroad.

**Rath Packing Company, Waterloo, Iowa**

This plant is in good condition and is presently used to generate electricity. Extraction and exhaust steam from the turbines are used for plant processes. Excess steam is available only 40% of the time. Therefore, back-up boiler fuel cost makes co-utilization economically unattractive compared to new coal-fired boilers.

Adequate land is available for ethanol plant siting and is presently owned by Rath. Steam line routing could be on Rath property, except for one road crossing.

The steam plant could support a 4.7 million gallon per year ethanol plant and local corn production should be adequate. Chicago Northwestern Railroad and highway facilities are excellent.
Corn Belt Power Cooperative, Earl F. Windom Station, Spencer, Iowa

This plant is used as a peaking facility, is in excellent condition, and has excess steam available. The only disadvantage to the site is that it is several miles from a major highway and that a wastewater treatment facility will be necessary. The advantages are the availability of land on site and adjoining the plant site, and the availability of resources in the immediate area, and the rural area in which the plant is located. The grain resources of the county in conjunction with the surrounding counties is sufficient for the plant. As with any large plant, the local consumption of the products and by-products will not meet the amount produced. Because of the rail service available, the products can be exported to distant markets.

Iowa Public Service Company, Hawkeye Plant, Storm Lake, Iowa

This facility is in fair condition and is used as a peaking facility and has excess steam available. The major disadvantages for co-utilization are the plans by IPS to phase the plant out of operation in 1982, and the two fuel alcohol plants that are in production or under construction in Storm Lake, and the age of the boiler plant. The major advantages of the plant site are the availability of land adjacent to the land site, the plant being located in a rural area, and the transportation and grain handling facilities available nearby.

Because of the plans to phase out the plant in 1982, co-utilization of the plant would not be feasible.
Iowa Public Service Company, Carroll Plant, Carroll, Iowa

This facility is no longer in service and is in the process of being retired. Besides not being in operation, the major disadvantage of the plant is the necessity to run a steam line through residential and industrial areas and under several roads and highways to get to a suitable alcohol plant site. Considerable amount of work would be necessary to get the plant operational. This coupled with the age of the plant and other factors make the plant infeasible for co-utilization.

Corn Belt Power Cooperative, Humboldt Plant, Humboldt, Iowa

This plant is older with the four boilers ranging from 29 to 31 years in age. It is used as a peaking facility at this time. Due to the limited number of hours the plant is on line, a great deal of preventative maintenance is underway. The major disadvantage to this location is the access to a major highway and the fact that a wastewater treatment facility may be necessary. The advantages of the site are that plenty of land is nearby, water is available from the Des Moines River, the site is served by new "ribbon rail", and the plant is in a rural setting. Because of the lower cost of installing new coal fired boilers, however, co-utilization would not be feasible.
Boone Valley Cooperative, Steam Generating Plant, Eagle Grove, Iowa

This plant is currently increasing its steam capacity but will have a very limited amount, if any, steam for sale at this time. Therefore, the facility was rejected after the Phase I analysis.

Northern Natural Gas, Ogden Compressor Station, Ogden, Iowa

The source of heat in this plant is two natural gas fired internal combustion engines. The engines are in excellent condition and are overhauled annually. The engines run continuously. Potential sites for the alcohol plant are available on land adjacent to the compressor station. Major disadvantages of this site are the need to develop a water supply and also waste treatment facilities. Advantages to the site are good access to major highways and good rail nearby.

Because the cost, per gallon of ethanol, for recovered heat from this facility is higher than for new coal-fired boilers, over a ten year period, co-utilization does not appear to be feasible.

Iowa Public Service, Neal Station, Sioux City, Iowa

This plant is in excellent condition and is operated continuously. The plant is a base generating plant which means that all boilers are operating continuously at part load and will be operated at the required capacity to meet the electrical generation requirements up to full capacity of the plant. The major disadvantage to this site is that a back up system will
be required to operate the fuel alcohol plant whenever the power plants re-
quire all the steam available. Also, at this time, two companies are in-
terested in purchasing steam from the power station. One of the possible
customers is Terra Chemical Company located on adjacent property and the
other is Alcohol, Inc., which had plans to construct a 50 MGY plant. At
the present time all work on the Alcohol, Inc., project has halted. An ad-
vantage of the site is the availability of water and transportation.

Corn availability is matched fairly well with the requirements for a 50 MGY
plant. Local consumption does not meet the proposed production levels so
transporting the products to distant markets will be required. Overall,
the facility is suitable for co-utilization.
SAMPLE CALCULATIONS
FOR
SUTHERLAND STATION, IOWA ELECTRIC LIGHT AND POWER COMPANY,
MARSHALLTOWN AND MARSHALL COUNTY, IOWA

1. Steam Generated in Evaporator

300,000 PPH @ 980 psig, 910°F

\[
m_1(h_1-h_2) = m_2(h_4-h_3)
\]

\[
300,000 \times (1454.9 - 382.15) = m_2(1195.55 - 69.74)
\]

\[
m_2 = \frac{285,900 \text{ #/hr}}{}
\]

2. Alcohol manufacturing capability

24 hr/day, 340 d/yr

Total steam = 285,900 x 24 x 340 = 2.3329 x 10^9 lb/hr.

50,000 Btu/gal alcohol

1125.81 Btu/lb steam

\[
2.3329 \times 10^9 \times 1125.81 = 52,529,034 \text{ gal/yr}
\]

\[
\frac{50,000}{50,000}
\]

3. Line Sizing - Steam

150 psig sat. steam

V = 2.752 cu. ft./lb

Line length = 3600 ft.

Assume velocity = 7000 ft./min.

285,900 #/hr x 2.752 = 13,113 cu. ft./min. = 4765 #/min

\[
A = \frac{\text{flow}}{\text{Velocity}} = \frac{13,113}{7000} = 1.87 \text{ sq. ft.}
\]

D = 1.54 ft. or approximately 18" pipe (I.D. = 17.25")
Sample Calculation

Pressure drop - Use Darcy's formula

\[ \Delta P = 37.8 \text{ psi} \]

Assume maximum \( P = 20 \text{ psi} \)

\( D = 19.59" \)

Use 24" standard weight pipe

4. Line Sizing - Condensate

100°F condensate

\[ V = 0.016130 \text{ cu. ft./lb} \]

285,900 lb/hr = 575 GPM

\( D = 0.45 \text{ ft.} = 5.4 \text{ inches} \)

Use 6" pipe (I.D. = 5.76")

\[ \Delta P = 43 \text{ psi} \]

If use 8" pipe (I.D. = 7.625)

\[ \Delta P = 11 \text{ psi} \]

5. Modification Costs

A. Evaporator - $523,240

B. Piping Modifications - $2,032,000

C. Underground Piping - $2,917,170

D. Condensate Return Set - $20,000

Total $5,492,410

6. Water Treatment System = $348,000

7. Water Cost

25% of condensate = 144 GPM x 60 x 24 = 207,360 GPD

Average gal/month = 5,875,200 gal/month

\[ = 785,455 \text{ cu. ft. mon.} \]
Sample Calculations

Cost - 1st 500 cu. ft. = 12.50
Next 5500 cu. ft. @ 1.10/100 = 60.50
Next 44,000 cu. ft. @ .73/100 = 321.20
Next 250,000 cu. ft. @ .66/100 = 1650.00
Next 485,455 cu. ft. @ .50/100 = 2427.28

Total = 4471.48/month

= $.76/1000 gal

Chemical Cost - based on UNI @ $.63/1000 gal

Total = $1.39/1000 gal.

= $.003/1000# steam

8. Fuel Cost

$38/ton 10,500 Btu/lb, 85% eff.

\[
\frac{10,500 \text{ Btu/lb}}{1000 \text{ lb}} \times \frac{\text{85% eff.}}{} = \frac{2.40}{1000 \text{ lb}} \text{ Steam}
\]

9. Steam Cost - Purchase

Fixed charges = Annual Fixed Charge Rate (Fixed Charges)

\[
\text{Annual Steam Generated} \times \frac{1.23 (5,840,410)}{285.9 (24)(340)} = \frac{.31}{1000 \text{ lb}}
\]

Water & treatment Chemicals = $0.003/1000 lb
Maintenance = $0.69/1000 lb
Fuel = $2.40 lb

Total = $3.31/1000 lb

\[
1125.81 \text{ Btu/lb} \times \frac{3.31}{1000 \text{ lb}} = \frac{.15}{\text{gal alcohol}}
\]

10. Average Cost - 10 years - Purchase Steam

Escalation Factors

\[
\begin{align*}
\text{Labor & Materials} &= 1.473 \\
\text{Coal} &= 1.755 \\
\text{Natural Gas} &= 2.596
\end{align*}
\]

\[
\begin{align*}
\text{Fixed Charges} &= \frac{.31}{1000 \text{ lb}} \\
\text{Maintenance} &= .60 \times 1.473 \\
\text{Fuel} &= 2.40 (1.755)
\end{align*}
\]

Total = $5.48/1000 lb

= $2.40/gal alcohol
11. New Coal Fired Boiler Installation Costs

\[ \text{Fixed Cost} = \frac{1.23 \times 25,731,000}{285.9 \times 24 \times 340} = \frac{31.76}{1000} = 0.03176/1000 \]

\[ \text{Water Treatment} = \frac{1.23 \times 4666}{24 \times 340} = 0.0221/1000 \]

\[ \text{Fuel} = \frac{1000 \times 1125.81 \times 38 \times 0.85}{10,500 \times 2000} = 0.043/1000 \]

\[ \text{Maintenance} = 0.60/1000 \]

\[ \text{Water & Treatment Chemicals} = 0.003/1000 \]

Total = 0.43/1000

Total = 0.20/gal alcohol

12. Average Cost - 10 years - New Boiler

Same escalation factors as Item 10

\[ \text{Fixed costs} = 1.26/1000 \]

\[ \text{Water Treatment} = 0.07/1000 \]

\[ \text{Fuel} = 2.40 \times 1.755 \]

\[ \text{Maintenance} = 0.60 \times 1.473 \]

Total = 6.52/1000

Total = 0.289/gal alcohol
13. Land Required
At 52.5 million gals/year the land required is slightly
greater than 20 acres.
Land available at Marshalltown = 220 AC
220 > 20 acres \therefore\text{ adequate}

14. Corn Required
From assumptions
Product = 2.5 gals ethanol per bushel corn
Bushels = 52,529,034 - 21,011,614 Bu.

15. Process Water Required
From assumptions
Process make-up water = 5.5 gal
gal ethanol
Maximum = 5.5 x 52,529,034
= 288,910,000 gal/yr water = 590 gpm

16. Condensate Make-Up Water
From steam usage calculations: Make-up water for
condensate return (25% loss)
Sutherland station requires 144 gpm
plus 16% for demin. backwash = 23 gpm

17. Ethanol Plant Cooling Water
Cooling water for ethanol plant requires 150 gpm at 85° max.
per million gals per year of ethanol produced.
Assume cooling tower used, use 3% loss for cooling tower
150 gpm x 3% x 52,529
= 236 gpm
18. Total Water Required

\[ 590 + 144 + 23 + 236 = 993 \text{ gpm} \]

19. Check Water Available

\[ \text{Required} = 993 \text{ gpm} = 1.430 \text{ MGD exist.} \text{ 6" line capacity} = 650 \text{ gpm but city would construct 12" line} \]

\[ \text{Treatment capacity} = 10 \text{ MGD} \]

\[ \text{Average daily use} = 5 \text{ MGD} \]

\[ \text{City water is available} \]

20. Wastewater Generated

From assumptions

\[ \text{5 gals wastewater per gal ethanol produced} \]

\[ \text{Wastewater} = 5 \times 52,529,034 \]

\[ = 262,645,170 \text{ gal/yr} \]

\[ = 772,486 \text{ gal/day} \]

\[ = 1.19 \text{ c.f.s.} \]

21. Check Wastewater Plant Capacity

\[ \text{Treatment Plant Capacity} = 5.5 \text{ MGD} \]

\[ \text{Present Hydraulic Loads} = 6.2 \text{ MGD} \]

\[ \text{B.O.D. Capacity} = 18,000 \text{ lbs/day} \]

\[ \text{present B.O.D. loads} = 25,000 \text{ lbs/day} \]

\[ \text{Next year a covered anaerobic lagoon to be added to aid B.O.D. loads} \]

\[ \text{But plant is hydraulically loaded} \]

22. Potential Local DDG Market

\[ \text{Assume} \]

\[ \text{Mature cattle can consume 7.0 lbs DDG per day} \]

\[ \text{Calves can consume 4.9 lbs DDG per day} \]

\[ \text{Poultry can consume 0.05 lbs DDG per day} \]

\[ \text{Swine can consume 2.8 lbs DDG per day} \]

\[ \text{All cattle and calves} = \text{(beef cows + milk cows + cattle marketed)} = \text{calves} \]

\[ \text{Marketed cattle has fed one full year at full ration (7 lbs DDG per day)} \]
Calves have fed one full year at partial ration
(4.9 lbs DDG per day)
Sows farrow twice yearly
Pigs eat at full ration (2.8 lbs DDG per day) for 17.3 weeks

