Chariton Valley Biomass Project
Iowa Switchgrass Cofiring Update

2nd World Conference and Technology Exhibition on Biomass for Energy and Industry and Climate Protection
Rome, Italy

A G E N D A

- **Focus of December 2003 Test Burn**
- **Test Burn Statistics & Activities Update**
- **Emissions Results to Date**
- **Status of Reporting**
- **What's Next ???**

- **Questions / Discussions**

Focus of December Test Burn

- Optimize Processing Equipment Performance
- Obtain Clearer Understanding of Air Emissions
- Determine SWG effect on Fly Ash Marketability
- Obtain OGS Performance Data

Test Burn Statistics

- Co-fired 1,673 bales of SWG (753 tons).
  - Average Weight of 900 #
  - Average Moisture 12.8 %
- Gathered nearly 300 samples for lab analysis
  - Raw Coal Samples
  - SWG Samples (raw, debaled, ground)
  - Ash Samples (Bottom ash, Fly ash, Economizer)
  - Liquids (bottom ash)
- Collected 2,760# of Fly Ash for analysis & Testing
  - 160# from auto sampler (5 gallon buckets)
  - 2,600 # bulk samples (55 gallon drums)
- Generated Approx 1100 Mwh (from SWG)
- Aux Pwr Load Approx 25 kwh/ton SWG

Testing Activities Update

- Coal Samples Tested for:
  - Ultimate Analysis; Ash Mineral & fusion temp; LOI; Water Soluable Alkalis; RCRA Trace Elements
- SWG Samples Tested for:
  - Ultimate Analysis; Ash Mineral & Fusion Temps; LOI; Sieve Particle Distribution; Water Soluable Alkalis; RCRA trace Elements; Ash Resistivity
  - Petrography (Carbon Characterization)
  - Ash Resistivity – Clean Air Engineering

Testing Activities Update

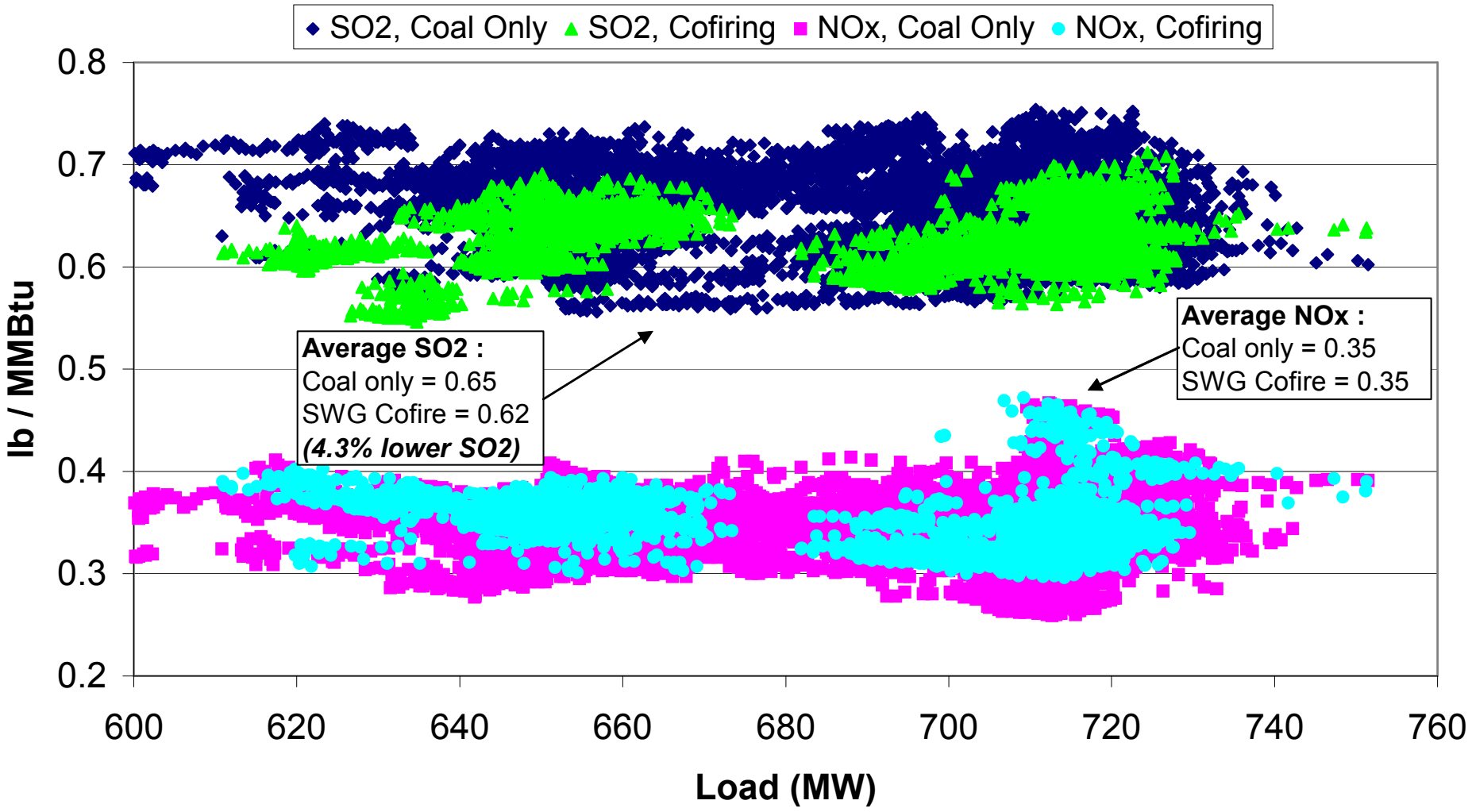
- Fly Ash Samples:
  - Sent to Iowa State Univ. for testing (03/2004)
    - Project provided a detailed description of sample collection methodology, etc
    - Uniformity & Comparative analysis
    - Compression cylinder testing (results w/in 60 days)
    - ISU pleased with volume of material provided
  - Samples Provided to IDOT from bulk samples for their analysis and testing

