Koda Energy

Biomass to Energy

What is Koda Energy, LLC?

- Koda is a partnership between Rahr Malting and the SMSC that creates “green energy” from burning **dry** biomass fuels.
- Koda’s combined heat and power biomass plant is located on property owned by Rahr Malting in Shakopee MN.

Rahr Malting Company

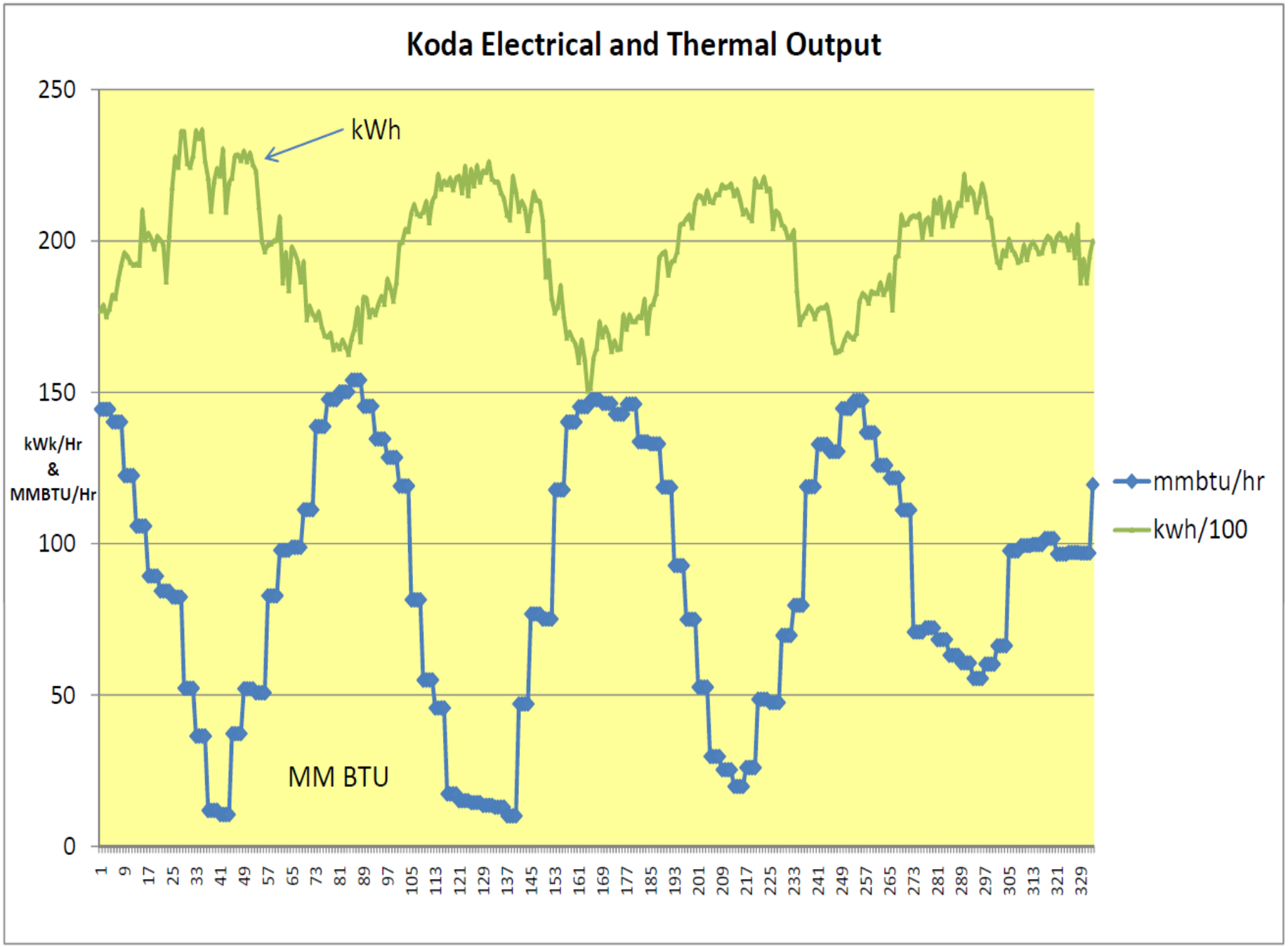
- The Rahr family has made malt for 167 years.
- Operational in Shakopee since 1936.
- The Shakopee plant currently employs over 110 skilled workers.
- It is the 2nd largest malting facility in one location in the world.