Statistics and calculations for 1979

**Cattle**
- 63,000 cattle and calves
- 18,500 beef cows
- 900 milk cows
- 26,000 cattle marketed
  - 63,000 - (18,500 + 900 + 26,000) = 17,600
  - 17,600(4.9) + 45,400(7) = 404,040 lbs DDG per day
  - \(404,040 \times 365 = 147,474,600\)
  - \(= 1.475 \times 10^8\) lbs DDG per year

**Poultry**
- 51,000 head x .05 x 365 = 930,750 lbs DDG per year

**Swine**
- \((26,500\text{ sows \times } \frac{2}{3} (181,000\text{ pigs})) 2.8 (365)\)
  - \(= 75,202,166.7\)
  - \(= 7.520 \times 10^7\) lbs DDG per year

Total for 1979, Cattle + Poultry + Swine = \(2.236 \times 10^8\) lbs DDG per year

Statistics and calculations for 1980

**Cattle**
- 65,000 cattle and calves
- 20,500 beef cows
- 800 milk cows
- 24,000 cattle marketed
  - 65,000 - (20,500 + 800 + 24,000) = 19,700
  - 19,700(4.9) + 45,300(7) = 413,630 lbs DDG per day
  - \(413,630 \times 365 = 150,974,950\)
  - \(= 1.510 \times 10^8\) lbs DDG per year

**Poultry**
- 50,000 head x .05 x 365 = 912,500 lbs DDG per year

**Swine**
- \((26,000\text{ sows \times } \frac{2}{3} (194,000\text{ pigs})) 2.8 (365)\)
  - \(= 79,375,333\)
  - \(= 7.938 \times 10^7\) lbs DDG per year
Sample Calculations

23. Potential Local Alcohol Market

Assumptions: Alcohol market = 10% gasoline consumption
Total Iowa Consumption of gasoline, 1980 = 36,418,250 bbl.
   $\frac{36,418,250 \text{ bbl}}{42} = 1,529,566,500 \text{ gal}$
Total Iowa Motor Vehicle Registrations, 1980: 2,925,619
   $\frac{1,529,566,500 \text{ gal}}{2,925,619 \text{ reg.}} = 522.818 \text{ gal/reg}$
Marshall CO reg: 44,144.
   $44,144 \times 522.818 = 23,079,281 \text{ gal gasoline}$
   $0.1(2.31 \times 10^7) = 2.31 \times 10^6 \text{ gal}$, potential alcohol market

24. Surface Water Chemical Costs

If city water not available at site, either river or well water must be treated
for process and steam generating.

Process water treatment chemicals
   Alum: $0.17 \text{ lbs} \times \frac{19}{100 \text{ lb}} = \frac{.032}{1000 \text{ gal}}$
   Lime: $1.53 \text{ lbs} \times \frac{3}{50 \text{ lb}} = \frac{.092}{1000 \text{ gal}}$
   H2SO4: $0.15 \text{ lbs} \times \frac{4.56}{1000 \text{ gal}} = \frac{.007}{100 \text{ lbs}}$
Steam generating treatment chemicals

\[
\text{H}_2\text{SO}_4: \quad 5.425 \text{ lbs} \times \$4.56 = \$2.47/1000 \text{ gal.} \\
\frac{1000 \text{ gal}}{100 \text{ lbs}}
\]

\[
\text{NaOH:} \quad 6.4 \text{ lbs} \times \$12 = \$7.68/1000 \text{ gal.} \\
\frac{1000 \text{ gal}}{100 \text{ lbs}}
\]

As water used for steam generating must be pretreated by process water treatment equipment, total chemical cost includes all of above.

Total cost = \$1.146/1000 gal.

= \$0.002/1000# steam
## PETROLEUM STORAGE FACILITIES IN IOWA

<table>
<thead>
<tr>
<th>Area of State</th>
<th>Storage Capacity (Gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest (LeMars, Spencer, Rock Rapids)</td>
<td>17.5 million</td>
</tr>
<tr>
<td>North Central (Fort Dodge)</td>
<td>5.5 million</td>
</tr>
<tr>
<td>Omaha-Council Bluffs</td>
<td>83 million</td>
</tr>
<tr>
<td>Sioux City</td>
<td>35 million</td>
</tr>
<tr>
<td>Mason City</td>
<td>26 million</td>
</tr>
<tr>
<td>Des Moines</td>
<td>90 million</td>
</tr>
<tr>
<td>Iowa City</td>
<td>30 million</td>
</tr>
<tr>
<td>Waterloo</td>
<td>16.5 million</td>
</tr>
<tr>
<td>Dubuque</td>
<td>42 million (12 mill.- barge)</td>
</tr>
<tr>
<td>Quad Cities</td>
<td>56.5 million (16 mill.- barge)</td>
</tr>
<tr>
<td>Cedar Rapids</td>
<td>2 million</td>
</tr>
<tr>
<td>Ottumwa</td>
<td>4 million</td>
</tr>
<tr>
<td>Sioux City</td>
<td>5 million</td>
</tr>
<tr>
<td>Burlington</td>
<td>5 million (barge)</td>
</tr>
<tr>
<td>Clinton</td>
<td>12 million (barge)</td>
</tr>
</tbody>
</table>
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LOCATION - SIOUTH CITY, IOWA

HOURS OPERATED - BOILER #1-PEAKING ONLY, BOILER #2 AND #3 CONTINUOUS

STEAM PRESSURE - #1-1850 PSIG; #2 AND #3 - 2400 PSIG

STEAM TEMPERATURE - SUPERHEATED

CAPACITY - #1 - 1,050,000#/HR; #2-2,320,000#/HR; #3-3,505,000#/HR

BUILT - #1-1963; #2, #3 - 1972

Fired by - #1 - CYCLONE BURNERS; #2, #3 CIRCULAR BURNERS (PULVERIZED COAL)

GENERAL CONDITION - EXCELLENT

WATER TREATMENT CAPACITY - CURRENTLY OPERATING AT MAXIMUM CAPACITY

AIR POLLUTION CONTROL & EQUIP. - ELECTROSTATIC PRECIPITATORS

OIL STORAGE AVAILABLE - NONE

NATURAL GAS AVAILABLE - AVAILABLE NEARBY

ELECTRICAL SERVICE AVAILABLE - SUBSTATION AT PLANT

RAIL SERVICE - CHICAGO NORTHWESTERN

RAIL CONDITION - EXCELLENT

ROADS - EXCELLENT - SERVED BY I-29, U.S. HIGHWAY 75, 20, 73.

AREA UNEMPLOYMENT - NOT KNOWN AT THIS TIME

LAND AVAILABLE - ENOUGH FOR A 50 MILLION GALLON PER YEAR PLANT NEARBY

TAXES - APPROX. $27.03 PER $1000 ASSESSED VALUE

GRAIN RESOURCES (3 YEAR AVERAGE) - 25,635,333 BU. CORN HARVESTED FOR GRAIN

DATA BASE AREA - PLYMOUTH AND WOODBURY COUNTIES; 1734 SQ. MILES OR 1,109,760 ACRES

WATER AVAILABILITY - SUFFICIENT WATER AVAILABLE FOR A LARGE PLANT

ESTIMATED SIZE ETHANOL PLANT - 50 MILLION GALLON PER YEAR
A firm called Alcohol Inc. had plans to build a 50 million gallon per year plant at Sioux City utilizing excess steam from the Neal plant. At this time, work on the plant has stopped for an undetermined length of time.
SITE FOR ALCOHOL INC
FUEL ALCOHOL PLANT

POSSIBLE SITE

POSSIBLE SITE

POSSIBLE SITE
CORN BELT POWER COOPERATIVE
HUMBOLDT POWER PLANT

LOCATION - HUMBOLDT, IOWA

HOURS OPERATED - 300-400 HRS - USED AS PEAKING PLANT ONLY

STEAM PRESSURE - BOILER #1, #2, #3 - 600 PSIG, BOILER #4 - 850 PSIG

STEAM TEMPERATURE - #1, #2 - 825° F, #3 - 900° F, #4 - 900° F

CAPACITY - #1 & #2 - 90,000 # PER HR, #3 - 125,000 # PER HR, #4 - 165,000 # PER HR

BUILT - #1 & #2 - 1950, #3 - 1952, #4 - 1954

FIRED BY - TRAVELING GRATE STOKER

GENERAL CONDITION - VERY GOOD

WATER TREATMENT CAPACITY - APPROXIMATELY 20 GPM

AIR POLLUTION CONTROL & EQUIP. - MECH. CYCLONE; CYCLONE W/PRECIPITATOR

OIL STORAGE AVAILABLE - NONE

NATURAL GAS AVAILABLE - AVAILABLE ON SITE

ELECTRICAL SERVICE AVAILABLE - SUBSTATION SITE

RAIL SERVICE - CHICAGO NORTHEASTERN RAILROAD

RAIL CONDITION - EXCELLENT - NEW RIBBON RAIL INSTALLED IN LAST TWO YEARS

ROADS - EXCELLENT - SERVED BY STATE HWY 3 AND 169

AREA UNEMPLOYMENT - 3.4%

LAND AVAILABLE - OVER 20 ACRES AT POWER PLANT SITE

TAXES - $17.94 PER $1,000 OF ASSESSED VALUATION

GRAIN RESOURCES (3 YEAR AVERAGE) - 14,497,000 BU. CORN HARVESTED FOR GRAIN

DATA BASE AREA - HUMBOLDT COUNTY - 435 SQ. MILES OR 278,400 ACRES

WATER AVAILABILITY - LARGE AMOUNTS AVAILABLE

ESTIMATED SIZE ETHANOL PLANT - 30 MILLION GALLON/ YEAR PLANT
#4 boiler is most efficient of the 4 boilers. The plant is in good to excellent condition with the exception of the ash handling system. Corn Belt Power has plans to upgrade the ash system in the near future. A great deal of preventive maintenance is being done on the plant since it is not line very often. Boilers #1 & #2 were refractored completely in the last year. #3 was partially refractored, and #4 did require any work. Combustion controls are in good condition but are obsolete and hard to get parts for. Plant has a total generating capacity of 52 MW. Fuel cost has been running at approximately $50 per ton of coal. Plant is located approximately 5 miles from city on the bank of the Des Moines River. City of Humboldt is active in trying to obtain new business in Humboldt. For this reason the Humboldt Rail Improvement Corporation was formed. This corporation spent $1.8 million to upgrade the rail system and is chiefly responsible for having "ribbon" rail installed on the rail line.
North Elevation

Rail Car Thawing
Building & Cooling Tower

Water Treatment Facilities
LOCATION - EAGLE GROOVE, IOWA

HOURS OPERATED - 24 HOURS PER DAY, 7 DAYS PER WEEK

STEAM PRESSURE - 650 PSIG THRU TURBINE, 150 PSIG TO PROCESS

STEAM TEMPERATURE - 850 °F AT TURBINE

CAPACITY - 200,000 # PER HOUR WITH NEW BOILER BEING INSTALLED

BUILT - 1949, NEW BOILER UNDER CONSTRUCTION

FIRED BY - TRAVELING GRATE STOKER

GENERAL CONDITION - CURRENTLY BEING REBUILT

WATER TREATMENT CAPACITY - WILL HAVE 465 GPM CAPACITY

AIR POLLUTION CONTROL & EQUIP. - BAGHOUSE

OIL STORAGE AVAILABLE - NONE

NATURAL GAS AVAILABLE - NEARBY, IN LIMITED AMOUNTS

ELECTRICAL SERVICE AVAILABLE - SUBSTATION AT PLANT

RAIL SERVICE - CHICAGO NORTHWESTERN

RAIL CONDITION - EXCELLENT - NEW RIBBON RAIL INSTALLED

ROADS - EXCELLENT - SERVED BY STATE HIWAY 17, HIWAY 3 AND I-35 NEARBY

AREA UNEMPLOYMENT - 3.3%

LAND AVAILABLE - VERY LIMITED AMOUNTS - NOT MORE THEN 10 ACRES AT SITE

TAXES - $27,94534 PER $1000 ASSESSED VALUE

GRAIN RESOURCES (3 YEAR AVERAGE) - 21,074,667 BU. CORN HARVESTED FOR GRAIN

DATA BASE AREA - WRIGHT COUNTY - 577 SQ. MILES OR 369280 ACRES

WATER AVAILABILITY - LARGE AMOUNTS AVAILABLE (1300 GPM)

ESTIMATED SIZE ETHANOL PLANT - N/A - SEE NOTES NEXT PAGE
NOTES:

AT THIS TIME BOONE VALLEY COOP DOES NOT KNOW HOW MUCH EXCESS CAPACITY THEY WILL HAVE OR FOR HOW LONG THEY WILL HAVE IT IF IT IS AVAILABLE. THE ALCOHOL PLANT, IF STEAM WOULD BE AVAILABLE, WOULD ONLY NEED THE ACTUAL FERMENTATION DISTILLATION, AND ON-SITE FUEL STORAGE SINCE AN EXISTING ELEVATOR IS OPERATING NEARBY AND AN ABANDONED ELEVATOR IS ON THE POSSIBLE SITE ALONG WITH TWO METAL STORAGE BUILDINGS. THERE IS NOT ROOM FOR A SEPARATE BOILER PLANT. BOONE VALLEY IS CURRENTLY COMPLETELY REBUILDING THE EXISTING BOILER COMPLETELY AND ALSO BUILDING A NEW BOILER. THE TIME FRAME BEFORE THE BOILERS WILL BE ON LINE IS 1½ YEARS. A LOCAL TRUCKING FIRM IS AVAILABLE TO HANDLE ANY HAULING OF FUEL, RAW MATERIALS, AND BY-PRODUCTS. THIS FIRM HAS OVER 300 UNITS. AN INDUSTRIAL PARK IS AVAILABLE AT THE NORTH END OF TOWN BUT A SEPARATE BOILER WOULD BE REQUIRED.
FEED MILL

EXISTING ABANDONED GRAIN ELEVATOR

SOUTH ELEVATION
AVAILABLE METAL BLOGS.

