

Cofiring Coal with Switchgrass: The Chariton Valley Biomass Project

Prepared for:

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Presentation Objective

- Provide project background & update
 - for more see www.cvr.cd.org/biomass.htm
- Describe on-going test burn activities
- Photos of equipment (this is real, now)
- Describe Antares' role in the project
- Review next steps . . .

What is Switchgrass?

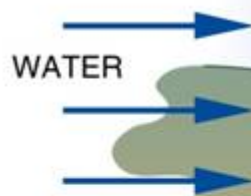
ORNL-DWG 93M-8892

SWITCHGRASS

- DECREASED WINDFLOW AND EVAPORATION



- LESS EROSION FROM SURFACE FLOW



- DEEP ROOTING SYSTEM BENEFITS



- NATIVE C4 PERENNIAL

- CAN BE GROWN ON MARGINAL LANDS OR ROTATED WITH OTHER CROPS

- EXCELLENT NESTING AND INVERTEBRATE HABITAT

- ROOT MASS CAN REACH 8 DRY Mg/ha; AN EXCELLENT CARBON SINK



Switchgrass Cofiring Ottumwa, Iowa

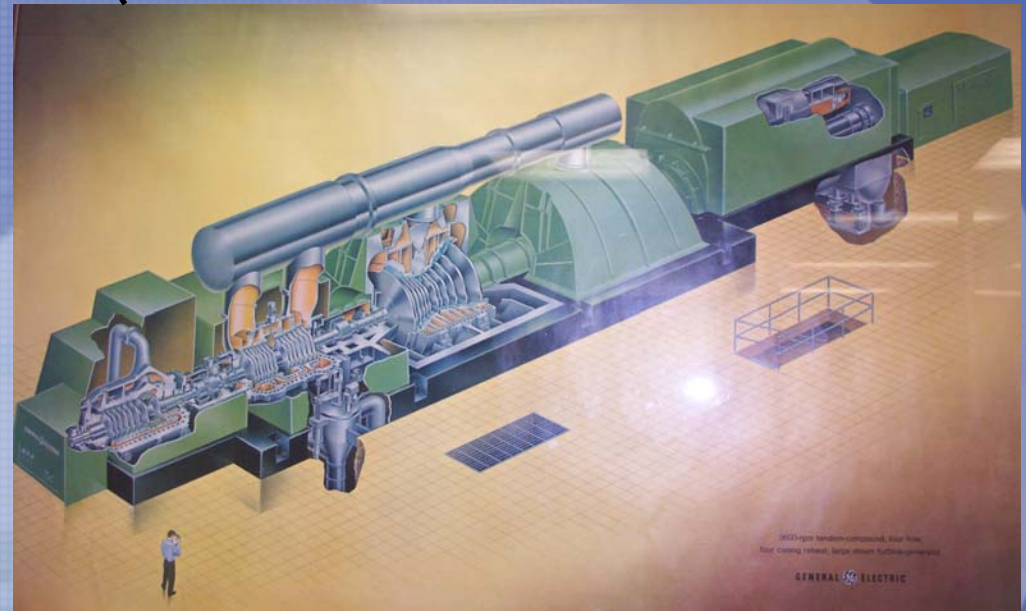
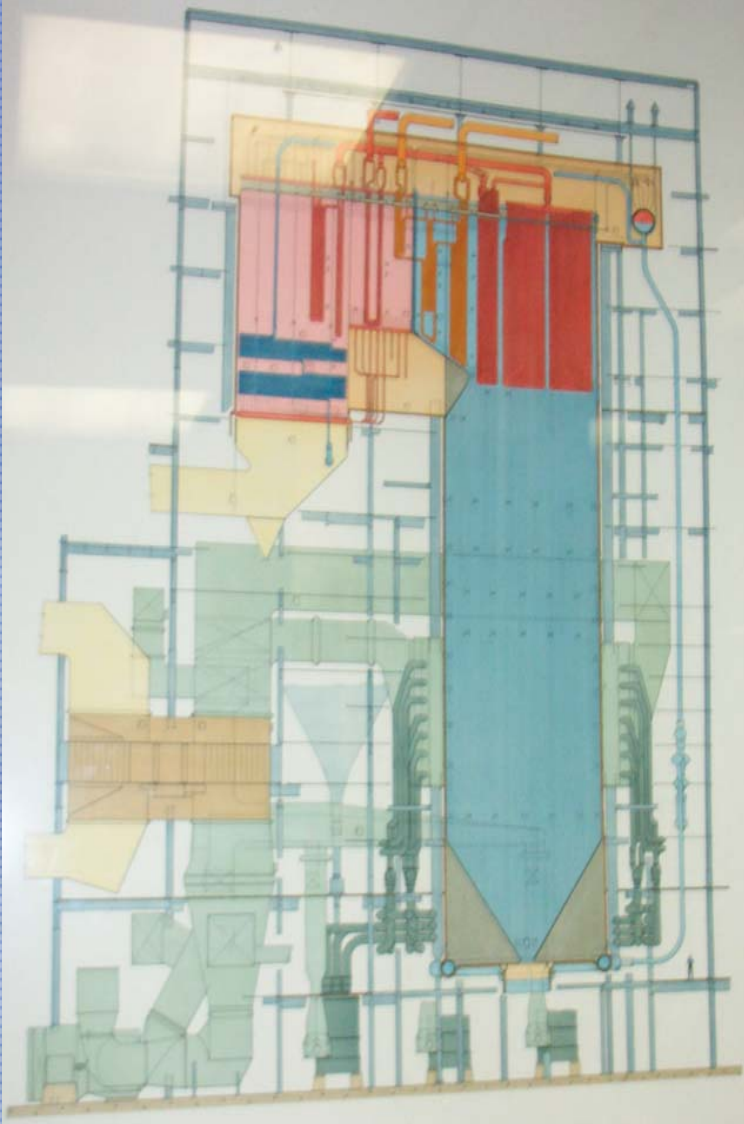
- Ottumwa Generating Station
 - Alliant Energy / Mid-American
 - 726 MW, PRB Coal, 1982 startup
 - Twin furnace T-fired PC boiler
 - 2.5 to 5% heat input from switchgrass, 12.5 to 25 ton/hr
 - Separate biomass injection, 2 - 4 ports
- Status
 - 2000 hr continuous test burn on-going
 - Newly constructed facility completed
 - Long term test to investigate fouling, slagging, and corrosion impacts
- Fuel
 - 3' x 4' x 8' switchgrass bales
 - 2-step milling process to 1/8" minus



