

Animal Waste Distributed Gen, Renewable Energy Portfolio, Interconnection and Net Metering

Biomass South 2008
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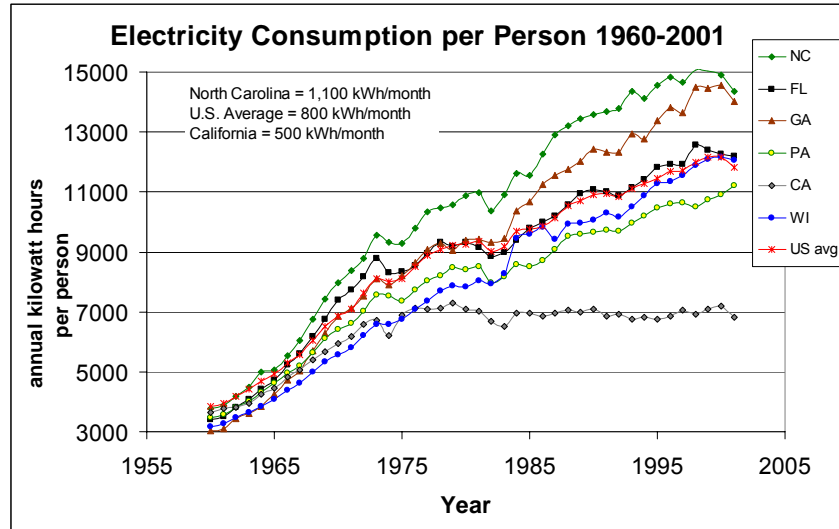
Why do we need a Renewable Energy and Efficiency Portfolio Standard in the SE?



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NC, GA and FL- three of most inefficient energy economies in the U.S.



Source: U.S. Department of Energy, Energy Information Administration, 2006

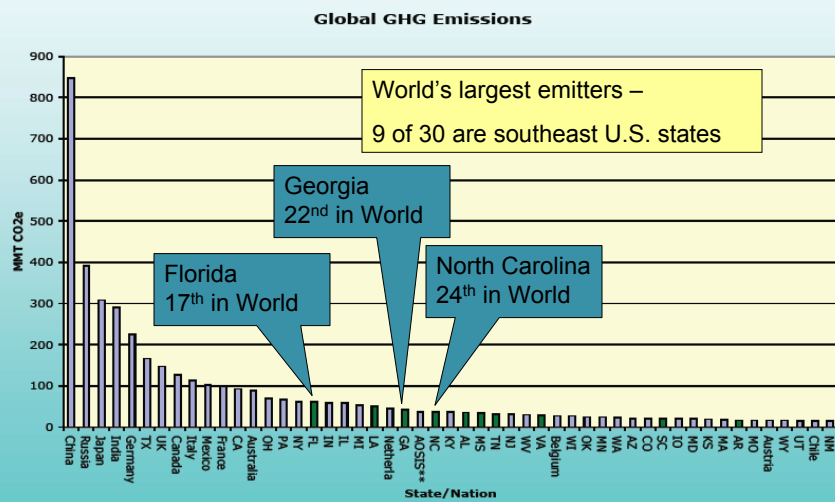


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World's 50 largest GHG producers

