Opportunities for Biomass to Energy in Kentucky

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Presentation Overview

- Context
  - Kentucky's Energy Strategy
  - The Case for Renewable Energy
  - Task Force Final Report
- Why Biomass?
  - Renewable Energy Resources
- Anaerobic Digestion 101
- Clean Energy Policy
  - Federal Drivers
    - Clean Energy Portfolio and Resource Requirements
  - State and Utility Drivers
- Projects
- Technical Assistance

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Context

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Strategy for Energy Independence

Intelligent Energy Choices for Kentucky's Future

1. Improve the Energy Efficiency of Kentucky's Homes, Buildings, Industries, and Transportation fleet
2. Increase Kentucky's Use of Renewable Energy
3. Sustainably Grow Kentucky's Production of Biofuels
4. Develop a Coal-to-Liquids Industry in Kentucky to Replace Petroleum-Based Liquids
5. Implement a Major and Comprehensive Effort to Increase Gas Supplies, Including Coal-to-Gas
6. Initiate Aggressive Carbon Capture/Sequestration Projects for Coal-Generated Electricity in Kentucky
7. Examine the Use of Nuclear Power for Electricity Generation in Kentucky

energy.ky.gov/resources/Pages/EnergyPlan.aspx

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The Case for Renewable Energy

- Reduce electricity cost
- Add predictability to future electricity expenses
- Reduce greenhouse gas emissions
- Meet renewable energy mandates/targets
- Become a model for others
- Local workforce development
- Emergency power benefits on critical infrastructure
- Diversify Kentucky's energy portfolio

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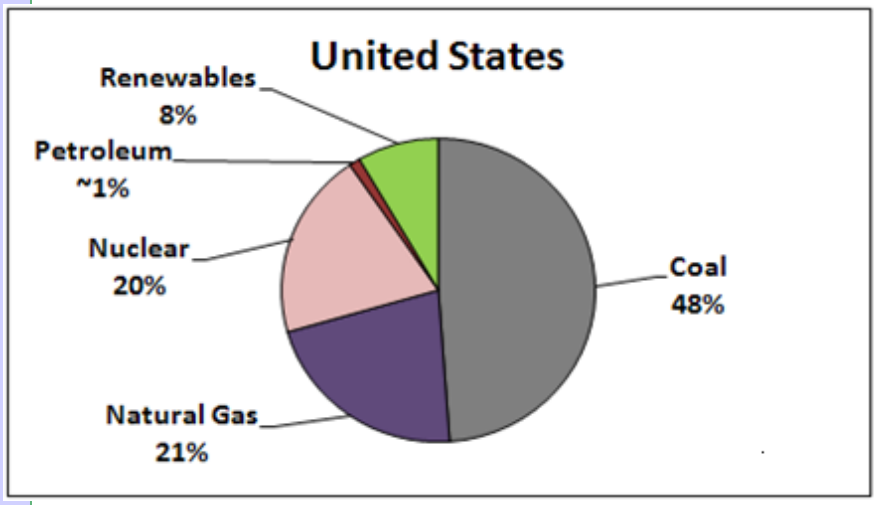
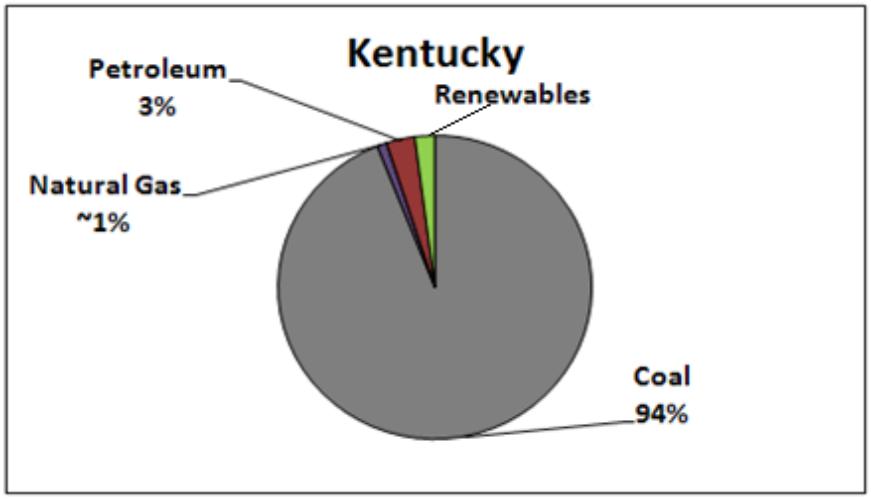
Electricity Portfolios: Does Diversity Matter?

United States and Kentucky in 2008





- Kentucky is ranked 33 in renewable electricity generation.
- States generating less renewable electricity include Missouri, Vermont, Kansas, Ohio, Indiana, West Virginia.

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Executive Task Force on Biomass and Biofuel Development

Task Force Recommendations

- Kentucky must identify a single agency to coordinate biomass development efforts.
- Kentucky must develop policies to mitigate demand risks.
- Kentucky must develop policies to mitigate supply risks.
- A biomass industry that is *sustainable* must be developed.
- Capitalization mechanisms must be developed.

energy.ky.gov/resources/Pages/btf.aspx

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Why Biomass?