How big is a 726 MW power plant?

Boiler (Steam Generator)

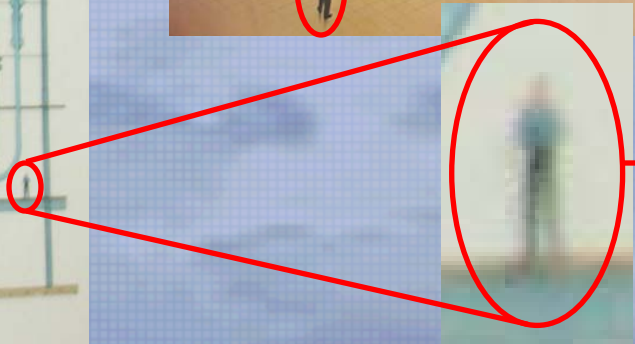
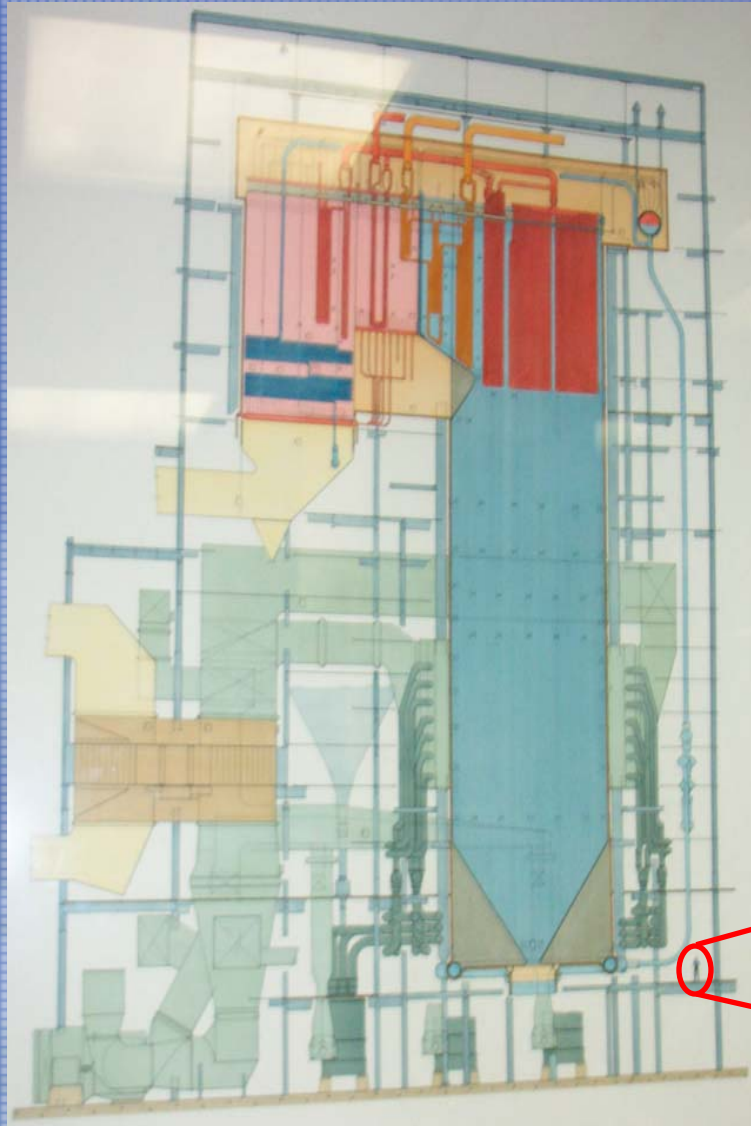
Steam Turbine & Electric Generator



How big is a 726 MW power plant?

