Methane Recovery & Digesters: Producer Considerations

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Methane Recovery from Livestock Operations Workshop

University of Nebraska Lincoln Extension

*Know how. Know **now.***

IANR

Drivers for Methane Recovery

- **Potential profit center**
  - Net income from energy sales
  - Energy cost savings
- **Improved neighbor relations**
  - Odor control
- **Part of vision / mission**
  - Green enterprise
  - Community collaboration

Barriers for Methane Recovery

- **Initial capital outlay**
  - Need for outside investment?
- **Extended payback period**
  - Uncertainty about economics
- **Operating a digester**
  - Management
  - Maintenance

Producers are Looking to Tip Scales in Their Favor

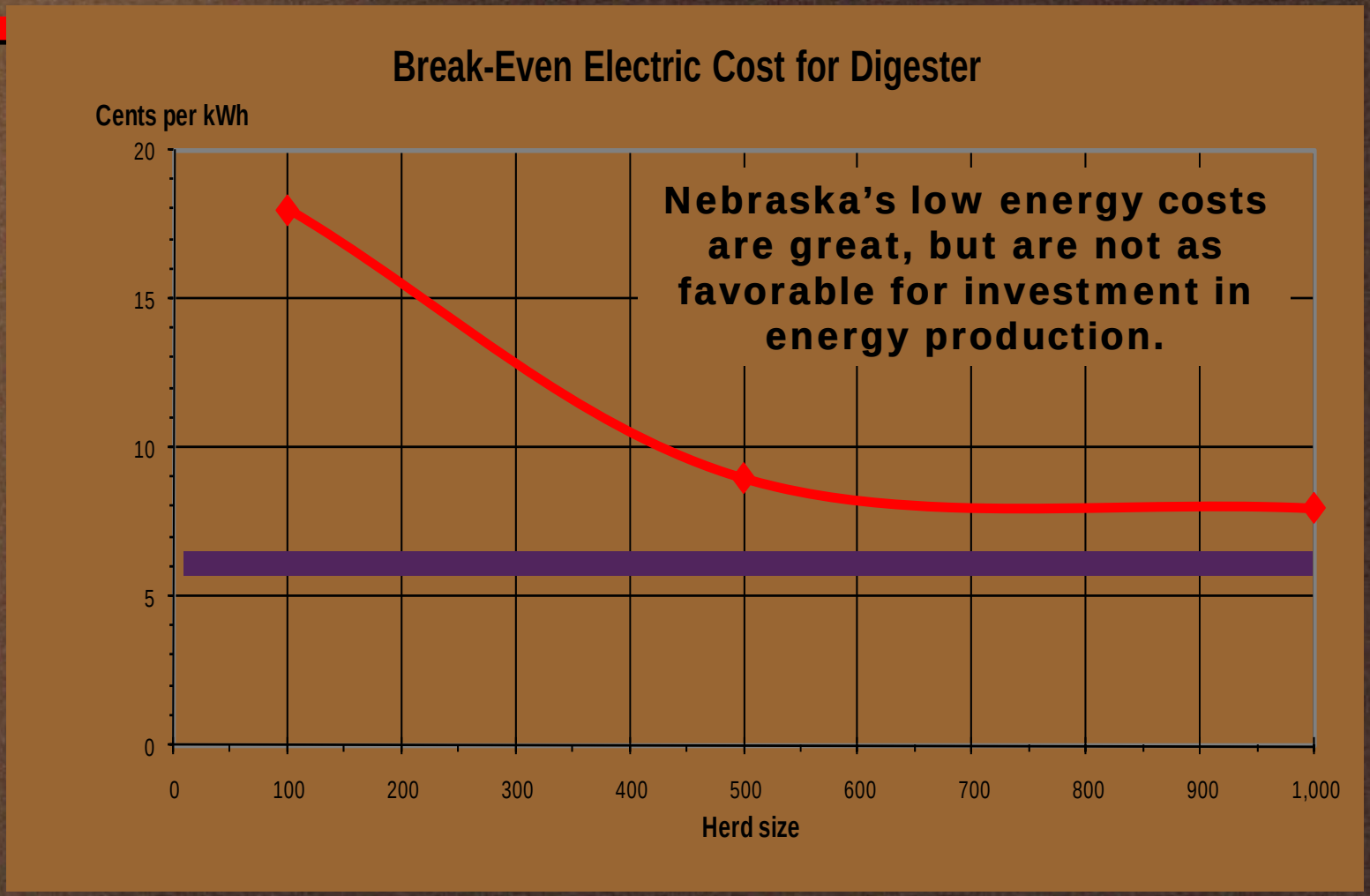
Economics of Methane Recovery: *Modeling Performed in 2003*

