

Gary Moore
Director of Facility Operations
Gundersen Health System
La Crosse, WI.

Gundersen Health System



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Our Envision[®] Program

- Gundersen Health System's energy plan is providing leadership for the healthcare industry on a journey to demonstrate that "green" is a healthy, socially responsible and economically beneficial strategy. Our specific plans turn good intentions and "green" theory into action.
 - We will meet 100 percent of our energy needs for our facilities by 2014 by improving energy efficiency and creating renewable energy.
 - We will commit to environmentally and economically sustainable business practices such as LEED certification of new buildings.
 - We will partner with communities to encourage sustainable economic growth and development as well as provide national leadership in renewable energy and energy efficiency programs.
 - We will use our Envision program as a tool to reduce the cost of care for our patients.

Balancing Multiple Objectives

“Two-Sided Green”

- Achieve Energy Independence
- Decrease Emissions Harmful to Health
- Decrease Emissions Harmful to Environment
- Use Renewable Resources
- Provide Benefit to Local Economy
- Improve Patient Experience & Cost
- Make Cost Effective and Sound Investments

Conservation

In 2008 Gundersen Health System launched an aggressive energy conservation effort which examined heating and cooling systems, lighting systems and employee behavior to identify opportunities to reduce energy consumption. Dozens of Energy Conservation Measures (ECMs) were then implemented.



HEALTH SYSTEM.

Gundersen Health System is saving \$1.25M annually from reduced energy use!