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Renewable Energy Resources

- **Wind** potential is limited by the resource in Kentucky.
- **Solar** potential is limited by its cost in Kentucky.
- Kentucky can expand its **hydroelectric** energy capacity.
- Kentucky can't produce electricity from its **geothermal** resource.
- Kentucky has significant potential to produce energy from **biomass.**

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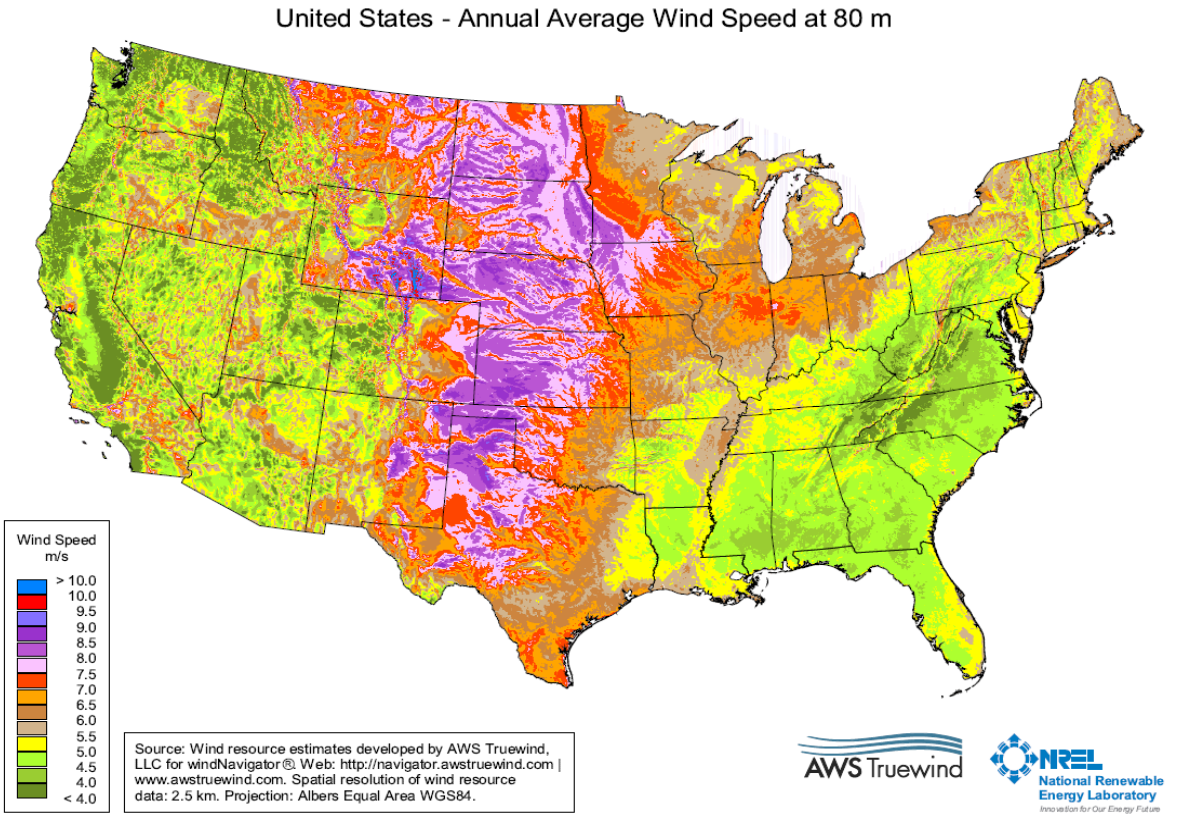
Renewable Energy Resources

U.S. Onshore Wind Resource



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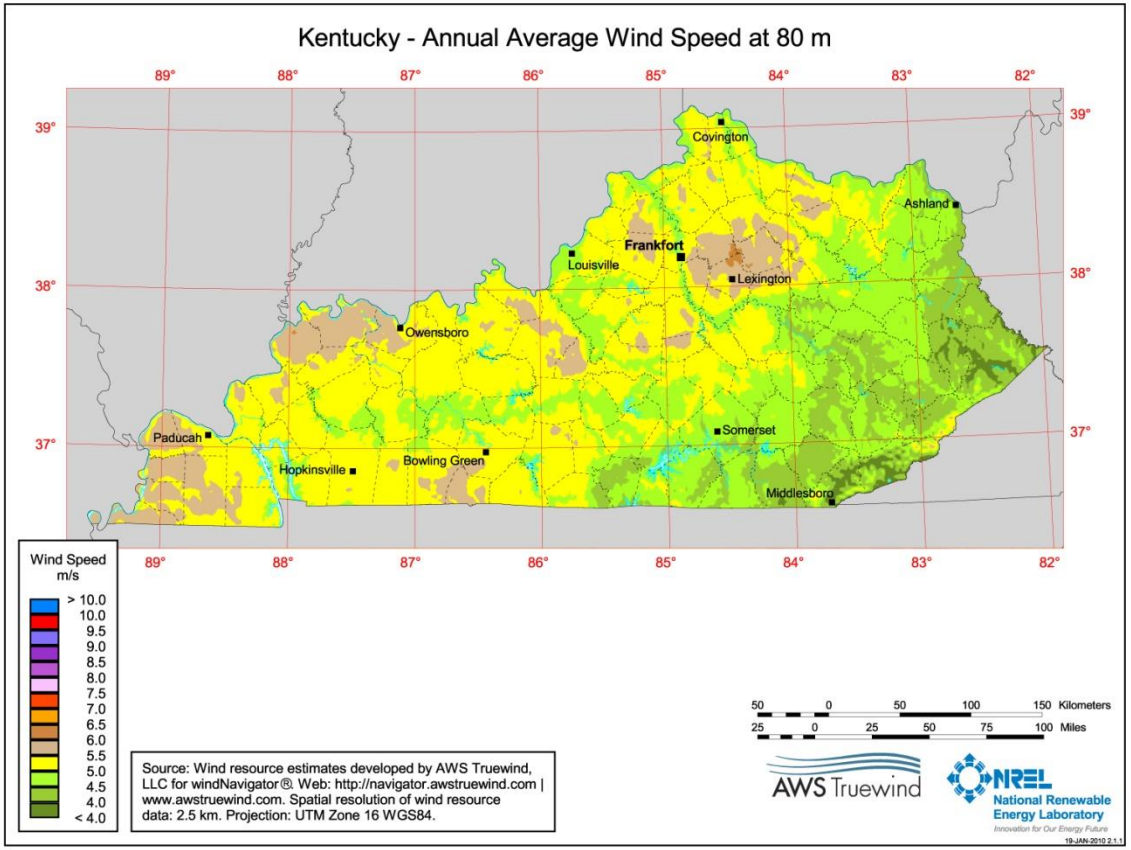
Renewable Energy Resources

