



Alternative Energy Options

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Hydro Electric Generation





Utility Scale Wind Farm





Customer Owned Rural Wind

- Interest high (# information requests, site assessments)
- Three sub markets
 - 1-20 kW: Residential (small)
 - >20 kW – 100 kW: Business & Farms
 - >100 kW – 15 MW: Community Projects
- Many steps to installation
 - Need good wind resource (>11 mph at 110 feet)
 - Town & county zoning problems
 - Small industry
 - Need federal incentives and attractive buyback rates
- Payback: 20 kW> depends on buyback and incentives

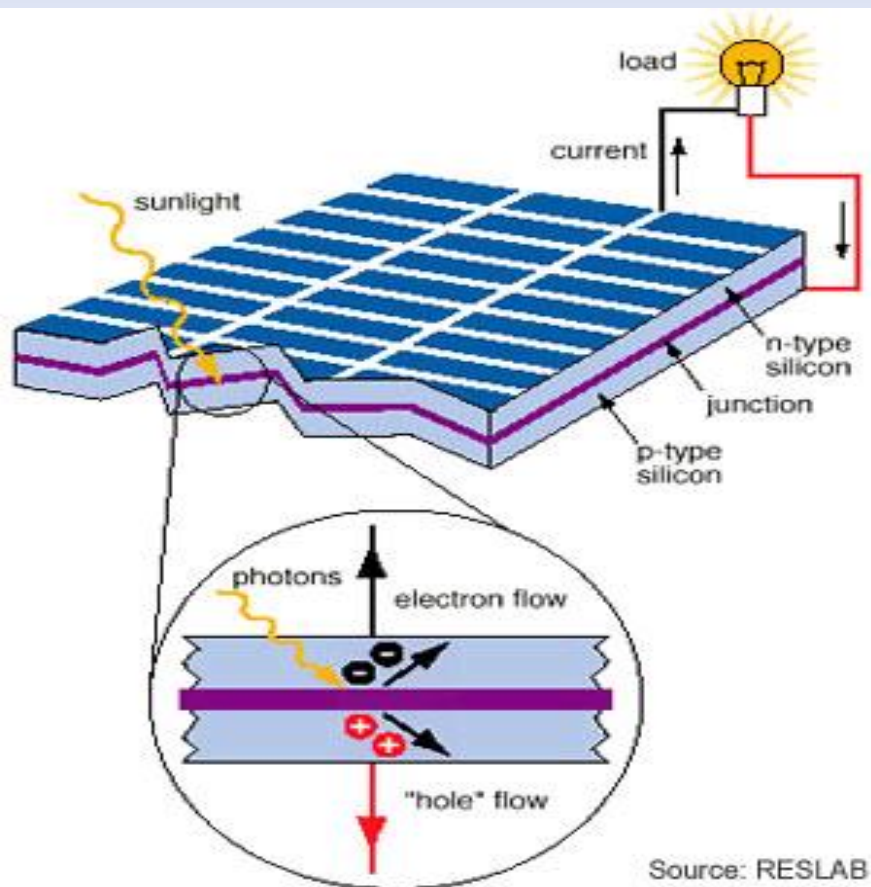


Small Wind Economics

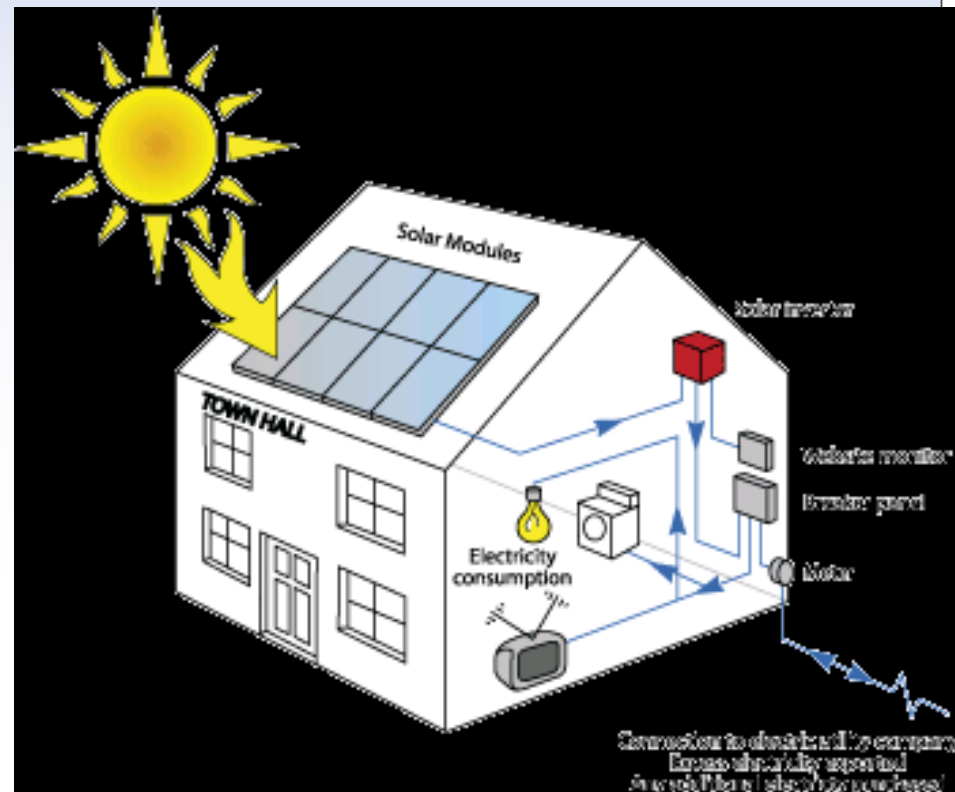
- 10 kW system on 120 foot tower
- Installed cost is ~\$52,200
- At 12 mph, system will produce 10,800 kWh/yr
- Payback: ~20 years
- A business can take accelerated depreciation, reduces payback to 16 years, no utility incentive yet in Iowa



Solar Electric (PV)

