

**KANDIYOHI COUNTY AND CITY OF WILLMAR ECONOMIC DEVELOPMENT COMMISSION (EDC)
AGRICULTURE AND RENEWABLE ENERGY DEVELOPMENT (AG) COMMITTEE**

MINUTES

December 17, 2015

Christianson & Associates, PLLP, Willmar

- Present:** Arvind Auluck-Wilson, Rollie Boll, Jon Folkedahl, Ian Graue, Kevin Halvorson, Dustin Kotrba, Larry Konsterlie, Dan Lippert, Keith Poier, Bruce Reuss, Dan Tepfer and Donnell Williamson
- Guests:** Steve Ahmann, Dr. Doug Allen, Rep. Dave Baker, Bob Bonawitz, Sandra Broekema, Kari Buttenhoff, Mayor Mav Calvin, Sean Christensen, Jerry Gesch, John Harren, Gary Hildebrand, Wes Hompe, Linda Kacher, Jon Kallen, Sen. Lyle Koenen, Carolyn Lange, Jason Lindahl, Shashi Menon, Rep. Tim Miller, Audrey Nelson, John Offerman, Bruce Peterson, Keith Poier, Doug Reese, Colleen Thompson and Donn Winckler
- Absent:** John Duevel
- Staff:** Steve Renquist, Executive Director; Connie Schmoll, Business Development Specialist
- Secretarial:** Diane Beck, Legal & Administrative Assistants, Inc.

Connie Schmoll called the meeting to order at approximately 7:35 a.m. followed by self-introductions. The regular Agriculture and Renewable Energy Development (Ag) Committee business meeting was not conducted due to presentations by EcoEngineers, Great River Energy and Energy and Organic Systems. The minutes of the September 17 and November 19, 2015 meetings will be presented at the Ag Committee meeting on January 21, 2016.

Schmoll introduced Shashi Menon and John Kallen, EcoEngineers, Des Moines, Iowa. EcoEngineers provides compliance and market access solutions to the renewable energy industry (see attached).

Following the presentation, a question and answer session was conducted. Questions from the audience included:

- Q:** What are the possibilities to have a sellable product from the Willmar Wastewater Treatment Plant?
- A:** EcoEngineers suggested a meeting between the parties to discuss the possibilities.
- Q:** Will the process of turning waste water into biogas eliminate the sodium concentration in water?
- A:** Sodium cannot be eliminated from the biogas process.
- Q:** What is the process of drawing gases out of the Kandiyohi County Landfill and transporting gas and what is the need for a constructed facility?
- A:** It is a closed-cell operation and cells must be lined and capped. Gas is transported via pipeline.
- Q:** What kind of capital investment would this take?
- A:** There are many variables; the biggest cost is size of digester.
- Q:** What is payback period?
- A:** It depends on capital cost and how much gas is being generated.

- Q: Are there are examples of this type of project?
- A: A plant in Des Moines, Iowa with Cargill. Des Moines conducted a study this year and is in the process of building an expansion to clean the gas and use for pipeline fuel. San Antonio, Texas is also conducting a project.
- Q: Where is Xcel with this concept?
- A: They are onboard with the concept as it helps with the compliance/regulation issues.
- Q: What is the investment to conduct a feasibility study for Willmar?
- A: It depends on how many of the challenges/opportunities are available.
- Q: Is biogas generated for electricity or transported via pipeline and what is the cost of cleaning the gas?
- A: Cleaning the gas is more expensive but more efficient; there are more profits on the back-end.

Schmoll shared EcoEngineers is willing to meet with the key partners in Kandiyohi County/Willmar.

Schmoll introduced Sandra Broekema of Great River Energy. Broekema presented an overview of the DryFining (fuel enhancement process) case study of Clean Power Plan at Coal Creek Station in North Dakota (see attached).

John Offerman and Gary Hildebrand representing Energy and Organic Systems gave a brief description of their new project First Light Organic Waste Conversion System which uses solar energy to convert organic waste to biogas.

Arvind Auluck-Wilson commented the purpose of today's presentations is to introduce the three concepts of biogas, clean coal and the fuel enhancement process. If the City of Willmar/Kandiyohi County would like additional information, EcoEngineers, Great River Energy and Energy and Organic Systems personnel are willing to meet with interested parties after today's meeting or at a later date.

Schmoll thanked the presenters, Senator Lyle Koenen, Representatives Dave Baker and Tim Miller for their attendance at today's meeting. The options will be discussed further with the City of Willmar and Kandiyohi County as desired and at upcoming Agriculture and Renewable Energy Committee meetings.

Chairperson Ian Graue recognized and congratulated Steve Renquist, Kandiyohi County and City of Willmar Economic Development Executive Director, on his years of service. Renquist will retire on December 31, 2015. Renquist stated it may be the right time to invest in the bio gas industry and hopes the Agriculture and Renewable Technology Committee will continue to support this technology. He believes it will save money and can enhance the future.

ADJOURNMENT—There being no further business, the meeting was adjourned at approximately 9:20 a.m.

NEXT MEETING—The next regular meeting is **7:30 a.m., Thursday, January 21, 2015**, at Christianson & Associates, PLLP, Willmar.