States = 34 of top 50 Global Emitters



Source: Pew Climate Center presentation to NC Climate Change Commission, 2006

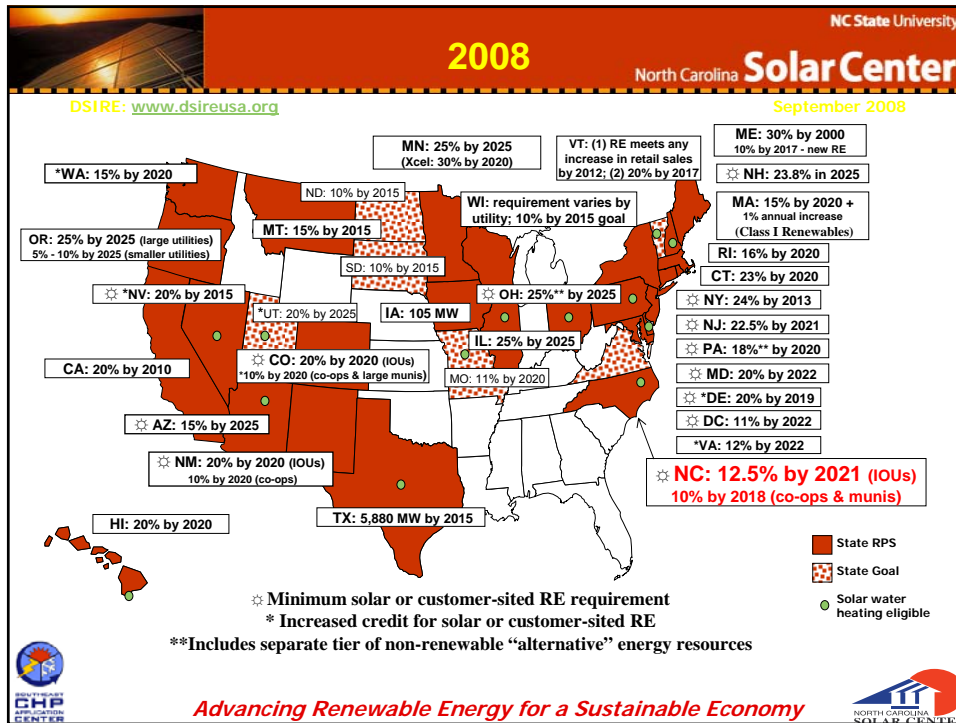
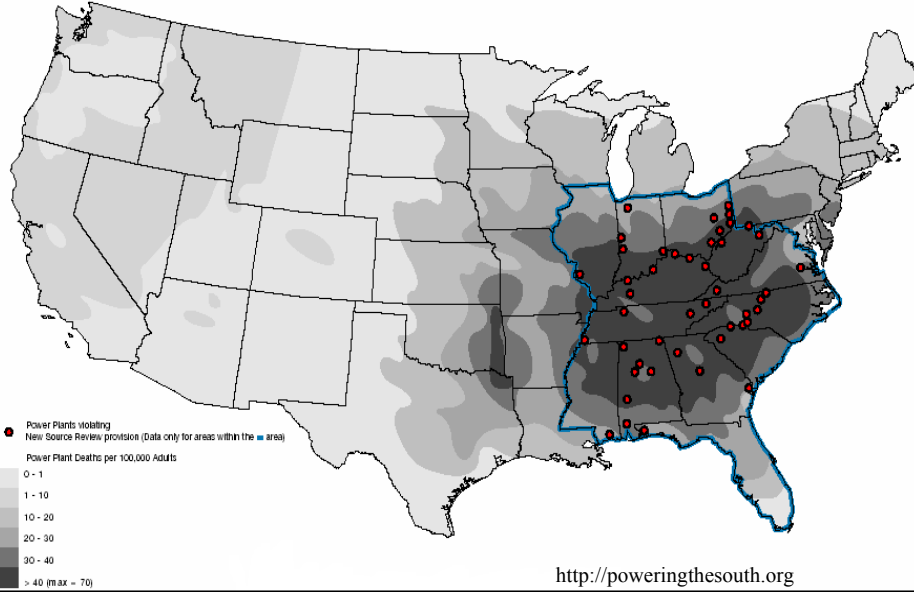


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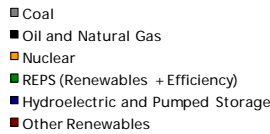
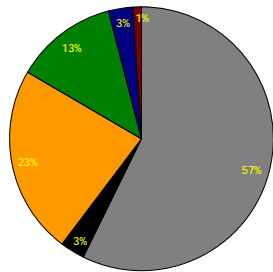
Yin & Yang of cheap power in SE

Risk of dying from coal fired power plant particulates



How will NC Utility Portfolio change our energy future?

2021 Resource Mix



- The least-cost portfolio
- Ratepayer cost risk is reduced
- All customer classes benefit and all utility suppliers participate
- Barriers are reduced for business ventures in a clean energy market



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NCSEA – Ivan Urlaub



Drivers for Renewable Energy & Energy Efficiency in SE

- **Agricultural community** is politically strong and owns renewable energy feedstock
- **Economic development** opportunities for rural regions that need jobs
- **Air quality and climate change** issues make fossil fuel plants less likely
- **Energy security and independence** perceived as critical need for growth in the region



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Renewable Energy and Energy Efficiency Portfolio Standard

Eligible Renewable/Other Technologies: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Geothermal Electric, Hydrogen, *Anaerobic Digestion*, Small Hydroelectric, Tidal Energy, Wave Energy

Applicable Sectors: Municipal Utility, Investor-Owned Utility, Rural Electric Cooperative