KY Wind Resource



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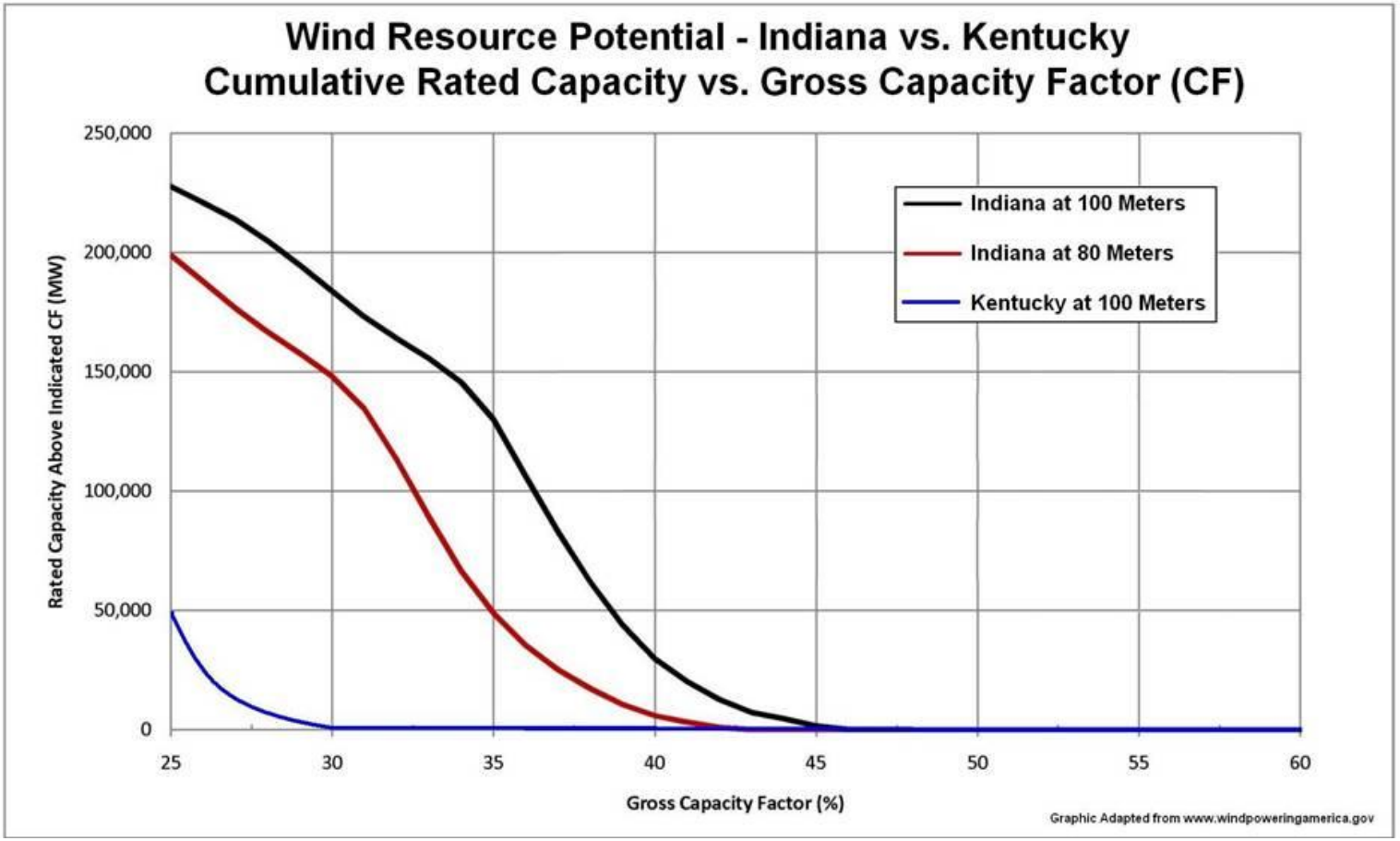
A Wind Resource Comparison