NORTH ELEVATION
AVAILABLE METAL BLOGS.
West Elevation Power Plant

Cooling Tower & Corn Elevator

North Elevation Power Plant

East Elevation Power Plant
LOCATION - OGDEN, IOWA

HOURS OPERATED - 24 HR/DAY, 7 DAYS/WEEK

STEAM PRESSURE - 150 PSIG

STEAM TEMPERATURE - SATURATED STEAM - 365°F

CAPACITY - 50,000 #/HR - NORTHERN NATURAL GAS CO. ESTIMATES

BUILT - N/A

FIRED BY - NATURAL GAS ENGINES; ONE V-16 engine and one V-20 ENGINE

GENERAL CONDITION - EXCELLENT

WATER TREATMENT CAPACITY - NONE

AIR POLLUTION CONTROL & EQUIP. - NONE

OIL STORAGE AVAILABLE - NONE

NATURAL GAS AVAILABLE - ON SITE

ELECTRICAL SERVICE AVAILABLE - 161 KV 115 KV LINE NEAR TIME

RAIL SERVICE - CHICAGO NORTHWESTERN

RAIL CONDITION - EXCELLENT

ROADS - EXCELLENT - SERVED BY U.S. HWY 30, 169, I-35 30 MILES AWAY

AREA UNEMPLOYMENT - NOT AVAILABLE

LAND AVAILABLE - MORE THAN 20 ACRES

TAXES - $22.04 PER $1,000 ASSESSED VALUE

GRAIN RESOURCES (3 YEAR AVERAGE) - 15,024,667 BU. CORN HARVESTED FOR GRAIN

DATA BASE AREA - BOONE COUNTY - 573 SQ. MILES OR 366,720 ACRES

WATER AVAILABILITY - WELLS WOULD HAVE TO BE DRILLED

ESTIMATED SIZE ETHANOL PLANT - 10 MILLION GALLON PER YEAR
NOTES:

CAPACITY OF PLANT IS BASED ON 40% RECOVERY OF EXHAUST HEAT WHEN ALL UNITS ARE OPERATED AT 90% CAPACITY. ENGINES ARE USUALLY DOWN FOR SEVERAL HOURS EVERY TWO WEEKS FOR CHANGE ON PLUGS. UNITS ARE ALSO DOWN TWICE A YEAR FOR PREVENTITIVE MAINTENANCE, 1 WEEK EACH TIME. THIS PERIOD IS USUALLY IN JUNE AND NOVEMBER.

ANOTHER SOURCE OF LOW TEMPERATURE HEAT IS THE COOLING WATER FOR THE ENGINES. COOLING WATER IS NOW PUMPED TO COOLING TOWERS VIA 10 and 12" PIPE. THE WATER TEMPERATURE IS USUALLY BETWEEN 130 - 140°F. THE FLOW RATE IS NOT KNOWN. IF A FUEL ALCOHOL PLANT IS BUILT AT THIS LOCATION, AN AUXILIARY BOILER MAY BE REQUIRED.

WASTEWATER WILL HAVE TO BE TREATED ON SITE SINCE THE CITY'S SYSTEM IS CURRENTLY AT FULL CAPACITY. AMPLE SPACE FOR FUEL ALCOHOL PLANT.
PLANT ENTRANCE

WEST ELEVATION

WEST COOLING TOWER

EAST COOLING TOWER
ENGINE & COMPRESSED GAS CONTROL CENTER

EXHAUST FROM V-20 ENGINE

V-20 ENGINE

V-16 ENGINE
IOWA PUBLIC SERVICE COMPANY

CARROLL ELECTRIC PLANT

LOCATION - CARROLL, IOWA

HOURS OPERATED - 0 - PLANT CLOSED DOWN DECEMBER 1980

STEAM PRESSURE - 420 PSIG

STEAM TEMPERATURE - 750°F

CAPACITY - BOILER # 1 - 60,000 # PER HR, BOILER # 2 - 60,000 # PER HR

BUILT - 1951

FIRED BY - TRAVELING GRATE STOKERS

GENERAL CONDITION - FAIR

WATER TREATMENT CAPACITY - APPROXIMATELY 200 GPM (ACCORDING TO PLANT PERSONNEL)

AIR POLLUTION CONTROL & EQUIP. - MECHANICAL CYCLONE SEPARATOR

OIL STORAGE AVAILABLE - OIL STORAGE ON ADJOINING PROPERTY

NATURAL GAS AVAILABLE - AT SITE

ELECTRICAL SERVICE AVAILABLE - SUBSTATION ON SITE

RAIL SERVICE - CHICAGO NORTHWESTERN RAILROAD

RAIL CONDITION - EXCELLENT

ROADS - EXCELLENT - SERVED BY U.S. HWY 30 AND 71

AREA UNEMPLOYMENT - 5.1%

LAND AVAILABLE - MORE THAN 20 ACRES - OVER 1 MILE AWAY FROM PLANT

TAXES - $24.83 PER $1,000 ASSESSED VALUATION

GRAIN RESOURCES (3 YEAR AVERAGE) - 14,250,333 BU. CORN HARVESTED FOR GRAIN

DATA BASE AREA - CARROLL COUNTY - 574 SQ. MILES OR 367,360 ACRES

WATER AVAILABILITY - 1,300 GPM

ESTIMATED SIZE ETHANOL PLANT - NOT TO EXCEED 20 MILLION GALLONS PER YEAR
NOTES:

PLANT HAS HAD PACKING REMOVED FROM FEED WATER PUMPS. MUCH WORK AND UNDETERMINED COST WOULD BE NEEDED TO BRING THE PLANT BACK ON LINE. THIS FACT IN COMBINATION WITH THE AGE OF THE BOILERS AND THE LACK OF A SITE NEARBY TEND TO MAKE THE FEASIBILITY OF USING THE EXISTING BOILER NOT GOOD. PLANT PERSONNEL BELIEVED THAT THE PLANT COULD NOT MEET AIR POLLUTION CONTROL STANDARD AT FULL LOAD.

AVAILABLE SITE TO EAST OF CITY IS LARGE ENOUGH FOR BUILDING COMPLETE NEW PLANT WITH BOILER (65 ACRES).
Cooling Tower
NORTHEAST ELEVATION

Cooling Tower
SOUTHWEST ELEVATION

Main Coal
STORAGE AREA

NORTHEAST ELEVATION
Steam Drum

Turbine Exhaust Lines
City of Carroll, Iowa

1—St. Lawrence School  
2—Carroll High School  
3—Graham Park  
4—Swimming Pool  
5—High School Athletic Field  
6—Baseball Field  
7—Post Office  
8—Public Library  
9—Court House  
10—City Hall & Fire Station  
11—Rolling Hills Park  
12—Kuemper Catholic High School  
13—Water Works Park  
14—South Side Park  
15—Minchen Park  
16—North Side Park  
17—Fairview Elementary School  
18—Chamber of Commerce  
19—Holy Spirit School  
20—St. Anthony Hospital  
21—Carroll Recreation Center  
22—New Hope Village  
23—Municipal Golf Course  
24—Historical Museum
## IOWA PUBLIC SERVICE COMPANY

### HAWKEYE PLANT

**LOCATION** - STORM LAKE, IOWA

**HOURS OPERATED** - 200 - USED ONLY AS PEAKING PLANT

**STEAM PRESSURE** - 600 PSIG

**STEAM TEMPERATURE** - 825°F

**CAPACITY** - 
- **BOILER #1** - 100,000# PER HR.
- **BOILER #2** - 125,000# PER HR.

**BUILT** - 
- #1 - 1948,
- #2 - 1953

**Fired By** - TRAVELING GRATE STOKERS

**General Condition** - FAIR

**Water Treatment Capacity** - 160 - 170 GPM (ACCORDING TO PLANT PERSONELL)

**Air Pollution Control & Equip.** - MECHANICAL CYCLONE

**Oil Storage Available** - NONE

**Natural Gas Available** - NEAR SITE

**Electrical Service Available** - SUBSTATION & TRANSFORMERS ON SITE

**Rail Service** - ILLINOIS CENTRAL RAILROAD

**Rail Condition** - GOOD

**Roads** - GOOD - SERVED BY STATE HWY 5 & U.S. HWY 71 @ STORM LAKE

**Area Unemployment** - FLUCTUATES BETWEEN 1.8 AND 3.5%

**Land Available** - MORE THAN 20 ACRES

**Taxes** - $19.88 PER $1,000 OF ASSESSED VALUE

**Grain Resources (3 Year Average)** - 20,174,666 BU. CORN HARVESTED FOR GRAIN

**Data Base Area** - BUENA VISTA COUNTY - 572 SQ. MILES OR 366,080 ACRES

**Water Availability** - 2 WELLS ON SITE, 1 OPERABLE, 6" LINE TO STORM LAKE

**Estimated Size Ethonal Plant** - 5 TO 10 MILLION GALLONS PER YEAR *

* WELL CAPACITY NOT KNOWN BUT ASSUME MINIMUM OF 100 GPM
NOTES:

PLANT TO CLOSE IN 1982. MANY OF THE CONTROLS ARE OBSOLETE. THE RELIABILITY OF THE PLANT IS QUESTIONABLE DUE TO THE AGE OF THE PLANT. TWO ALCOHOL PLANTS ARE CURRENTLY BEING BUILT OR IN OPERATION IN STORM LAKE. ONE PLANT PRODUCES 300,000 GALLONS OF LOW GRADE FUEL ALCOHOL (90% ALCOHOL) AND THE OTHER PRODUCES 2½ MILLION GALLONS OF ANHYDROUS ALCOHOL PER YEAR INITIALLY WITH PLANS TO EXPAND TO 4 MILLION GALLONS PER YEAR IN THE NEAR FUTURE.
North Cooling Tower

South Cooling Tower

Water Treatment Building

Water Treatment Basin
Power Plant Control Center

Circular Burners

Coal Handling Equipment

Electrostatic Precipitator
Vicinity Map
(Scale: 5 miles)

Corn Belt Power Coop
Spencer, Iowa Plant
Boiler Checklist - Plant Name Sutherland Station, Iowa Electric Light & Power, Marshalltown, IA

Steam Pressure #1 & 2 - 980 psig Temp. 910 °F Capacity 300,000 ea.

Boiler Age - Installed #1 & 2 - 1955, #3 - 1961

Boiler Maintenance

<table>
<thead>
<tr>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly</td>
<td>Tube leaks</td>
<td>Good</td>
</tr>
<tr>
<td>Yearly</td>
<td>Tube leaks</td>
<td>Good</td>
</tr>
<tr>
<td>Yearly</td>
<td>Cleaning &amp; seals</td>
<td>Very good</td>
</tr>
<tr>
<td>Yearly</td>
<td>Routine</td>
<td>Good</td>
</tr>
<tr>
<td>1976</td>
<td>Wheels replaced</td>
<td>Good</td>
</tr>
<tr>
<td>#3-3yr. overhaul program</td>
<td>#3:3yr. overhaul program</td>
<td>Good</td>
</tr>
<tr>
<td>Present</td>
<td>Fill &amp; girt replacement</td>
<td>Very Good</td>
</tr>
<tr>
<td>1981</td>
<td>Crushers overhauled</td>
<td>Good</td>
</tr>
</tbody>
</table>

Combustion Controls - Pneumatic

Condition - Average
Maintenance - Routine, New O\textsubscript{2} analyzers being installed

Water Treatment - Demineralizers and polishers

Capacity - Unknown-not running at full capacity
Condition - Good

Exist. Air Pollution Control Equipment

Condition - Good - normal wire and insulator breakage
Type - ESP

Package Boiler Site Availability - None existing - Yes:

Oil Storage (Existing) 2,500,000 gallons
Natural Gas-Available

Any local Environmental Regulations other than IDEQ

ACCREDITATION STATUS

Full X Part-time

No. of KW on Grid

#1 & 2 - 33 MW EA
#3 - 39 MW

Operation Hr/yr

6300+ each
Boiler Checklist cont.