Summary: Emissions Results to Date

- From Continuous Emissions Monitoring System:
  - 6000 minutes of emissions data collected and analyzed
  - 8 am – 6 pm on all test days
  - 53 hours cofiring, 47 hours coal-only
  - Average heat input from switchgrass was 2.5% of boiler total
  - Results when cofiring:
    - Average Sulfur Dioxide (SO2) emissions decreased by over 4%
    - Average Nitrogen Oxides (NOx) emissions did not change
    - Average Stack Opacity increased by a percentage point
- From Stack Emissions Testing:
  - Particulates decreased by 4% (PM), and 14% (PM10)
  - Carbon Monoxide (CO) emissions did not change
  - Mercury emissions decreased by 7%

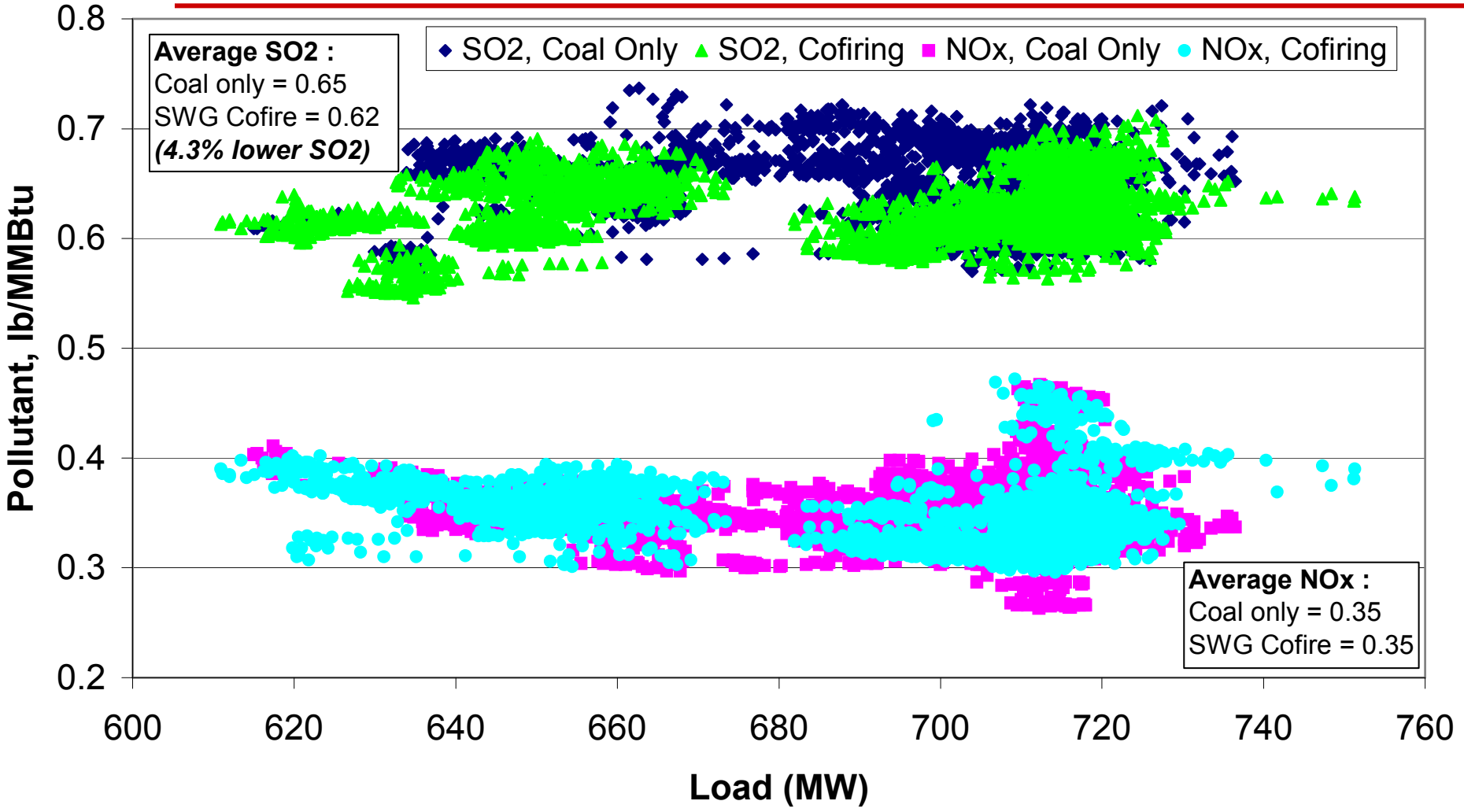
Chariton Valley Biomass Project--Interim Test Burn
NOx & SO2 vs. Load, Ottumwa Generating Station

Continuous Emissions Monitoring System Data for: December 1 to 12, 24 hours per day