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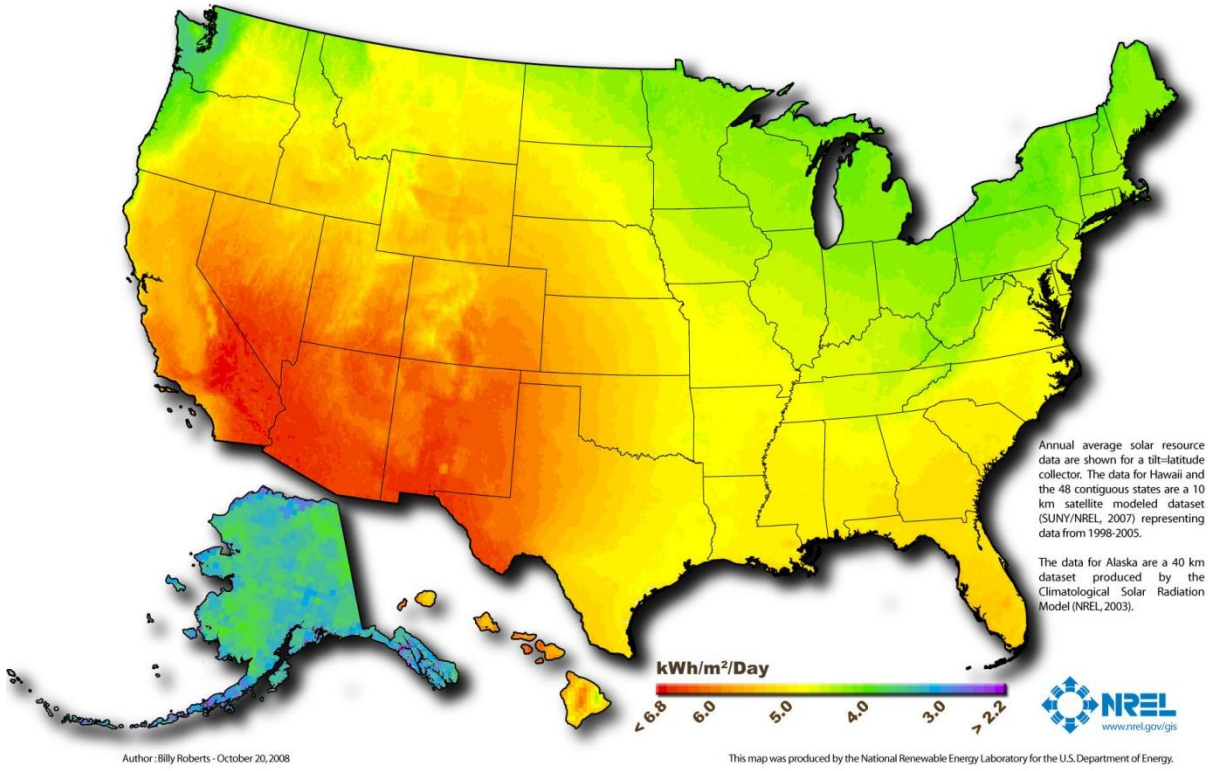
Renewable Energy Resources

U.S. Solar Resource



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KY Hydroelectric Resource

- 855 MW of potential at sites already dammed
- Three new Hydroelectric plants planned or under construction
  - Meldahl
  - Cannelton
  - Smithland

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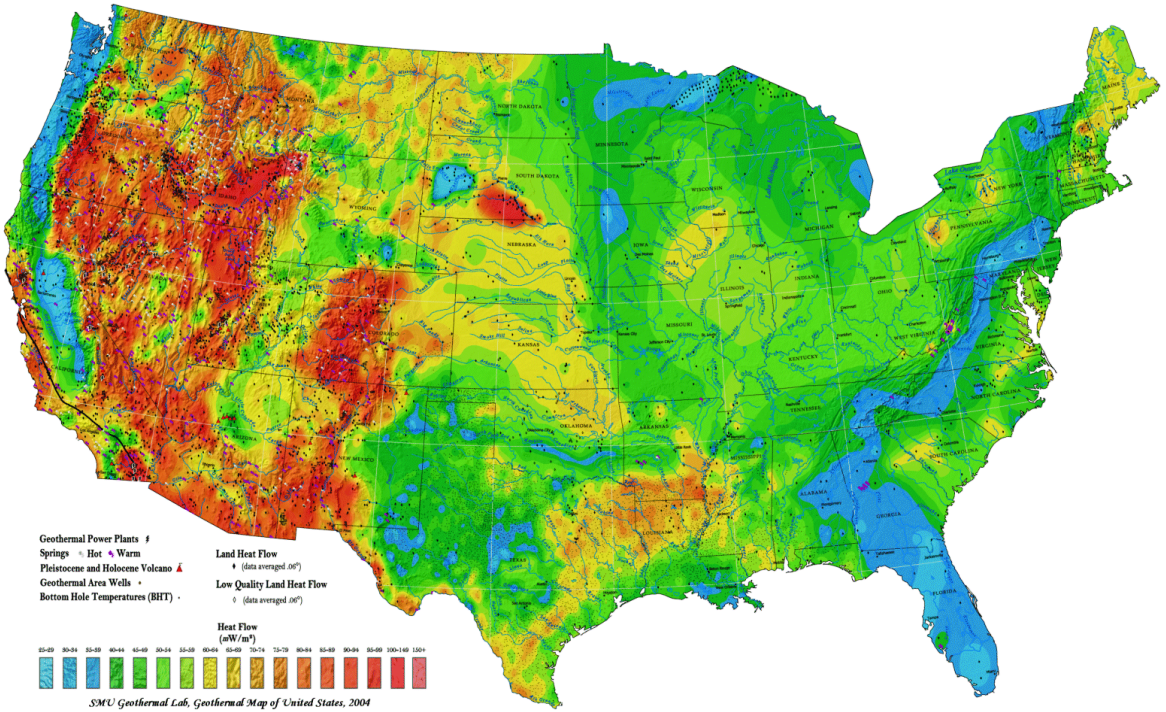
U.S. Geothermal Resource