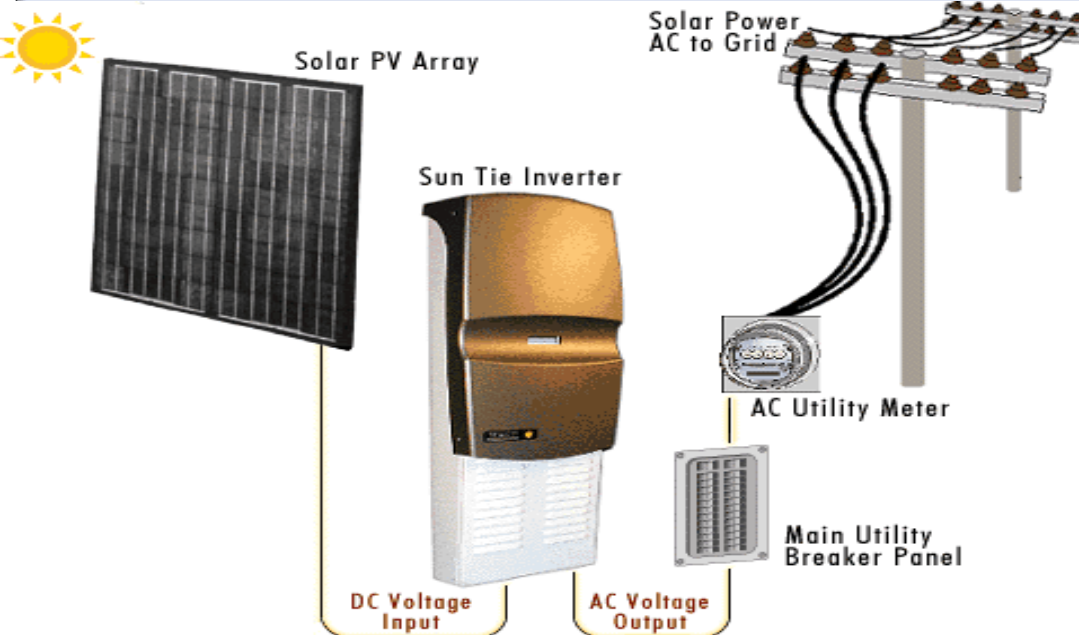


Source: RESLAB





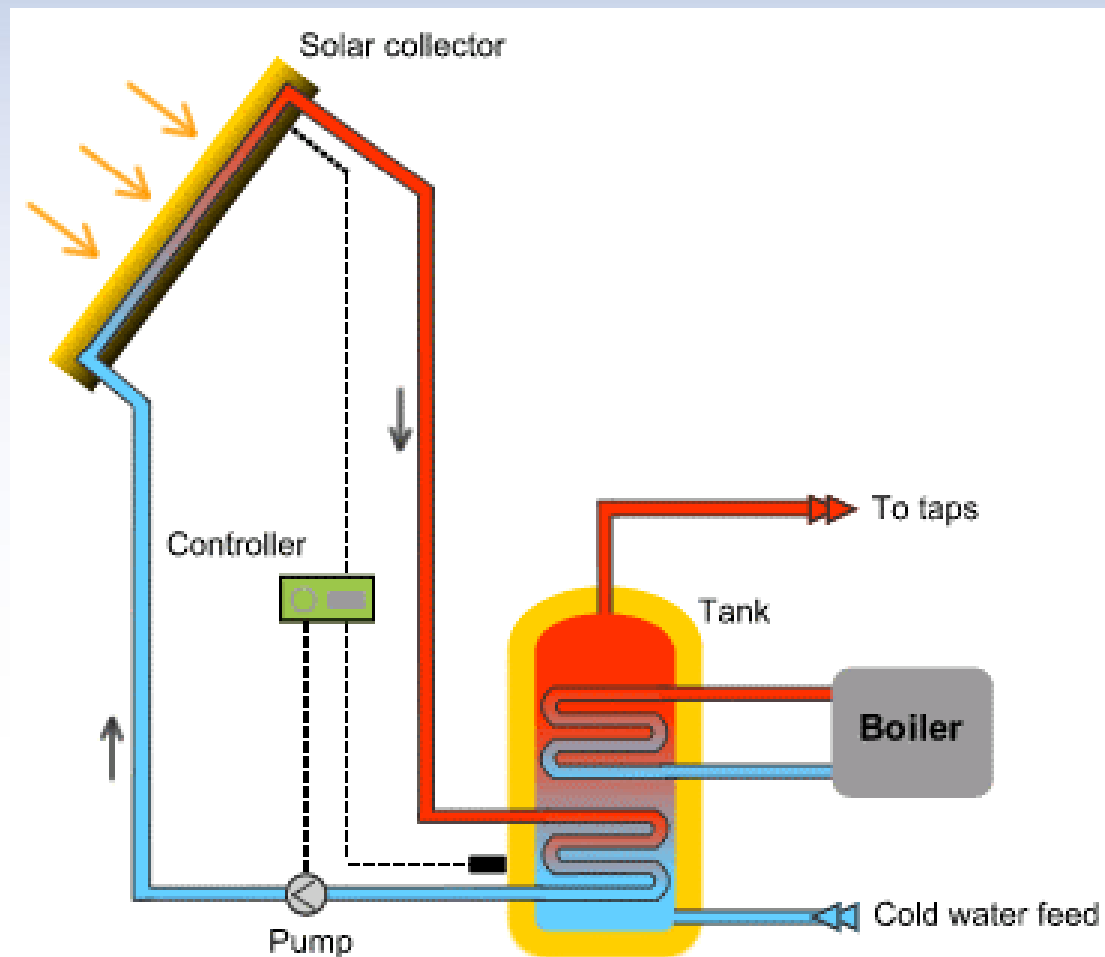
Residential PV Economics (2 KW) roof mounted, grid connected – no batteries