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Presentation to Kandiyohi County and City of Willmar EDC

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Our Mission Is To Develop Sustainable Solutions For The World



ECOENGINEERS
People Driven Solutions

Program Management for Renewable Fuels Industry

- Navigate the complexity of energy regulations
- Gain access to carbon and fuel markets
- Clients range from Fortune 500 companies to small startups

Provide Environmental, Energy and Sustainability Consulting

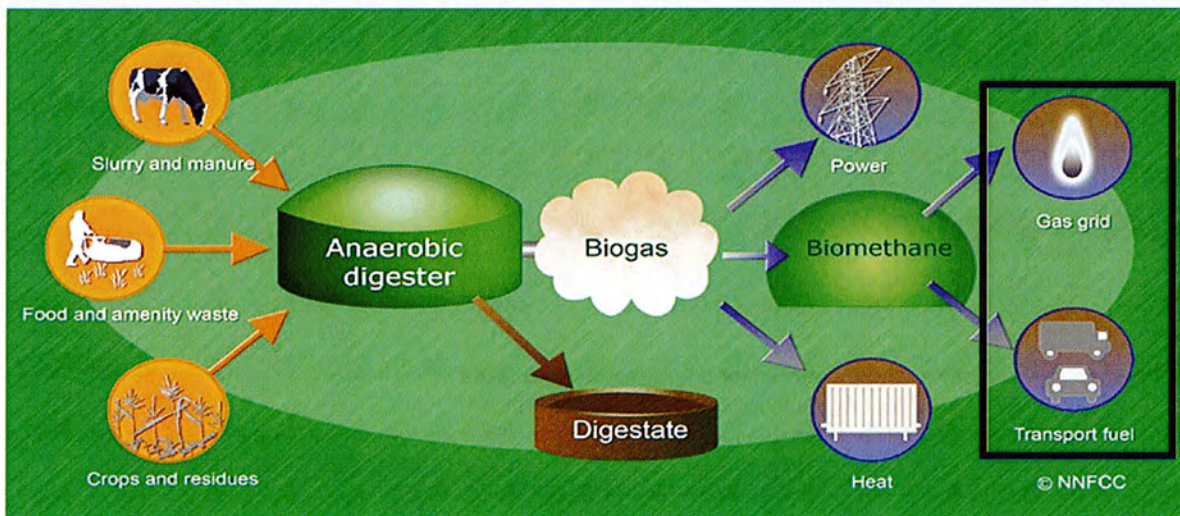
- Environmental compliance & strategy
- Carbon modeling and carbon intensity reduction platforms
- Municipal, industrial and institutional clients

Develop RNG projects that are a model for energy recovery & reuse

- Municipal, industrial, agricultural, and institutional settings
- Regulatory expertise allows us to monetize energy credits from "green gas" into the best markets.
- Comprehensive project development process is a one-stop shop for project feasibility analysis, engineering, equipment sourcing, financing and operations

- 1. Background on the RNG Opportunity
- 2. Current Situation in Willmar/Kandiyohi County
- 3. Potential Solutions/Opportunities
- 4. How EcoEngineers Can Assist

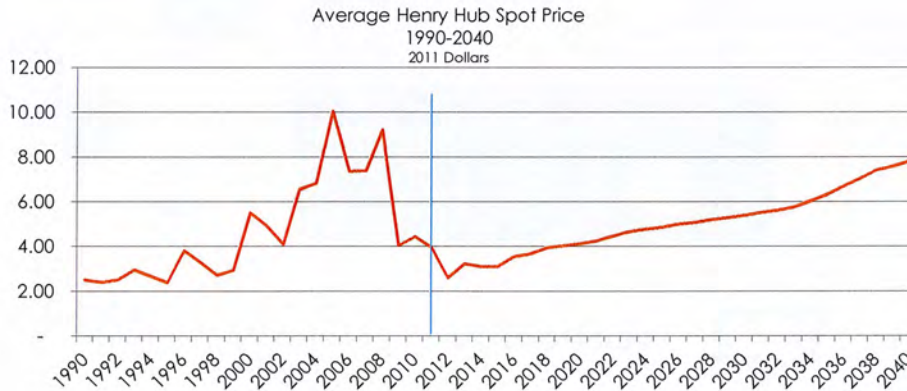
The Evolution Of Clean Energy: Renewable Natural Gas (RNG)



Underlying Commodity is Pipeline Quality Natural Gas



Natural Gas Demand Increasing As The US Moves Away From Coal Fired Power



Carbon Credits Add Significant Value To RNG



One MMBTU of Pipeline Quality Biogas Produced in the Midwest and Used for Transportation in California

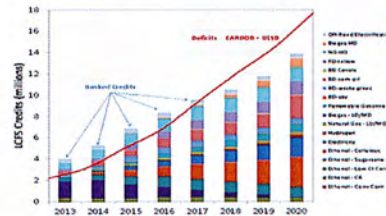
Value of Gas	\$3.00	26%
Value of RINs	\$4.70	40%
Value of LCFS Credits	\$4.04	34%
Total	\$11.74	100%

RFS




CAP & TRADE

LCFS




We Are The Leader In Carbon Credit Realization




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WHY ECOENGINEERS?




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Audits of **OVER 150 BIOFUEL PLANTS** in **18 COUNTRIES**



OVER 1 BILLION GALLONS OF BIOFUEL CAPACITY UNDER MANAGEMENT




OVER 50 PRODUCERS have enrolled in **RIN COMPLIANCE PROGRAM**




Assisted **REGISTRATION & PREPARATION** for over **30 LCFS PATHWAY PROJECTS**


TRANSACTIONED OVER 1.7 BILLION RINS IN 2014




4.7 MILLION RINS PROCESSED EACH DAY on our automated platform



ONE OF THE FIRST USEPA RECOGNIZED RIN Quality Assurance Programs




Current Situation in Willmar/Kandiyohi County



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- Coal based electric plant generation
- County owned landfill
- WWTP with generated biosolids
- Area food production industries with potential high strength wastewater and waste water residuals
- Expanded renewables development - Willmar Municipal Utilities has installed and operates two wind turbines