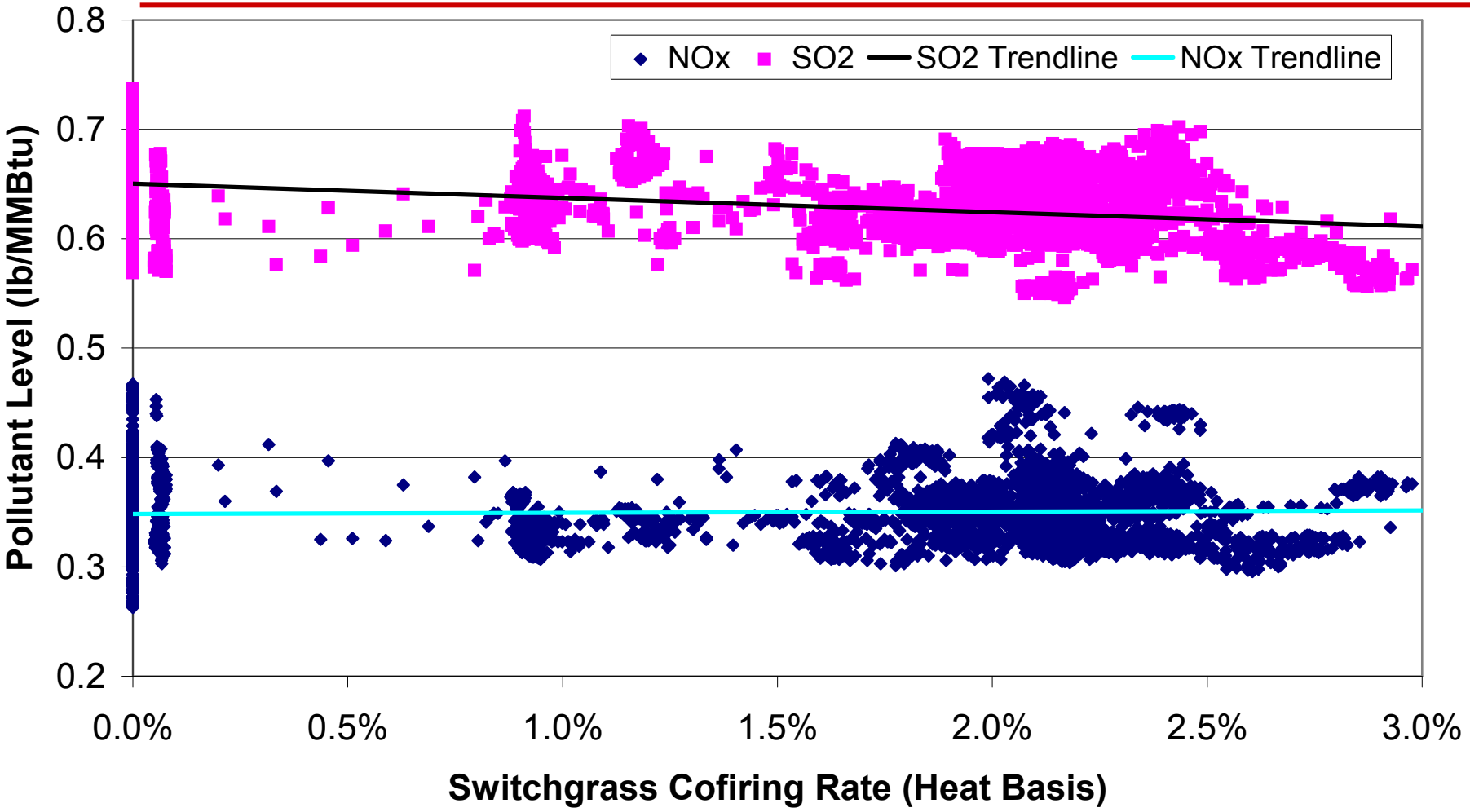
Chariton Valley Biomass Project--Interim Test Burn
NOx & SO2 vs. Load, Ottumwa Generating Station

Continuous Emissions Monitoring System Data for: December 1 to 5, December 8 to 12, 8 am to 6 pm



Chariton Valley Biomass Project--Interim Test Burn
NOx & SO2 vs. Cofire Rate, Ottumwa Generating Station

Continuous Emissions Monitoring System Data for: December 1 to 5, December 8 to 12, 8 am to 6 pm



Status of Reporting

- Report Submittal to IDNR – Mid February, 2004
  - Draft Report Submitted – February 13, 2004
  - Final Report to be submitted upon receipt of laboratory analysis and report (May)
- Report to USDOE – June, 2004
- Ash Report (from ISU) – September 2004

So….What's Next ???

- Focus on completion of Fly ash testing and acceptability by IDOT
- Completion of Emissions reporting to IDNR
- Completion of fly ash resistivity testing / determination of effect on ESP performance
- Continue efforts to optimize processing equipment performance and "layout".
- Perform additional "testing" to better understand SWG/Opacity relationship (cold air testing)
- USDOE Has approved funding for relocation of SWG processing facility to top of hill
- Long Term Test Burn now targeted for late 2005


Straw Palace
(Straw Storage)
Hoop Building
(Straw Storage)
OGS Main
Plant Building
“Biosilo”
(Straw Storage &
Processing)