- Installed cost: ~\$16,000
 - No Iowa incentive as yet
 - Federal Tax Credit: \$2,000
- Final cost to customer: \$10,400
- Delivers: ~2,400 kWh/year
- Payback: ~18 years
- Most components will last 40-50 years



Solar Water Heating





Residential Solar Hot Water



- Less expensive than PV
- Delivers ~ three times the energy per unit area than PV
- 30% federal tax credit.
- No utility incentive yet in Iowa .
- Equipment certified. Installer certification starting
- Potential for large growth, especially as natural gas costs increase

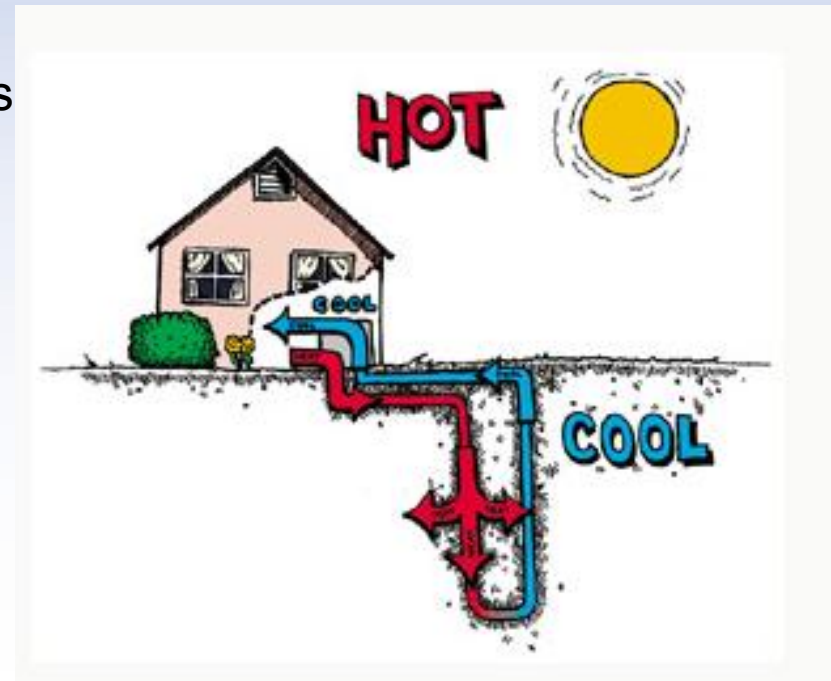




GeoThermal: Renewable Hybrid

- 1 unit of electricity + 3 units of earth's energy = 4 units to occupied space
- Bridges efficiency & RE sources
- Reduces electric demand
- Demand & RE coincidental
- **24/7/365** Availability
- Iowa offers a \$300 per ton rebate for qualified installations

Reduces GHG Emissions!