Boiler (Steam Generator)

Steam Turbine & Electric Generator



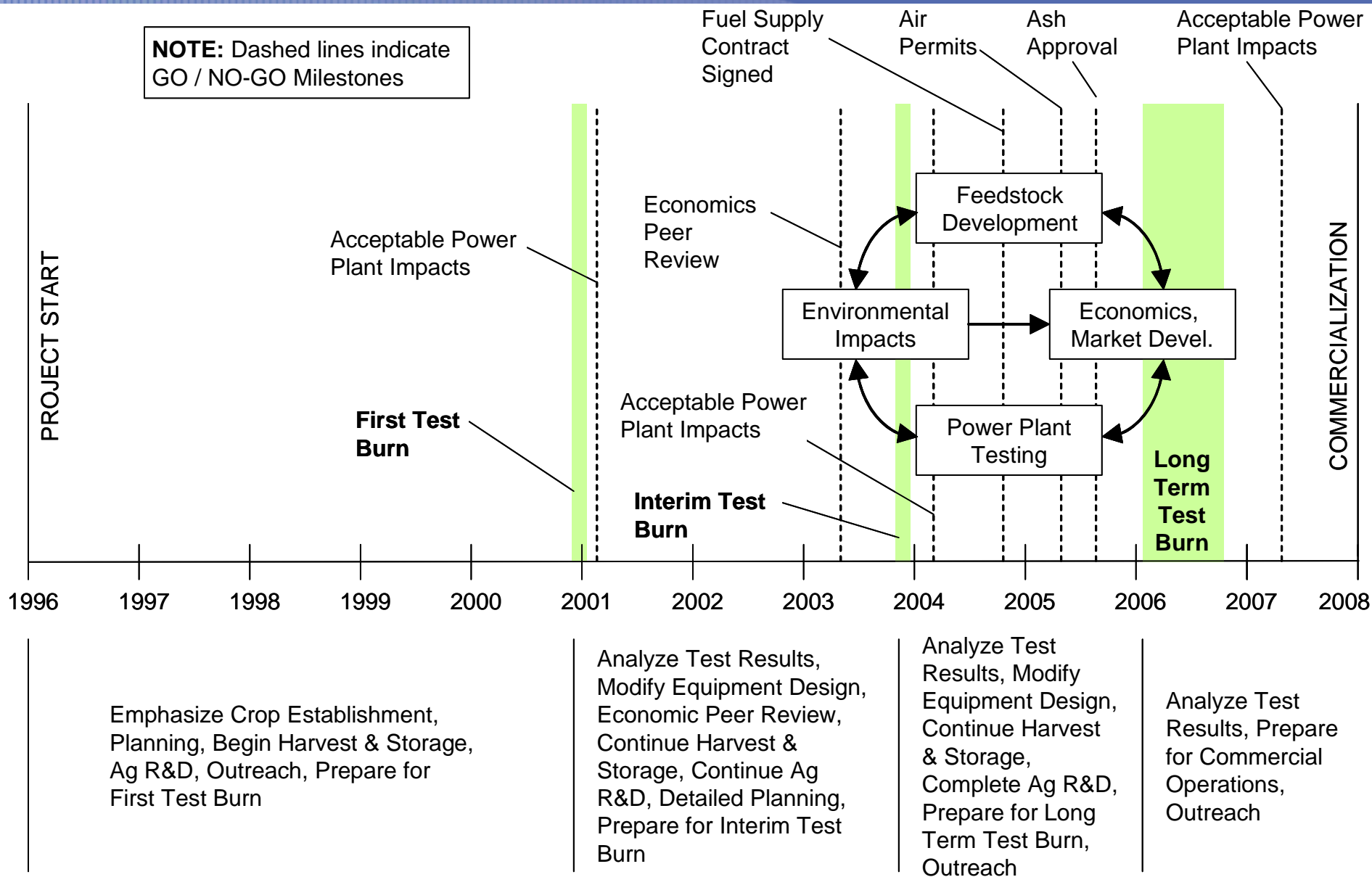
6 ft tall man

Project Background

- Drivers
 - Local rural income & environmental benefits
 - Hedge against carbon regs & portfolio standards
- Funding (started in 1996)
 - Cost share between U.S. Dept. of Energy & Project Partners
 - Approx. \$16 million from DOE through end of FY06
 - Farm Bill considerations will be key to commercial viability
- Test & Phase I Commercial Facility ("Grass Station")
 - Designed for 12.5 ton/hour, 24 hr/day
 - 25,000 tons of switchgrass for 2,000 hour continuous test burn accumulated from 4,000 acres over several years
 - Contains several innovative, first-of-a-kind pieces of equipment (which are working great)
 - 17.5 MW of **BASELOAD** Renewable Energy
 - Automated control & monitoring system
 - Would require 100,000 tons/yr, from 25k to 75k acres initially
 - Concept based on operating Danish straw-fired plants