Standard: 12.5% of 2020 retail sales by 2021 for investor-owned utilities; 10% of 2017 retail sales by 2018 for electric cooperatives and municipal utilities

Technology Minimum: 0.2% solar electricity and thermal energy by 2018; *0.2% swine waste by 2018; 900,000 MWh of poultry waste by 2014*



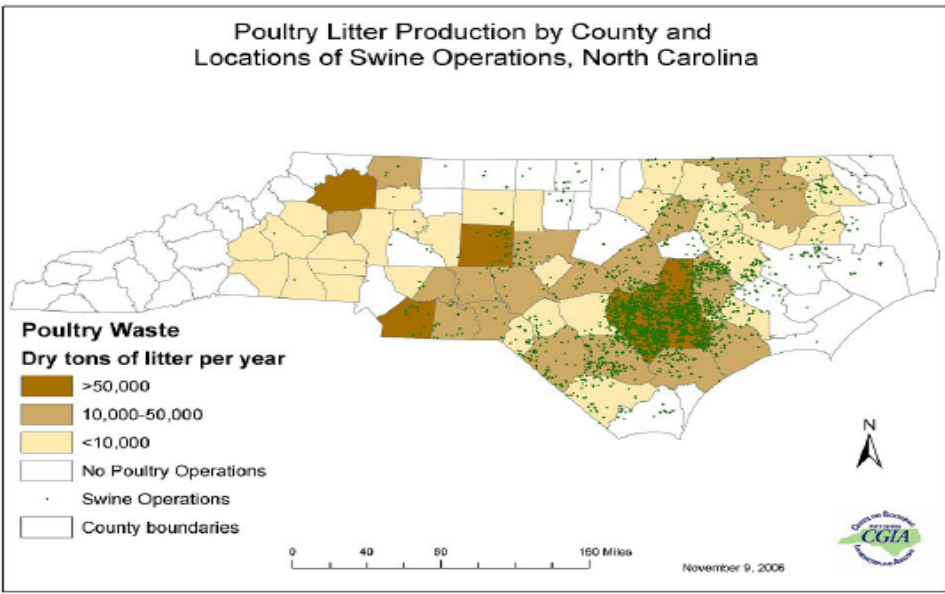
www.dsireusa.org

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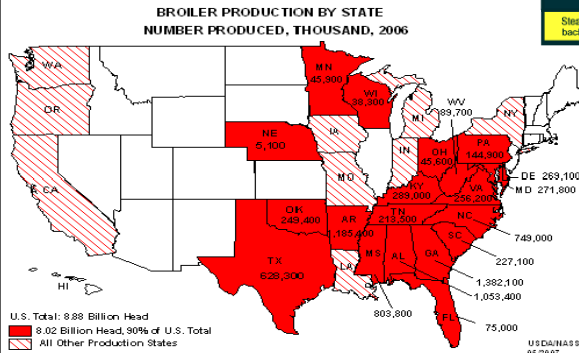
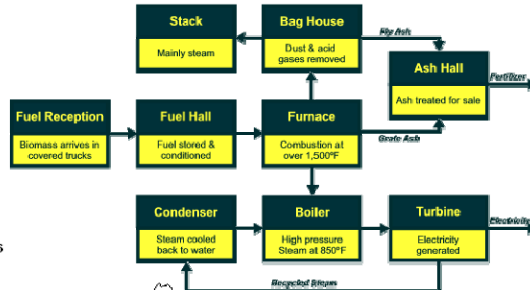


La Capra Study recommended 93MWyr swine AD and 102MWyr poultry waste

Poultry Litter Production by County and Locations of Swine Operations, North Carolina



Poultry litter electricity & fertilizer



Anaerobic Digester fuels CHP



- Nutrients reduction
- Biogas production
 - 16 MM BTU/day

- Installed 120kW
- Radiator and Exhaust heat exchangers
- 10,000 gallons hot water storage
- Assume 50 kWe generator