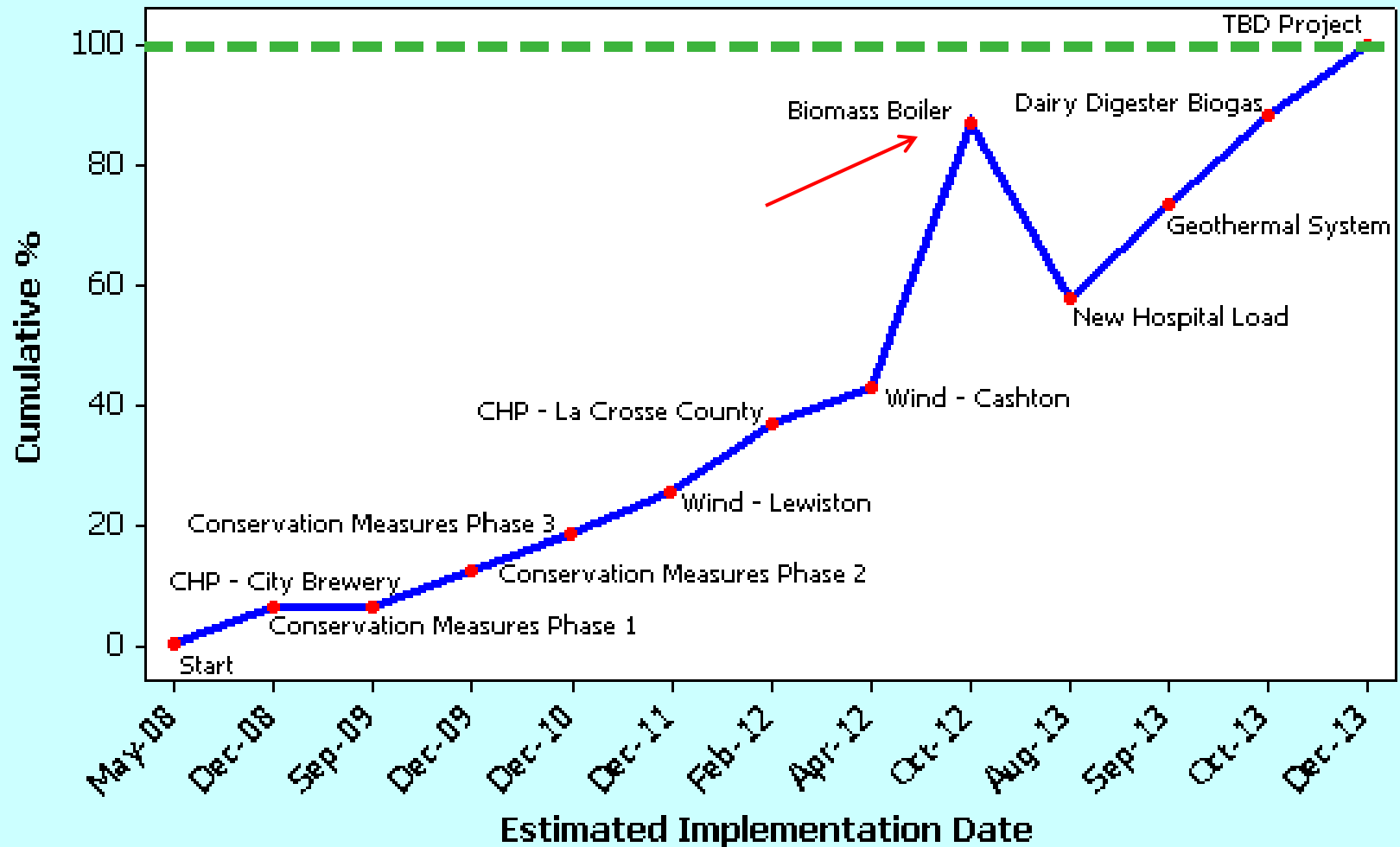
Renewable Energy Projects



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Energy Independence Plan

Gundersen's Energy Independence Plan



Biomass Boiler Project

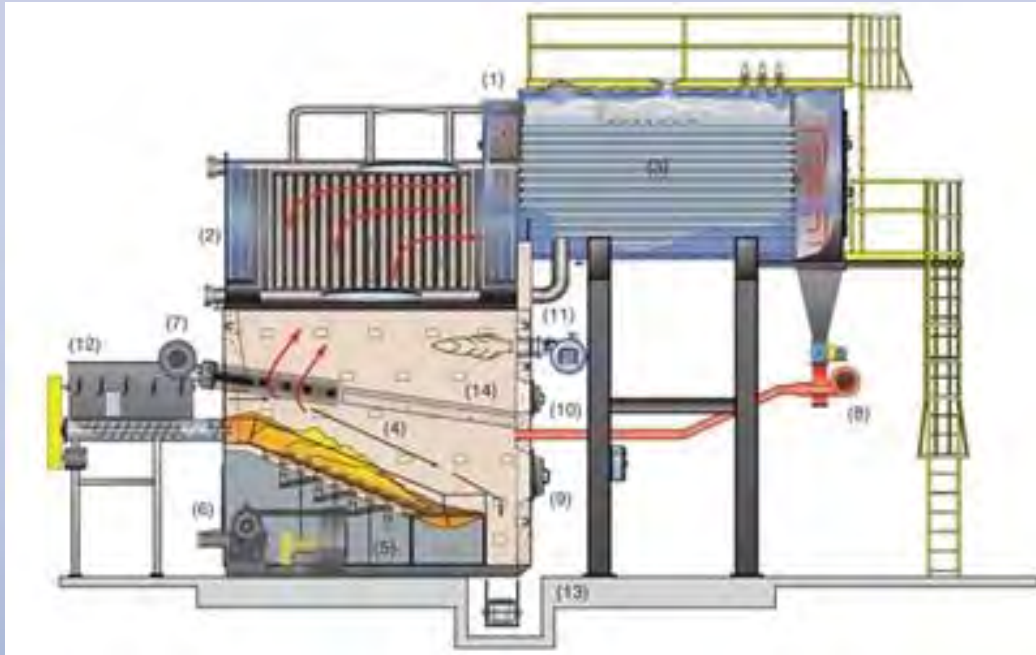
2013 Implementation

Benefits:

- 38% of energy independence goal (~150,000 MMBtu and 2,200,000 kWh)
- Will produce the majority (80%) heat / steam used by the health system
- Projected annual savings of \$500,000...helping to control the cost of care
- On-site electricity production with back pressure steam turbine