Chariton Valley Project Timeline

NOTE: Dashed lines indicate GO / NO-GO Milestones



Chariton Valley Biomass Project

Research / Reports



Crop Studies & Cost



Soil Stability/Erosion/Carbon



Harvest Impacts on Wildlife



Air/Ash/Water Impacts

Equipment Development



Baler Development



Bale Accumulator



Bale Handling



Biomass Processing

Processing Facility



June 2005



August 2005



September 2005



November 2005

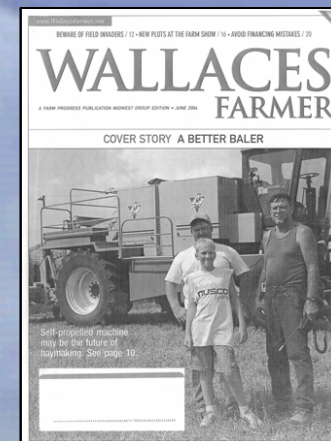
Outreach



Public Outreach



Web Outreach



Publications



Growing Season



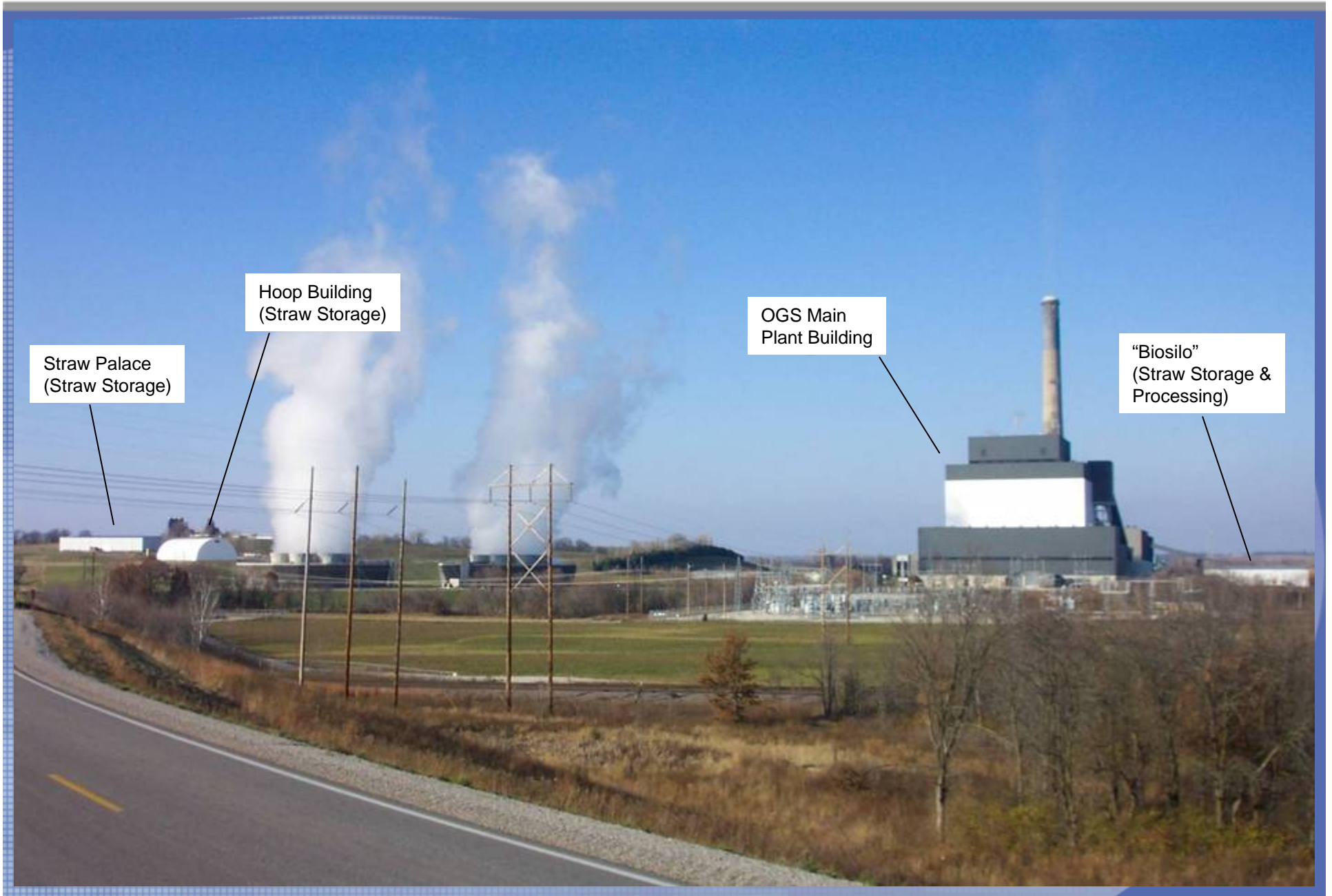
After Frost, Before Harvest



During Harvest



After Harvest



OGS Site Plan





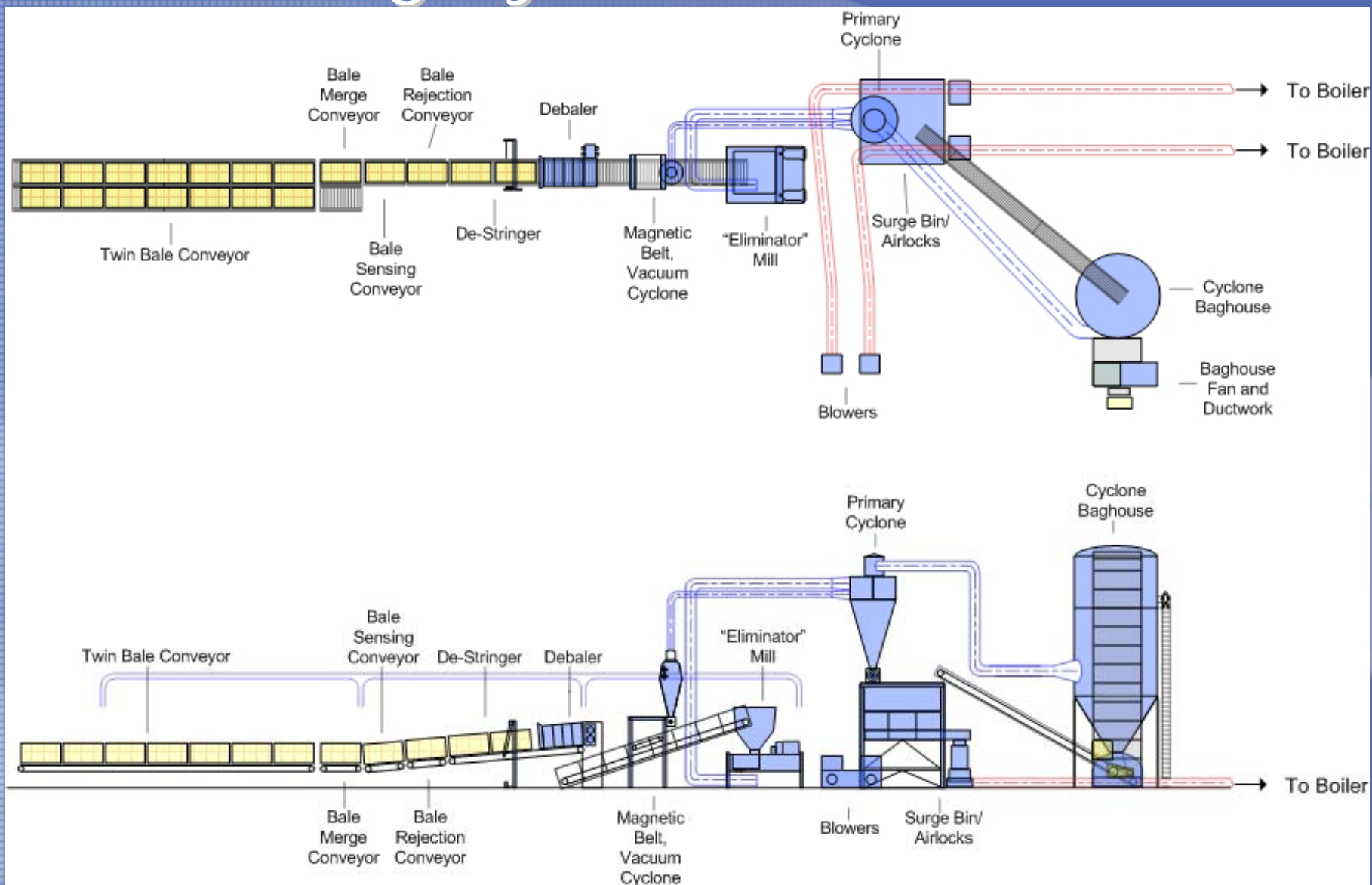
Replacing up to 5% of this



with this



Processing System at OGS



Front End of Processing System . . .



- Teleboom loading
- Automated bale handling
 - Moisture, weight, reject, de-string, debale, metal removal, mill, burn