- **Inputs:**
  - Generated electricity offset on-farm use at 6 ¢/kWh
  - Construction costs from 1997
  - Various incentives
- **Outputs:**
  - Break-even electric price
  - Payback period
  - Return on investment

Incentive Programs

- **No-interest loan for capital purchases**
- **Cost-share program (or grant)**
  - 20% of the capital cost
- **Tax credits**
  - 1/10 ¢ per kWh generated
  - 1 ¢ per kWh generated
- **Sale of excess electricity to utility**
  - 2 ¢ per kWh (vs. 6-7 ¢ per kWh retail)
  - 4 ¢ per kWh

Base Break-Even Points (Dairies)



Summary of Economic Picture:
2003 Evaluation of Baseline Digester

	10,000-head swine finisher	1000-head dairy
Capital cost	$491,000	$296,000
Break-even price on electricity	8.5 ¢ / kWh	8 ¢ / kWh
Payback period	8.2 years	7.9 years
Return on investment	(-)	(-)

Assuming no incentives utilized

Summary of Economic Picture:
2003 Evaluation of Investment in Digester

Without any incentives (baseline)

- **Difficult to justify economically at the modeled sizes for swine or dairy**
  - Relatively long payback periods
  - Negative returns on investment
- **Ignored 'intangible costs/benefits'**

Summary of Economic Picture:
2003 Evaluation of Investment in Digester

With incentives

- **Any realistic incentive noticeably improved the economic picture**
  - Positive rates of returns at the largest modeled sizes (some even favorable)
  - Moderate – moderately long payback period
- **Ignored 'intangible costs/benefits'**

Methane Recovery via Digesters:
Prospective Benefits for Odor Control

Lessens acute problems during land application

Further reduction in odor during storage

Digested manure is less odorous

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Value of Odor Control

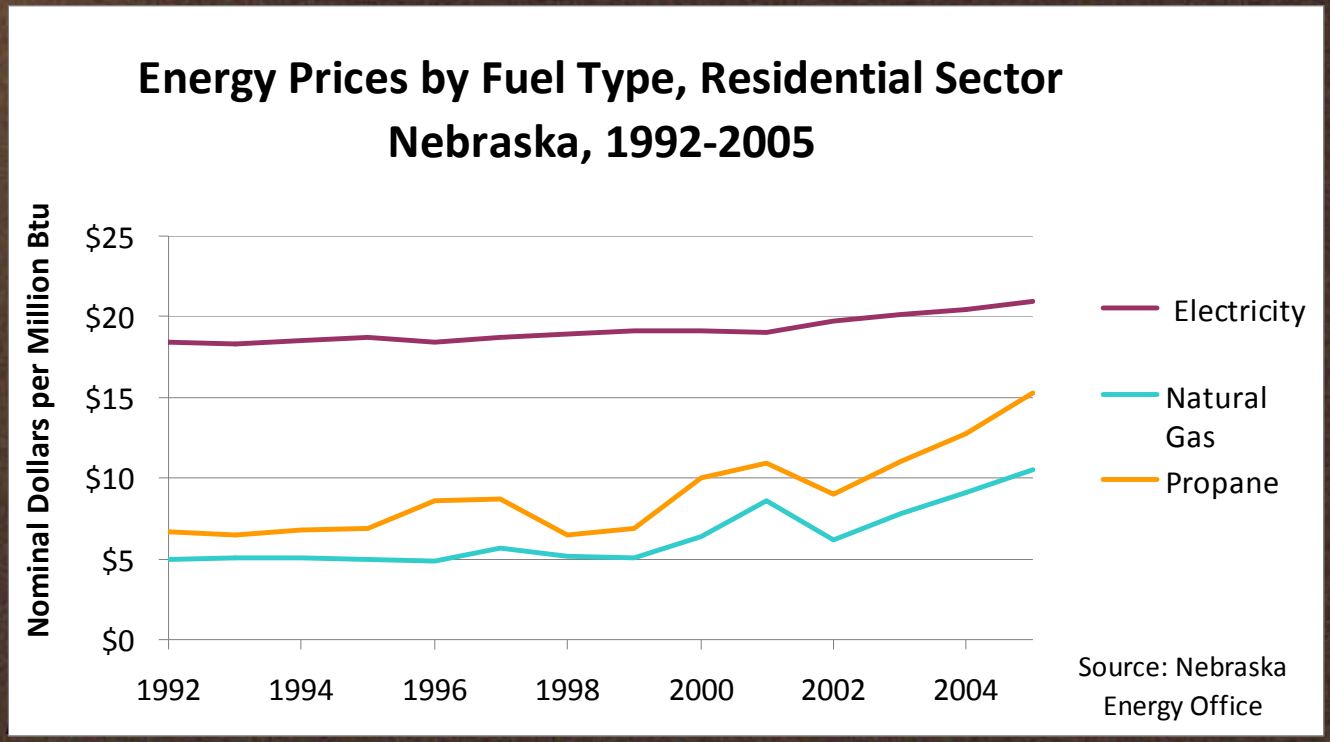
- **Very challenging to assign a value**
  - No value ←→ Relatively high value
- **Digester has smaller 'odor footprint'**
  - Lower odor emissions from storage
  - May be less difficult to site a facility
- **Less prone to complaints w/digester**
  - Fewer chronic problems during storage
  - Fewer acute problems for land application