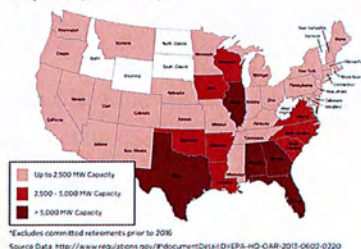
Issues and Challenges: Electric Generation



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- Clean Power Plan compliance for electric generation
 - Fuel switching, co-firing, retirement baseload assets, or development of non-emitting generation sources.
- Minnesota RPS - 25% by 2015
- Other environmental regulatory impacts - coal combustion residuals compliance, tightening airshed (NAAQS), other air regulations

EPA-Projected Coal Capacity Retirements Under 111(d) Proposal* (2016-2020)



Issues and Challenges: Wastewater Treatment



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- WWTP biosolids land application
 - Produced wastewater biosolids can only be land applied certain times of the year
 - Tightening regulations by MPCA will further restrict land application
- Existing WWTP Capacity-
 - With a higher industrial load from area food processing (Jennie-O and Willmar Foods) existing WWTP will face pressures to reduce these loadings while meeting tightening NPDES discharge requirements



Issues and Challenges: Municipal Solid Waste Landfill



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- Existing County Landfill
 - Passive LFG system only
 - Portion of Landfill capped
 - Older Cells not RCRA Subtitle D Compliant
 - Leachate hauled off-site during portions of year
 - Capacity and Post closure issues and costs



Challenges = Opportunities



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Biogas can address multiple compliance challenges.

a. LFG from County Landfill

- i. Collect/clean/compress/pipe gas – monetize environmental attributes
- ii. Improve yield by recycling leachate into active cells

b. Operate WWTP as a bio-refinery by producing biogas with on-site AD

- i. Accept outside loads from solids generated by area industries (attract new industries with high strength wastewater)
- ii. Collect/clean/compress/pipe gas – monetize environmental attributes
- iii. Reduce land application costs of biosolids
- iv. Use gas on site to reduce substantial electric costs associated with aeration at WWTP

c. Biogas can also be used to co-fire at EGU

- i. Comply with Clean Power Plan
- ii. Reduce compliance costs associated with coal based generation (CCR, PM2.5, mercury)

Biogas Project Experience



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- **Compliance manager at multiple biogas projects producing RNG**
 - Manage EPA/CARB registrations and ongoing compliance
 - Help monetize environmental credits with QA/QC programs
 - Develop and assist in compliance strategy to lower CI
- **Preferred advisor to State of Iowa**
 - Mapped biomass potential of the state of Iowa
 - Evaluating impact of biogas on resiliency of rural wastewater infrastructure and economic growth
 - Participating in state energy planning
- **Currently conducting feasibility analysis of five locations**
 - Economic, technical and regulatory analysis
 - Anticipated groundbreaking of first completed project in early 2016



We Can Manage The Complexity Of The Entire Supply Chain



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Manage Financial Risk

- Debt liability
- Equity risk

Manage Contract Fulfilment

- Upgraded gas
- Credit sales

Ensure Revenue Optimization

- Maximize revenues through active management of sales

Develop New Markets

- Monitor market opportunities and develop new ones to sustain and increase revenues

Manage Regulatory Matters

- Manage regulatory volatility; preserve and develop policy supports

Manage Operational Costs

- Manage all the operational costs, quality control, transport and sales.

Next Steps



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Develop a compliance strategy that meets current energy regulations and is proactive, sustainable and generates revenue.

- Conduct a comprehensive analysis of the biogas potential in the regional waste shed and explore private wastewater treatment (AD) as a win-win solution
- Analyze technology options for anaerobic digestion and gas upgrading and develop optimum solutions
- Conduct economic analysis of monetizing environmental attributes to accelerate payback period of capital investments
- Develop regulatory compliance strategy for utility and land applications including potential to co-fire biogas with coal at EGU
- Integrate all of the above into comprehensive compliance and sustainability plan that could potentially generate revenue

We Want to Hear From You!



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Questions?

Contact –

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515-343-6492

Improving plant efficiency and reducing carbon intensity with DryFinishing™ fuel enhancement system