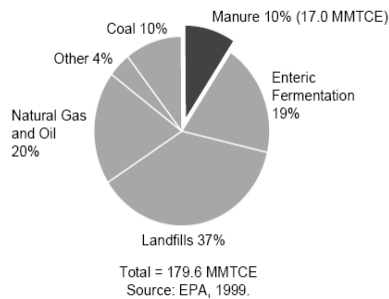
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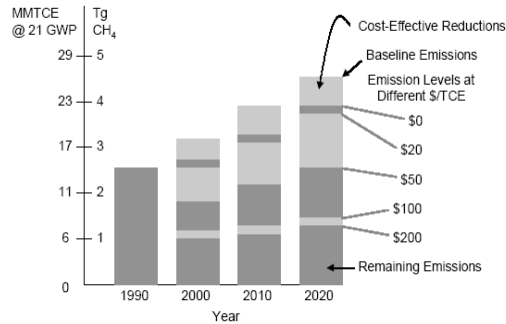
Capturing and combusting manure methane would significantly reduce GHG loading

Exhibit 5-1: U.S. Methane Emissions from Livestock Manure Management (MMTCE)

Percent of Methane Emissions in 1997



Emission Estimates and Reductions



U.S. Environmental Protection Agency - September 1999

Livestock Manure Management 5-1



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Good Interconnection and Net Metering Policies as well as Regulations are necessary to encourage Animal Waste Distributed Generation

See Connecting To the Grid

<http://www.irecusa.org>

http://www.epa.gov/chp/state-policy/interconnection_fs.html



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Effective Interconnection Policy



- Sets fair fees that are proportional to project size
- Ensure policies are transparent, uniform, detailed and public
- Allows interconnected net-metered systems 2-MW and larger
- Adopt plug-and-play rules for residential and small commercial scale systems and expedited procedures for other systems
- Process applications quickly, using standardized and simplified forms
- Prohibit restrictive requirements i.e. additional insurance requirements, redundant external disconnect switch

INTERCONNECTION

STATE	Grade
IREC Model	A
New Jersey	B
Arizona	B
California	C
Ohio	C
Texas	C
New York	C
Colorado	C
Otago*	C
Massachusetts	C
Georgia	C
New Mexico*	C
Vermont	C
Minnesota	C
Rhode Island	D
Wisconsin	D
West Virginia	D
Arkansas	D
New Hampshire	D
Virginia	D
Iowa	D
Maryland*	D
Montana	D
Michigan	D
Indiana	D
Pennsylvania	D
Connecticut	D
North Carolina	F
D.C.	F
Wyoming	F
Louisiana	F
Delaware	F
Hawaii	F
Utah	F
Washington	F
Missouri	F



http://www.newenergychoices.org/uploads/FreeingTheGrid2007_report.pdf
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Aspects of Utility Interconnection Guiding Procedures & Standards

- Procedures
 - FERC SGIP (Small Generator Interconnection Procedures) Order 2006 www.ferc.gov
- Standards
 - IEEE 1547-2003 (& substandards) – grid interaction with respect to:
 - Normal conditions: Voltage, load flow, flicker
 - Abnormal conditions: Fault detection and anti-islanding



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Effective Net Metering Policy



- Provides a billing arrangement where 1-kWh generated by the customer has the exact same value as 1-kWh consumed by the customer
- Allow rollover of excess electricity
- Reduces unnecessary red tape and special fees i.e. standby charges, riders and extra metering cost
- Customer owns Renewable Energy Credits and Carbon Credits from their generation
- Ensures customer receive credit at the utility's full retail rate
- Allow systems over 1MW to net meter
- Does not place restrictive limit on total net metering program capacity

STATE	Rating
AL	A
AK	A
AR	A
CA	A
CO	A
CT	A
DC	A
DE	A
FL	A
GA	A
HI	A
IA	A
ID	A
IL	A
IN	A
KS	A
KY	A
LA	A
MA	A
MD	A
ME	A
MI	A
MN	A
MO	A
MS	A
MT	A
NC	A
ND	A
NH	A
NJ	A
NM	A
NV	A
OH	A
OK	A
OR	A
PA	A
RI	A
SC	A
SD	A
TN	A
TX	A
UT	A
VA	A
VT	A
WA	A
WI	A
WV	A
WY	A
DC	F
GA	F
NC	F
WI	F



http://www.newenergychoices.org/uploads/FreeingTheGrid2007_report.pdf

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Typical Generation Agreements

<u>Generation Mode</u>	<u>Type Generation</u>	<u>Agreements*</u>	<u>Schedules and Riders</u>
"Sell All"	All types	CSP and Interconnection Agreements	CSP schedule
"Buy All/Sell All"	All Types	CSP, Interconnection, and Retail Agreements	CSP and applicable class retail schedule
"Sell Excess"	PV	Applicable CSP or PV, Interconnection, and Retail Agreements	Applicable CSP or PV schedule, applicable class retail schedule and standby rider
	Other	Applicable CSP, Interconnection, and Retail Agreements	CSP schedule, and applicable class retail schedule and standby rider
"No Sale"	All types	Retail and Interconnection Agreement	Applicable class retail schedule and standby rider



* In some cases the interconnection agreement will be a part of the CSP, PV, or Retail Agreement.