Shakopee Mdewakanton Sioux Community (SMSC)

- A federally recognized Indian Tribe.
- The largest employer in Scott County.
- Nearly $700 million in annual revenues in Minnesota attributed to the SMSC.

What Does Koda Produce?

- Koda's has two products.
  - 16.5 MW of net electrical energy. (average)
  - 125 MM BTU's/hr of thermal energy. (average)
- Rahr purchases all of the heat generated from this system to replace its natural gas usage in 7 large industrial kilns.
  - ~ 75 million cubic feet/month of reduced NG usage.
- The electricity generated from this system is:
  - Purchased by Rahr to power the malting plant.
  - Sold to outside power purchasers in need of base load and/or biomass renewable energy. (Xcel Energy)


Koda Electrical and Thermal Output
250
200
150
100
50
0
kWk/Hr & MMBTU/Hr
kWh
MM BTU
mmbtu/hr
kwh/100
1
9
17
25
33
41
49
57
65
73
81
89
97
105
113
121
129
137
145
153
161
169
177
185
193
201
209
217
225
233
241
249
257
265
273
281
289
297
305
313
321
329

Biomass Fuels

- Biomass fuels supplied by Rahr, local agri-businesses, city entities, wood recyclers, and farmers in a 50 mile radius.
- Fuel - 175,000 tons/year required.
  - Agri Business co-products.
    - Rahr's by-products.
    - Oat hulls from General Mills.
    - Chaff and seed screening material from other agricultural processes.
  - Wood
    - Municipal tree trimmings. (dried)
    - Recycled dimensional lumber.
  - Other dry agricultural residues such as: chopped corn cobs and stover, beet pulp, sunflower shells, grass seed, old seed corn, and many others.
- Most of these products had no reliable market before Koda, many were sent to landfills when a viable outlet could not be found.