Sandra Broekema

December 17, 2015



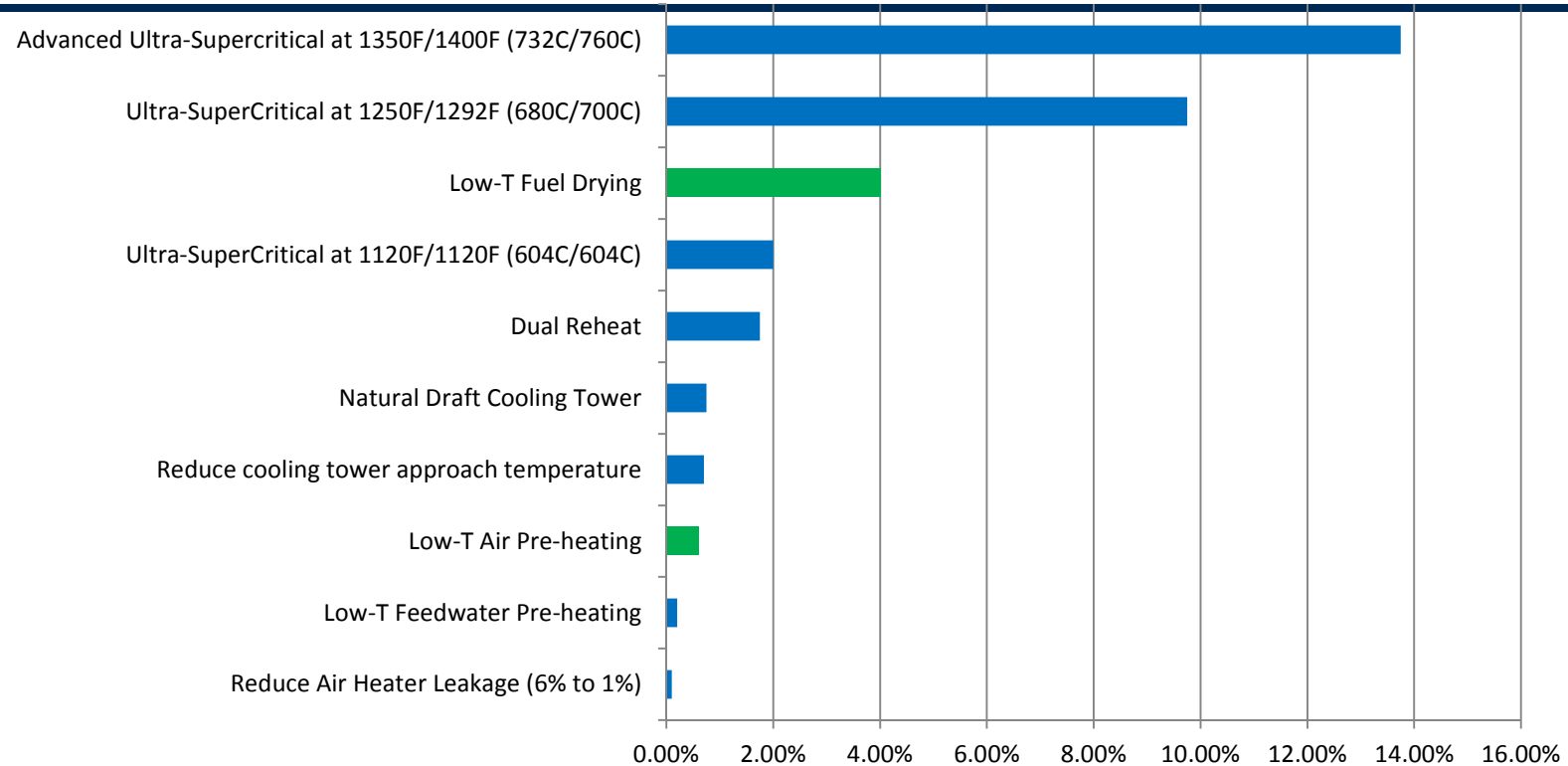
Clean Power Plan

▶ Federal Implementation Plan – Building Blocks

- **Building Block 1** - reducing the carbon intensity of electricity generation by improving the heat rate of existing coal-fired power plants.
- **Building Block 2** - substituting increased electricity generation from lower-emitting existing natural gas plants for reduced generation from higher-emitting coal-fired power plants.
- **Building Block 3** - substituting increased electricity generation from new zero-emitting renewable energy sources (like wind and solar) for reduced generation from existing coal-fired power plants.

▶ DryFining improves net unit heat rate & reduces carbon intensity

Heat Rate Improvement technology comparison



What is DryFining™ fuel enhancement?

- ▶ DryFining is a patented technology for utilizing waste heat and mechanical separation for drying and refining low-rank coal
- ▶ DryFining can benefit a large portion of US and world coal-fired plants
- ▶ DryFining benefits
 - Cost effective
 - Improves plant efficiency
 - Lowers CO₂ intensity for power



Case Study: Coal Creek Station

- ▶ 2 x 600 MW natural circulation
- ▶ 64 low NO_x burners, SOFA
- ▶ ND lignite, mine mouth plant
 - 6,200 BTU/lb
 - 38% moisture
- ▶ Commissioned 1979, 1981
- ▶ Base load, low cost power
- ▶ Wet scrubbers, precipitators
- ▶ DryFining commercial in 2009
 - Over 40 million tons of coal beneficiated



DryFinishing™ Fuel Enhancement Process

- ▶ Low temperature, atmospheric pressure process
 - No high temperature or high pressure parts
 - No exotic materials
- ▶ Uses waste heat from power plant
 - No external heat sources are used
- ▶ Simple design, few moving parts
 - Equipment is simple and relatively inexpensive to manufacture



DryFinishing for 600 MW (500 TPH)