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Renewable Energy Tax Credit (Corporate)

Incentive Type: Corporate Tax Credit

Eligible Renewable/Other Technologies: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Renewable Transportation Fuels, Spent pulping liquor, Solar Pool Heating, Daylighting, Anaerobic Digestion, Ethanol, Methanol, Biodiesel

Applicable Sectors: Commercial, Industrial

Amount: 35%

Maximum Incentive :\$2.5 million per installation

Carryover Provisions: Credit is taken in five equal installments; allowable credit may not exceed 50% of a taxpayer's liability for the year, reduced by the sum of all other credits.

Eligible System Size: No stated size limits for systems. Maximum of 50 kWh battery storage capacity per kW of hydro generator capacity (DC rated); maximum of 35 kWh battery storage capacity per kW for other technologies

Equipment/Installation Requirements: System must be new and in compliance with all applicable performance and safety standards. Specific equipment and installation requirements vary by technology



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Just my opinion

- Obtain guidance upfront from experienced engineer and equipment provider, before settling on interconnection and metering rate choices.
- Select a short term contract for the utility rates, REC's and carbon credits.
- Don't over estimate AD production and understand seasonal variations in output to avoid oversized generator.
- Consider CANbus control for engine-generator and grid protection integration.
- Don't start and stop the equipment to chase the TOU rate, rate penalties will take your profit and internal condensation will ruin the engine.
- Figure out how to use the waste heat to qualify for CHP REC's.



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Do we have some questions?