Plant Design

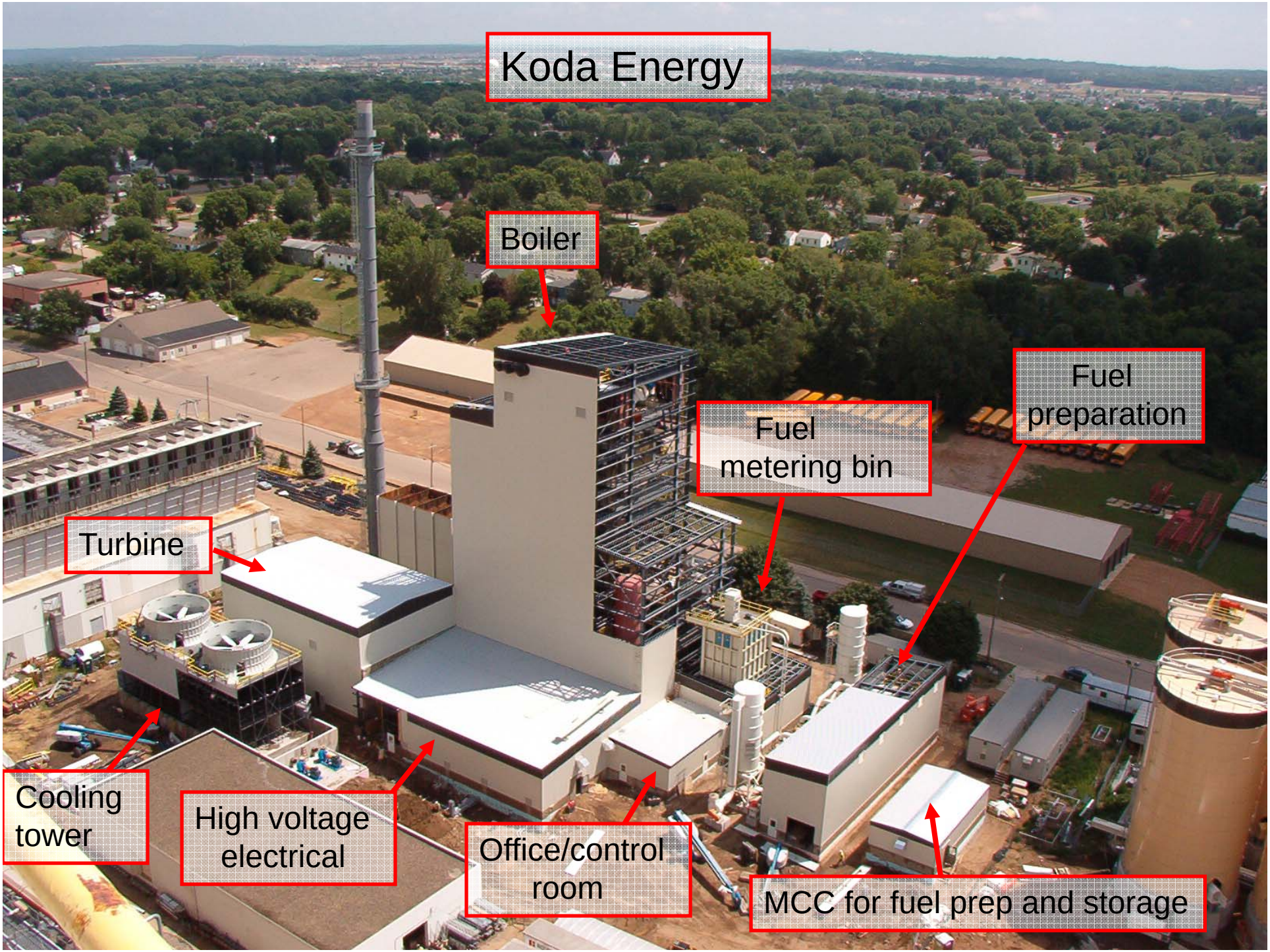
- Boiler Options
  - Fluidized bed system
    - Better suited for higher moisture – lower quality fuels
  - Stoker system
    - Not ideal for burning “dust”
  - Gasifier design not efficient
- Suspension burning system chosen for Koda
  - Flame stability
    - Self sustaining combustion w/o natural gas – 100% Biomass fired
  - Lower emissions & higher efficiency than stoker
  - Low unburned carbon
  - Rapid response & 50% turn down capability

