Energy From Agriculture:

New Technologies, Innovative Programs & Success Stories

December 14-15, 2005 *St. Louis, Missouri*

Farm Foundation

USDA's Office of Energy Policy and New Uses

NRCS

Rural Development

Agricultural/Renewable Contributions to US Electricity Usage

Otto Doering, Purdue University

Focus

Concern About The Viability of Biomass
As a Generation Fuel

Biomass as a Heat Source

Consider Competing Sources & Uses
Also, Opportunity Cost – For Supplier & User

Material Characteristics

Low Energy Density a Liability
Bulk & Weight vs. Value

Energy Contents

Biomass: 8.25 Mbtu/Ton

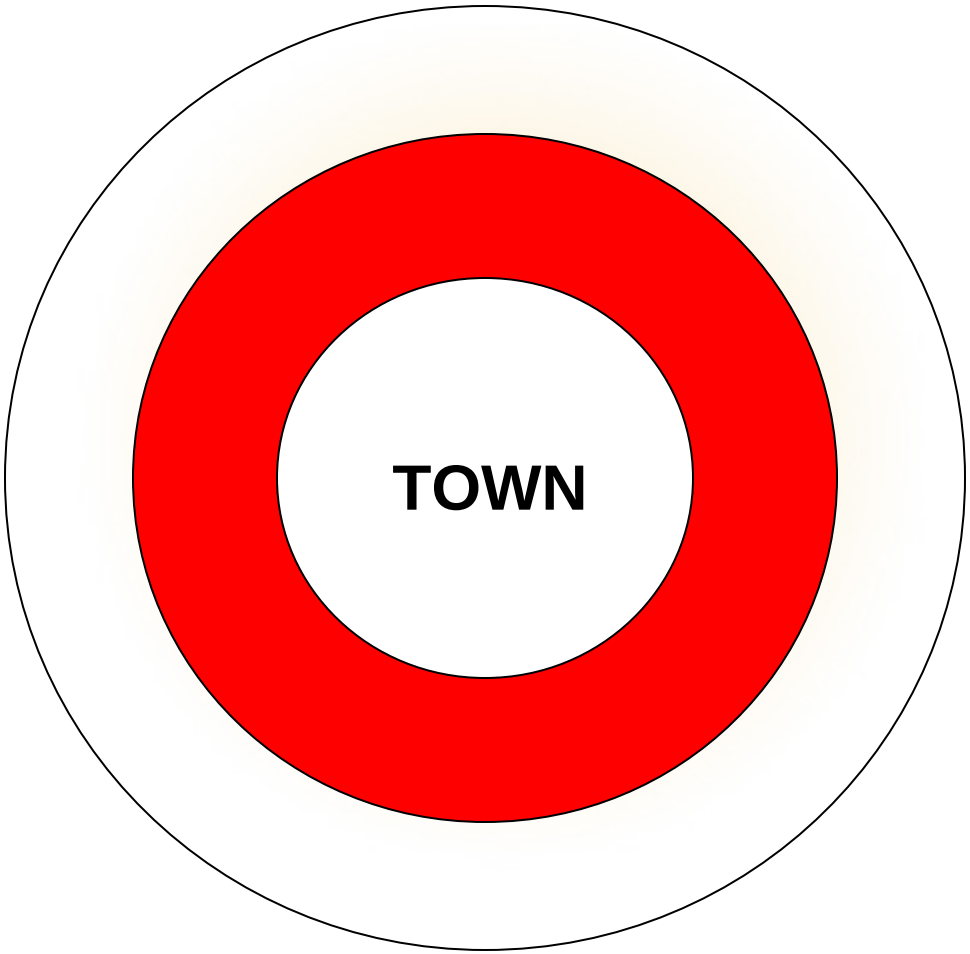
Paper Pellets: 13.03 Mbtu/Ton

Bituminous Coal: 25 Mbtu/Ton

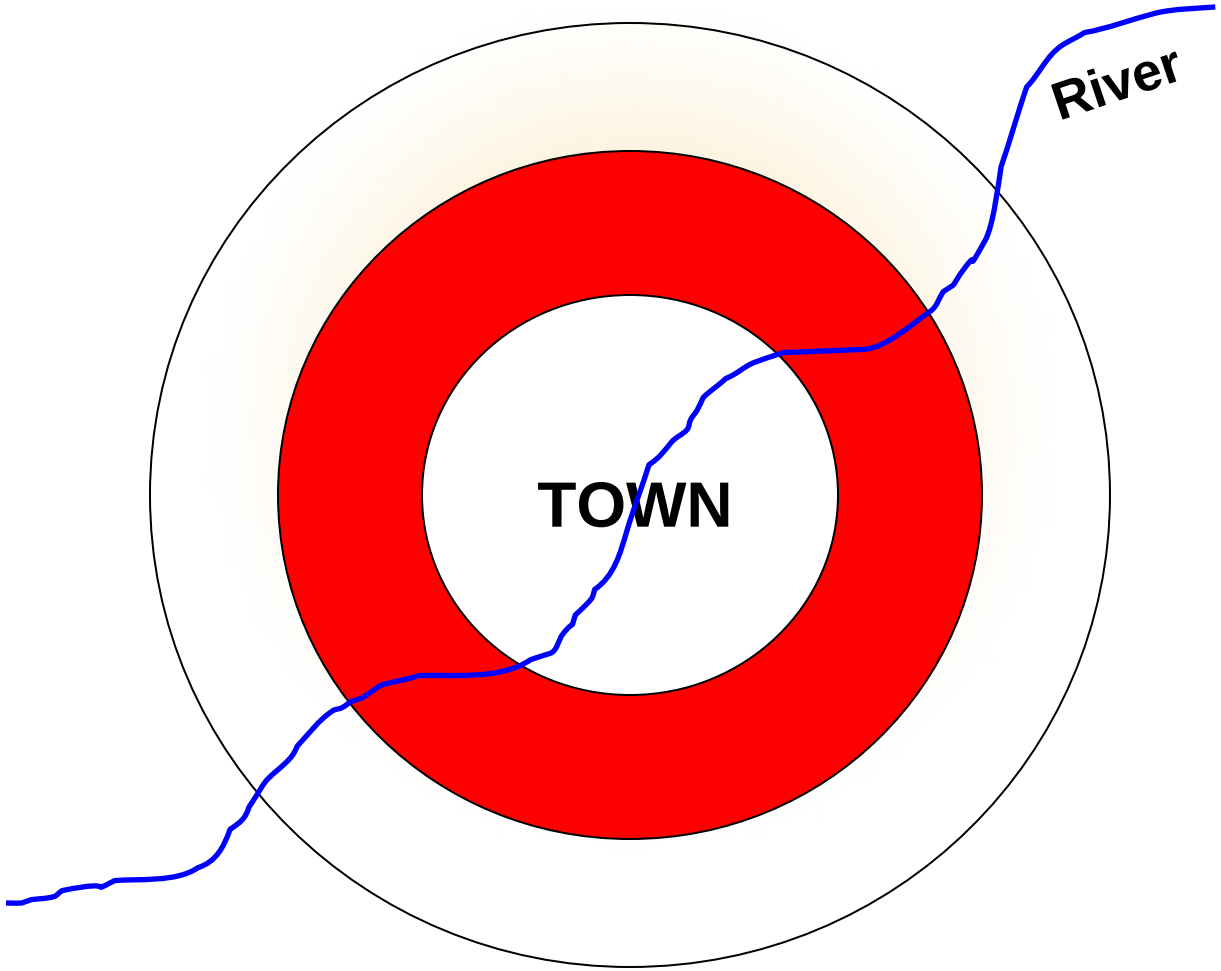
Von Thunen

The Originator of Spatial Economics
Lessons from The Isolated State

Von Thunen's World



Von Thunen's World



Availability of Biomass

Today: 194 M dry Tons
(Corn Stover 75 M Tons)

Future: 500 to 1,000 M dry Tons

Availability Is Not the Issue!

Which Use Will Draw It?

For Heat, Competition Is With Coal Not Oil or Gas

Compare Spot Coal at $37 (high)

With Biomass at $37 (low)

However, Biomass Is 1/3 the Energy

Biomass Supply Will Likely Be Drawn to Petrochemical Substitutes (High Value)

Experience of Direct Firing

Denmark – Straw

US – Switchgrass

US Direct Firing Issues

1. US Policy Is Universal – Biomass Is local
2. Low Bulk Density – Location & Transport
3. Biomass Is Not Homogeneously Distributed
4. Past Ag. Research Not Concerned With Fuel Use
5. Heat for Electricity Is low value – Biomass May Require High Value Product To Be Feasible

Distributed Power Option

Critical Logistics of the Grid
Value of Antaras's Northeast Study

Burning Issues for Co-firing

Combustion, Chemicals, & Ash

Pollution Reduction Is Only Proportional

Logistics of Handling, Processing, & Firing Are Key

The Challenge

Bulk, Transportation, & Handling

Competition Is Coal

Co-firing Is Not Easy

The Supply Is Geography Limited

Electricity Is Cheap

To Overcome the Challenges

High Value Needed for Environmental Benefits

Cogeneration with High Value for Heat

Solve the Small Scale Issues

High Subsidies

High Power Price

High Cost for Clean Coal Technology