Biomass Heat and Power



Biomass Boiler

800 H.P./ 450 PSI



Steam Turbine Generator

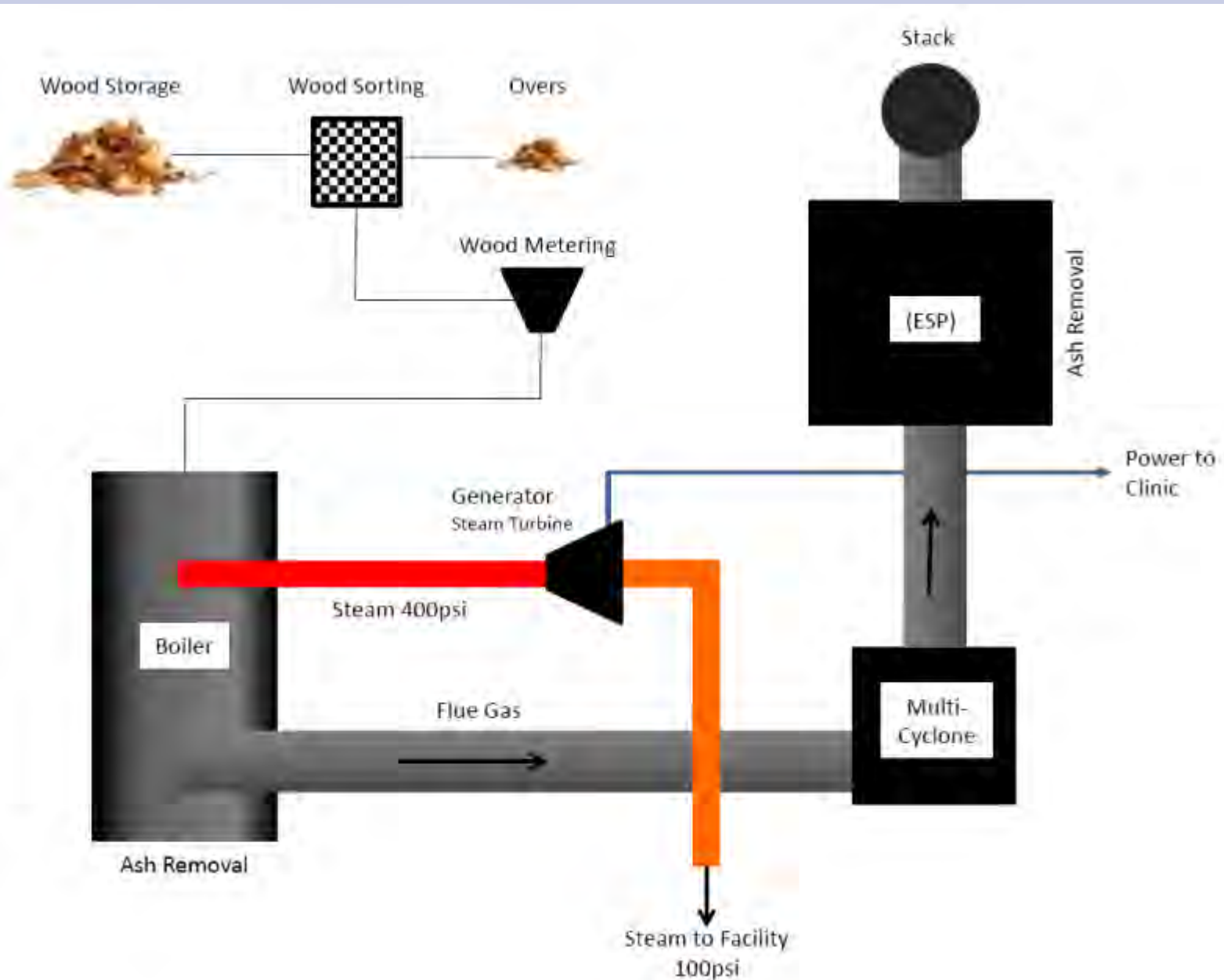
(2.2M kW/hr Reduction)