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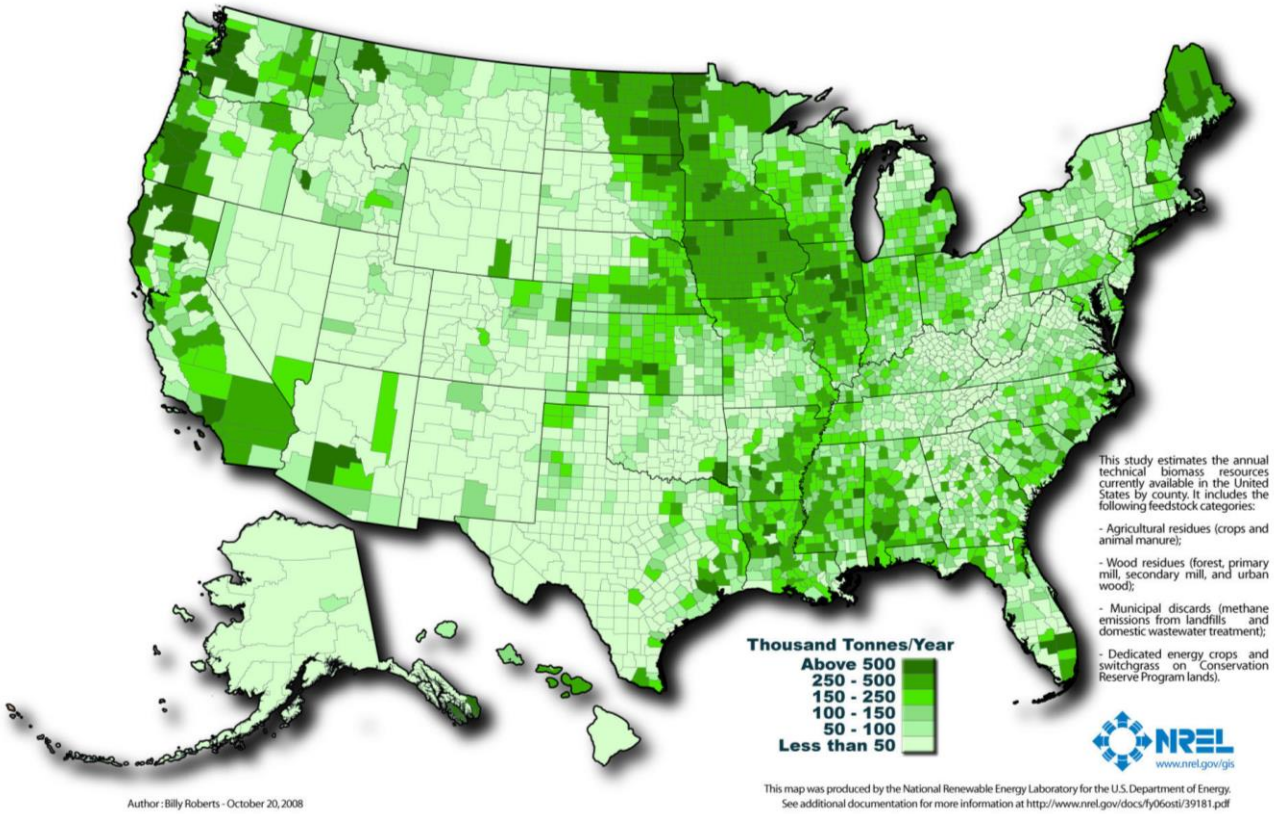
U.S. Biomass Resource



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Why Biomass in Kentucky?

Environmental Issues
June 2006

- It's Kentucky's Renewable Resource
  - Production is distributed throughout every county, and is not dependent upon topography or type of soil
- It's Sustainable
  - Productivity, not diversion
  - Adds value
- It Creates jobs!!!!!!!!
  - Using untapped resources equals new jobs & new wealth

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Anaerobic Digestion 101

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Anaerobic Digestion 101

- Process whereby micro-organisms break down biodegradable material in the absence of oxygen
- Process produces biogas which can feed a cogeneration system and produce electricity and heat
- It's a form of distributed generation of electricity.
- By converting biogas into energy, greenhouse gas (CO_2 and CH_4) emissions are reduced.

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Anaerobic Digestion 101

Inputs

- Food Waste including distilling/brewing waste
- Industrial waste such as paper manufacturing residue
- Abattoir Waste
- Sewage Sludge
- Ag Waste (manure, slurry, straw, feathers, crop residue)

Outputs

- Biogas yields Electricity and Heat
- Digestate
- Renewable Electricity Credits/Carbon Credits