Dust Collectors for 600 MW



Dust Collector Gallery

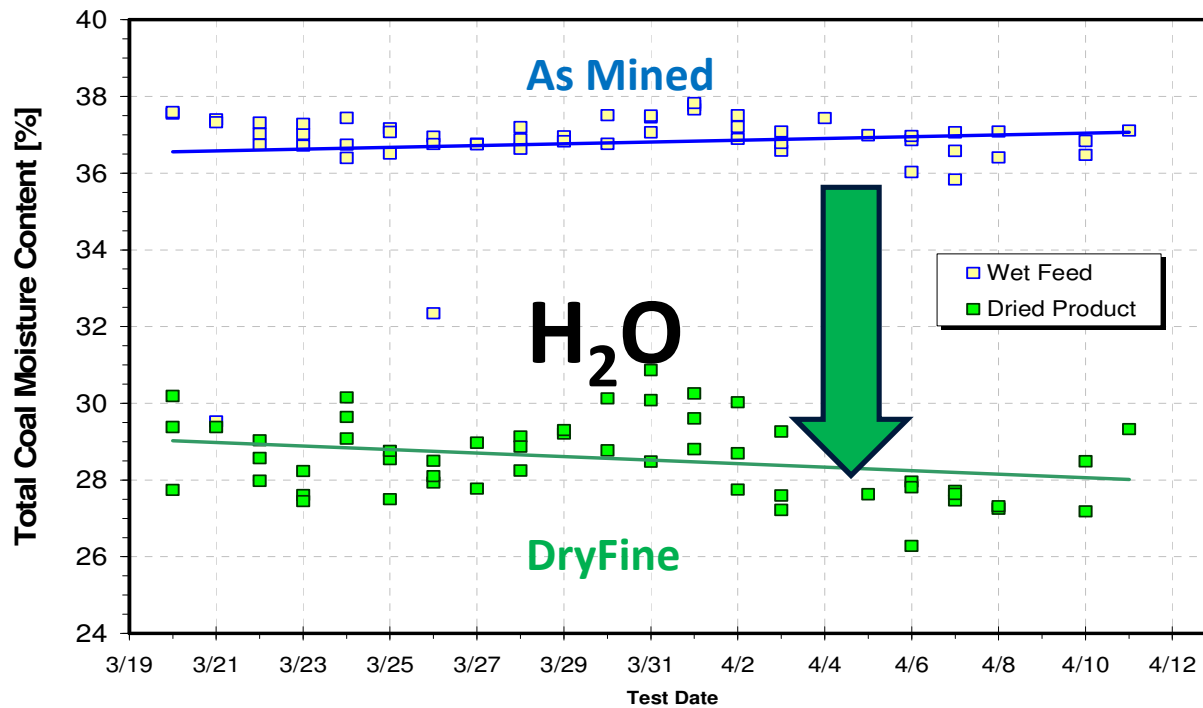


Refined Coal Conveyors