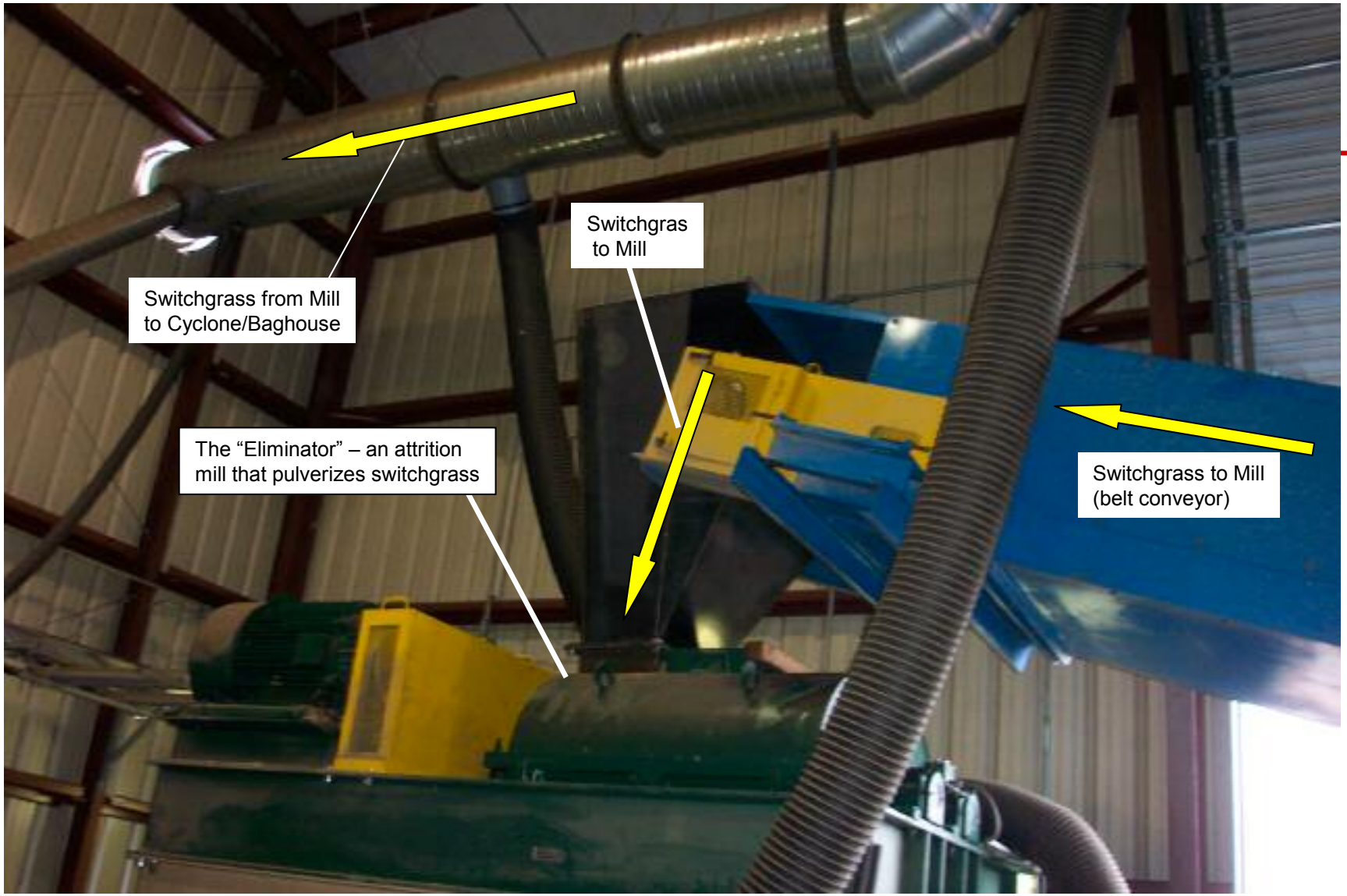

Cyclone / Baghouse
(filters dust from
processing equipment)
“Biosilo”
(Straw Storage &
Processing)