Fuel Cost

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>38 $/Ton</td>
</tr>
<tr>
<td>Oil</td>
<td>0.70 $/Gal (2 yrs. ago)</td>
</tr>
<tr>
<td>Nat. Gas</td>
<td>5.07 $/1000 cu. ft. MBTU</td>
</tr>
</tbody>
</table>

Drawing or Sketch - easily reproducible

Conceptualize steam out of building (rough sketch)

Units one and two are on intermediate status, will to to stand-by when Chilicothe & Muscatine plants go on-line. Can provide steam at pressure required either from turbine extraction or PRV/Desuperheater from boiler.
**Facility Name/Location**  
Iowa Electric Light & Power - Marshalltown

**Land Availability**

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>220 Ac.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td>Private</td>
</tr>
<tr>
<td>City</td>
<td>Marshalltown Industrial Park</td>
</tr>
<tr>
<td>Location</td>
<td>Immediately W. of plant</td>
</tr>
<tr>
<td>Cost</td>
<td>$13,300 to $18,100/Ac.</td>
</tr>
<tr>
<td>Zoning</td>
<td>M-2 heavy ind. - needs special use permit from Board of Adjust</td>
</tr>
</tbody>
</table>

**Feedstock Availability**

**Storage/Terminal Capacity**  
Owner  
Location  
Potential Grain Production (Bu.)  
Potential Grain Production Location  
Transportation (Type)(Truck, Rail, Barge)  
To Storage/Terminal  
Owner  
From Storage/Terminal  
To Ethanol Site  
Owner  
See attached list  
Truck/Rail  
Independents/Chicago M. Western R.R.  
Independents/C.N.W.R.R.

**Product/By-Product**

**Local Ethanol Market**  
(Name)  
(Gulf Central Storage & Pipeline)

**Alcohol Transporters**  
(Name)  
(Green Mountain Pipeline)

**Local D.D.G. Market**  
(Name)  
(Green Products in Conrad)

**D.D.G. Transporters**  
(Name)  
(Arbie Mineral Feed Co., Inc.)  
(Truck/Rail)
Iowa Energy Policy Council  
Boiler Co-Utilization Study - Marshalltown Plant

## Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Mains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>City</td>
<td>Wells</td>
<td>River</td>
</tr>
<tr>
<td>City Mains</td>
<td>at N.W. corner of site</td>
<td>650 gpm @ 20psi, 5MGD</td>
<td></td>
</tr>
<tr>
<td>Future Construction</td>
<td>12&quot; main along Church St.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wells

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Aquifer</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### River

<table>
<thead>
<tr>
<th>Intake Location</th>
<th>Capacity</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Gas/Electric Utilities

#### Gas (Owner)

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa Electric Light &amp; Power</td>
<td></td>
<td>10&quot;</td>
<td>985 btu/cu ft.</td>
</tr>
</tbody>
</table>

#### Electric (Owner)

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa Electric Light &amp; Power</td>
<td></td>
<td>34.5 KV</td>
<td></td>
</tr>
</tbody>
</table>

### Wastewater Facilities

#### Mains

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600' West of site</td>
<td>8&quot;</td>
<td>will require lift sta. at Linn Creek</td>
</tr>
</tbody>
</table>

#### Wastewater Treatment Plant

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity (B.O.D./Gal. per day)</th>
<th>Future Expansions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated Sludge Plant</td>
<td>18,000 B.O.D. now is 25,000 B.O.D.</td>
<td>1-1(\frac{1}{2}) MG capacity and pretreatment in 1982</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5MGD</td>
<td>Hydraulically loaded at 6.2 MGD</td>
</tr>
</tbody>
</table>
Environmental Constraints

Air
Local Constraints
Ambient Air Quality Analysis
Emission Modeling Data (DEQ)
Available Air Pollution Increments
(from DEQ)

Water
Stream Discharge Limitations

County Constraints

Reducing Energy Requirements

Existing Plants/Processes
Name
High Temp. Effluent (Preheating)(Gal./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Gal./Day)
Cooperative Agreements
Available Additional Energy

Other Applications
Company Name
Size
Location
Existing/Needed Capacity
Product Used
Product Produced

Miscellaneous Information
Available Area Employment
% Unemployment
Potential for Labor Force

Other Potential Site Data
Local Development Contracts
Building Codes/Restrictions
Available Area for Backup Systems
Boilers
Water Treatment
Wastewater Treatment Plant
Fuel, Etc.

Steam Line Routing to Site
Local Financing Incentives
MARSHALLTOWN AREA
GRAIN TERMINALS

Liscomb - Pillsbury
St. Anthony - Mackin Grain Co.
Clemons - Clemons Grain & Supply Co.
Albion - The Pillsbury Co.
Green Mountain - The Pillsbury Co.
State Center - Goodman MLG. & State Center Grain and Feed
LeGrand - Carlson Agri Service
Melbourne - Bob's Feed and Service & Melbourne Grain Co.
Haverhill - Haverhill Elevator, Inc.
Ferguson - Fronings Western Grain
Dunbar - Marshall Farm Service
Laurel - Farmers Coop.
Gilman - Farmers Coop.
Marshalltown - Bob's Feed & Supply
Rhodes - Ag Service, Inc.
North Elevation

North Elevation
Coal Handling

South Elevation
Boiler Checklist - Plant Name: Maynard Plant, Iowa Public Service, Waterloo, IA

Steam Pressure: 1470/900 psig  Temp.: 1000 °F  Capacity: 300,000/100,000 PPH

Boiler Age - Installed 1958, 1951

<table>
<thead>
<tr>
<th>Boiler Maintenance</th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td>1971</td>
<td>Replaced in 1958 unit</td>
<td>Good</td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Air Heaters Lungstrom/ Tubular</td>
<td></td>
<td>Some tubes plugged</td>
<td>Good</td>
</tr>
<tr>
<td>Stokers/Burners 58-PC</td>
<td></td>
<td>Stokers removed - '51 unit</td>
<td></td>
</tr>
<tr>
<td>Fans</td>
<td></td>
<td></td>
<td>Excellent</td>
</tr>
<tr>
<td>B.F.P.</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Cooling Tower None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
</tbody>
</table>

Combustion Controls - Pneumatic

Condition - Good
Maintenance - Some parts problems - '51 system replaced in 1971

Water Treatment - Demineralizer

Capacity - 25 GPM ea - 2 trains
Condition - Good - New Resin

Exist. Air Pollution Control Equipment

Condition - Good
Type - ESP - 1958, nothing - 1951

Package Boiler Site Availability

| Oil Storage (Existing)        | Yes | No               |
| Natural Gas-Available        | Yes | No               |

Any local Environmental Regulations other than IDEQ  Yes No

ACCREDITATION STATUS

<table>
<thead>
<tr>
<th>No. of KW on Grid</th>
<th>Full</th>
<th>Part-time</th>
</tr>
</thead>
</table>

| Operation Hr/yr   | 53/22 | Peaking   |

Yes X  No
Boiler Checklist cont.

Fuel Cost

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>38-39</td>
<td>(10,500 Btu/ Ib)</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>$/Gal</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nat. Gas</td>
<td>$/1000 cu. ft.</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Drawing or Sketch - easily reproducible

Conceptualize steam out of building (rough sketch)
Facility Name/Location: Iowa Public Service - Waterloo

<table>
<thead>
<tr>
<th>Land Availability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parcel No.</td>
<td></td>
</tr>
<tr>
<td>Acres</td>
<td>several from 1.7Ac to 15.7Ac.</td>
</tr>
<tr>
<td>Ownership</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>Yes</td>
</tr>
<tr>
<td>City</td>
<td></td>
</tr>
<tr>
<td>Industrial Park</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>North of Airline Hwy; E. of Airport</td>
</tr>
<tr>
<td>Cost</td>
<td>$17,000 +</td>
</tr>
<tr>
<td>Zoning</td>
<td>M-2 Heavy Industrial</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feedstock Availability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage/Terminal Capacity</td>
<td>1,000,000Bu</td>
</tr>
<tr>
<td>Owner</td>
<td>Pillsbury</td>
</tr>
<tr>
<td>Location</td>
<td>S. of River at Bismark &amp; Cleveland</td>
</tr>
<tr>
<td>Potential Grain Production (Bu.)</td>
<td></td>
</tr>
<tr>
<td>Potential Grain Production Location</td>
<td></td>
</tr>
<tr>
<td>Transportation (Type) (Truck, Rail, Barge)</td>
<td></td>
</tr>
<tr>
<td>To Storage/Terminal Owner</td>
<td>Truck/Rail</td>
</tr>
<tr>
<td>From Storage/Terminal To Ethanol Site Owner</td>
<td>Truck/Rail</td>
</tr>
<tr>
<td></td>
<td>Chicago, Rock Island</td>
</tr>
<tr>
<td></td>
<td>Waterloo-Cedar Falls &amp; Northern</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product/By-Product</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Ethanol Market (Name)</td>
<td>Northland Products</td>
</tr>
<tr>
<td>Alcohol Transporters (Name) (Location) (Type) (Exist/Potential Capacity)</td>
<td>Possibly Williams Bros. S. on Hwy 63</td>
</tr>
<tr>
<td>Local D.D.G. Market (Name) D.D.G. Transporters (Name) (Location) (Type) (Exist/Potential Capacity)</td>
<td></td>
</tr>
</tbody>
</table>
Facility Name/Location
Iowa Public Service - Waterloo

Land Availability
Parcel No.
Acres
Ownership
Private
City
Industrial Park
Location
Cost
Zoning

Feedstock Availability
Storage/Terminal Capacity
400,000 Bu
Owner
Geerling Feed
Location
E. of 18th at Court
Potential Grain Production (Bu.)
Potential Grain Production Location
Transportation (Type)(Truck, Rail, Barge)
To Storage/Terminal
Owner
Truck/Rail
Ill.-Central Gulf
From Storage/Terminal
To Ethanol Site
Owner
Truck/Rail
Waterloo-Cedar Falls & Northern

Product/By-Product
Local Ethanol Market (Name)
Alcohol Transporters (Name)
(Location)
(Type)
(Exist/Potential Capacity)
Local D.D.G. Market (Name)
D.D.G. Transporters (Name)
(Location)
(Type)
(Exist/Potential Capacity)
Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Mains</td>
<td>Location</td>
<td>Wagner Road</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>980 gpm-12&quot; main</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wells</td>
<td>Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquifer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limitations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>River</td>
<td>Intake Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limitations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gas/Electric Utilities

Gas (Owner) | I.P.S. | W. of W.C.F.R.R.-runs 1 mile N. of Airline Highway |
Location | 1 mile N. of Airline Highway | |
Capacity | 25 psi | |
Size | 4" | |
Limitations | None | |
Electric (Owner) | I.P.S. | West of W.C.F.R.R. |
Location | West of W.C.F.R.R. | |
Capacity | 13.8 KV | |
Size | 13.8 KV | |
Limitations | None | |

Wastewater Facilities

Mains | Along Hwy 20 to Wagner St. |
Location | Along Hwy 20 to Wagner St. | |
Size | 12" | |
Limitations | None | |
Capacity (c.f.s.) | |
Future Extensions | |
Wastewater Treatment Plant | Mitchell and Easton |
Location | Mitchell and Easton | |
Size | |
Limitations | 300 B.O.D. -- 350 S.Solids | |
Capacity (B.O.D./Gal. per day) | 28 MGD -- 15 MGD Ave. daily flow | |
Future Expansions | |
Environmental Constraints

Air

Local Constraints
Ambient Air Quality Analysis
Emission Modeling Data (DEQ)
Available Air Pollution Increments
(from DEQ)

Water
Stream Discharge Limitations (DEQ)

County Constraints
None

Reducing Energy Requirements

Existing Plants/Processes

Name
High Temp. Effluent (Preheating) (Gal./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Gal./Day)
Cooperative Agreements
Available Additional Energy


Other Applications

Company Name
Possibly Chamberlain Mfg.