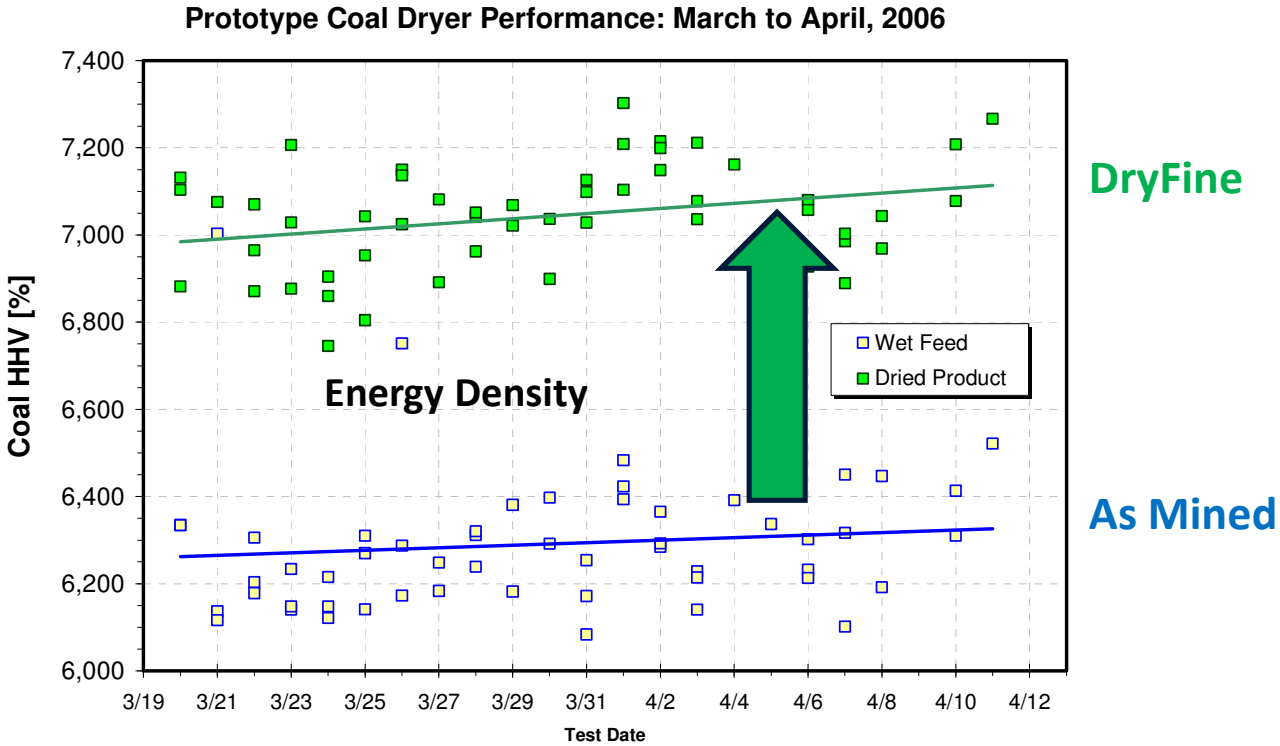


Moisture Reduction

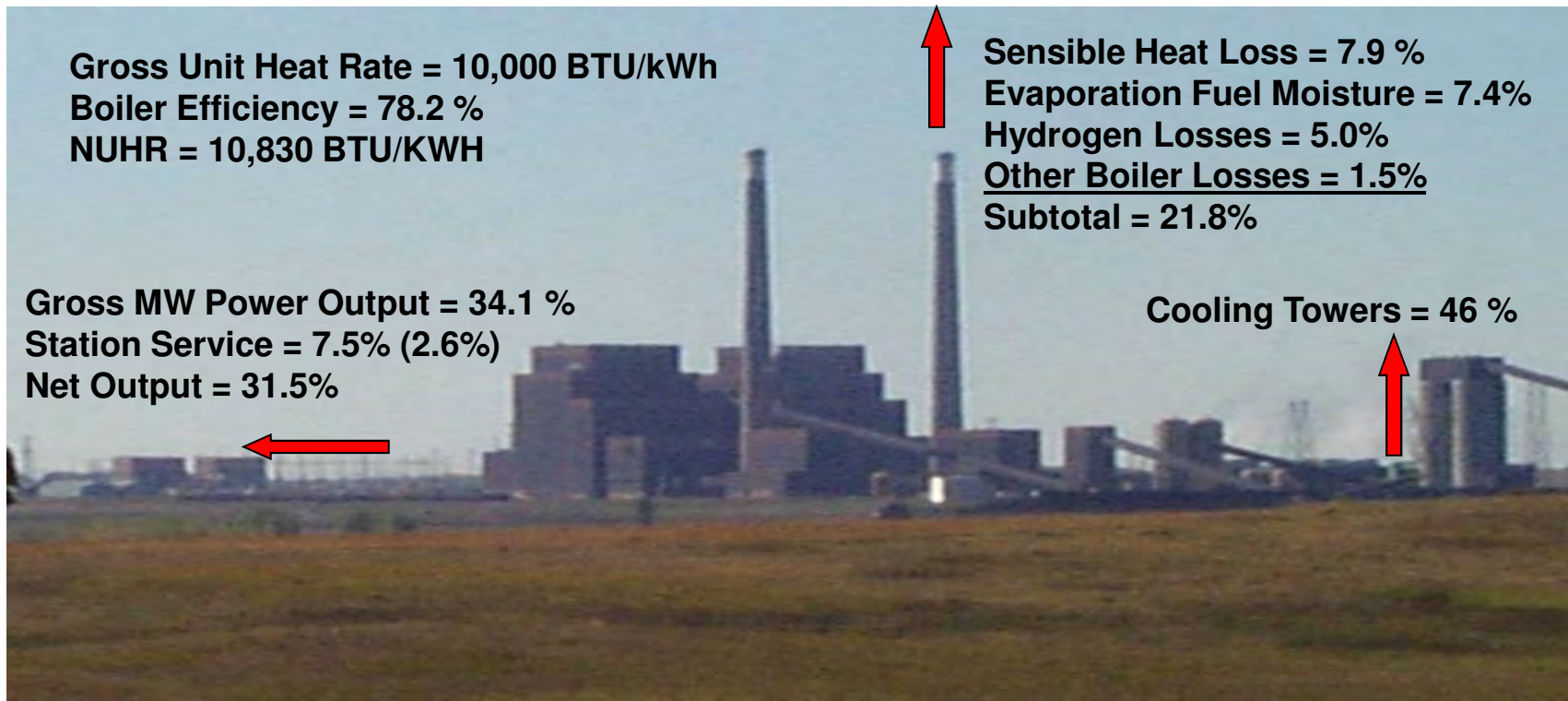
Prototype Coal Dryer Performance: March to April, 2006