Bale Infeed Conveyor

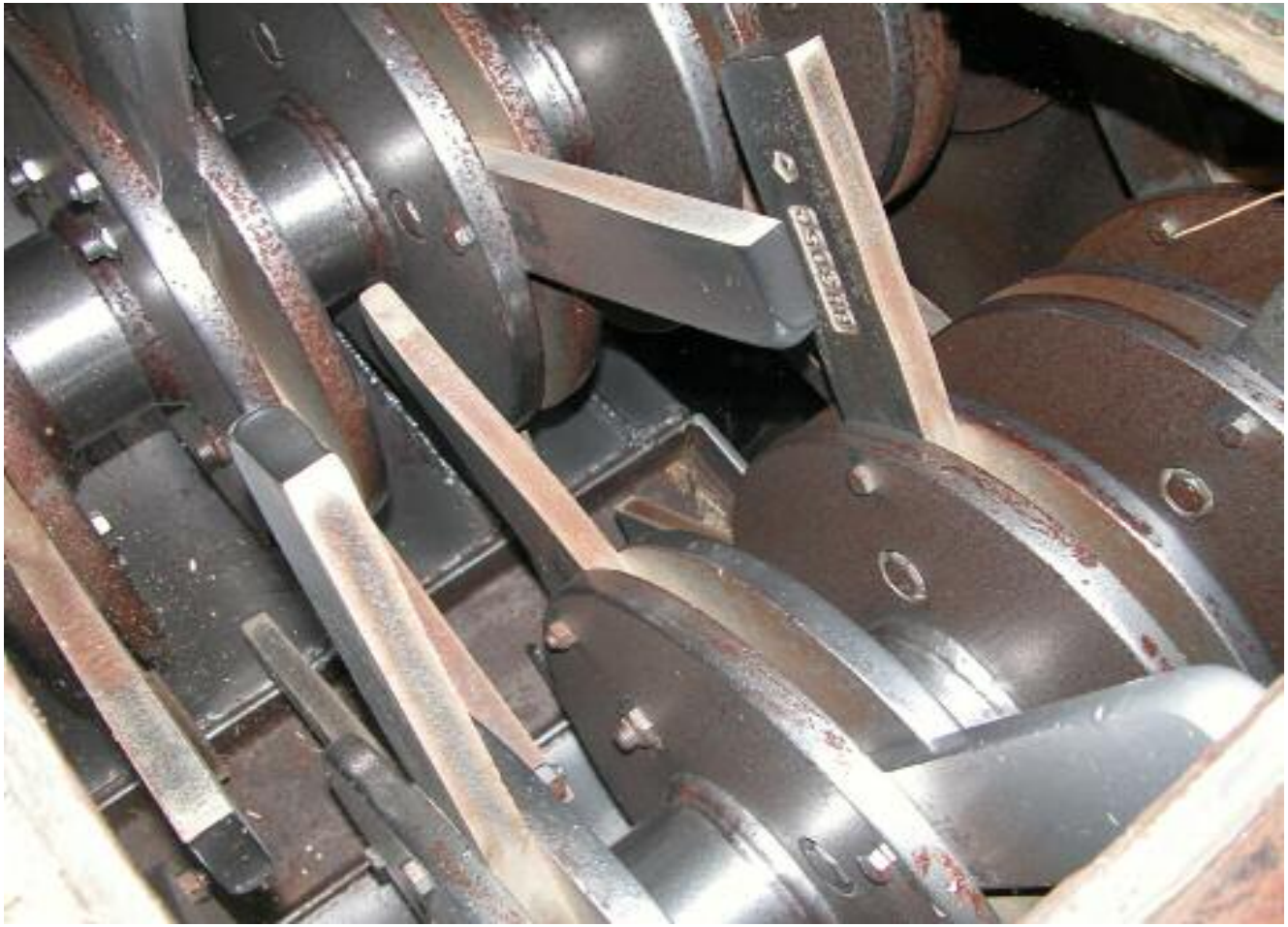
Loading 1000 lb. Bale

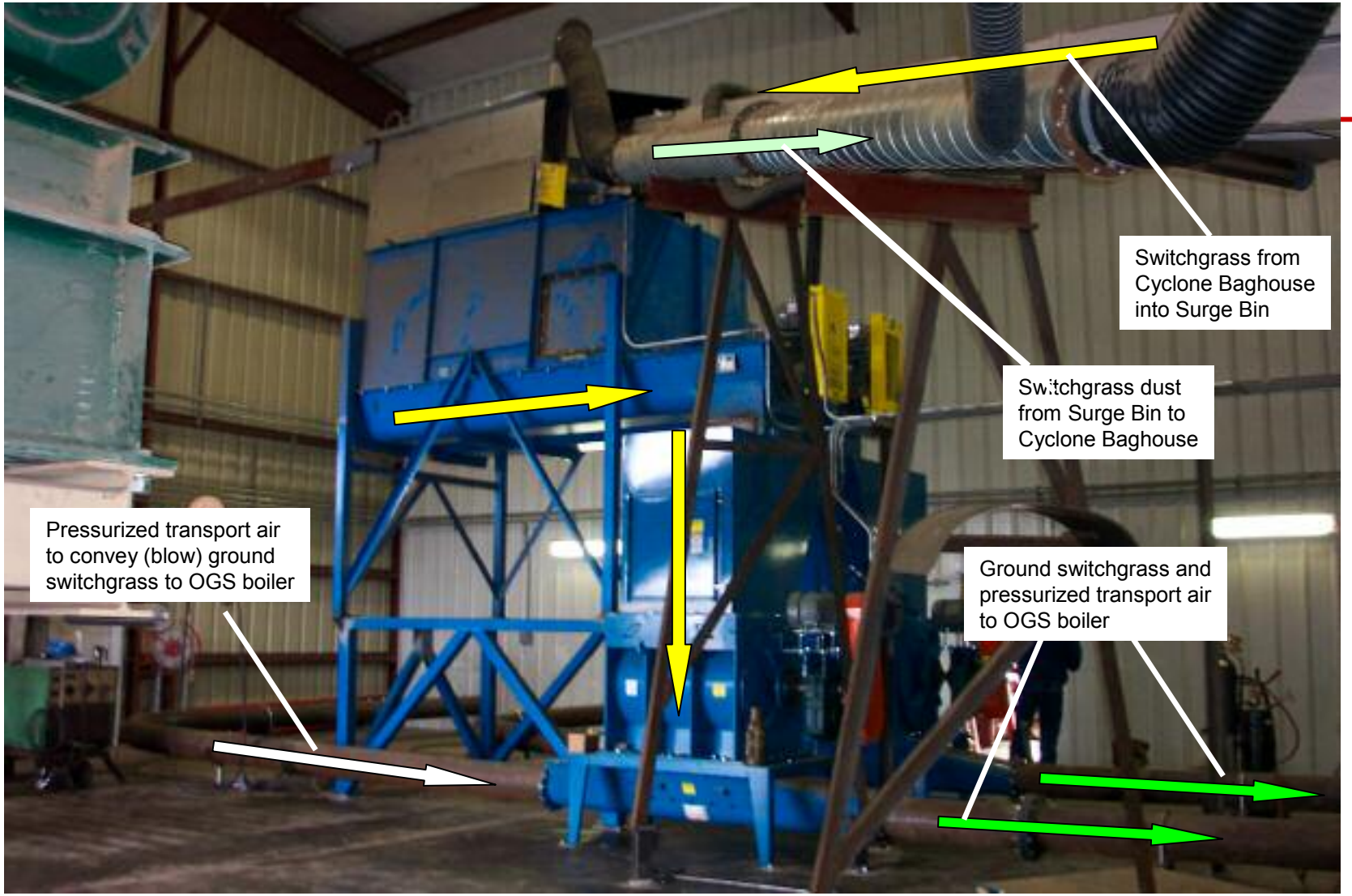
400 Hp De-baler

Cutter blade on the D-Stringer.