400 KW

38% of Energy Independence Goal
\$500,000 Annual Energy Savings

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Biomass CHP Flow Diagram



Location of Biomass Building



Biomass Building



Chip Bunker Entrances



Wood Chip Bunker



Wood Chip Scrap System



Conveyor system



Magnet

Feed system to boiler

Sorting grate with 2x2 hole's

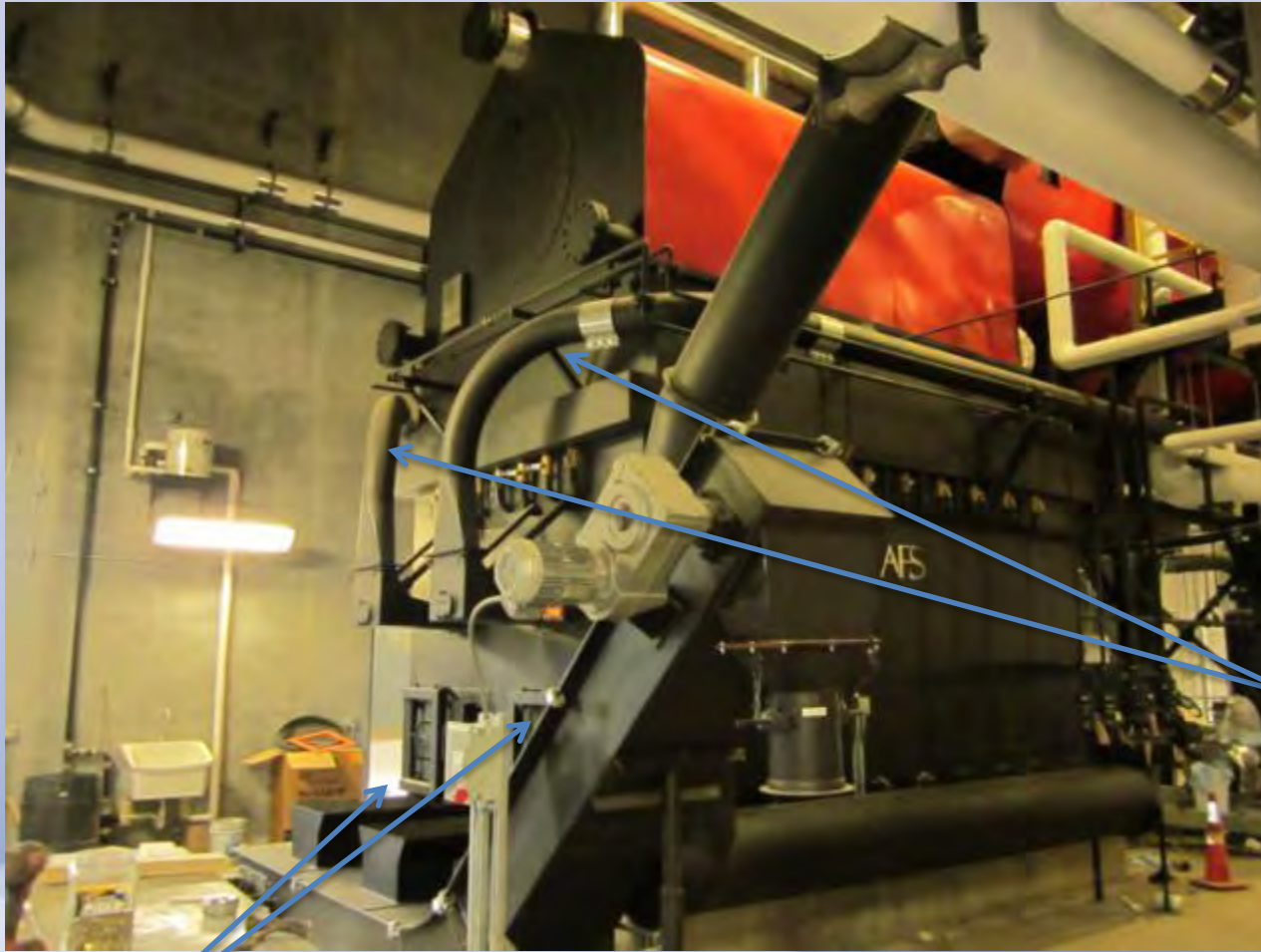
Over's chute

Metering Bin



Pressure reducing station for when we are not using generator.