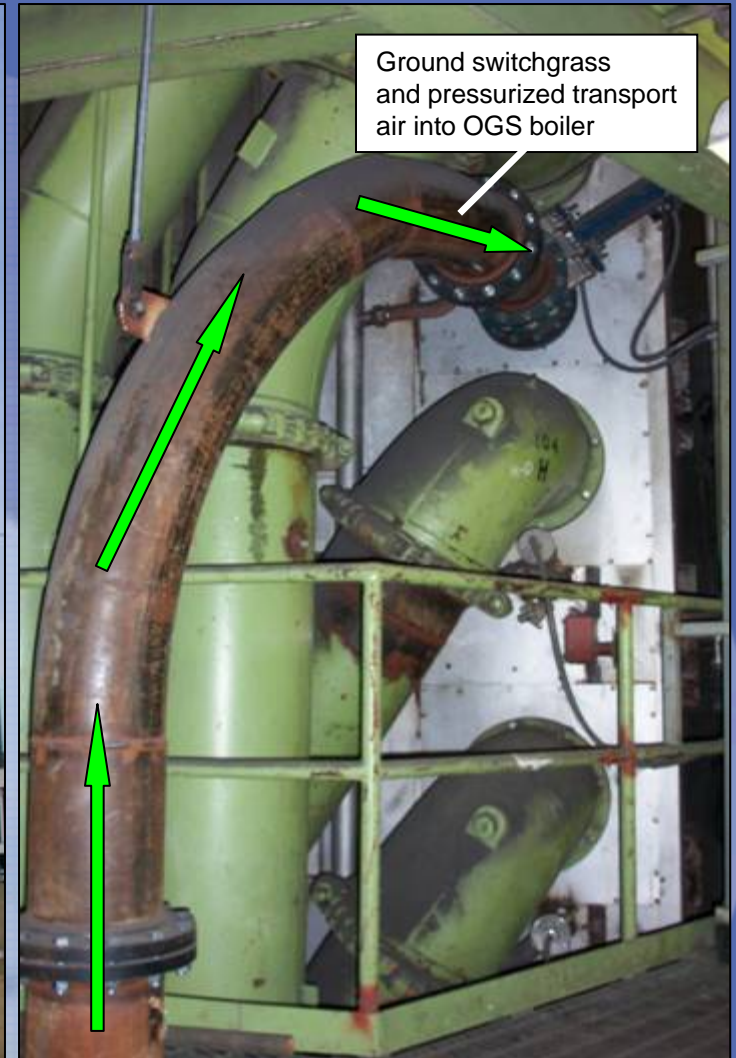
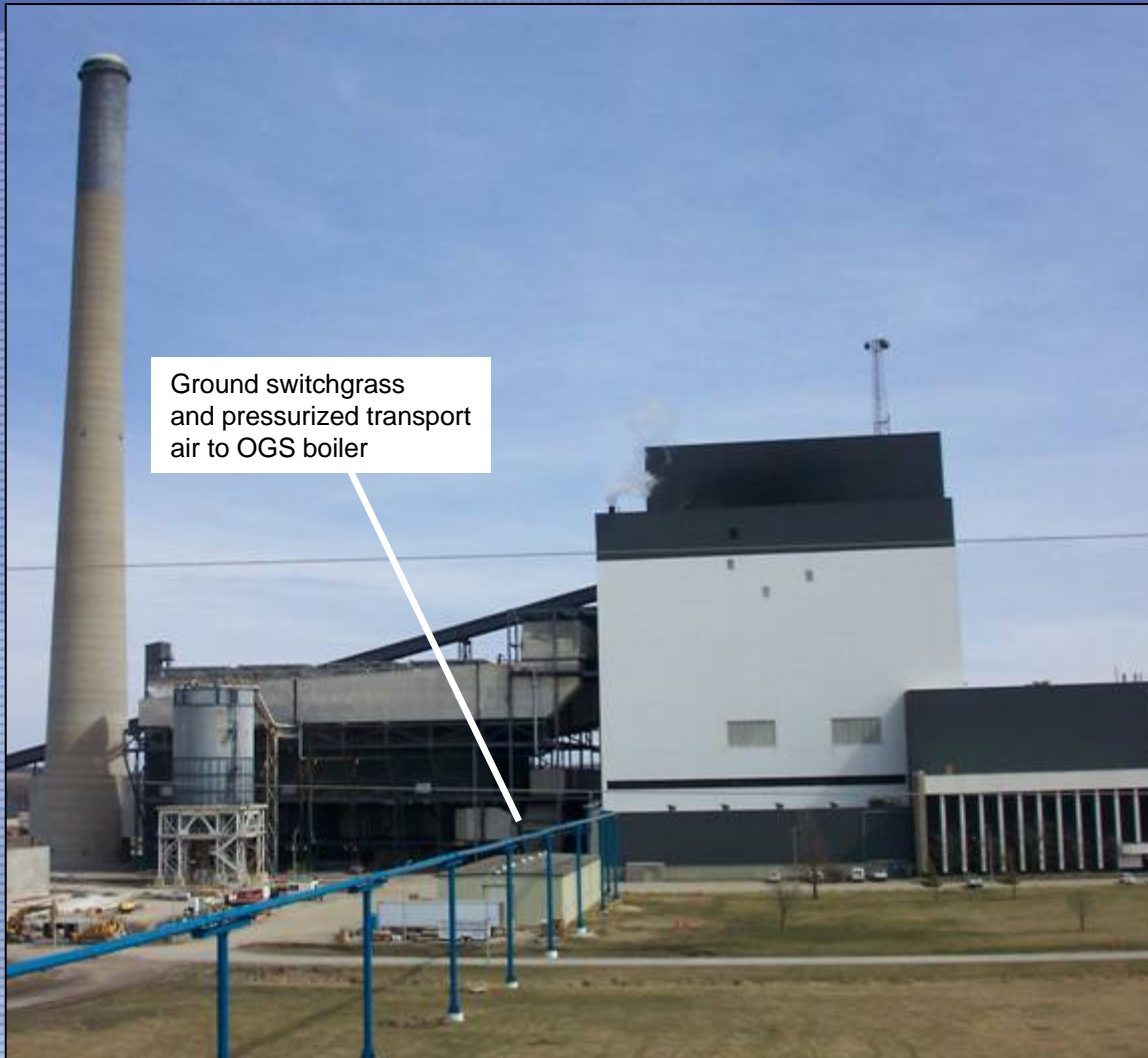
Back End of Processing System . . .