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Benefits of REPS for NC

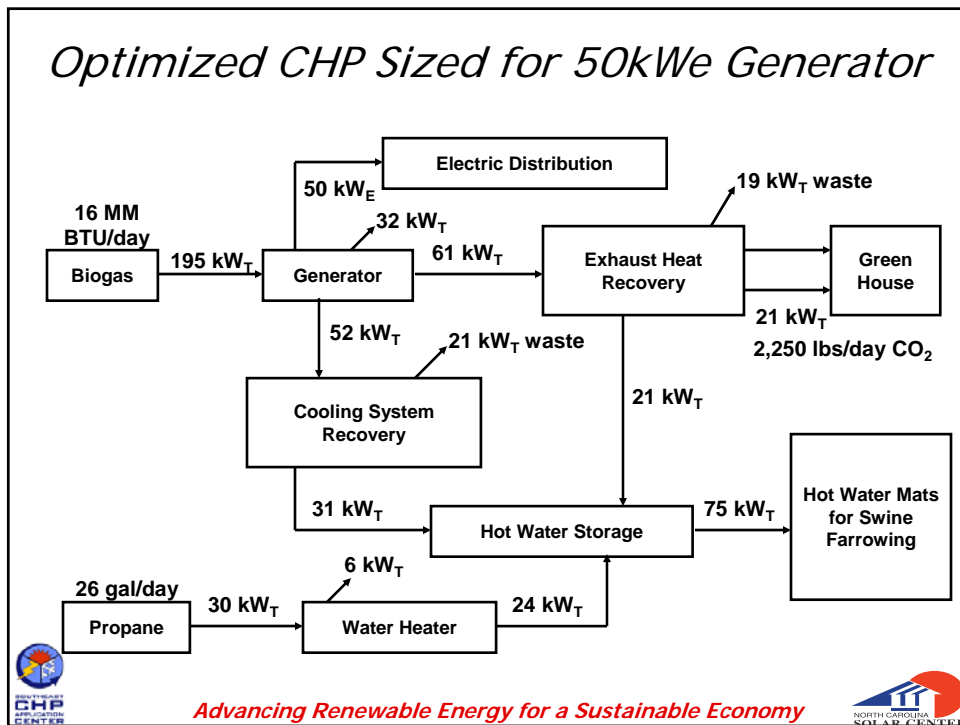
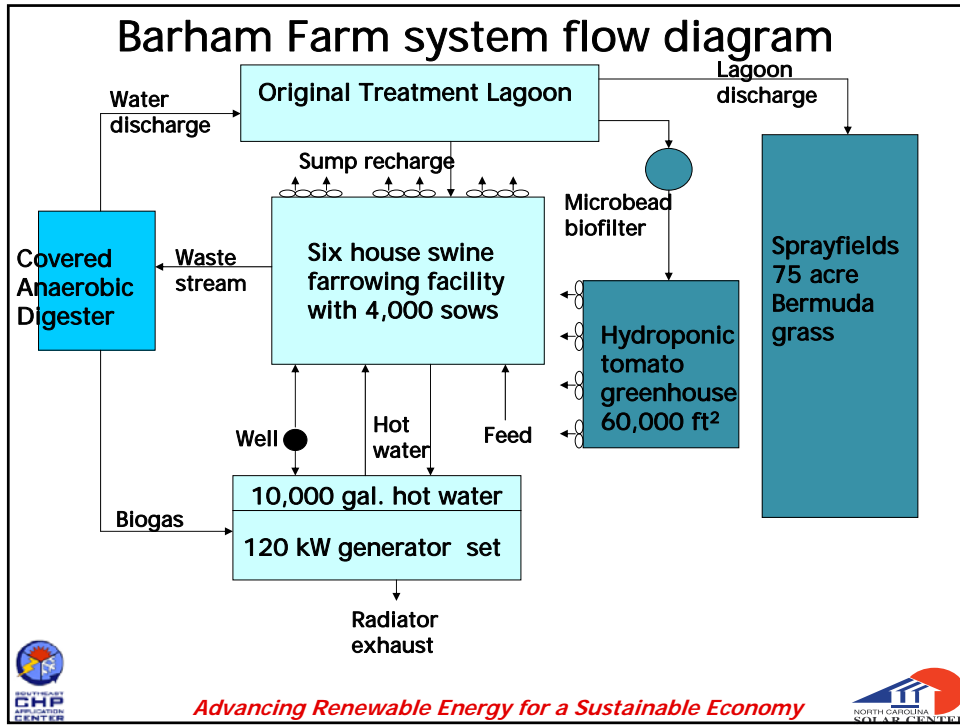
- Economic Benefits (net gain)
 - Rate impact estimated lower than new coal or nuclear
 - 2,000+ net jobs per year
 - \$1.5 billion more in wages through 2017
 - \$2.7 billion increase in Gross State Product
 - Keeps more \$'s circulating in NC economy
- Social Benefits
 - Creates local wealth statewide; close to the land
 - Strengthens rural counties
- Environmental Benefits
 - Helps resolve hog and poultry waste/pollution issues
 - Improves air and water quality
 - *Reduces NC's CO₂ emissions by 13+ million metric tons per year*



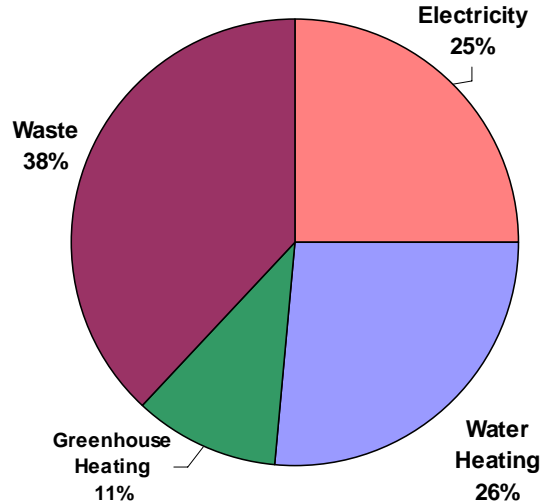
This slide from Legislative presentation on REPS, 2005 by
Urlaub – sources ASU Energy Center, La Capra/NCUC.

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Distribution of Fuel Usage



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Emissions savings of CHP

Environmental effect of not using grid supplied power for infrared heaters while producing 50kWe from biogas on-site

CO ₂	1,121,630 lbs/year
NO _x	2,505 lbs/year
SO _x	6,263 lbs/year
Particulate Matter	827 lbs/year

By using methane gas to create energy instead of releasing it into the atmosphere, overall greenhouse gas effects are reduced because methane has a GWP that is 23 times higher than carbon dioxide.



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Energy Savings with CHP

Electricity not used for infrared heat	+ \$36,140 per year
Electricity produced by generator	+ \$11,145 per year
Propane for Boiler	- \$ 9,330 per year
Total Savings	\$37,955 per year

System Cost	\$192,600
Simple Payback Time	~ 6 years



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