University of Iowa
Biomass Fuel Project

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District Energy – Combined Heat & Power (CHP)

• **What is District Energy?**

Source: IDEA Website/Smarttools
District Energy @ UI
2020 Vision - The University of Iowa's Sustainability Targets

1. Achieve Net-negative Energy Growth

Consume less energy on campus in 2020 than consumed in 2010 despite projected growth

2. Green Our Energy Portfolio

Achieve the goal of 40% renewable energy consumption on the campus by 2020

https://sustainability.uiowa.edu/our-vision/2020-vision-the-university-of-iowas-sustainability-targets/
How much energy does the UI consume compared to my house?

• UI annual energy use is equal to:
  – 3,500 homes
  – 35,000 homes
  – 350,000 homes
  – 1,000,000 homes
How much energy does the UI consume compared to my house?

• UI annual energy use is equal to:
  – 3,500 homes
  – 35,000 homes
  – 350,000 homes
  – 1,000,000 homes
Annual energy use at UI is:

The same energy use as all of the homes in Iowa City
Why doesn’t the UI convert to solar?
UI analysis of solar

• Solar panels on every campus rooftop would provide 12.8% of the energy needs for the UI campus.

• Solar does not have the scale to provide 40% renewables.
What about wind?

- If a wind farm was built on the UI grounds, the electricity generated would provide 7.7% of the energy needs for the campus.
Biomass Fuel Project
UI analysis of biomass

• Displaces coal
  – UI Power Plant currently purchases approximately 2400 truckloads of coal each year
  – Displace ~4 tons of coal/acre

• Funding requirements
  – Does not require additional capital
  – Goal is to minimize fuel budget impact
Average Midwest Home Annual Energy Use

- Electricity: 32%
- Fossil Fuels: 68%

115 MMBtu per year

www.eia.gov Residential Energy Consumption Survey
UI 2010 Baseline Energy Use

- Fossil Fuels: 68%
- Electricity: 24%
- Biomass: 8%

4,000,000 MMBtu per year
UI 2020 Projected Energy Use

Fossil Fuels 35%
Biomass 40%
Electricity 25%

4,000,000 MMBtu per year
Benefits of Biomass at UI
4,000,000 MMBtu per year

- What is the UI annual energy budget (fuel and electricity) for 2015-2016?
  - $1 Million
  - $30 Million
  - $200 Million
  - $3 Billion
4,000,000 MMBtu per year

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Biomass Fuel Portfolio

• Industrial byproducts:
  – Current: oat hulls
  – Future: energy pellets, cardboard recycling sludge, scrap from furniture making

• Wood chips:
  – Current/past: timber stand improvement, pallet remanufacture
  – Future: opportunity wood, short rotation woody crops

• Energy grasses:
  – Current development: Miscanthus
  – Future: prairie and switchgrass
Industrial By-Product: Oat Hulls

- UI has been burning oat hulls for energy since 2003
- Sourced from Quaker Oats in Cedar Rapids, IA
- 5-yr contract for 40,000 tpy
- Displaces roughly 1000 truckloads of coal/year

sustainability.uiowa.edu/initiatives/biomas-s-fuel-project/
Allow existing equipment to be used without modification

Fuel pellets make use of non-recyclable industrial byproducts

Partnering with UI Chemistry Department to quantify emissions changes
Wood Chips
Current wood chip supply:
Scrap from pallet manufacturing

Over 150 truckloads of wood chips used in 2015

Wood chips will displace 100 truckloads of coal at the UI Power Plant
Energy Grass

• Miscanthus x giganteus
  – 350 acres planted in 2015
  – 175 acres planted in 2016
  – Partnership with ISU, Dr. Emily Heaton

sustainability.uiowa.edu/initiatives/biomass-fuel-project/
117 MMBtu per year

• How many acres of Miscanthus would you need to provide energy for the average midwest home for one year?
  – Less than 1 acre
  – 10 acres
  – 100 acres
  – 1000 acres
117 MMBtu per year

• How many acres of Miscanthus would you need to provide energy for the average midwest home for one year?
  – Less than 1 acre
    – 10 acres
    – 100 acres
    – 1000 acres
  – 0.75 acres
• \(\sim 15\%\) of land within Iowa fields not profitable in corn

• Planting \(\sim 15\%\) of land within Iowa fields to diverse perennials provides disproportionate environmental benefit

• Planting \(\sim 15\%\) of land within Iowa fields to perennial high-yielding energy crops provides enough biomass

Slide courtesy of Dr. Emily Heaton, Iowa State University

[Link to Iowa State University sustainability initiatives] sustainability.uiowa.edu/initiatives/biomass-fuel-project/
Science-based Trials of Rowcrops Integrated with Prairie Strips

www.prairiestrips.org

Slide courtesy of Matt Helmers, Iowa State University.

Thank you