2/13/2008

3/11/2008

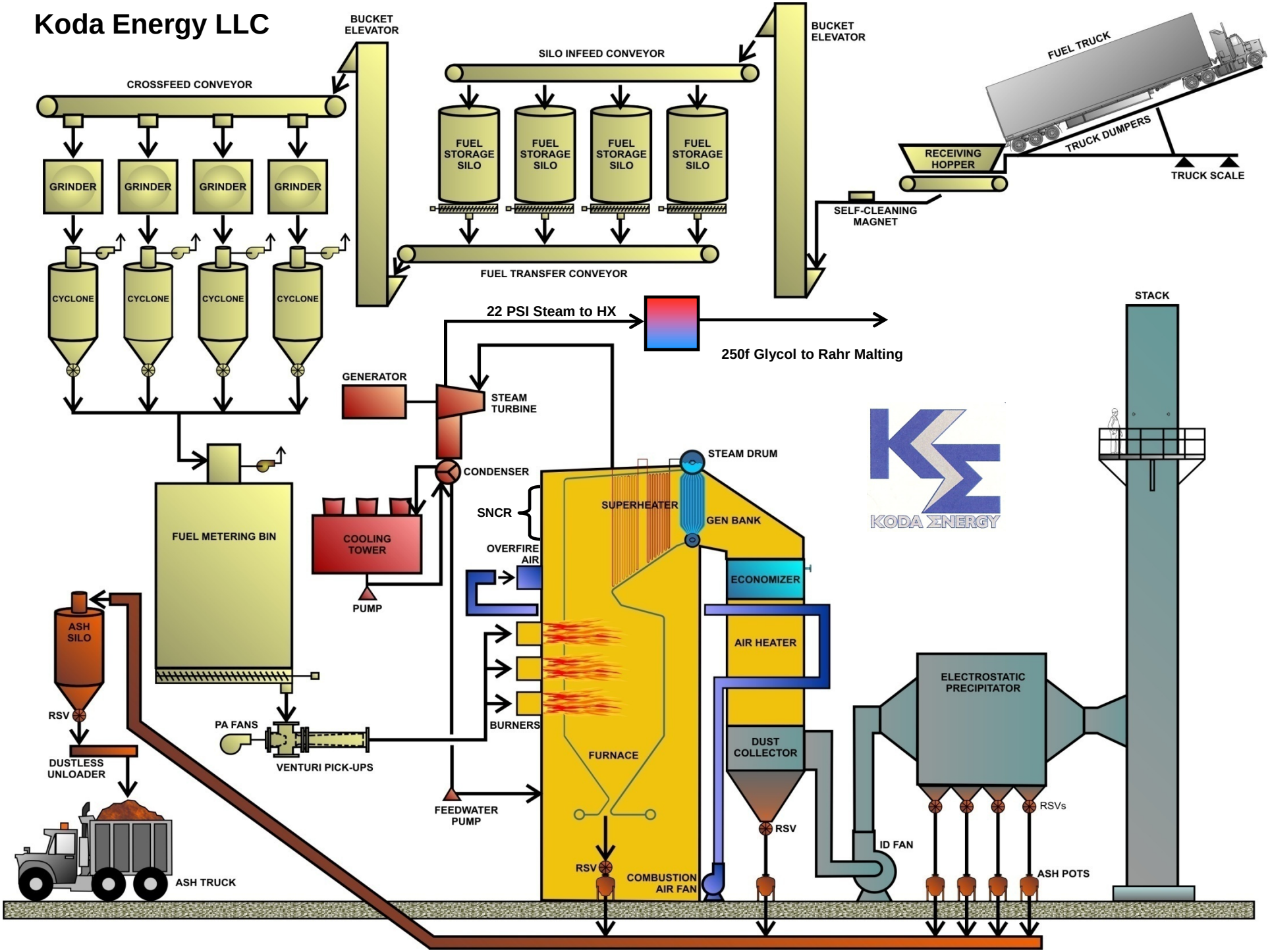
7/25/2008

4/21/2008


Koda Energy
Boiler
Fuel preparation
Fuel metering bin
Turbine
Cooling tower
High voltage electrical
Office/control room
MCC for fuel prep and storage