Typical Geothermal Operating Cost Comparisons





Bio Gas

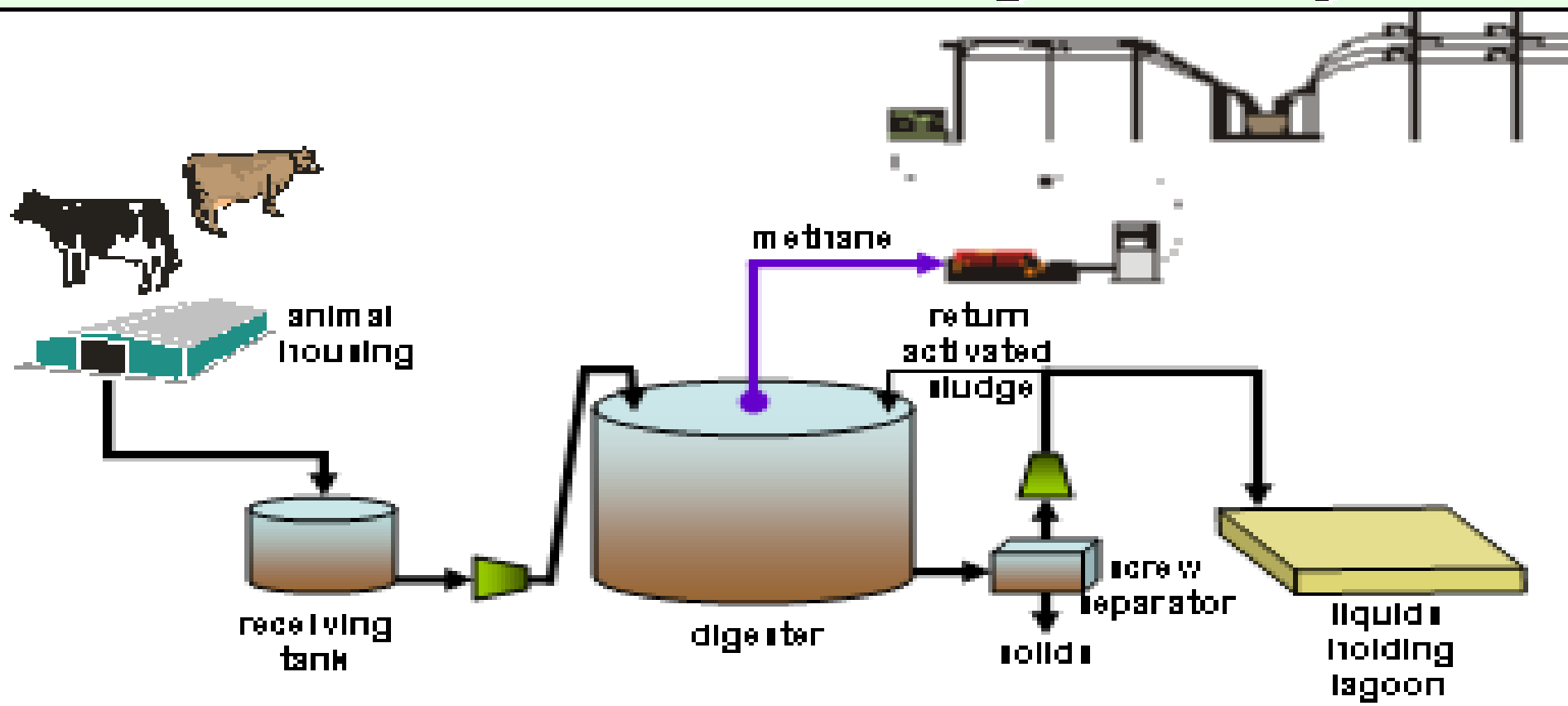
Anaerobic Digester





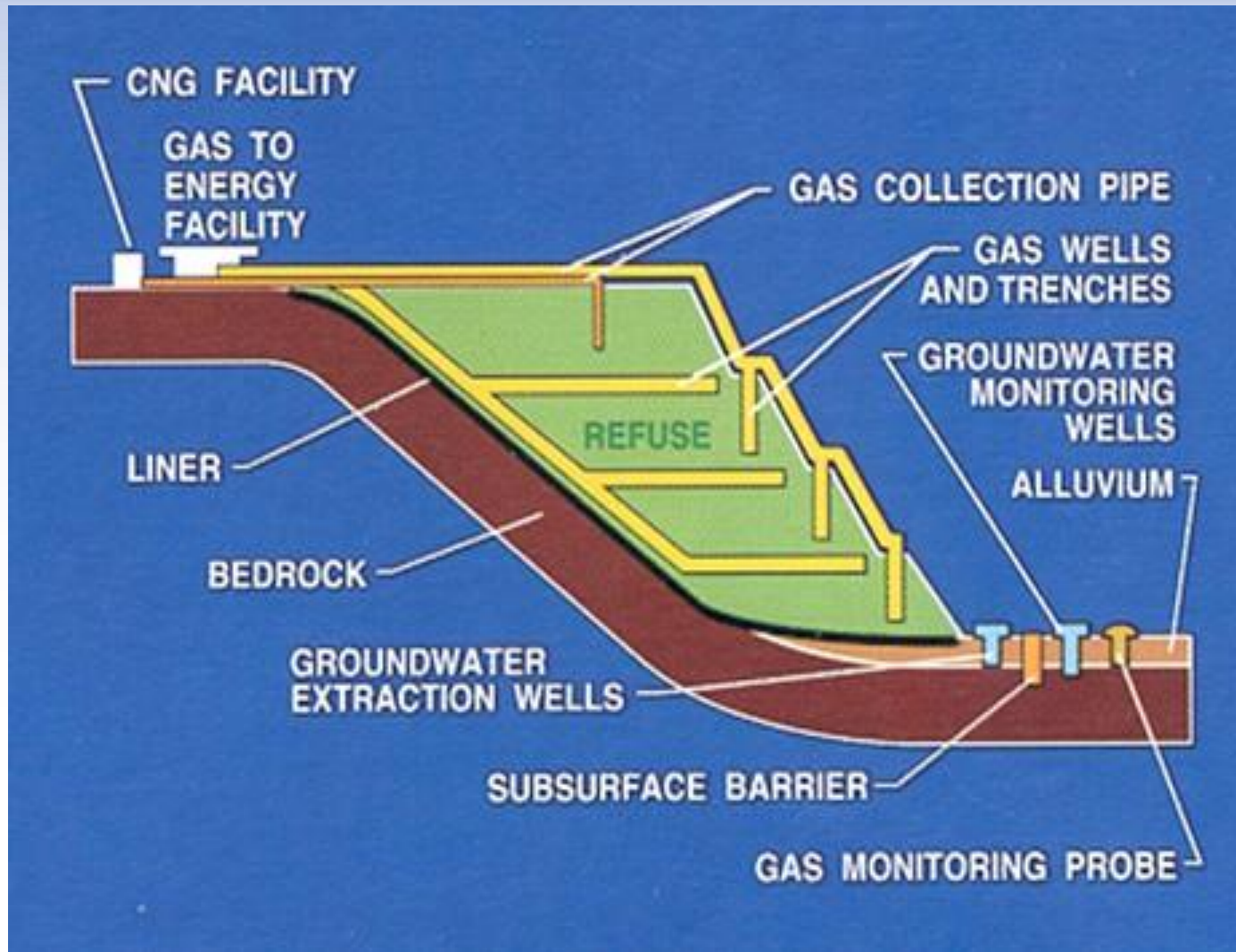