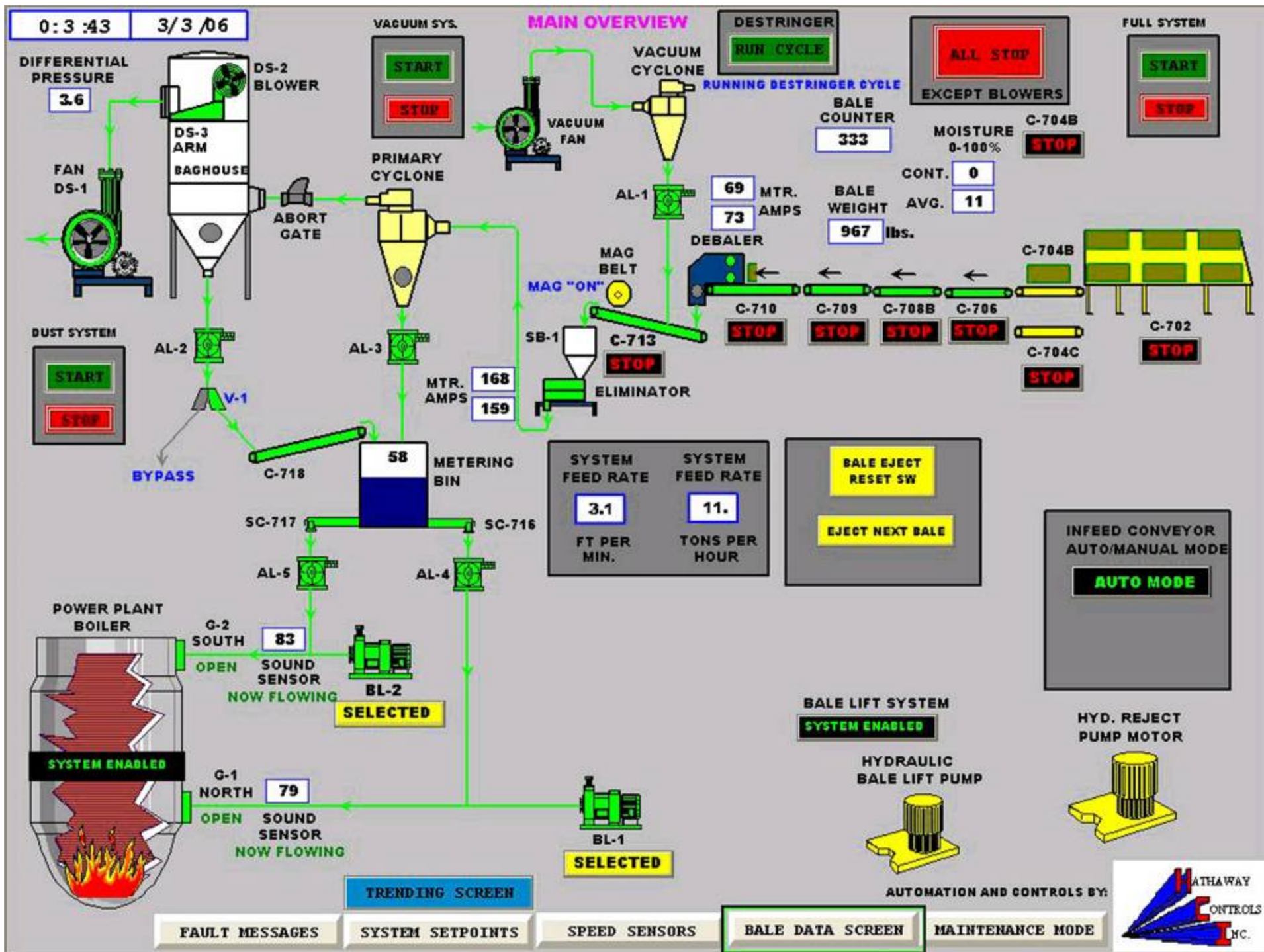
- High-efficiency cyclone and baghouse for dust control and filtering
- Emissions test last week

- 2-stage milling process to reduce particle size
- Final product fed into 2 blow lines to boiler