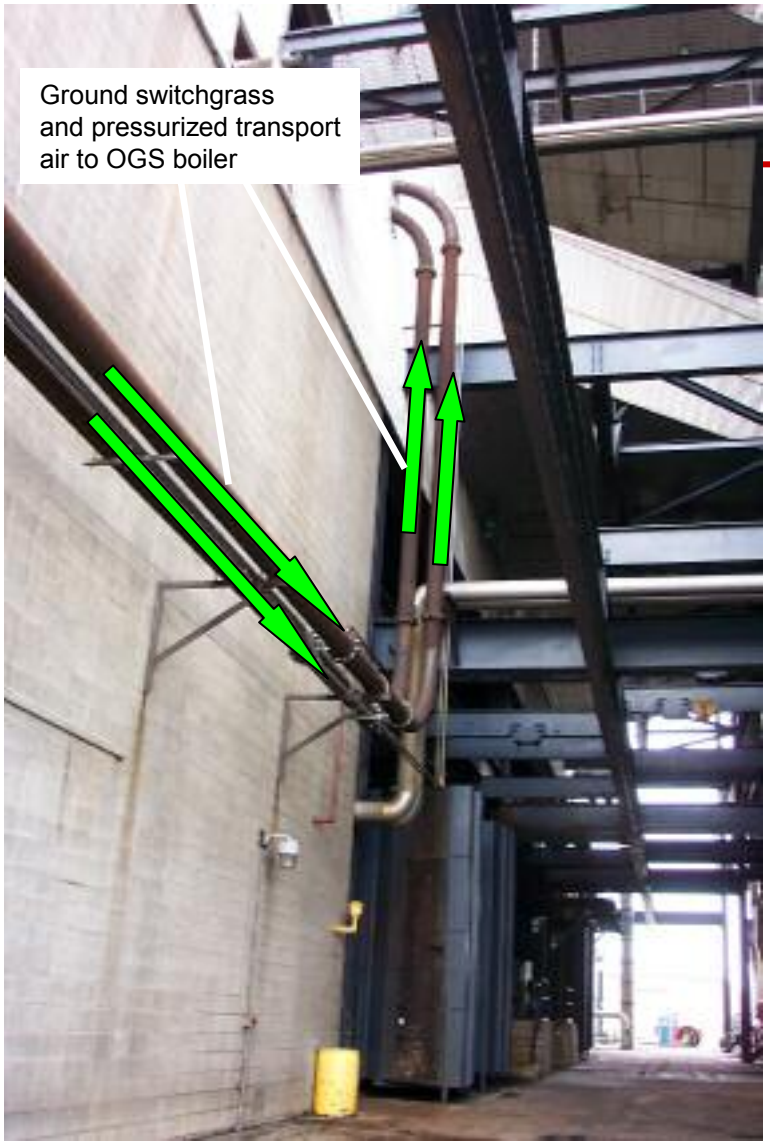

Switchgrass from Mill to Cyclone/Baghouse
Switchgras to Mill
The “Eliminator” – an attrition mill that pulverizes switchgrass
Switchgrass to Mill (belt conveyor)