Size

Location

Existing/Needed Capacity

Product Used
Steam

Product Produced
Ammunition

Miscellaneous Information

Available Area Employment
% Unemployment 5-1/2%
Potential for Labor Force 3700

Other Potential Site Data
Antic. Expansions

Local Development Contracts

Building Codes/Restrictions
State Bldg. Code, Ht. Restriction

Available Area for Backup Systems

Boilers Yes
Water Treatment Yes
Wastewater Treatment Plant Yes
Fuel, Etc. Yes

Steam Line Routing to Site
Up Hwy 20 then W.C.F.R.R. to site

Local Financing Incentives
Ind. Rev. Bonds, Tax Abatement
Boiler Checklist - Plant Name: Rath Packing Co., Waterloo, Iowa

Steam Pressure: 410 psig  Temp: 675 °F  Capacity: #6-75,000 ea. pph  #7 & 8-125,000 ea. pph

Boiler Age - Installed #6-1940, #7-1945, #8-1956

<table>
<thead>
<tr>
<th>Boiler Maintenance</th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td>8-1981</td>
<td>41 tubes</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>7-1974</td>
<td>All tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6-1980</td>
<td>All tubes</td>
<td></td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td>Replace #7 next 24 months</td>
<td>Good except 7</td>
</tr>
<tr>
<td>Air Heaters</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stokers/Burners #8-PC</td>
<td></td>
<td>Routine</td>
<td>Good</td>
</tr>
<tr>
<td>Fans</td>
<td></td>
<td>Routine</td>
<td>Good</td>
</tr>
<tr>
<td>B.F.P.</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Cooling Tower</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td></td>
<td>Replaced Piping ($16,000-$18,000)</td>
<td>Good</td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
</tbody>
</table>

Combustion Controls - Pneumatic

Condition - Average
Maintenance - Partial Replacement w/electronic - Bailey services 3 times/year

Water Treatment - Chemical treatment in boilers only

Capacity Condition

Exist. Air Pollution Control Equipment

Condition - Good
Type - #8 mech. coll., none on other units

Package Boiler Site Availability

Oil Storage (Existing) Yes X No
Natural Gas-Available Yes X No

Any local Environmental Regulations other than IDEQ Yes X No

ACCREDITATION STATUS None

Full Part-time

No. of KW on Grid Operation Hr/yr
Boiler Checklist cont.

Fuel Cost

- Coal: $52.00 / Ton Approx.
- Oil: $/Gal
- Nat. Gas: $/1000 cu. ft.

Drawing or Sketch - easily reproducible

Conceptualize steam out of building (rough sketch)
WEST ELEVATION
IOWA ENERGY POLICY COUNCIL
BOILER CO-UTILIZATION STUDY
BROWN ENGINEERING COMPANY
FIELD INFORMATION SURVEY

Facility Name/Location
Rath Packing Co. - Waterloo

Land Availability

| Parcel No. | 25 Ac |
| Ownership | Private Rath Prop. |
| City | Industrial Park |
| Location | 3400' from plant |
| Cost | |
| Zoning | U-1 unclassified |

Feedstock Availability

| Storage/Terminal Capacity | 1,000,000 Bu |
| Owner | Pillsbury |
| Location | S. of River at Bismark and Cleveland |
| Potential Grain Production (Bu.) | |
| Potential Grain Production Location | |
| Transportation (Type)(Truck, Rail, Barge) | Truck/Rail |
| To Storage/Terminal Owner | Chicago-Rock Island |
| From Storage/Terminal Owner | Rail/Truck |
| To Ethanol Site | C.N.W.R.R./Independents |

Product/By-Product

| Local Ethanol Market (Name) | Northland Products |
| Alcohol Transporters (Name) | Possibly Williams Bros. |
| (Location) | South on Hwy 63 |
| (Type) | |
| (Exist/Potential Capacity) | |

| Local D.D.G. Market (Name) | |
| D.D.G. Transporters (Name) | |
| (Location) | |
| (Type) | |
| (Exist/Potential Capacity) | |
## Facility Name/Location
Rath Packing Co. - Waterloo

### Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Industrial Park</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Feedstock Availability

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>400,000 Bu.</th>
<th>Geerling Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>E. of 18th at Court</td>
<td></td>
</tr>
</tbody>
</table>

### Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market</th>
<th>Northland Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol Transporters</td>
<td>Possibly Williams Bros.</td>
</tr>
<tr>
<td></td>
<td>S. on Hwy 63</td>
</tr>
</tbody>
</table>

| Local D.D.G. Market       |                      |
| D.D.G. Transporters       |                      |
### Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX</td>
<td>XX</td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

**City Mains**
- Location: North side of property
- Capacity: 3950 gpm-6"-45 MGD capacity, 28 MGD max. pumped

**Wells**
- Location
- Capacity
- Aquifer
- Limitations

**River**
- Intake Location
- Capacity
- Limitations

### Gas/Electric Utilities

**Gas (Owner)**
- Location: on Nevada St. to south of R.R. tracks
- Capacity: 70 psi
- Size: 3"
- Limitations: None

**Electric (Owner)**
- Location: on Nevada St. to south of R.R. tracks
- Capacity
- Size: 13.8 KV
- Limitations: None

### Wastewater Facilities

**Mains**
- Location: South of property
- Size: 54"main
- Limitations

**Wastewater Treatment Plant**
- Location: Mitchell and Easton
- Size
- Limitations: 300B.O.D.-350 S. solids
- Capacity (B.O.D./Gal. per day): 28 MGD --15 MGD ave. daily flow

**Future Expansions**
Environmental Constraints

Air

Local Constraints
Ambient Air Quality Analysis
Emission Modeling Data (DEQ)
Available Air Pollution Increments (from DEQ)

Water
Stream Discharge Limitations D.E.Q.

County Constraints None

Reducing Energy Requirements

Existing Plants/Processes

Name
High Temp. Effluent (Preheating)(Ga./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Ga./Day)
Cooperative Agreements
Available Additional Energy

Other Applications

Company Name Possibly Chamberlain Manufacturing
Size
Location
Existing/Needed Capacity
Product Used Steam ?
Product Produced Ammunition

Miscellaneous Information

Available Area Employment
% Unemployment 5-1/2%
Potential for Labor Force 3700

Other Potential Site Data
Local Development Contracts
Building Codes/Restrictions State Bldg. Code
Available Area for Backup Systems
Boilers
Water Treatment
Wastewater Treatment Plant
Fuel, Etc.

Steam Line Routing to Site
Local Financing Incentives Industrial Revenue Bonds, Tax Abatement
North Elevation

North Elevation

East Elevation
EAST ELEVATION
Boiler Checklist - Plant Name: Plant #2, Vandalia Rd., Iowa Power, Des Moines, IA

Steam Pressure: 2@ 1250, 1@ 1450, 1@ 1800 | Temp.: 950°F | Capacity: 425,000 PPH

Boiler Age - Installed: #6-1963, #9-1950, #10-1954, #11-1964

Boiler Maintenance

<table>
<thead>
<tr>
<th>Component</th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td>1978</td>
<td>#6-6 removed, #10-2 removed</td>
<td>Good</td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Air Heaters</td>
<td></td>
<td>#6&amp;10 - new baskets</td>
<td>Good</td>
</tr>
<tr>
<td>Stokers/Burners *</td>
<td></td>
<td>#10-broken shaft replaced</td>
<td>Good</td>
</tr>
<tr>
<td>Fans</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>B.F.P.</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Cooling Tower</td>
<td>1978/81</td>
<td>Misc., Replac. fan cycl. deck</td>
<td>Good</td>
</tr>
<tr>
<td>Ash Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
</tbody>
</table>

Combustion Controls - Pneumatic

Condition - Showing Age
Maintenance - Replacement Parts - hard to obtain - replacing with new as required.

Water Treatment - City Water
Softeners & demineralizers (evaporator on large unit)
Capacity: 60 GPM
Condition: Good

Exist. Air Pollution Control Equipment - None on 6 & 9

Condition: Good
Type: ESP - 10 & 11

Package Boiler Site Availability - Possibly would require retired equipment removal

Oil Storage (Existing): 300,000 + 5,000,000
Natural Gas-Available

Any local Environmental Regulations other than IDEQ

ACCREDITATION STATUS

Full X Part-time X

No. of MW on Grid: 282 summer/248 winter

* #6 oil/gas fired
#9 gas fired/had pulverizers-retired because of no pollution controls
#10 & 11 - PC fired
Fuel Cost

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Cost per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>$/Ton</td>
</tr>
<tr>
<td>Oil</td>
<td>$/Gal</td>
</tr>
<tr>
<td>Nat. Gas</td>
<td>$/1000 cu. ft.</td>
</tr>
</tbody>
</table>

Drawing or Sketch - easily reproducible

Conceptualize steam out of building (rough sketch)
Facility Name/Location: Iowa Power and Light Company - Des Moines

Land Availability:
- Parcel No.: ADM Site
- Acres: 168 Ac
- Ownership: Private
- City: Industrial Park
- Location: M-2

Feedstock Availability:
- Storage/Terminal Capacity Owner
- Location
- Potential Grain Production (Bu.):
- Potential Grain Production Location
- Transportation (Type) (Truck, Rail, Barge)
  - To Storage/Terminal: Rail/Truck Owner
  - From Storage/Terminal: Williams Bros.-Ethanol-Pipe Line
  - To Ethanol Site: Truck/Rail for Solids Owner

Product/By-Product:
- Local Ethanol Market (Name): Oil Companies (possibly Pesters)
- Alcohol Transporters (Name) (Location) (Type) (Exist/Potential Capacity)
- Local D.D.G. Market (Name)
- D.D.G. Transporters (Name) (Location) (Type) (Exist/Potential Capacity)
Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains</td>
<td>D.M. Water Works</td>
<td>Vandalia Road/S.E. 43rd St.</td>
<td>1200 gpm - 96 MGD capac/58 MGD consumption</td>
<td>Future Construction 24&quot; main</td>
</tr>
</tbody>
</table>

Wells

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Aquifer</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

River

<table>
<thead>
<tr>
<th>Intake Location</th>
<th>Capacity</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gas/Electric Utilities

Gas (Owner)

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Electric (Owner)

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wastewater Facilities

Mains

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Limitations</th>
<th>Capacity (c.f.s.)</th>
<th>Future Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gravity main capacity is 1120 gpm</td>
<td></td>
</tr>
</tbody>
</table>

Wastewater Treatment Plant

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Limitations</th>
<th>Capacity (B.O.D./Gal. per day)</th>
<th>Future Expansions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>45 MGD; Ave = 30 MGD</td>
<td>New treatment plant in future</td>
</tr>
</tbody>
</table>
Environmental Constraints  Iowa Power would need electr. STAT Precip. on boilers to supply Ethanol plant.

Air
Local Constraints
Ambient Air Quality Analysis  DEQ monitoring at Pleasant Hill
Emission Modeling Data (DEQ)
Available Air Pollution Increments
(from DEQ)

Water
Stream Discharge Limitations

County Constraints

Reducing Energy Requirements

Existing Plants/Processes
Name
High Temp. Effluent (Preheating) (Gal./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Gal./Day)
Cooperative Agreements
Available Additional Energy

Other Applications
Company Name  Nothing presently
Size
Location
Existing/Needed Capacity
Product Used
Product Produced

Miscellaneous Information
Available Area Employment
% Unemployment
Potential for Labor Force

Other Potential Site Data
Local Development Contracts - None
Building Codes/Restrictions - Heavy Industry
Available Area for Backup Systems
Boilers
Water Treatment
Wastewater Treatment Plant
Fuel, Etc.

Steam Line Routing to Site  Along R.R. R.O.W. to N.W. then No.
Local Financing Incentives  Asked to place moratorium on taxes
North Elevation

East Elevation
Boiler Checklist - Plant Name: Iowa Southern Utilities, Burlington, IA

Steam Pressure: 2000 psig  Temp: 1005°F  Capacity: 1,425,000 PPH

Boiler Age - Installed: 1967

Boiler Maintenance

<table>
<thead>
<tr>
<th></th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td></td>
<td>Patches</td>
<td>Good</td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Air Heaters</td>
<td>1979</td>
<td>Replaced baskets</td>
<td>Good</td>
</tr>
<tr>
<td>Stokers/Burners P.C.</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Fans 2-FD (Pressurized)</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>B.F.P.</td>
<td></td>
<td>Rewound one motor</td>
<td>Good</td>
</tr>
<tr>
<td>Cooling Tower</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td>Wet sluice</td>
<td>Some replaced</td>
<td>Good</td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
</tbody>
</table>

Combustion Controls - Pneumatic

Condition: Good
Maintenance: May have some parts problem in future, manufacturer to discontinue production.

Water Treatment - Flash evaporator
- Demineralizer for start-up
Capacity: Unknown
Condition: Good

Exist. Air Pollution Control Equipment

Condition: Good
Type: ESP

Package Boiler Site Availability

Oil Storage (Existing) Yes X No
Natural Gas-Available Yes X No X

Any local Environmental Regulations other than IDEQ Yes X No

ACCREDITATION STATUS

Full X Part-time

No. of KW on Grid 208 MW
Operation Hr/yr Continuous except 2-4 wk. maintenance shut-down
Boiler Checklist cont.