Biogas Digesters

Flows in an Anaerobic Digester System





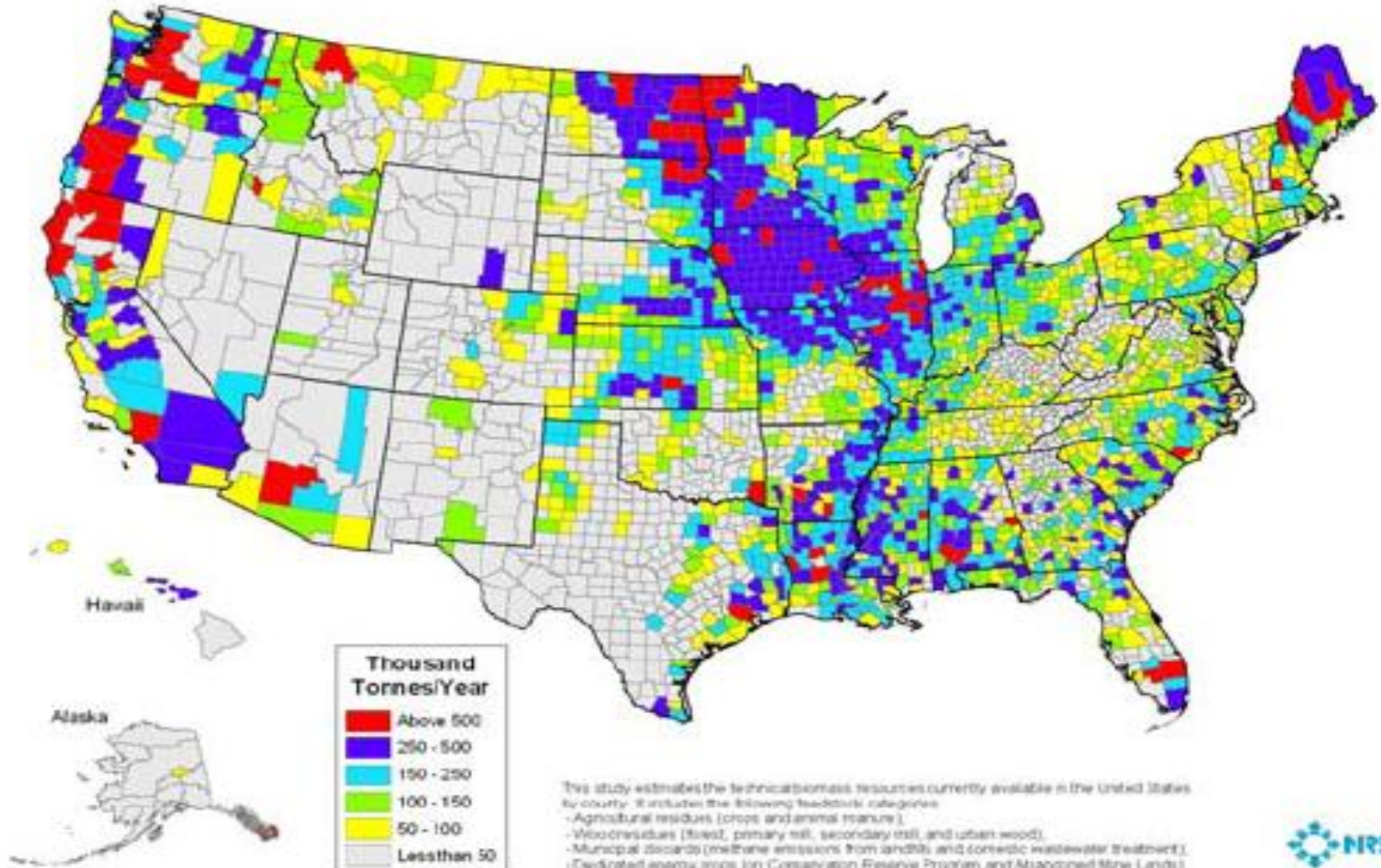
Landfill Gas





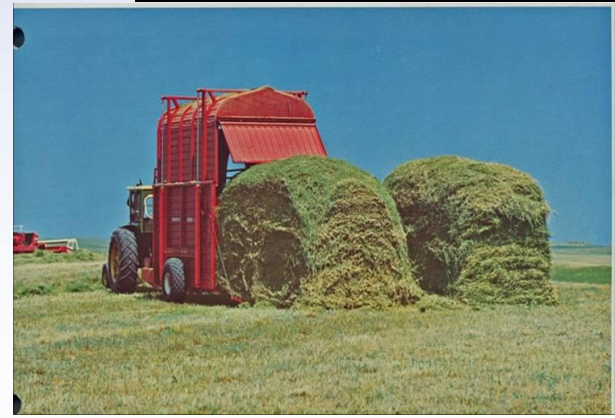
We're In The Biomass Belt

Biomass Resources Available in the United States





Biomass Fuel Options





with this

Replacing this





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