Problem

To determine the feasibility of using corn stover as a combined heat and power source for rural community colleges

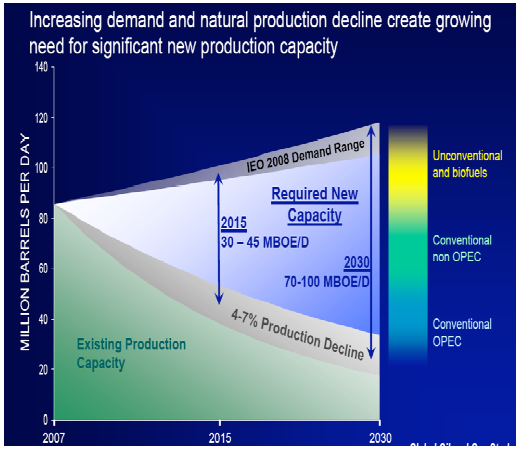
Objectives

-Survey the potential for CHP application using modified EPA guidelines
-Scale up from single to multiple farm system for stover conversion to CHP
-Identify future stover CHP options
-Investigate creation of an online database

Background

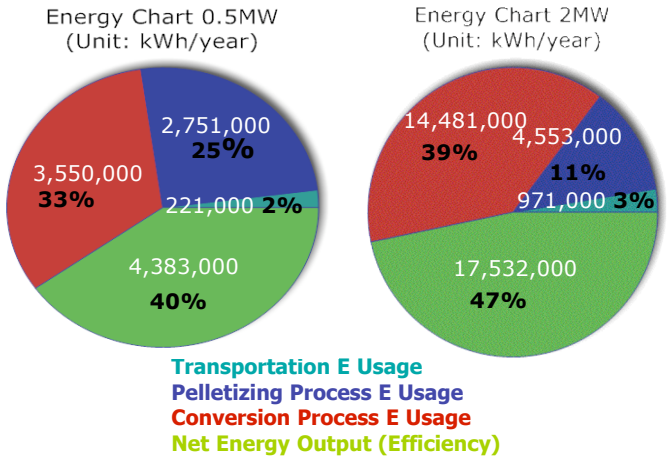
Current, non-renewable energy sources pose a significant problem to the global society as a whole. Without a dependable way to renew an energy source, the scope and sustainability of that supply is finite.

Solid biomass from substances previously considered waste have immense potential that remains largely unexplored.



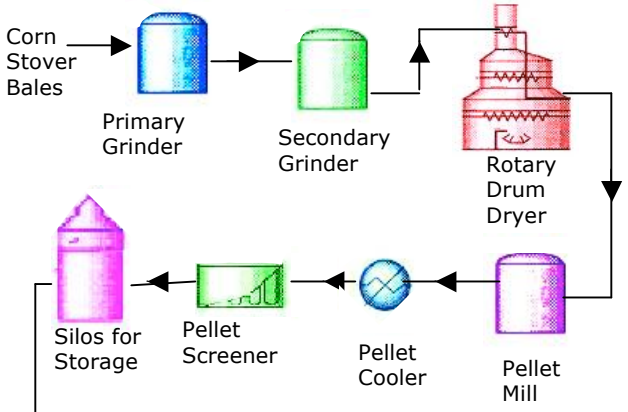
Matlock, Mark, 2008 NWU Presentation

Energy Analysis

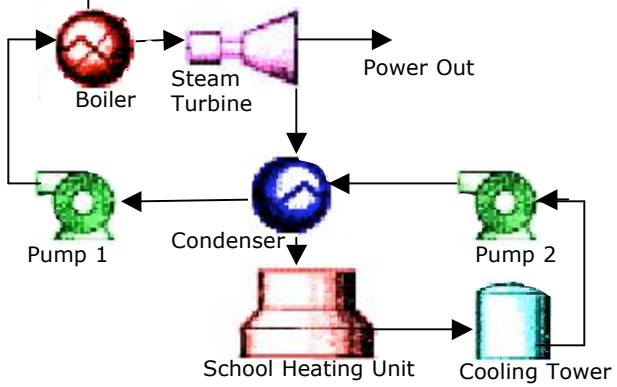


Transportation E Usage
Pelletizing Process E Usage
Conversion Process E Usage
Net Energy Output (Efficiency)