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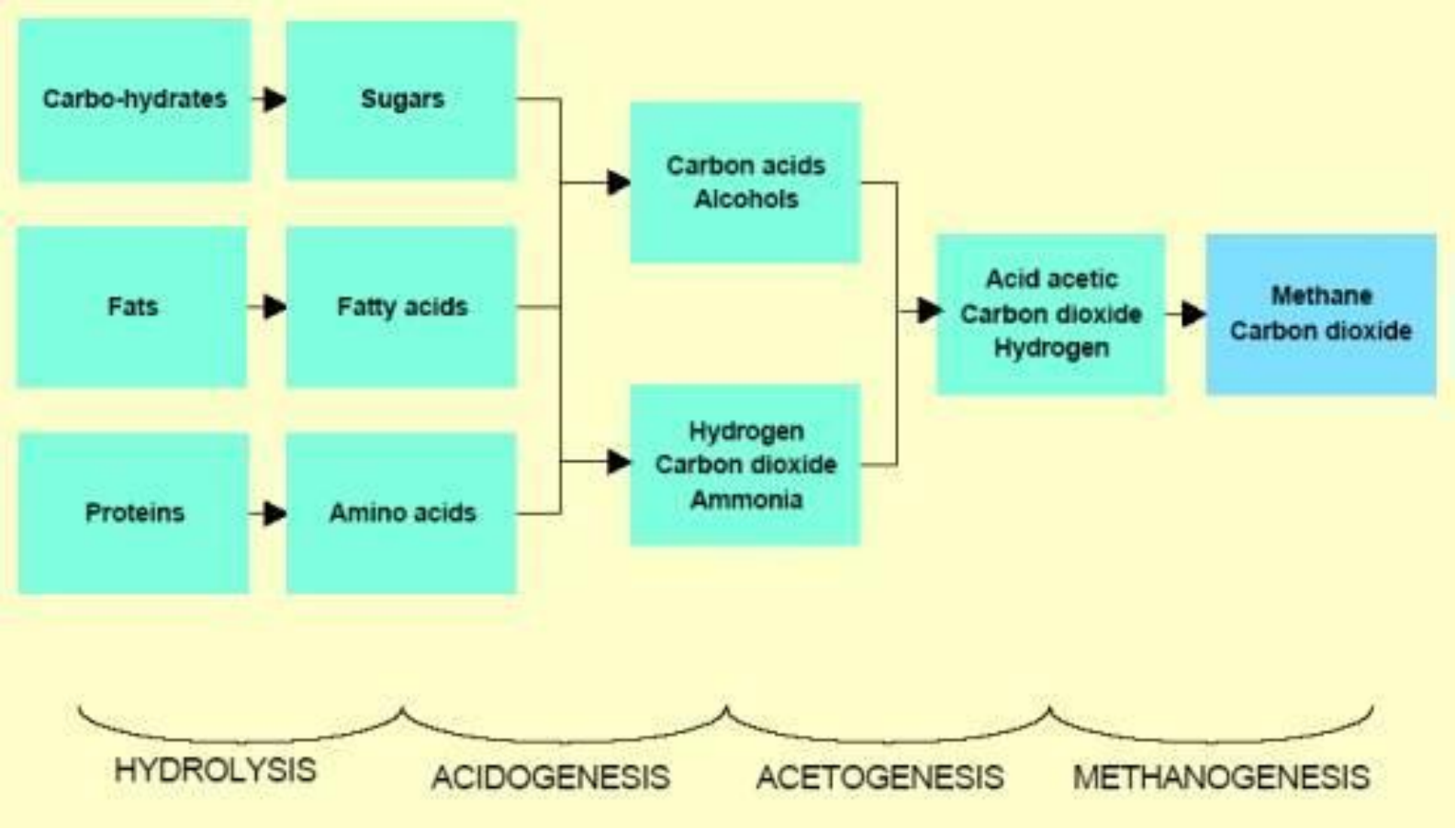
Anaerobic Digestion 101



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Clean Energy Policy

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Policies Driving Clean Energy

- Federal Policies
  - Tax Incentive Policy
  - EPA Regulations
  - Clean Energy Mandate
- State and Utility Policies
  - Clean Energy Mandates
  - Tax Incentive Policy
  - Rebates and Standard Offers

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Tax Incentive Policy

- Utility Scale Incentives
  - Investment Tax Credit and Grant
  - Production Tax Credit

EPA Regulations and Permitting Actions

- Clean Air Transport Rule
  - Reduction in annual SO_2 and NO_x emissions
  - Intended to improve air quality of downwind states
- Tailoring Rule
- Coal Combustion Waste Requirements
- Permitting requirements related to the mining of coal

Federal Drivers

National Clean Energy Portfolio Standards

- Requires utilities to meet a portion of electricity demand with clean energy resources including renewables and energy efficiency measures.

- Past Legislation
  - American Clean Energy and Security Act
  - Renewable Electricity Promotion Act of 2010

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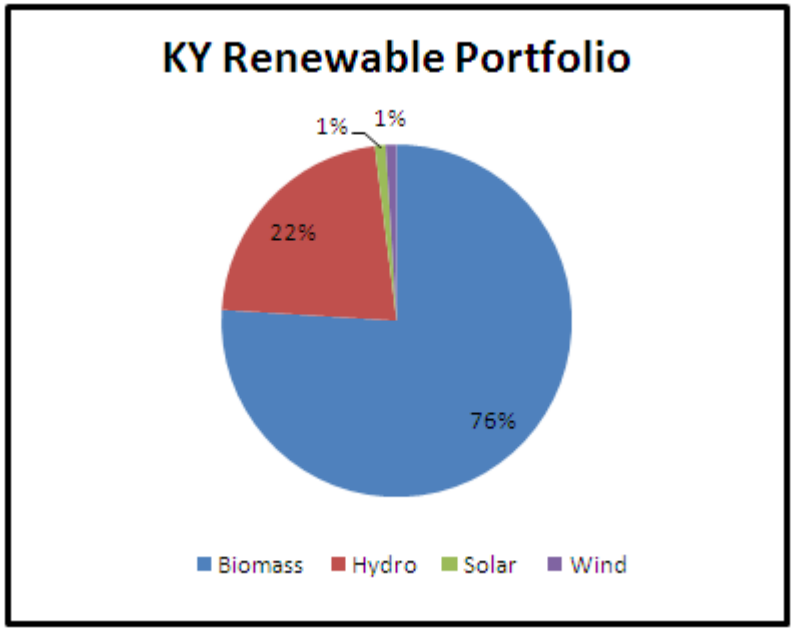
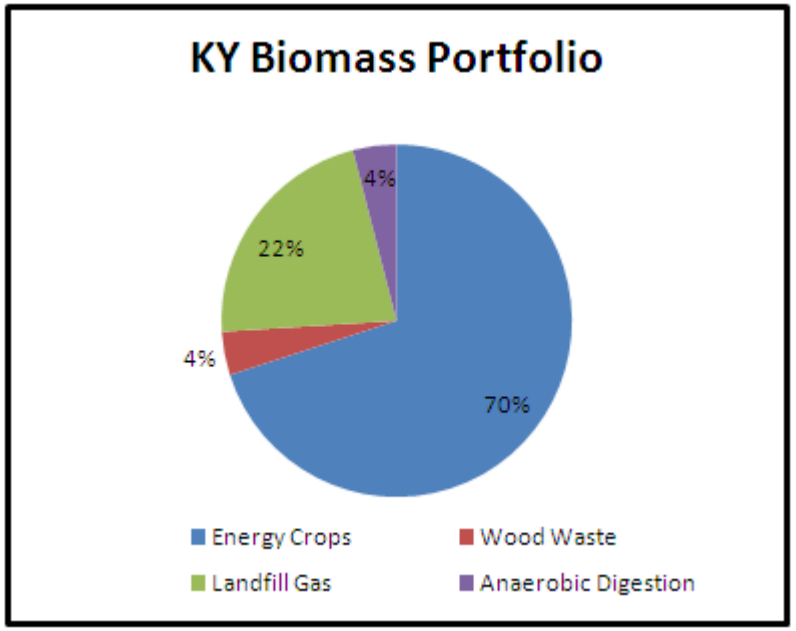
A KY Clean Energy Portfolio