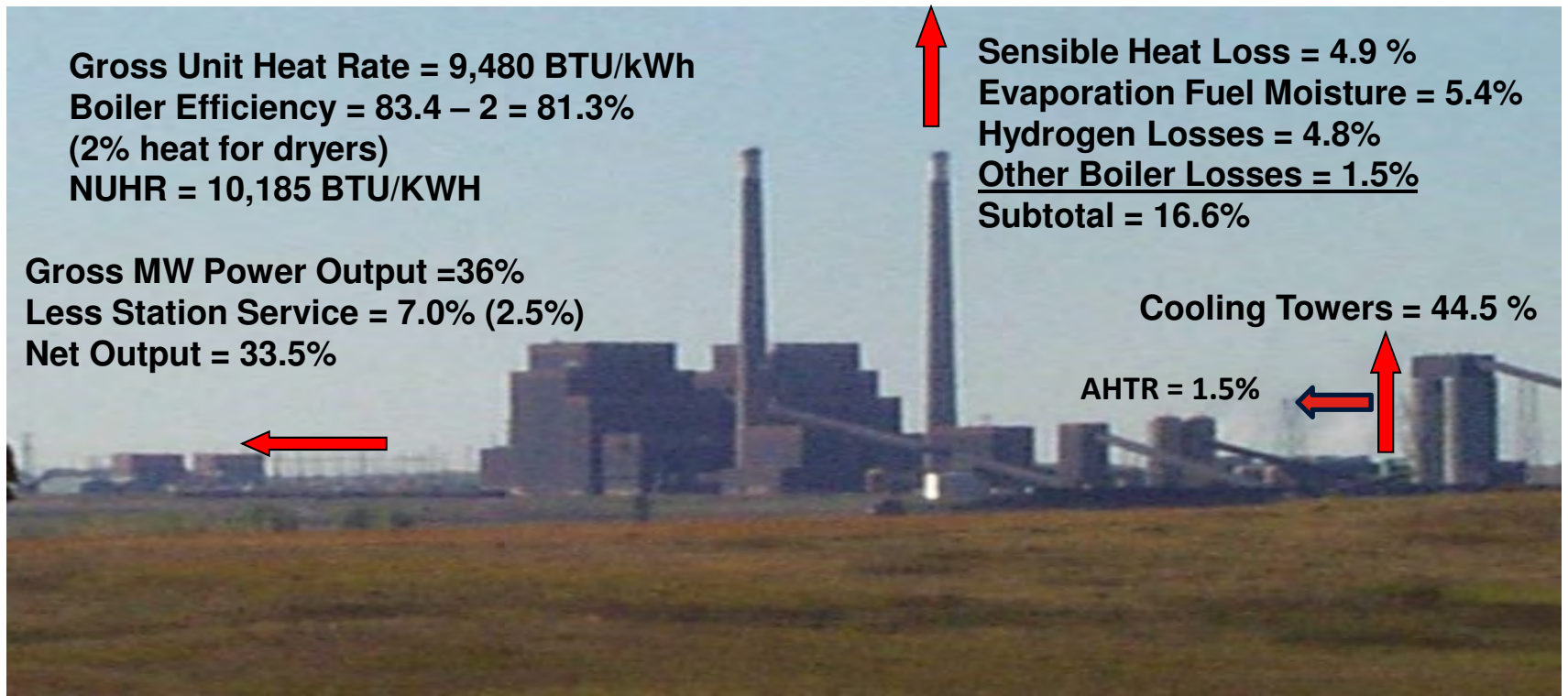
Energy Density Improvement



Coal Creek Station Unit 2 - BEFORE



Coal Creek Station Unit 2 - AFTER



Gross Unit Heat Rate = 9,480 BTU/kWh
Boiler Efficiency = $83.4 - 2 = 81.3\%$
(2% heat for dryers)
NUHR = 10,185 BTU/KWH

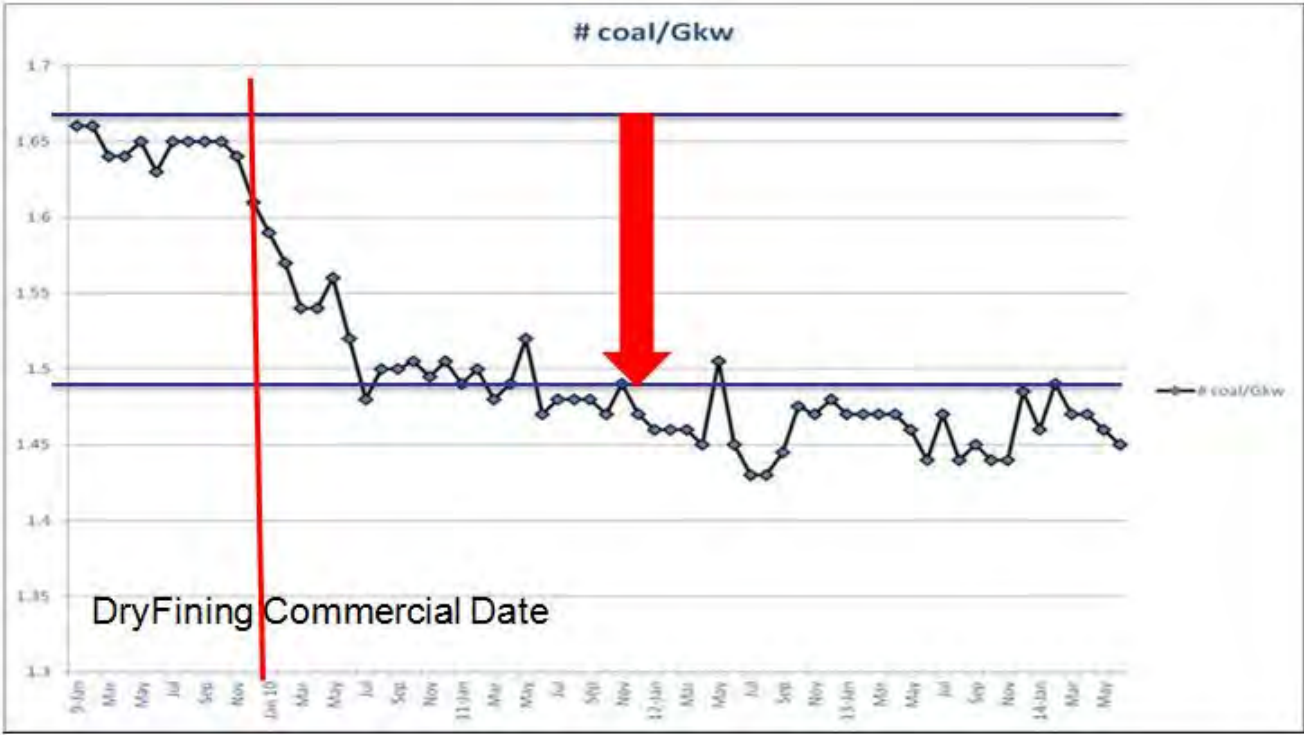
Gross MW Power Output = 36%
Less Station Service = 7.0% (2.5%)
Net Output = 33.5%

Sensible Heat Loss = 4.9 %
Evaporation Fuel Moisture = 5.4%
Hydrogen Losses = 4.8%
Other Boiler Losses = 1.5%
Subtotal = 16.6%

