2007 Indiana Renewable Resources Study

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2007 Renewable Resources Study

• Renewable energy trends
• Barriers and incentives
• Individual renewable resources
  – wind
  – energy crops
  – organic waste
  – solar/photovoltaics
  – fuel cells
  – hydropower
Data for geothermal, wind and solar was not available before 1960, 1982 and 1983 respectively.  
Source: EIA
2006 U.S. Total Energy Consumption by Energy Source

Total = 99.960 Quadrillion Btu

- Natural Gas 23%
- Coal 23%
- Nuclear Energy 8%
- Renewable Energy 7%
- Petroleum 40%

Total = 6.844 Quadrillion Btu

- Solar 1%
- Biomass 48%
- Geothermal 5%
- Hydroelectric 42%
- Wind 4%

Source: EIA
2006 U.S. Electricity Generation by Energy Source

- Coal: 49%
- Natural Gas: 20%
- Petroleum: 2%
- Nuclear: 19%
- Renewable: 10%
- Other: 1%
- Hydroelectric: 76%
- Conventional Hydroelectric: 76%
- Wood/Wood Waste: 10%
- MSW/Landfill Gas: 4%
- Geothermal: 4%
- Solar/PV: 0.1%
- Wind: 7%

Source: EIA
Renewables Share of U.S. Electricity

Data for 2006 is preliminary.  Source: EIA
2004 Indiana Total Energy Consumption by Energy Source

2004 Total Indiana Consumption = 2.946 Quadrillion Btu

- Coal: 55%
- Natural gas: 18%
- Petroleum: 30%
- Renewable: 1.5%
- Hydroelectric: 10%
- Biomass: 90%
- Net interstate electricity flow and losses: -5%
- Other: 0.1%

Source: EIA
Renewables Share of Indiana Electricity

Source: EIA
Barriers to Renewables

• Major barrier is cost
  – most renewable technologies have high capital costs
  – Indiana had the 5th lowest electricity rates in the country in 2004, according to the Energy Information Administration (5.58 cents/kWh vs. national average 7.47 cents/kWh)

• Limited resources are also a problem for some technologies
  – solar/photovoltaics, hydropower, wind
Incentives for Renewables

• Federal
  – tax credits and exemptions (production tax credit)
  – grant programs

• State
  – net metering rule
  – grant programs
  – tax credits
  – emissions credits

• Utilities
  – green pricing programs
Wind Resources
Growth in U.S. Wind Power

Source: AWEA/GEC database.
Wind Power Capacity
Indiana Wind Power

- Most recent wind map shows some potential areas in the northern half of the state
- 330 MW of wind power expected on line in 2007 in Benton County
  - Benton County Wind Farm (130 MW)
  - Fowler Ridge Wind Farm (200 MW)
Energy Crops

• Transportation fuels
  – ethanol
  – soy diesel

• Other possibilities
  – fast growing hardwood trees (hybrid poplar/willow)
  – grasses (switchgrass)

• Barriers to be overcome
  – other high-value uses for the land
  – harvesting and transportation costs
  – price of competing fossil fuels
Organic Waste Biomass

• This resource is the single largest source of renewable energy in Indiana
  – primarily due to the use of wood waste
• It is the second largest source of renewable electricity generation in the state
  – landfill gas
  – municipal solid waste
  – animal waste biogas
  – wastewater treatment
Solar Energy / Photovoltaics

Source: DOE
Fuel Cells

• Currently available fuel cells cost about $3000/kW
• This is roughly twice the cost of a large coal plant and about 10 times the cost of a natural gas-fired combustion turbine
• There is a large amount of research being performed to solve some of the problems
  – cost
  – efficiency
  – hydrogen production
  – hydrogen storage
Hydroelectric Power

• Indiana has about 60 MW of hydroelectric generating capacity.
  – mostly run-of-the-river (no dam)
  – largest source of renewable electricity

• The U.S. Department of Energy identified another 66 MW of potential hydropower at existing dams
  – Only about 42 MW was considered viable (spread out over 27 sites)
2007 Electricity Forecast

• SUFG is working on the 2007 electricity forecast
  – consumption
  – prices
  – resource requirements
• Expected to be released this fall
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