Pneumatic feed system

Manual ash scrape

Steam Turbine Generator



Concerned About Emissions?

So Are We!

- Remember that Gundersen Health System is a Healthcare Provider
 - Our Envision program is designed to reduce emissions that contribute to health problems...must be consistent with our mission
 - This project will offset emissions from fossil fuel sources
- We have thousands of staff members working here each day
- We have hundreds of hospital patients staying here each day
 - Some have compromised immune systems & respiratory function
- We want to be good neighbors and good community leaders

How Do You Ensure Low Emissions?

- Start with clean fuel sources (only organic)...no medical waste
 - Clean woodchips (milling operation, forestry harvesting)
 - Low moisture & dirt to minimize ash
 - No paints, treatments, glues, metals, plastics...no construction waste
- Efficient combustion
 - Underfire / overfire, stoker grate combustion chamber for thorough burn (Fire box burn @1400 F.)
 - Automated controls for combustion and emission systems
- “Cadillac” emissions control systems
 - Effective stack height
 - Multi-Cyclonic separator to remove fly ash
 - Electrostatic precipitator...the “gold standard”
- DNR emissions modeling prior to permit
- Compliant to EPA & DNR standards...with regular testing

Our Fuel Specification

Supplier Commitments in Contract

4. QUALITY

All wood fuel shall be chipped fuels which include bark produced from sound, untreated wood. Slabs from sawmill process are acceptable if conforming to the following specifications:

- Chipped fuel shall be free of dirt, rocks, clay, metals, or other foreign materials.
- Supplier shall screen all wood fuel to be delivered under this contract.
- Chip dimension shall not exceed 2.5 inches and be free of fibers, stringers, or sticks more than 2.5 inches in length.
- Delivered moisture content shall be no more than 50%. No water shall be added to the wood fuel by the seller. Moisture content will be measured on an as-received basis.
- Wood residue must be a clean fresh mix free of substances foreign to natural composition of wood such as preserving chemicals, paint, processing chemicals, glues, chlorine, sulphurous, phosphorous, nitrogenous chemicals that might be classified as hazardous or appear in flue gas or ash. The fuel shall be free of chemicals or materials that would cause Gundersen Lutheran to be in violation of its air emissions permit or cause the ash to be ineligible for its intended use. Permit requirements may be amended from time to time beyond Gundersen Lutheran's control.
- The fuel should be free of nails or other metal. The wood fuel should be free of rotten material which evidences a state of decomposition. The wood fuel should be free of leafy greens or needles.
- Any woody biomass fuel from tree trimming, sawmill, or chip mill sources must comply with harvesting techniques consistent with the Wisconsin Council on Forestry and Wisconsin DNR's Woody Biomass Harvesting Guidelines.
- Fuel density shall be 12 – 20 pounds per cubic foot
- Higher Heating Value of fuel shall be greater than 7,500 Btu / lb. on a dry basis
- Initial Deformation Temperature (IDT) of ash to be greater than 2,100 degrees Fahrenheit.
- Ash shall be less than 10% (weight percent, dry basis) inorganic material, including inorganic material that is part of the normal composition of wood and inorganic material that is not part of the makeup of natural wood.
- All wood fuel not conforming to these specifications may be rejected by the Gundersen Lutheran. If the entire truck is rejected, chips will be returned to Supplier if the Supplier so requests. All round trip freight, demurrage, and other charges incurred by rejected chips shall be charged to the Supplier's account and Gundersen Lutheran may deduct any such amount from any sums due Supplier by Gundersen Lutheran.

Investigation prior to purchase

- Smell?
 - We could not detect smells at any of the facilities we've visited while boilers were operating
 - These facilities did not have the extensive emissions controls this system will have
- Particulates?
 - No flakes or ash from the stack (Multi –Cyclone – ESP)
 - This system has excellent, redundant, particulate removal technology
- Smoke?
 - There will not be any “smoke”
 - You will notice white plumes on cold days much like the current boilers...this will be water vapor condensate
- Truck Traffic?
 - Seasonal...1 to 4 trucks per day