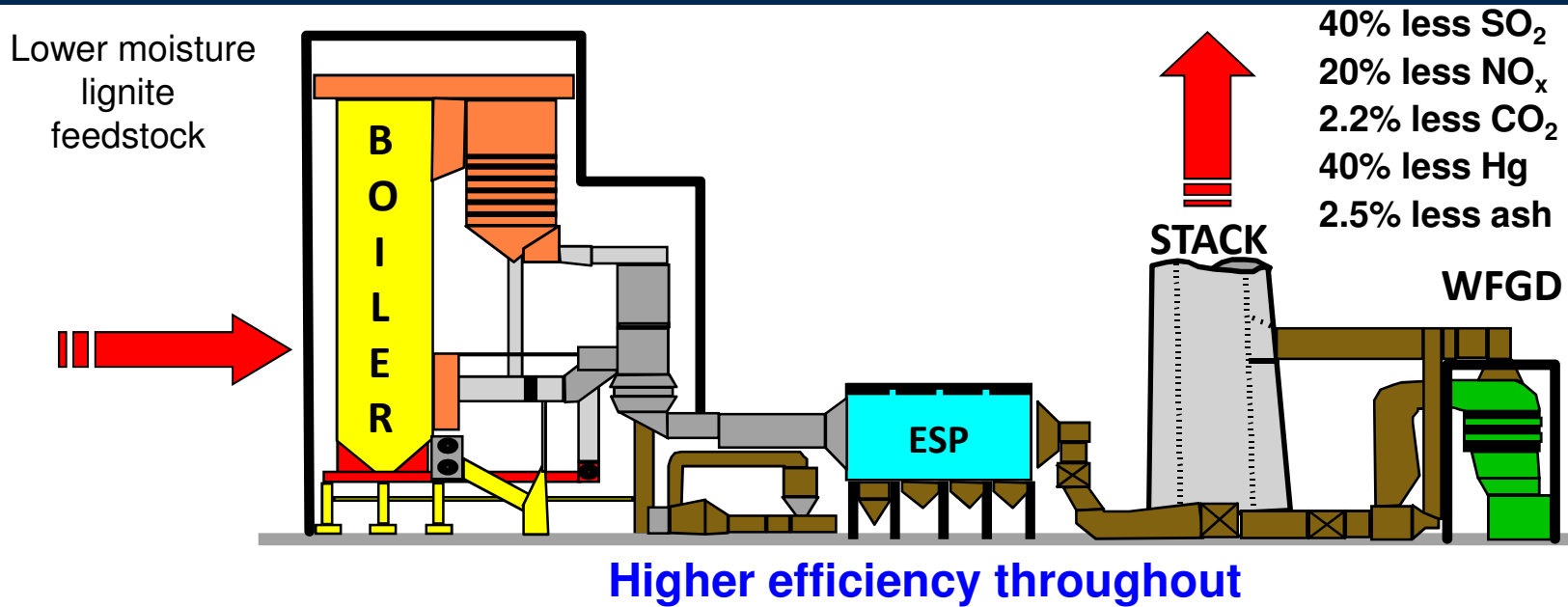
Cooling Towers = 44.5 %

AHTR = 1.5%

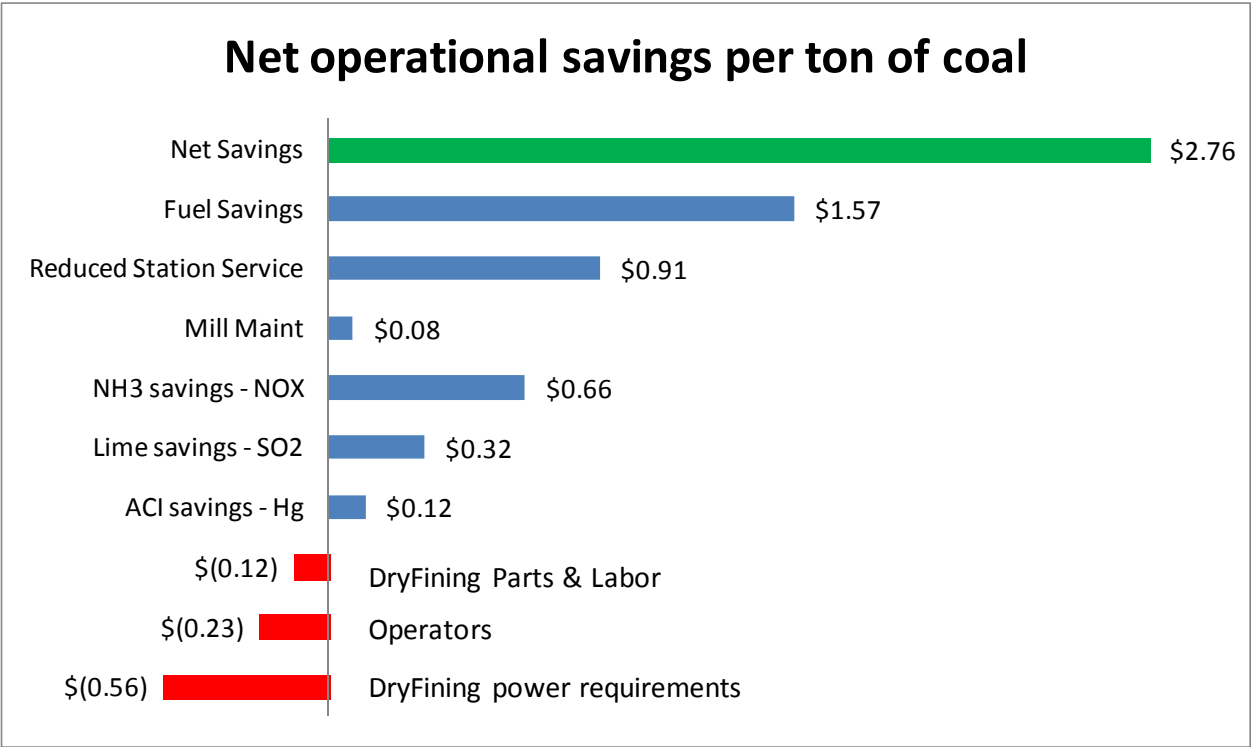
Reduction in Fuel per MW Produced



DryFining Emissions Reductions



DryFinishing Net \$/Ton Savings



DryFinishing™ Summary

- ▶ DryFinishing can help plants meet their State Implementation Plan goals
 - Retains reliable base-load generation sources
 - Reduces carbon footprint and emissions of regulated pollutants
 - Helps keep consumer electrical rates affordable



Next step: Feasibility Assessment

- ▶ How much heat rate improvement is possible at this unit?
 - What are the specific operational constraints?
- ▶ Estimate improvement in carbon intensity.
- ▶ Estimate the total installed cost for this application.
 - Location, location, location
 - Sources of residual heat

For more information:

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- ▶ sbroekema@GREnergy.com
- ▶ (763) 445-5304