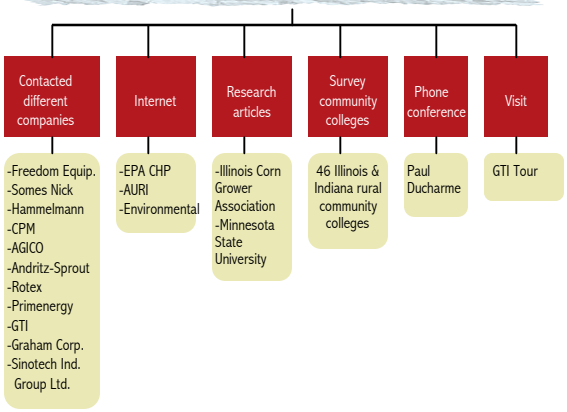
Pelletizing Process



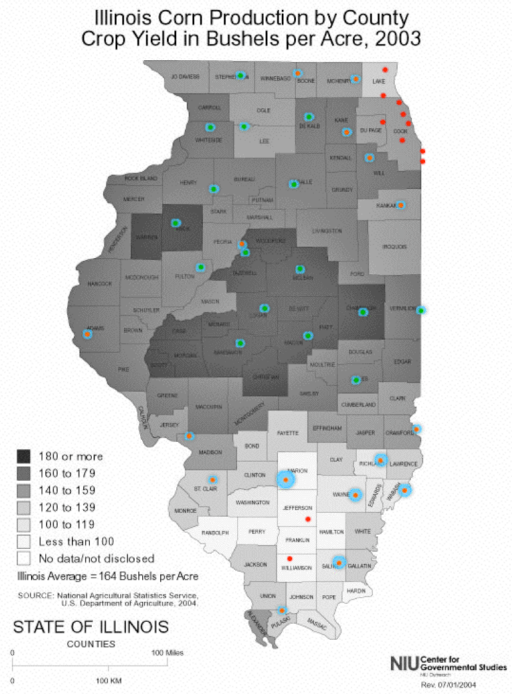
Conversion Process



Methodology



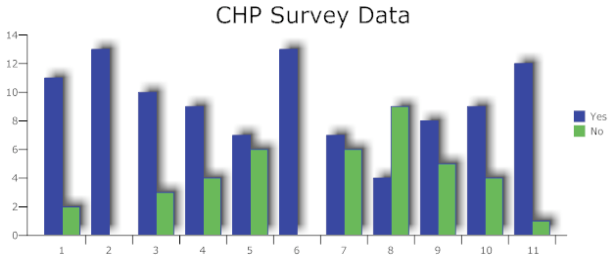
Illinois Potential



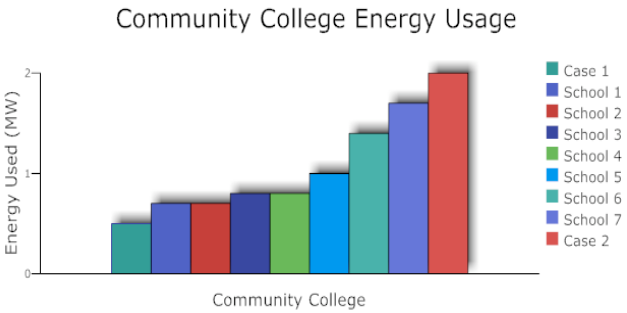
- **Not a good candidate**
- **Maybe a good candidate**
- **A good candidate**

Survey Data

Preliminary data from community colleges:



1. More than $.07/kWh electricity usage
2. Concern about impact of current/future energy cost
3. Given facility in a deregulated electricity market
4. Concern about power reliability
5. Operate more than 5,000 hours/year
6. Thermal loads throughout the year
7. Existing central plant
8. Expectation to replace/upgrade central plant in <5 years
9. Anticipation of facility expansion in <5 years
10. Implementation of energy efficiency measure
11. Interest in reducing facility's impact on the environment



0.5MW case	2MW case
12 farms/yr with 40% pick up of corn stover	51 farms/yr with 40% pick up of corn stover
10,400,000lb stover/yr	45,600,000lb stover/yr
4,800 tons pellets/yr	21,100 tons pellets/yr
1 ton pellets/hr if pelletizing system runs 6.75 months/yr	5 ton pellets/hr if pelletizing system runs 6 months/yr

Conclusions

-CHP is feasible for the researched:
- heat requirement
- power requirement
- stover production and storage

-75% of farmers would be willing to participate in a CHP project

-100% of schools which responded would be good candidates for CHP*

-Current gas turbine options not fit for this scale

*according to EPA guidelines

Recommendations

-Cost effectiveness/payback analysis
- •Specific case study-surrounding land and CHP specifications

-Stirling Engine
- •Look into modular systems

-Investigate energy effective farming/biodiversity
- •Look into international humanitarian applications

-Internet database~more user friendly

The Corn Stalkers

Instructor: Don Tijunelis
Team Members: Ross Brazzale, Richard Byrne, James Cheever, Michael Clark, Ray DeBoth, Elena Dorr, Jeremy Gibbs, Katherine Lazicki, Abhishek Prabha Kumar, Tyler Rhodes, Bertha Vandegrift, Robert Williams, Terrika Worthon, Xin Yi Yeap

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IPRO 349

Solid Fuel from Biomass for Cogeneration

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