Fuel Cost

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>32.00</td>
</tr>
<tr>
<td>Oil</td>
<td>$/Gal</td>
</tr>
<tr>
<td>Nat. Gas</td>
<td>$/1000 cu. ft.</td>
</tr>
</tbody>
</table>

Drawing or Sketch - easily reproducible

Conceptualize steam cut of building (rough sketch)

Plant has one boiler serving one turbine—any shut-down would mean loss of steam source.
IOWA ENERGY POLICY COUNCIL
BOILER CO-UTILIZATION STUDY
BROWN ENGINEERING COMPANY
FIELD INFORMATION SURVEY

Facility Name/Location: Iowa Southern Utilities, Burlington

Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>75</td>
</tr>
<tr>
<td>Ownership</td>
<td>Private</td>
</tr>
<tr>
<td>City</td>
<td>ISU</td>
</tr>
<tr>
<td>Industrial Park</td>
<td>on property</td>
</tr>
<tr>
<td>Location</td>
<td>S.U. of ISU property</td>
</tr>
<tr>
<td>Cost</td>
<td>$2700-$3500/Ac; $15,000/Ac with barge access</td>
</tr>
<tr>
<td>Zoning</td>
<td>None</td>
</tr>
</tbody>
</table>

Feedstock Availability

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>Wayne Bros. Div. of GARNAC North, Industrial Bottoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Potential Grain Production (Bu.)</td>
<td></td>
</tr>
<tr>
<td>Potential Grain Production Location</td>
<td></td>
</tr>
<tr>
<td>Transportation (Type) (Truck, Rail, Barge)</td>
<td>Truck/Rail/Barge</td>
</tr>
<tr>
<td>To Storage/Terminal Owner</td>
<td></td>
</tr>
<tr>
<td>From Storage/Terminal To Ethanol Site Owner</td>
<td>All to ISU, TR/R to 75 Ac. Site</td>
</tr>
<tr>
<td></td>
<td>Independent/Burlington Northern</td>
</tr>
</tbody>
</table>

Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market (Name)</th>
<th>Carpenter Station Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol Transporters (Name)</td>
<td></td>
</tr>
<tr>
<td>(Location)</td>
<td>North Bottoms Area, 1/2 mi. N. of CBD</td>
</tr>
<tr>
<td>(Type)</td>
<td>Barge/Truck; Petro./Fuel Oil</td>
</tr>
<tr>
<td>(Exist/Potential Capacity)</td>
<td>3-1/2 million Gal/?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local D.G.G. Market (Name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.D.G. Transporters (Name)</td>
</tr>
<tr>
<td>(Location)</td>
</tr>
<tr>
<td>(Type)</td>
</tr>
<tr>
<td>(Exist/Potential Capacity)</td>
</tr>
</tbody>
</table>
## Facility Name/Location

Iowa Southern Utilities, Burlington

### Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td></td>
<td>Industrial Park</td>
</tr>
</tbody>
</table>

### Feedstock Availability

#### Storage/Terminal Capacity

<table>
<thead>
<tr>
<th>Owner</th>
<th>Taber and Co.(A.D.M)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>6 blocks S. of C.B.D.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Potential Grain Production (Bu.)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Grain Production Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transportation (Type)(Truck,Rail,Barge)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To Storage/Terminal</th>
<th>Truck/Rail/Barge</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Owner</th>
<th>Independent/Burlington Northern</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>From Storage/Terminal</th>
<th>All to ISU TR/RR to 75 Ac. Site</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>To Ethanol Site</th>
<th>Independent/Burlington Northern</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Owner</th>
<th></th>
</tr>
</thead>
</table>

### Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market (Name)</th>
<th>Danville Mill and Supply</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Alcohol Transporters (Name)</th>
<th>Independent/Burlington Northern</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(Location)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(Type)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(Exist/Potential Capacity)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Local D.D.G. Market (Name)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>D.D.G. Transporters (Name)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(Location)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(Type)</th>
<th>Truck/Rail</th>
</tr>
</thead>
</table>

| (Exist/Potential Capacity) | ? |
Facility Name/Location: Iowa Southern Utilities, Burlington

Land Availability

- Parcel No.
- Acres
- Ownership: Private
- City: Industrial Park
- Location
- Cost
- Zoning

Feedstock Availability

- Storage/Terminal Capacity
  - Owner: Miss. Grain Dealers
  - Location: Gulf Port, Ill.
  - Gulf Port, Ill.

- Potential Grain Production (Bu.)
  - Potential Grain Production Location

- Transportation (Type) (Truck, Rail, Barge)
  - To Storage/Terminal: Truck/Rail/Barge
  - Owner: Danville Mill & Supp
  - From Storage/Terminal
  - To Ethanol Site
  - Owner: All to ISU TR/RR to 75 Ac. Site

Product/By-Product

- Local Ethanol Market (Name)
- Alcohol Transporters (Name)
  - (Location)
  - (Type)
  - (Exist/Potential Capacity)

- Local D.D.G. Market (Name)
- D.D.G. Transporters (Name)
  - (Location)
  - (Type)
  - (Exist/Potential Capacity)
**Facility Name/Location**
Iowa Southern Utilities, Burlington

**Land Availability**

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Location</th>
<th>Cost</th>
<th>Zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Feedstock Availability**

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>Owner</th>
<th>Location</th>
<th>Potential Grain Production (Bu.)</th>
<th>Potential Grain Production Location</th>
<th>Transportation (Type) (Truck, Rail, Barge)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Des Moines Co. Farm Service</td>
<td>Danville</td>
<td>Truck/Rail</td>
</tr>
</tbody>
</table>

**Product/By-Product**

<table>
<thead>
<tr>
<th>Local Ethanol Market</th>
<th>(Name)</th>
<th>Alcohol Transporters</th>
<th>(Name)</th>
<th>(Location)</th>
<th>(Type)</th>
<th>(Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local D.D.G. Market</th>
<th>(Name)</th>
<th>D.D.G. Transporters</th>
<th>(Name)</th>
<th>(Location)</th>
<th>(Type)</th>
<th>(Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Facility Name/Location: Iowa Southern Utilities, Burlington

Land Availability:

- Parcel No.
- Acres
- Ownership: Private
- City: Industrial Park
- Location
- Cost
- Zoning

Feedstock Availability:

- Storage/Terminal Capacity: Meekers Landing
- Location: 8-10 miles N. of Burlington
- Potential Grain Production (Bu.):
- Potential Grain Production Location
- Transportation (Type)(Truck, Rail, Barge):
  - To Storage/Terminal Owner
  - From Storage/Terminal To Ethanol Site Owner
- All to ISU TR/RR to 75 Ac. Site

Product/By-Product:

- Local Ethanol Market (Name)
- Alcohol Transporters (Name)
  - (Location)
  - (Type)
  - (Exist/Potential Capacity)
- Local D.D.G. Market (Name)
- D.D.G. Transporters (Name)
  - (Location)
  - (Type)
  - (Exist/Potential Capacity)
## Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells Location</th>
<th>Capacity</th>
<th>Future Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Mains</td>
<td>I.S.U. Site</td>
<td>None</td>
<td>None</td>
<td>20 yrs from now</td>
</tr>
<tr>
<td>Location</td>
<td>Private Site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wells
- **Location**: New wells may be possible
- **Capacity**: 1000 gpm - very little drawdown
- **Aquifer**: surficial
- **Limitations**: land area may be small for amount needed

### River
- **Intake Location**: New wells may be possible
- **Capacity**: 1000 gpm - very little drawdown
- **Limitations**: land area may be small for amount needed

## Gas/Electric Utilities

### Gas (Owner)
- **Location**: Mich/Wisc. Pipeline Co.
- **Capacity**: 2-1/2 miles from site
- **Size**: Interruptable
- **Limitations**: Same

### Electric (Owner)
- **Location**: I.S.U.
- **Capacity**: in area
- **Size**: 161 KV
- **Limitations**: Same

## Wastewater Facilities
- **Capacity (B.O.D./Gal. per day)**: 20 years from now

### Mains
- **Location**: I.S.U.
- **Size**: 161 KV
- **Limitations**: Same

### Wastewater Treatment Plant
- **Location**: I.S.U.
- **Size**: 161 KV
- **Limitations**: Same
- **Capacity (B.O.D./Gal. per day)**: I.S.U.
- **Future Expansions**: Same
Environmental Constraints

### Air
- **Local Constraints**
  - Ambient Air Quality Analysis
  - Emission Modeling Data (DEQ)
  - Available Air Pollution Increments (from DEQ)

Concordia, Township is better than Burlington for available air pollution increments.

### Water
- **Stream Discharge Limitations**

Corps of Engrs. Primary Permitting Authority.

### County Constraints

Eagle Roosts Also Conservation Commission Involvement.

Reducing Energy Requirements

### Existing Plants/Processes
- **Name**
- **High Temp. Effluent (Preheating) (Gal./Day)**
- **Make-Up Water Effluent (Gal./Day)**
- **Cooling Water Effluent (Gal./Day)**
- **Cooperative Agreements**
- **Available Additional Energy**

None

Alter Barge Terminal may use hi-temp effluent to keep slips open in winter.

Make-Up Water Effluent (Gal./Day) 

Cooling Water Effluent (Gal./Day) 

Cooperative Agreements 

Available Additional Energy 

Other Applications

None

Company Name

Size

Location

Existing/Needed Capacity

Product Used

Product Produced

Miscellaneous Information

### Available Area Employment

- % Unemployment: 5.9%
- Potential for Labor Force: 5000+

### Other Potential Site Data

- Local Development Contracts
- Building Codes/Restrictions: Co. may not have restrictions
- Available Area for Backup Systems
  - Boilers: sufficient
  - Water Treatment: sufficient
  - Wastewater Treatment Plant: sufficient
  - Fuel, Etc.: sufficient

### Steam Line Routing to Site

- Local Financing Incentives Industrial Rev. Bonds
Boiler Checklist - Plant Name: Fair Station, Eastern Iowa REC, Mountpelier, Iowa

Steam Pressure: 850 psig  Temp.: 900 °F  Capacity: 610,000 PPH

Boiler Age - Installed #1-1958, #2-1967

### Boiler Maintenance

<table>
<thead>
<tr>
<th>Component</th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td>Last 2 Years</td>
<td>6 patched</td>
<td>Good</td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Heaters</td>
<td></td>
<td>#1 replaced haskets</td>
<td>Good</td>
</tr>
<tr>
<td>Stokers/Burners P.C.</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Fans</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>B.F.P.</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Cooling Tower</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
</tbody>
</table>

### Combustion Controls
- **Type**: Pneumatic
- **Condition**: Good
- **Maintenance**: Routine, no parts problems

### Water Treatment
- **Capacity**: 2 wells, demineralizer
  - 70,000 gallons storage
- **Condition**: Unknown, fill tanks approx. every 5-7 days

### Exist. Air Pollution Control Equipment
- **Type**: Mech. coll., ESP
- **Condition**: Good

### Package Boiler Site Availability
- **Oil Storage (Existing)**: 18,000 gal. approx.  
  - Yes
- **Natural Gas-Available**: Yes
- **Any local Environmental Regulations other than IDEQ**: Yes

### ACCREDITATION STATUS
- **No. of KW on Grid**: 62.5
- **Operation Hr/yr**: Full time except routine shut-down
- **Full X**  Part-time

---
Boiler Checklist cont.

**Fuel Cost**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Cost ($)</th>
<th>$/MMBtu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td></td>
<td>$/Gal</td>
</tr>
<tr>
<td>Nat. Gas</td>
<td>3.00</td>
<td>$/MMBtu</td>
</tr>
</tbody>
</table>

Drawing or Sketch - easily reproducible

Conceptualize steam out of building (rough sketch)
IOWA ENERGY POLICY COUNCIL

BOILER CO-UTILIZATION STUDY

BROWN ENGINEERING COMPANY

FIELD INFORMATION SURVEY

Facility Name/Location: Eastern Iowa Light & Power - Montpelier, Iowa

Land Availability:
- Parcel No.:
- Acres: 150
- Ownership:
- City: Industrial Park
- Location: Across Road
- Cost:
- Zoning: Agricultural

Feedstock Availability:
- Storage/Terminal Capacity:
- Owner:
- Location:
- Potential Grain Production (Bu.): Scott County Storage Terminals
- Location:
- Transportation (Type) (Truck, Rail, Barge):
  - To Storage/Terminal Owner:
  - From Storage/Terminal Owner:
  - To Ethanol Site Owner:

Product/By-Product:
- Local Ethanol Market (Name):
- Alcohol Transporters (Name) (Location) (Type) (Exist/Potential Capacity):
- Local D.D.G. Market (Name):
- D.D.G. Transporters (Name) (Location) (Type) (Exist/Potential Capacity): McMillian Oil Storage Facil. Near Pillsbury
- Kent Feeds/Grain Processing, Muscatine
Iowa Energy Policy Council
Boiler Co-Utilization Study - Montpelier Plant

Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City Mains</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Location</td>
<td>XX</td>
<td>Wells</td>
<td>River</td>
</tr>
<tr>
<td></td>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Future Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wells

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Aquifer</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200-250 gpm---4+ gpm /ft drawdown</td>
<td>Selerian</td>
<td>exist wells</td>
</tr>
</tbody>
</table>

River

<table>
<thead>
<tr>
<th>Intake Location</th>
<th>Section 10-Construction Permit &amp; 404 Placement Permit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Limitations</td>
</tr>
</tbody>
</table>

Gas/Electric Utilities

Gas (Owner)

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa-Ill. Gas &amp; Electric (Davenport)</td>
<td>North side of Hwy 20</td>
<td>400 psi</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

Electric (Owner)

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Iowa Light and Power</td>
<td>69 KV</td>
<td></td>
<td>interconnected on system</td>
</tr>
</tbody>
</table>

Wastewater Facilities

Mains

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity (c.f.s.)</td>
<td></td>
<td>Future Extensions</td>
</tr>
</tbody>
</table>

Wastewater Treatment Plant

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>only for power plant (none for city)</td>
<td></td>
<td>Future Expansions</td>
</tr>
<tr>
<td>Capacity (B.O.D./Gal. per day)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environmental Constraints

Air
Local Constraints
Ambient Air Quality Analysis
Emission Modeling Data (DEQ)
Available Air Pollution Increments
(from DEQ)

Water
Stream Discharge Limitations

County Constraints

Reducing Energy Requirements

Existing Plants/Processes
Name
High Temp. Effluent (Preheating)(Gal./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Gal./Day)
Cooperative Agreements

Available Additional Energy

Other Applications

Company Name
Size
Location
Existing/Needed Capacity
Product Used
Product Produced

Miscellaneous Information

Available Area Employment
% Unemployment
Potential for Labor Force

Other Potential Site Data
Local Development Contracts
Building Codes/Restrictions
Available Area for Backup Systems
Boilers
Water Treatment
Wastewater Treatment Plant
Fuel, Etc.