August 2009

Koda Energy LLC



Koda CHP plant from the street

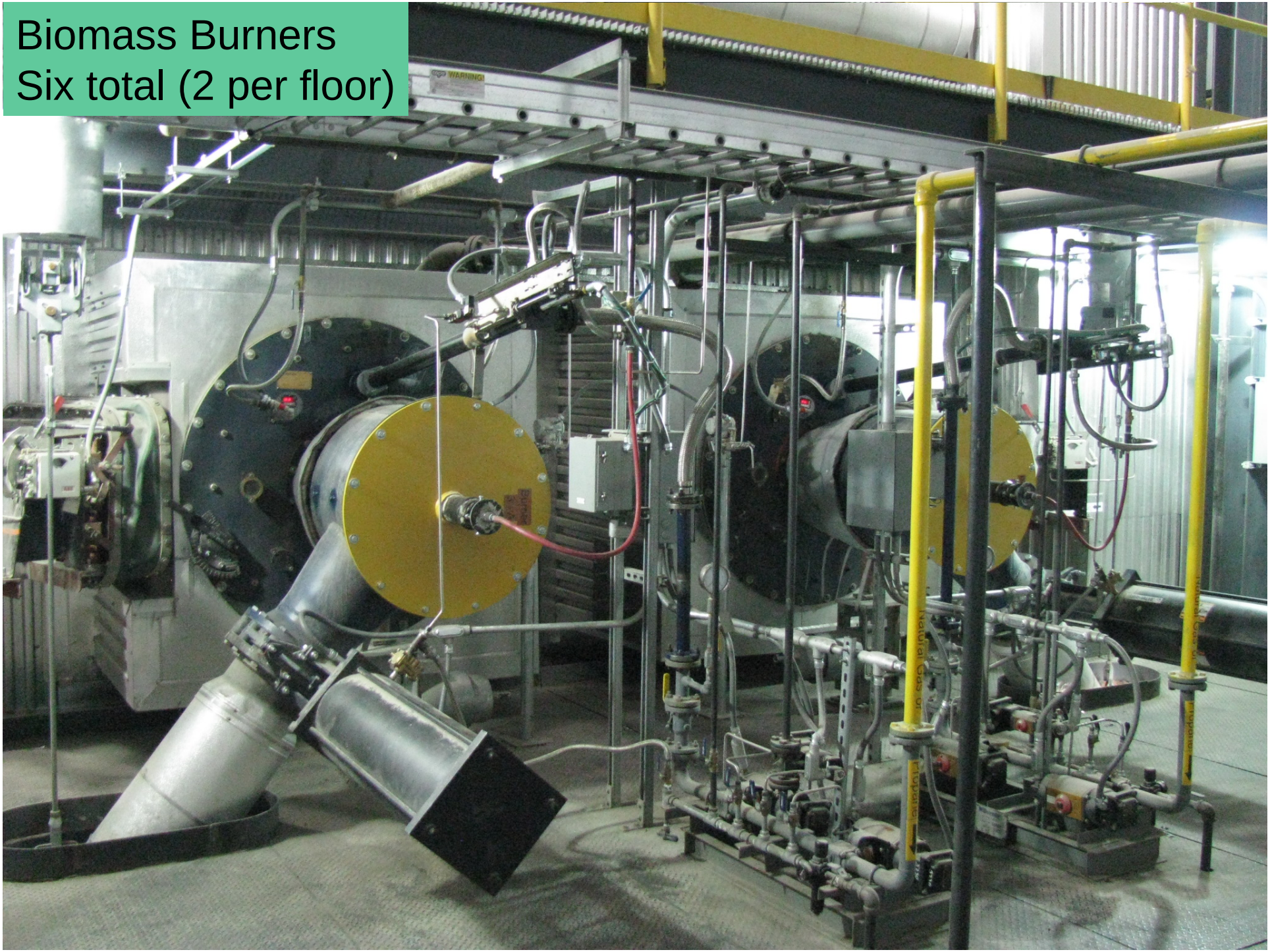
Where fuel enters the process

Point and area dust collection

The various fuels are segregated into four blending bins.

four hammermills

Biomass Burners
Six total (2 per floor)