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Resource Requirements

Resource	(mWh)	(mW)	Tons	Additional Requirements	Relative to 2008 Assumed Physical Resources
Dairy Cattle Manure	117075	20	1028700	67,500 Cattle	75% of All Kentucky Dairy Cattle
Poultry - Broiler Litter	125033	14	452	24,888,328 Birds	50% of All Kentucky Broilers
Poultry – Layer Litter	38866	5	42	2,292,267 Birds	50% of All Kentucky Layers
Poultry – Pullet Litter	4512	0.5	16	898,266 Birds	50% of All Kentucky Pullets
Hog Manure	15445	2	141049	141,049 Birds	50% of All Kentucky Hogs

Manure resource needed to produce 42 MW of power
KY has 16,000 MW of generation capacity.

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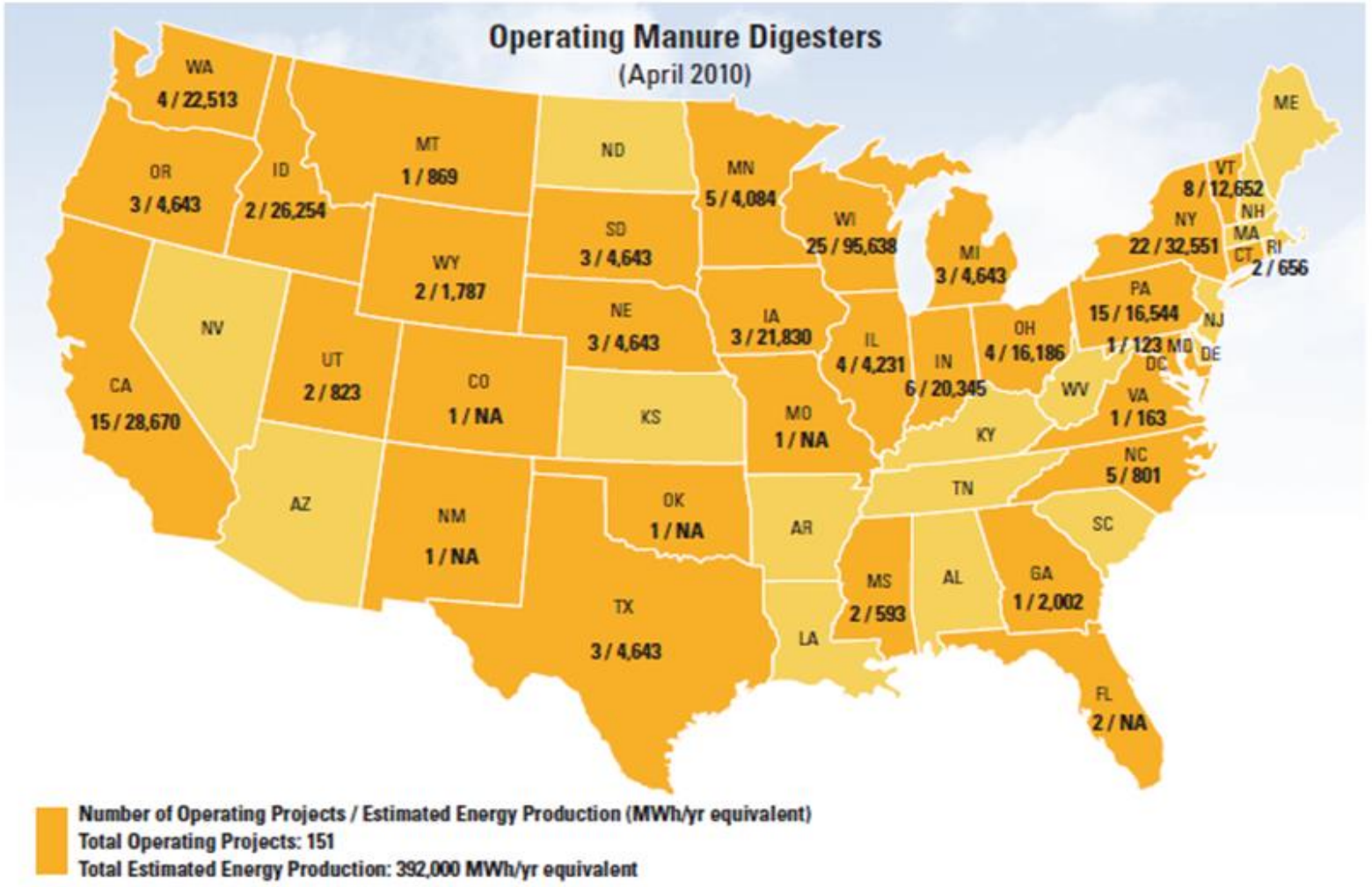
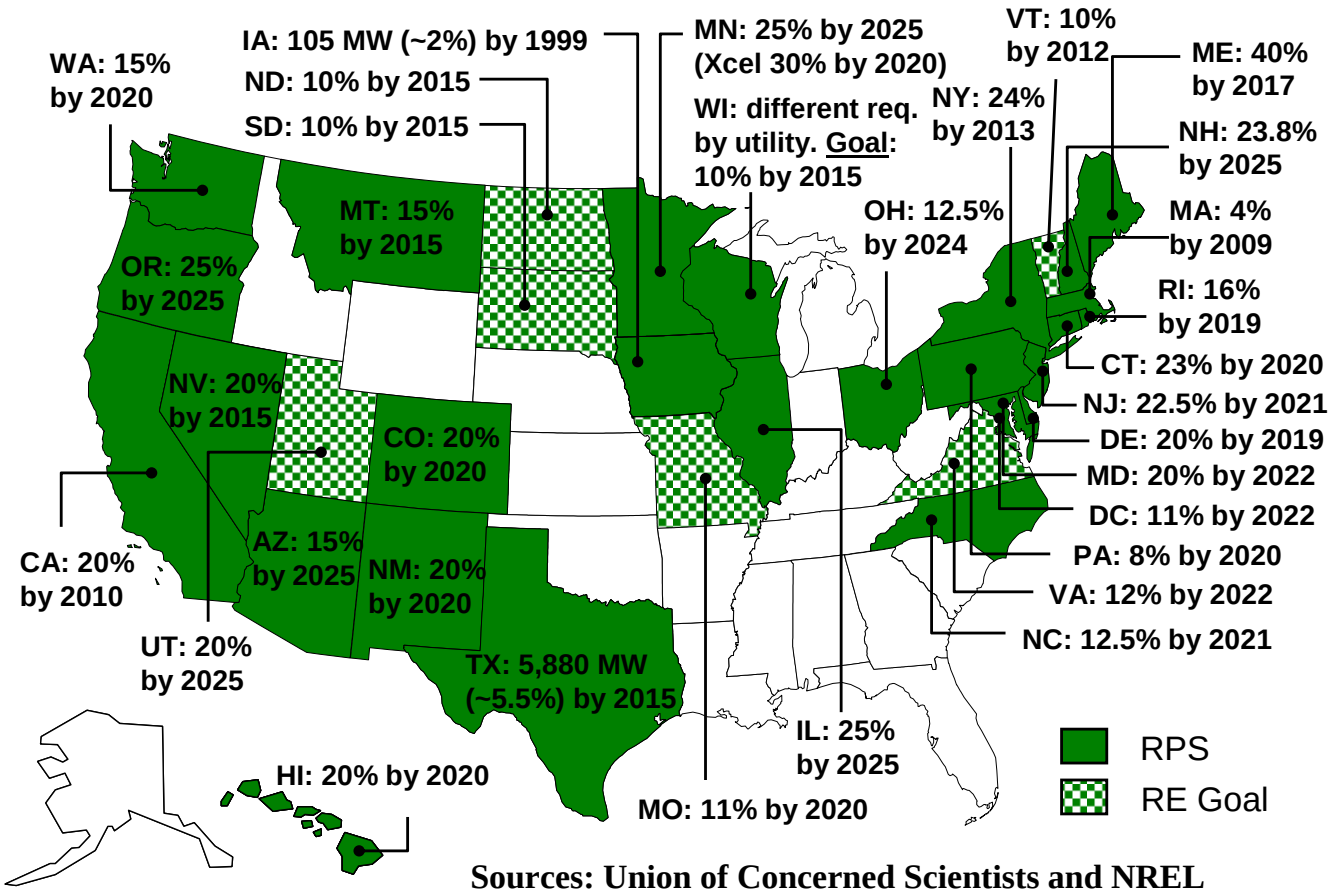
Animal Waste to Energy



Renewable Portfolio Standards



Sources: Union of Concerned Scientists and NREL

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Financial Incentives

- Utility Scale Tax Incentives
  - Renewable Energy Facility
  - Sales Tax Exemption
- Utility incentives for energy efficiency
- Tennessee Valley Authority
  - Generation Partners
  - Standard Offer

TVA Service Region

Projects

West Lafayette, IN WWTP

- Serves about 70,000 people
- Digester tanks are original
- Project Specs
  - Combined Heat and Power System
  - Water loop captures waste heat to heat the tanks
  - 2- 65 KW generating units produce electricity
- Biogas generated by the original tanks at one point heated the tanks; the system failed and biogas was flared.

West Lafayette, IN WWTP Financials

- Total project cost: $8.5 million
- Total CHP cost: $1.2 million
- CHP investment saves the rate payers electricity, natural gas and grease tipping fee costs
- Utility pays 6.5-7 ¢/kwh. Demand charges increase the cost to 13 ¢/kwh
- Utility expects a payback period of 7.5-10 years
- Contact: Dave Henderson
  dhenderson@westlafayette.in.gov

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Bel Cheese, Leitchfield, KY

- Examining anaerobic digestion to process whey
- Digesters will minimize effluent and produce enough gas to fuel boilers
- Excess gas will be produced
- Anaerobic Digestion as a solution to waste management

Technical Assistance

Southeast Combined Heat and Power Application Center

www.chpcenterse.org/home.html

- Viability screening tools
- Initial Feasibility Assessment
- Site Assessment Visits
- Assistance in Project Justification

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Questions?

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