Steam Line Routing to Site
Local Financing Incentives

Draw from Quad Cities and Muscatine
Plant is in Moline Airport approach pattern
Across Road to site
Steam Pressure: 800 psig  
Temp.: 900°F  
Capacity: 100,000 PPH available

Boiler Age - Installed: 1937, 1942, 1949, 1949

Boiler Maintenance

<table>
<thead>
<tr>
<th>Part</th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td></td>
<td></td>
<td>Reasonably good-in operating condition but showing their age.</td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Heaters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stokers/Burners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.F.P.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling Tower</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Combustion Controls - Pneumatic

Condition - good but showing age

Maintenance

Water Treatment - City water

Capacity - 2 trains - 100 GPM each, operate one at a time

Condition - good

Exist. Air Pollution Control Equipment

Condition - Good

Type - ESP - 72

Package Boiler Site Availability - Yes

Oil Storage (Existing) - 5,000,000 gal  
Natural Gas - Available

Yes X No

Any local Environmental Regulations other than IDEQ - Yes X No

ACCREDITATION STATUS

Full Part-time X

No. of KW on Grid - 225 KW

Operation Hr/yr -
Boiler Checklist cont.

Fuel Cost

Coal  $/5000 MBTU
Oil   $/Gal
Nat. Gas $/1000 cu. ft.

Drawing or Sketch - easily reproducible
Conceptualize steam out of building (rough sketch)
Facility Name/Location: Iowa - Illinois Gas & Electric - Bettendorf

Land Availability:
- Parcel No.: 11 acres
- Acres: 13.5 ac
- Ownership: Private
- Yes
- City: Industrial Park
- Location: 3600' N. of Iowa - Ill. (out of '65 flood)
- Cost: $20,000 - $25,000/ac with RAIL
- Zoning: I-3 Zone

Feedstock Availability:
- Storage/Terminal Capacity: 2,555,000Bu
- Owner: Pillsbury
- Location: Davenport
- Potential Grain Production (Bu.): 2,555,000Bu
- Potential Grain Production Location: Davenport
- Transportation (Type) (Truck, Rail, Barge):
  - To Storage/Terminal: Truck/Rail/Barge
  - Owner: Milwaukee/Independents
  - From Storage/Terminal: Truck/Rail
  - To Ethanol Site: Truck/Rail
  - Owner: Davenport, Rock Island & North Western/Truck

Product/By-Product:
- Local Ethanol Market (Name): Independents, also McMillan Oil
- Alcohol Transporters (Name): Independents, also McMillan Oil
- (Location): 
- (Type): 
- (Exist/Potential Capacity): 
- Local D.D.G. Market (Name): Linwood Stone Products
- D.D.G. Transporters (Name): Pillsbury, Cargill, Miss. River Grain
- (Location): 
- (Type): 
- (Exist/Potential Capacity):
IOWA ENERGY POLICY COUNCIL
BOILER CO-UTILIZATION STUDY
BROWN ENGINEERING COMPANY
FIELD INFORMATION SURVEY

Facility Name/Location: Iowa - Illinois Gas & Electric Co. - Bettendorf

Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Location</th>
<th>Cost</th>
<th>Zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td>Industrial Park</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Feedstock Availability

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>Owner</th>
<th>Location</th>
<th>Potential Grain Production (Bu.)</th>
<th>Location</th>
<th>Potential Grain Production Location</th>
<th>Transportation (Type)(Truck, Rail, Barge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>904,000Bu</td>
<td>Cargill</td>
<td>Buffalo, Ia.</td>
<td>950,000Bu</td>
<td>Davenport</td>
<td>Milw./Independents</td>
<td>Truck/Rail/Barge</td>
</tr>
</tbody>
</table>

Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market</th>
<th>(Name)</th>
<th>Alcohol Transporters (Name)</th>
<th>(Location)</th>
<th>(Type)</th>
<th>(Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local D.D.G. Market</td>
<td>(Name)</td>
<td>Ralston Purina Co. - Maehr Feed - Eldridge Coop-S/M!</td>
<td>Pillsbury, Cargill, Miss River Grain Co.</td>
<td>Truck/Rail/Barge</td>
<td>(Exist/Potential Capacity)</td>
</tr>
</tbody>
</table>
### Field Information Survey

#### Facility Name/Location

**Iowa - Illinois Gas and Electric - Bettendorf**

#### Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td></td>
<td>Industrial Park</td>
</tr>
</tbody>
</table>

#### Cost

- Zoning

#### Feedstock Availability

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>Location</th>
<th>Potential Grain Production (Bu.)</th>
<th>Transportation (Type)(Truck, Rail, Barge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>ConAgra</td>
<td>850,000 Bu.</td>
<td>Ralston Purina Co</td>
</tr>
<tr>
<td>Location</td>
<td>Davenport</td>
<td></td>
<td>Davenport</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>433 S. Pine St.</td>
</tr>
</tbody>
</table>

#### Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market (Name)</th>
<th>Alcohol Transporters (Name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local D.D.G. Market (Name)</td>
<td>D.D.G. Transporters (Name)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(Location)</th>
<th>(Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Location)</td>
<td>(Type)</td>
</tr>
<tr>
<td>(Exist/Potential Capacity)</td>
<td>(Exist/Potential Capacity)</td>
</tr>
</tbody>
</table>
Facility Name/Location

Iowa - Illinois Gas & Electric - Bettendorf

Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Industrial Park</th>
<th>Location</th>
<th>Cost</th>
<th>Zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Feedstock Availability

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>Owner</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>45,000</td>
<td>Maehr Feed &amp; Supply</td>
<td>6230 Brady St., Davenport</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Grain Production (Bu.)</th>
<th>Potential Grain Production Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maehr Feed &amp; Supply</td>
<td>6230 Brady St., Davenport</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transportation (Type) (Truck, Rail, Barge)</th>
<th>To Storage/Terminal</th>
<th>From Storage/Terminal</th>
<th>To Ethanol Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>Independent</td>
<td></td>
<td>Truck</td>
</tr>
<tr>
<td>Independent</td>
<td></td>
<td></td>
<td>Independent</td>
</tr>
</tbody>
</table>

Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market (Name)</th>
<th>Alcohol Transporters (Name) (Location) (Type) (Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local D.D.G. Market (Name)</th>
<th>D.D.G. Transporters (Name) (Location) (Type) (Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Mains</td>
<td>Davenport Water Co. (private)</td>
<td>12&quot; main in Hwy R.O.W. on N. Side</td>
<td>Mississippi</td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td>City</td>
<td>Mains</td>
</tr>
<tr>
<td>Capacity</td>
<td>Pump-30MGD treat 30MGD</td>
<td>Ave. Demand 18MGD, Peak Demand 25MGD</td>
<td></td>
</tr>
<tr>
<td>Future Construction</td>
<td></td>
<td>Excess Capacity 5MGD</td>
<td></td>
</tr>
</tbody>
</table>

Wells

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Aquifer</th>
<th>Limitations</th>
</tr>
</thead>
</table>

River

<table>
<thead>
<tr>
<th>Intake Location</th>
<th>Capacity</th>
<th>Limitations</th>
</tr>
</thead>
</table>

Gas/Electric Utilities

Gas (Owner)

<table>
<thead>
<tr>
<th>Iowa-Illinois Gas And Electric Co.</th>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Limitations less than or equal to 50,000 cuft/hr</td>
</tr>
</tbody>
</table>

Electric (Owner)

<table>
<thead>
<tr>
<th>Iowa-Illinois Gas and Electric Co.</th>
<th>Location</th>
<th>Capacity</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Limitations</td>
</tr>
</tbody>
</table>

Wastewater Facilities

Mains

Location

<table>
<thead>
<tr>
<th>48&quot; sewer interceptor-needs lateral</th>
</tr>
</thead>
</table>

Size

<table>
<thead>
<tr>
<th>Limitations</th>
</tr>
</thead>
</table>

Capacity (c.f.s.)

Future Extensions

Wastewater Treatment Plant

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26MGD</td>
<td></td>
</tr>
</tbody>
</table>

Capacity (B.O.D./Gal. per day)

<table>
<thead>
<tr>
<th>26MGD - Ave Flow= 18MGD</th>
</tr>
</thead>
</table>

Future Expansions

Oscar Meyer will stop hog slaughtering
Environmental Constraints

Air
Local Constraints
Ambient Air Quality Analysis
Emission Modeling Data (DEQ)
Available Air Pollution Increments
(from DEQ)

Water
Stream Discharge Limitations

County Constraints

Reducing Energy Requirements

Existing Plants/Processes
Name
High Temp. Effluent (Preheating)(Gal./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Gal./Day)
Cooperative Agreements
Available Additional Energy

Other Applications
Company Name
Size
Location
Existing/Needed Capacity
Product Used
Product Produced

Miscellaneous Information
Available Area Employment
% Unemployment 7.4%
Potential for Labor Force 13,663 (officially)

Other Potential Site Data
Local Development Contracts
Building Codes/Restrictions Follow subdivision code
Available Area for Backup Systems
Boilers
Water Treatment
Wastewater Treatment Plant
Fuel, Etc.

Steam Line Routing to Site
Local Financing Incentives Ind. Rev. Bonds
West Elevation
Boiler Checklist - Plant Name: Chemplex Company, Clinton, Iowa

Steam Pressure: 600 psig  Temp: *F  Capacity: PPH


Boiler Maintenance

<table>
<thead>
<tr>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td>Becoming a problem on older boilers</td>
<td></td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Heaters</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Stokers/Burners</td>
<td>May replace w/more efficient</td>
<td></td>
</tr>
<tr>
<td>Fans</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>B.F.P.</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Cooling Tower</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Coal Handling</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Combustion Controls

Condition - Installing a master control for all boilers

Maintenance

Water Treatment - Water from wells

Capacity - Lime, demineralizer, Calgon boiler injection

Condition - Not available

Good

Exist. Air Pollution Control Equipment - None

Condition

Type

Package Boiler Site Availability

Oil Storage (Existing)  Yes X  No

Natural Gas-Available  Yes X  No

Any local Environmental Regulations other than IDEQ  Yes X  No

ACCREDITATION STATUS - No generation

Full Part-time

No. of KW on Grid

Operation Hr/yr
Boiler Checklist cont.

Fuel Cost

Coal $/Ton
Oil $/Gal
Nat. Gas $/1000 cu. ft.

Drawing or Sketch - easily reproducible

Conceptualize steam out of building (rough sketch)

Presently steam limited - if a boiler is down, production is down - trying to develop an energy conservation program.
Facility Name/Location: Chemplex, Clinton

Land Availability:
- Parcel No.: 700
- Ownership: Private
- City: Getty Oil and American Can
- Industrial Park
- Location: Part of Sec. 19 & 20 T81N R6E 5th Prim. Merid.
- Cost: Ag. Land $4000-5000/ac. Ind. land $10,000-11,000/ac.
- Zoning: M-4 Zoning

Feedstock Availability:
- Storage/Terminal Capacity: Agri-Indust.
- Owner: Fulton, Ill.
- Location
- Potential Grain Production (Bu.): Fulton, Ill.
- Transportation (Type)(Truck, Rail, Barge):
  - To Storage/Terminal: Rail/Barge
  - Owner: Chic., Milwaukee, C.N.W. across river
  - From Storage/Terminal: Truck
  - To Ethanol Site: Determan Trucking & Fert.