Urea Injection for NOX Control

ESP for Particulate emission control

Steam turbine

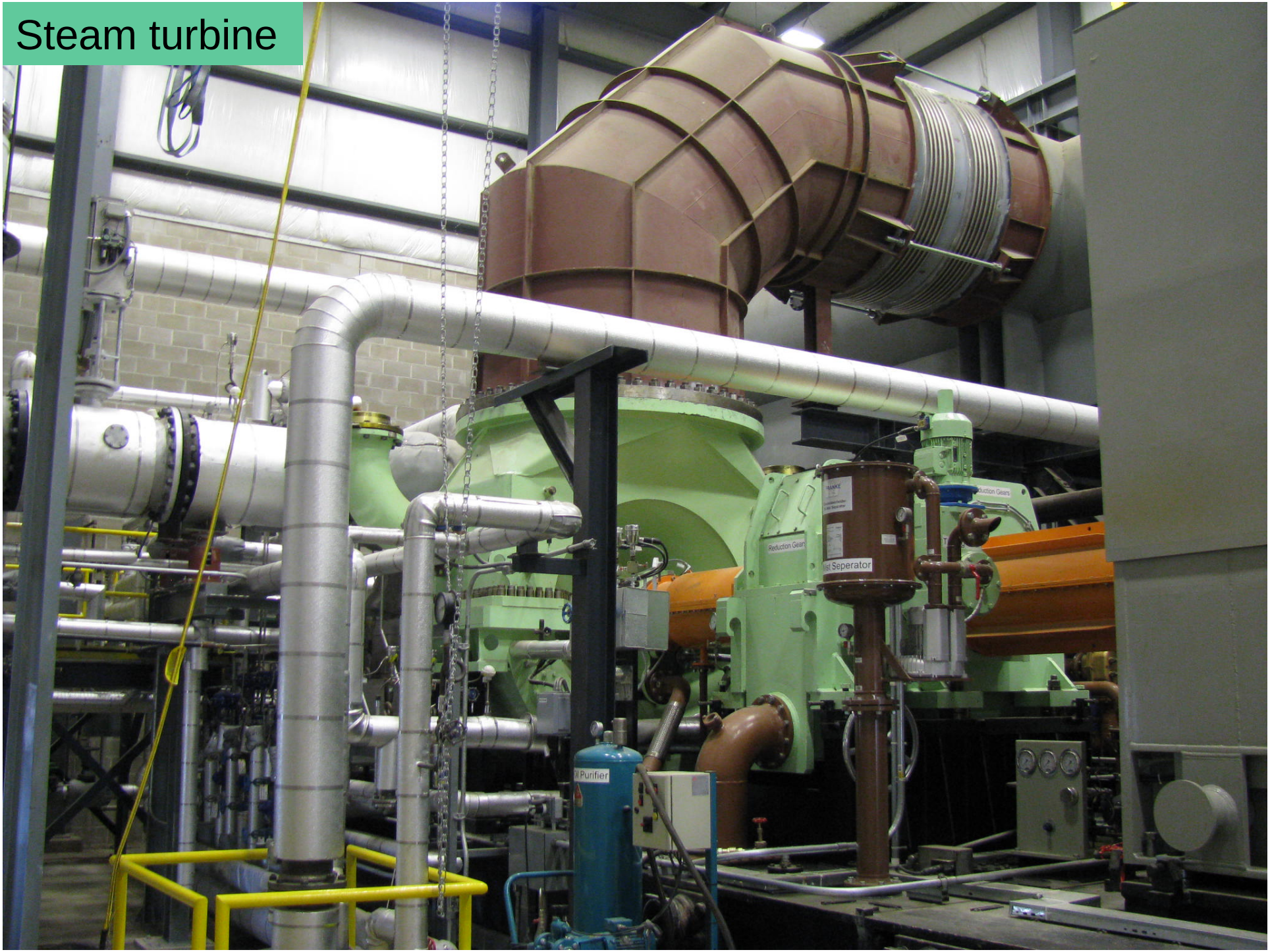
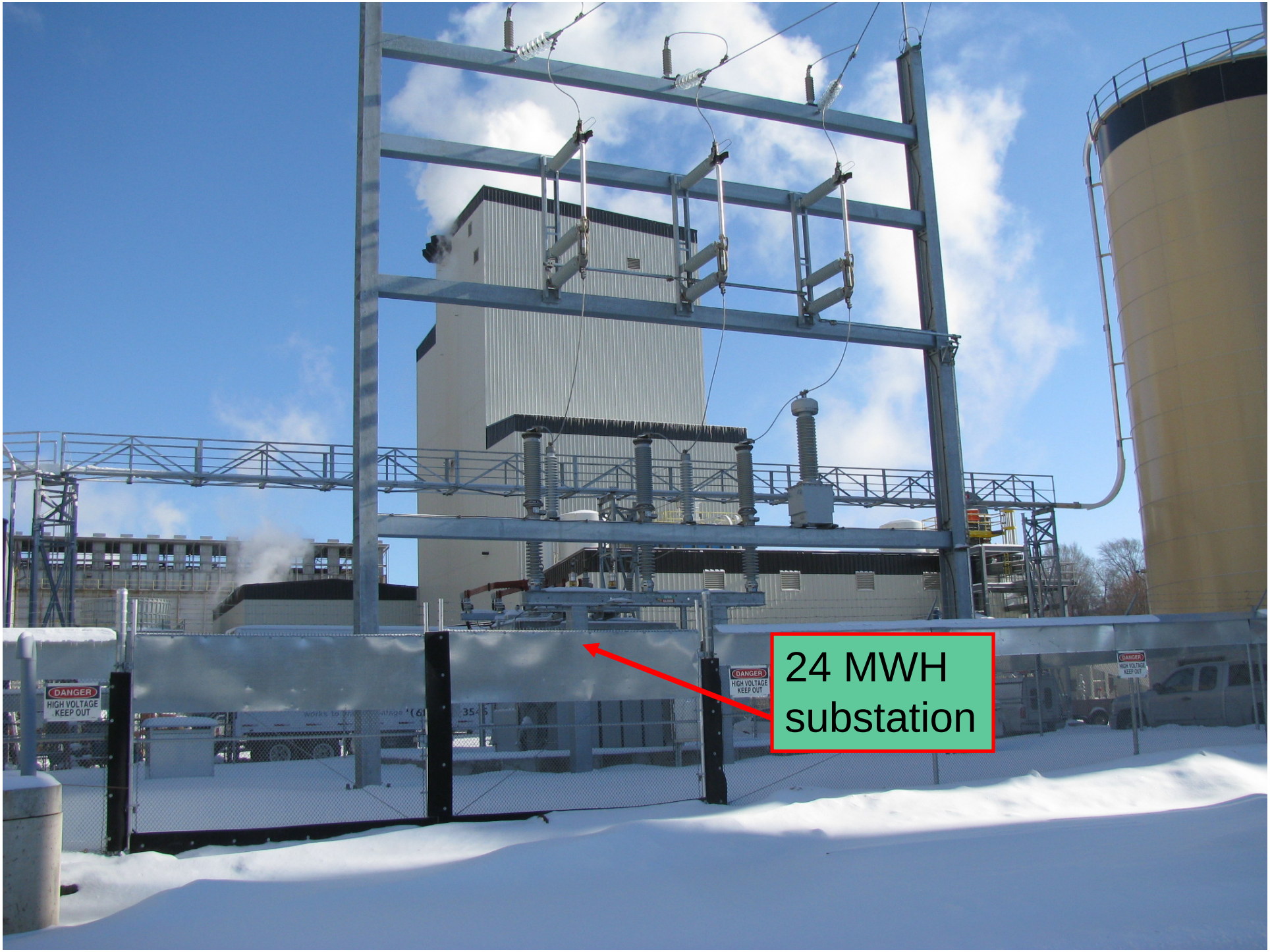


Plate & Frame Heat Exchanger to Heat glycol to 260 F


DANGER
HIGH VOLTAGE
KEEP OUT
24 MWH
substation

Environmental Benefits

- Renewable base load energy production.
- CO_2 emission reduction from avoided natural gas use for heat.
  - 70,000 tons/year.
- CO_2 emission reduction from electrical generation.
  - 190,000 tons/year compared to coal emission for electrical generation.
- Mercury emissions extremely low.
- All of Koda's ash is land applied to improve soils.
- Dedicated energy crops.
  - Reduced soil erosion.
  - improved water quality.
  - Sequestering carbon.

Project planning considerations

- Identify the feedstocks that are readily available, by volume and type.
- Perform proximate and ultimate analysis on all fuels.
- Select the most proper conversion technology for your type of feedstock.
- Calculate the expected energy production.
- Create a mutually beneficial relationship between your business unit and a large volume user of power and/or thermal energy.
- Add a person to your team with broad process/power plant experience to provide input before construction begins.