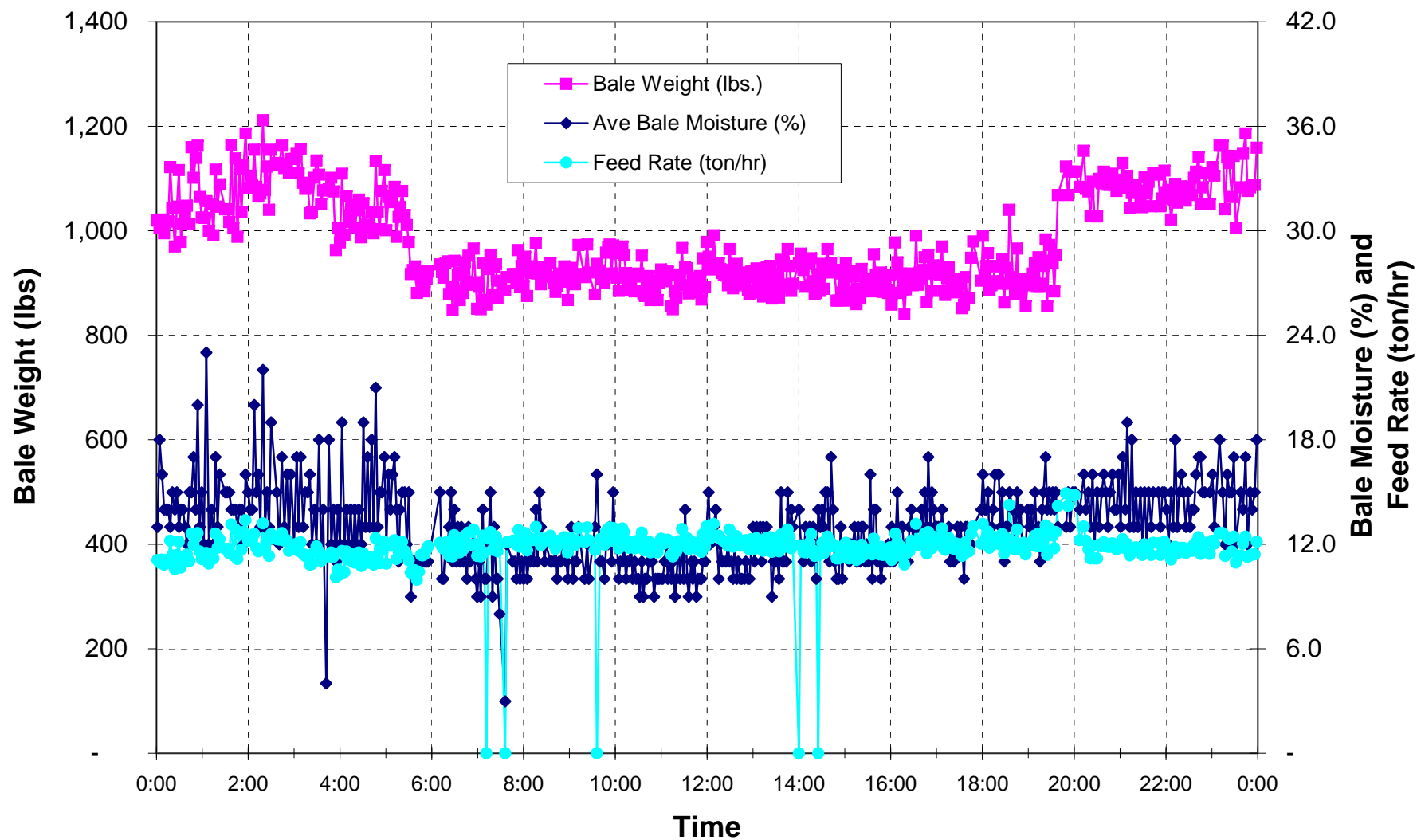




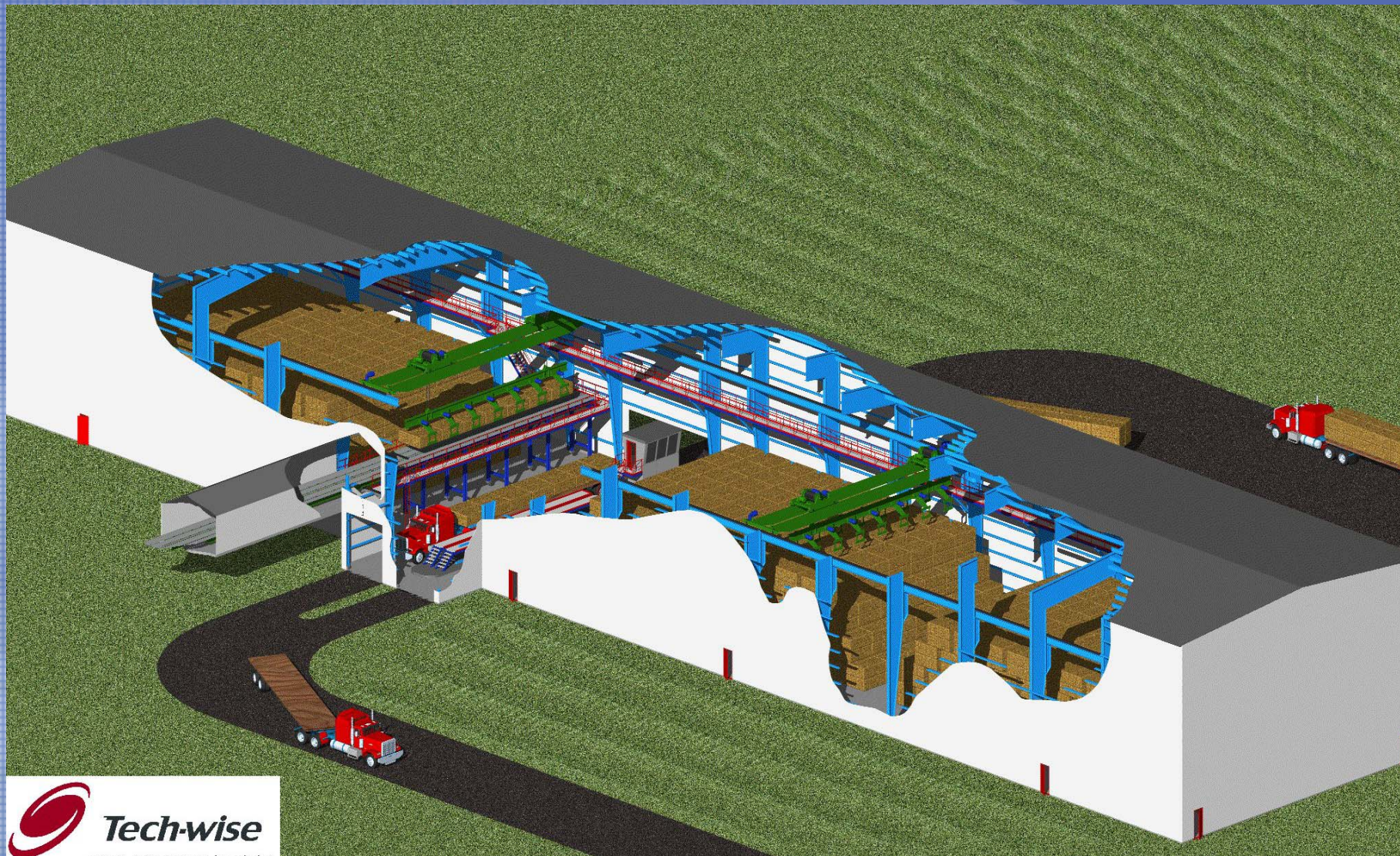
Switchgrass blow lines transporting ground switchgrass into boiler house (left) and boiler (right).



CHARITON VALLEY BIOMASS PROJECT Daily Switchgrass Processing Chart (Friday March 10, 2006)



Automated Fuel Supply Hall (Future)



Automated Crane in Danish Plant



Next Steps

- Complete Long Term Test Burn
 - Prove technical viability / no unacceptable impacts at power plant
 - Currently operating under a limited-term fuel supply contract during test burn
 - Obtain value for environmental benefits
 - SO2 credits, Renewable Energy Credits, Carbon Credits
- Changes needed in Farm Bill to allow switchgrass harvest from CRP acres
 - Large impact on supply availability and economics
- Execute signed commercial fuel supply contract
 - Prove no large risk factors to power plant / boiler
 - Demonstrate attractive economics for suppliers and power company
- Enlist switchgrass suppliers for commercial operation

THE END