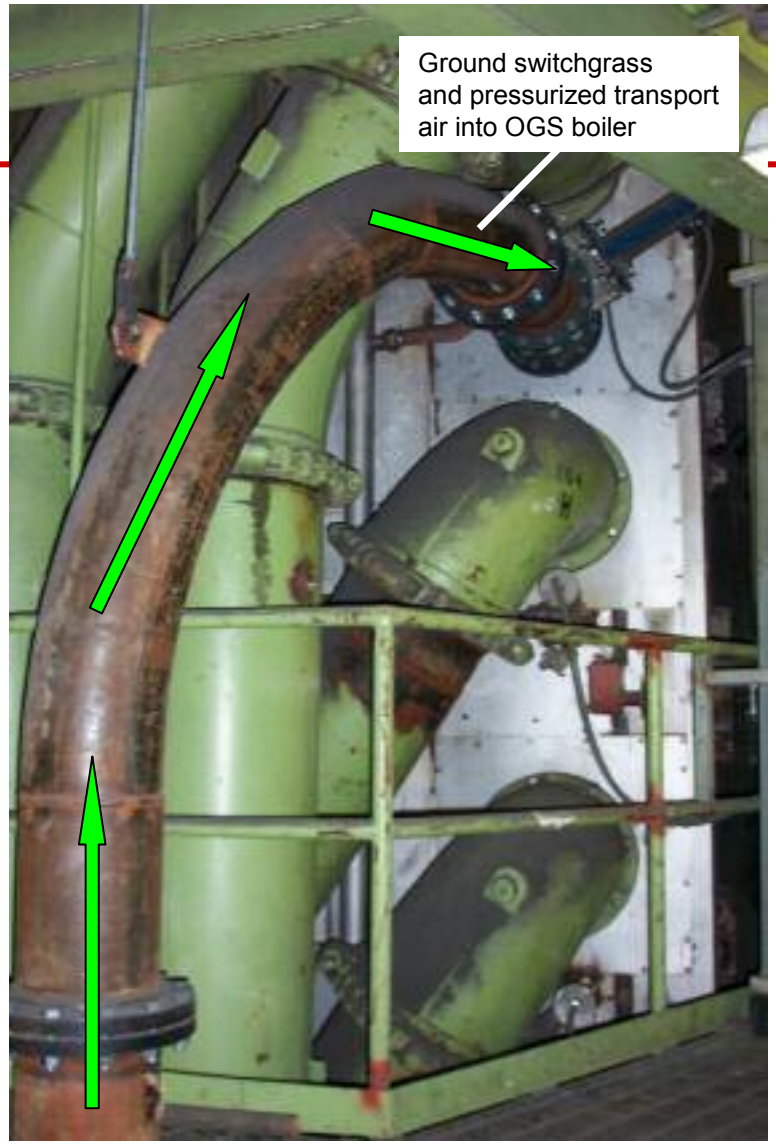
Secondary Grinder Internals





Surge Bin, Rotary Airlocks, and Switchgrass Blow Lines to Boiler.





Switchgrass Blow Lines Transporting Ground Switchgrass into Boiler House (left) and Boiler (right).