Product/By-Product:
- Local Ethanol Market (Name): Ruan Alcohol Transport
- Alcohol Transporters (Name):
  - Location: Clinton
  - Type: Trucking
- Local D.D.G. Market (Name): Clinton Corn Processing
- D.D.G. Transporters (Name):
  - Location: Clinton
  - Type: Clinton Corn Processing
- (Exist/Potential Capacity): 100,000-125,000 Bu./day
## Facility Name/Location

Facility Name/Location: Chemplex, Clinton

## Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Location</th>
<th>Cost</th>
<th>Zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
<td></td>
<td>Industrial Park</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Feedstock Availability

### Storage/Terminal Capacity

<table>
<thead>
<tr>
<th>Owner</th>
<th>Location</th>
<th>Potential Grain Production (Bu.)</th>
<th>Potential Grain Production Location</th>
<th>Transportation (Type)(Truck, Rail, Barge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peavy Barge Terminal</td>
<td>2nd St. on Beaver</td>
<td>C.F. Sales</td>
<td>Munie Dock &amp; Albany</td>
<td>Illinois</td>
</tr>
</tbody>
</table>

### From Storage/Terminal To Ethanol Site

<table>
<thead>
<tr>
<th>Owner</th>
<th>All</th>
<th>C.N.W.R.R.; IND.</th>
<th>All</th>
<th>C.Milw.; C, N. W.; Ind.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>Truck</td>
<td>Determan Trucking and Eastern Iowa Grain and Fert. and Independents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Product/By-Product

### Local Ethanol Market

<table>
<thead>
<tr>
<th>Name</th>
<th>Determan Trucking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Camanche</td>
</tr>
</tbody>
</table>

### Alcohol Transporters

<table>
<thead>
<tr>
<th>Name</th>
<th>Determan Trucking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Camanche</td>
</tr>
</tbody>
</table>

### Local D.D.G. Market

<table>
<thead>
<tr>
<th>Name</th>
<th>Overseas (no Tariff)</th>
</tr>
</thead>
</table>

### D.D.G. Transporters

<table>
<thead>
<tr>
<th>Name</th>
<th>Overseas (no Tariff)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overseas (no Tariff)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>Type</th>
<th>Exist/Potential Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility Name/Location</td>
<td>Chemplex; Clinton</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------</td>
<td></td>
</tr>
</tbody>
</table>

**Land Availability**

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td>Private</td>
</tr>
<tr>
<td>City</td>
<td>Industrial Park</td>
</tr>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td></td>
</tr>
<tr>
<td>Zoning</td>
<td></td>
</tr>
</tbody>
</table>

**Feedstock Availability**

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>500,000Bu.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>Gulfcoast Grain</td>
</tr>
<tr>
<td>Location</td>
<td>Camanche</td>
</tr>
</tbody>
</table>

| Potential Grain Production (Bu.) |          |
| Potential Grain Production Location |          |
| Transportation (Type)(Truck, Rail, Barge) |          |

| To Storage/Terminal Owner | All |
| From Storage/Terminal Owner |       |
| To Ethanol Site Owner | Truck Determinant Trucking and Eastern Iowa Grain and Fert. and Independents |

**Product/By-Product**

<table>
<thead>
<tr>
<th>Local Ethanol Market (Name)</th>
<th>Municipal Facil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol Transporters (Name)</td>
<td>Clinton</td>
</tr>
<tr>
<td>(Location)</td>
<td>Barge</td>
</tr>
<tr>
<td>(Type)</td>
<td>Exist/Potential Capacity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local D.D.G. Market (Name)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D.D.G. Transporters (Name)</td>
<td></td>
</tr>
<tr>
<td>(Location)</td>
<td></td>
</tr>
<tr>
<td>(Type)</td>
<td></td>
</tr>
<tr>
<td>(Exist/Potential Capacity)</td>
<td></td>
</tr>
</tbody>
</table>
### Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Mains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td>To 7th Ave and Hwy 30 intersection</td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td>8&quot;-10&quot;</td>
</tr>
<tr>
<td>Future Construction</td>
<td></td>
<td></td>
<td>none anticipated</td>
</tr>
<tr>
<td>Wells</td>
<td></td>
<td></td>
<td>on Chemplex Property</td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquifer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limitations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake Location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limitations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Gas/Electric Utilities

<table>
<thead>
<tr>
<th>Gas (Owner)</th>
<th>electric (Owner)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Location</td>
</tr>
<tr>
<td>Capacity</td>
<td>Capacity</td>
</tr>
<tr>
<td>Size</td>
<td>Size</td>
</tr>
<tr>
<td>Limitations</td>
<td>Limitations</td>
</tr>
<tr>
<td>Interstate Power</td>
<td>Interstate Power</td>
</tr>
<tr>
<td>Interruptable Service</td>
<td></td>
</tr>
</tbody>
</table>

### Wastewater Facilities

**Mains**

- Location
- Size
- Limitations
- Capacity (c.f.s.)
- Future Extensions
  - City Mains stop short of Chemplex Property

**Wastewater Treatment Plant**

- Location
- Size
- Limitations
- Capacity (B.O.D./Gal. per day)
- Future Expansions
Environmental Constraints

Air
Local Constraints
Ambient Air Quality Analysis
Emission Modeling Data (DEQ)
Available Air Pollution Increments
(from DEQ)

Water
Stream Discharge Limitations
County Constraints

Reducing Energy Requirements

Existing Plants/Processes
Name
Possibly Hawkeye Chem. Co.
High Temp. Effluent (Preheating) (Gal./Day)
Make-Up Water Effluent (Gal./Day)
Cooling Water Effluent (Gal./Day)
Cooperative Agreements
Available Additional Energy

Other Applications
Company Name
Possibly Hawkeye Chem. Co.
Size
Location
Existence/Needed Capacity
Product Used
Product Produced

Miscellaneous Information

Available Area Employment
% Unemployment
Potential for Labor Force

Other Potential Site Data
Local Development Contracts
City contract for utility extensions (2-3mi exterior)
Building Codes/Restrictions
Near Airport/clearances
Available Area for Backup Systems
Boilers
Water Treatment
Wastewater Treatment Plant
Fuel, Etc.

Steam Line Routing to Site
Local Financing Incentives
Action Grants
North East Elevation
Boiler Checklist - Plant Name Muscatine Power and Water, Muscatine, IA

Steam Pressure 650 psig Temp. 700 °F Capacity 210,000 PPH

Boiler Age - Installed #5-1943, #6-1948

<table>
<thead>
<tr>
<th>Boilers Maintenance</th>
<th>When</th>
<th>Extent</th>
<th>General Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superheater Tubes</td>
<td></td>
<td>Replaced water wall headers</td>
<td>Good</td>
</tr>
<tr>
<td>Economizer Tubes</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Air Heaters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stokers/Burners</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Fans</td>
<td>1975</td>
<td>New Fans</td>
<td>Good</td>
</tr>
<tr>
<td>B.F.P. -3</td>
<td></td>
<td>May replace 1</td>
<td>Good to Fair</td>
</tr>
<tr>
<td>Cooling Tower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash Handling</td>
<td>1973</td>
<td>Rebuilt</td>
<td>Good</td>
</tr>
<tr>
<td>Coal Handling</td>
<td></td>
<td>May replace scales</td>
<td>Good to Fair</td>
</tr>
</tbody>
</table>

Combustion Controls

Condition
Maintenance

Water Treatment - Demineralizers - 1969

Capacity
Condition

Exist. Air Pollution Control Equipment

Condition - Good
Type - Mechanical Collectors installed 1975

Package Boiler Site Availability

Oil Storage (Existing) 200,000 gal (New Plant) Yes X No
Natural Gas-Available Yes X No

Any local Environmental Regulations other than IDEQ Yes No X

ACCREDITATION STATUS

Full Part-time X

No. of KW on Grid

Operation Hr/yr

22,000 KW

#5-1500, #6-3000
Boiler Checklist cont.

**Fuel Cost**
- Coal: $1.75/ton MBTU
- Oil: $/Gal
- Nat. Gas: $3.15/1000-cu.-ft. MBTU

**Drawing or Sketch - easily reproducible**

*Conceptualize steam out of building (rough sketch)*

Currently negotiating to sell steam from these boilers to nearby grain processor. If contract signed, will have no excess steam. Currently building new plant (650 MW), most electricity sold to other utilities. Boilers 7 and 8 at old plant will then go on stand-by. Steam may be available from these units.
MUNICIPAL WATER AND LIGHT COMPANY
MUSCATINE POWER PLANT
MUSCATINE, IOWA
IOWA ENERGY POLICY COUNCIL

BOILER CO-UTILIZATION STUDY

BROWN ENGINEERING COMPANY

FIELD INFORMATION SURVEY

Facility Name/Location

Municipal Water and Light Co. - Muscatine

Land Availability

<table>
<thead>
<tr>
<th>Parcel No.</th>
<th>Acres</th>
<th>Ownership</th>
<th>City</th>
<th>Industrial Park</th>
<th>Location</th>
<th>Cost</th>
<th>Zoning</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>40</td>
<td>yes</td>
<td></td>
<td>Progress Park</td>
<td>4-5 mi. S. of plant</td>
<td>$6500/ac or less</td>
<td>M-2 Zone</td>
<td>restrictive covenants</td>
</tr>
</tbody>
</table>

Feedstock Availability

<table>
<thead>
<tr>
<th>Storage/Terminal Capacity</th>
<th>Owner</th>
<th>Location</th>
<th>Potential Grain Production (Bu.)</th>
<th>Transportation (Type)(Truck,Rail,Barge) To Storage/Terminal Owner</th>
<th>From Storage/Terminal To Ethanol Site Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All Independents/Chic.-Milwaukee</td>
<td>Truck/Rail Independents/Chicago-Milwaukee R.R.</td>
</tr>
</tbody>
</table>

Product/By-Product

<table>
<thead>
<tr>
<th>Local Ethanol Market (Name)</th>
<th>Alcohol Transporters (Name) (Location) (Type) (Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (possibly Grain Processing)</td>
<td>Garrent Trucking Muscatine Truck</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local D.D.G. Market (Name)</th>
<th>D.D.G. Transporters (Name) (Location) (Type) (Exist/Potential Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Testrake Green St. Truck</td>
</tr>
</tbody>
</table>
Facility Name/Location: Municipal Water & Light Co. - Muscatine

Land Availability

- Parcel No.
- Acres
- Ownership: Private
- City: Industrial Park
- Location
- Cost
- Zoning

Feedstock Availability

- Storage/Terminal Capacity
  - Owner: Continental Grain
  - Location: 116 Spring St.
- Potential Grain Production (Bu.): River Terminal Grp.
- Potential Grain Production Location: S.E. of Plant
- Transportation (Type) (Truck, Rail, Barge)
  - To Storage/Terminal: All
  - Owner: Indep/Chic.-Milwaukee
  - From Storage/Terminal: Independents
  - To Ethanol Site: Truck
  - Owner: Independents

Product/By-Product

- Local Ethanol Market (Name): None (possibly Grain processing)
- Alcohol Transporters (Name): Daufelt Trucking
- (Location): Muscatine
- (Type): Truck
- (Exist/Potential Capacity)
- Local D.D.G. Market (Name): Custom Feeds
- D.D.G. Transporters (Name): Grain Proc. Ker Feeds
- (Location): R.R. 6
- (Type): 1600 Oregon
- (Exist/Potential Capacity): Truck/Rail
Iowa Energy Policy Council  
Boiler Co-Utilization Study - Muscatine Plant

Water Availability

<table>
<thead>
<tr>
<th>Source</th>
<th>City</th>
<th>Wells</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Mains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Progress Park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>6&quot;-8&quot; Feeds 30&quot; to City</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Capacity</td>
</tr>
<tr>
<td>Aquifer</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake Location</td>
</tr>
<tr>
<td>Capacity</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
</tbody>
</table>

Gas/Electric Utilities

<table>
<thead>
<tr>
<th>Gas (Owner)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Capacity</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric (Owner)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Capacity</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
</tbody>
</table>

Wastewater Facilities

<table>
<thead>
<tr>
<th>Mains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
<tr>
<td>Capacity (c.f.s.)</td>
</tr>
<tr>
<td>Future Extensions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wastewater Treatment Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
<tr>
<td>Capacity (B.O.D./Gal. per day)</td>
</tr>
<tr>
<td>Future Expansions</td>
</tr>
</tbody>
</table>
Environmental Constraints

Air
- Previously non-attainment area now unclassified
- Local Constraints
  - Ambient Air Quality Analysis
  - Emission Modeling Data (DEQ)
  - Available Air Pollution Increments (from DEQ)

Water
- Stream Discharge Limitations
- County Constraints
  - D.E.Q.

Reducing Energy Requirements

Existing Plants/Processes
- Name: Future Roy Carver Elec. Foundry
- High Temp. Effluent (Preheating) (Gal./Day)
- Make-Up Water Effluent (Gal./Day)
- Cooling Water Effluent (Gal./Day) may sink well for cooling H₂O
- Cooperative Agreements: None

Available Additional Energy
- None

Other Applications
- None

Company Name
Size
Location
Existing/Needed Capacity
Product Used
Product Produced

Miscellaneous Information

Available Area Employment
- % Unemployment: 4.2%
- Potential for Labor Force: Labor force of 800 at Louisa will drop to 75 people.

Other Potential Site Data
- Local Development Contracts
- Building Codes/Restrictions: Possible ht. restriction - airport yes at Progress Park
- Available Area for Backup Systems
- Boilers
- Water Treatment
- Wastewater Treatment Plant
- Fuel, Etc.

Steam Line Routing to Site
- Local Financing Incentives: Industrial Rev. Bonds