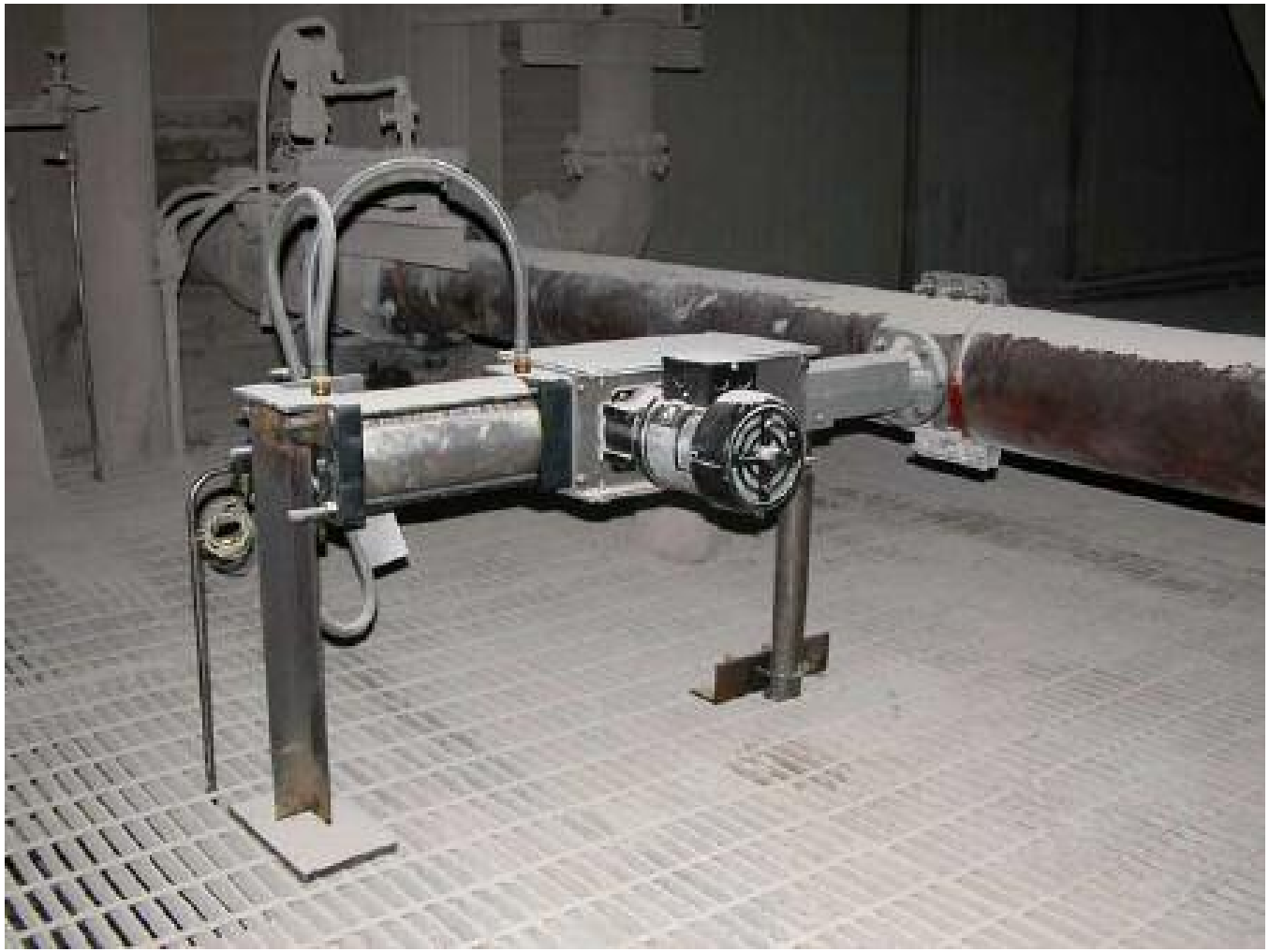
Debaled and Ground Switchgrass

Debaled Switchgrass

Ground Switchgrass

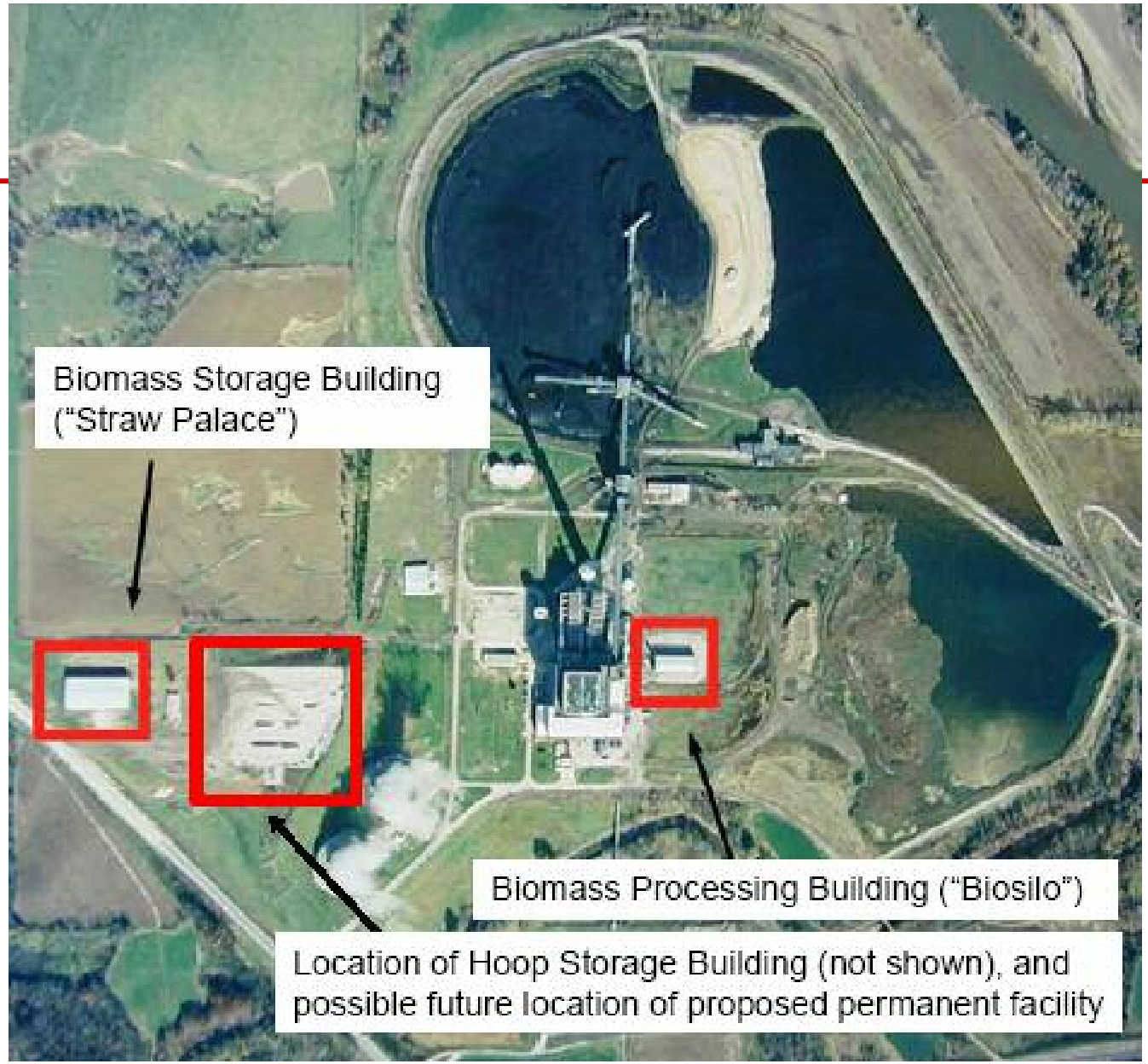
Switchgrass System Control Room.

Automated Flyash Sampler



Future Plans and Possibilities

- Long Term Co-fire Testing – 2005/2006
  - 2000+ hours (90 days) testing
  - Co-fire up to 25,000 Tons of SWG @ 12.5 TPH
  - Boiler performance / Operational Data
  - Combustion Optimization (RMT/CI)
  - Corrosion, Erosion, Slagging, Fouling data
- Commercial Operation
  - Depending upon economics
  - SWG Storage / Processing Facility Located off site
  - Alliant & Prairielands Fuel Supply Agreement
  - 100,000 – 200,000 TPY SWG co-fired @ OGS
  - SWG delivered to OGS boiler via pneumatic blow line


Biomass Storage Building
("Straw Palace")
Biomass Processing Building ("Biosilo")
Location of Hoop Storage Building (not shown), and
possible future location of proposed permanent facility

CVBP Process Facility
(Bale Storage and Reclaim Section)

Emissions Monitoring (GE)

Emissions Probe In Outlet Duct

GE's Mobile Emissions Lab

GE's Emissions Vans at Stack

Emissions Equipment at OGS

CEMS Probes In Outlet Duct

Portable Emissions Monitor

Other Sampling

Bottom Ash Liquids

Economizer Ash

Fly Ash Auto Sampler

Bulk Fly Ash

Bottom Ash


THANK YOU