Covers on Manure Storage:
Methane Capture & Odor Control

- **Maximum gas capture / odor control**
  - Impermeable cover with gas flare
- **Advantages (vs. digester)**
  - Lower capital cost
  - Similar/smaller odor footprint
  - More valuable manure – more N retained
- **Disadvantages:**
  - Odor during land application

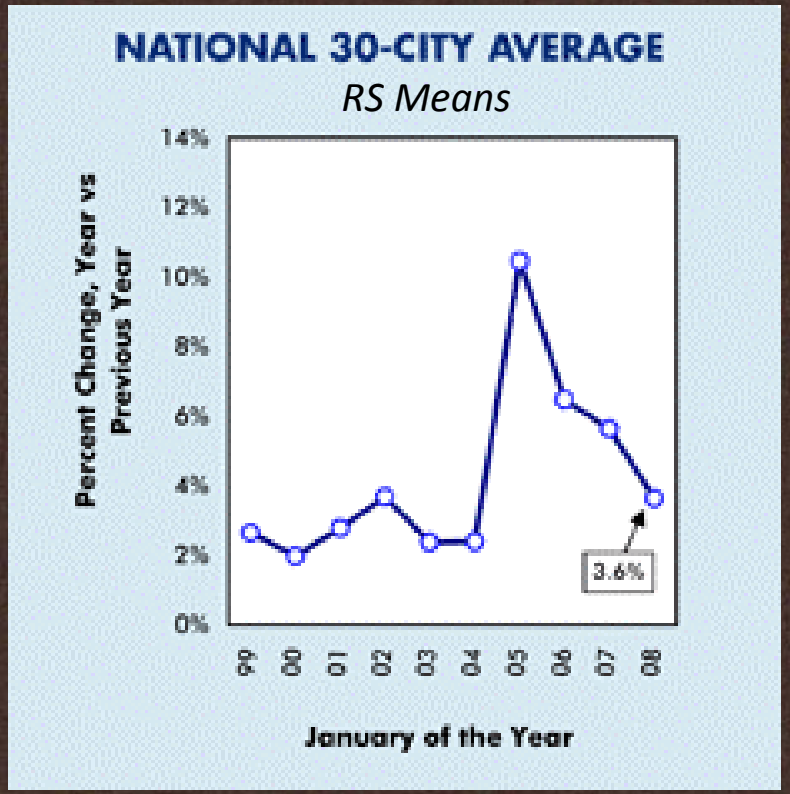
What about Today, Tomorrow?
Energy Price Trends - Nebraska

- 6th lowest U.S. electricity rate – 7.16 ¢/kWh
- 17% increase in residential electricity price
  - 2002 – 2008 (6.74 to 7.87 cents/kWh)

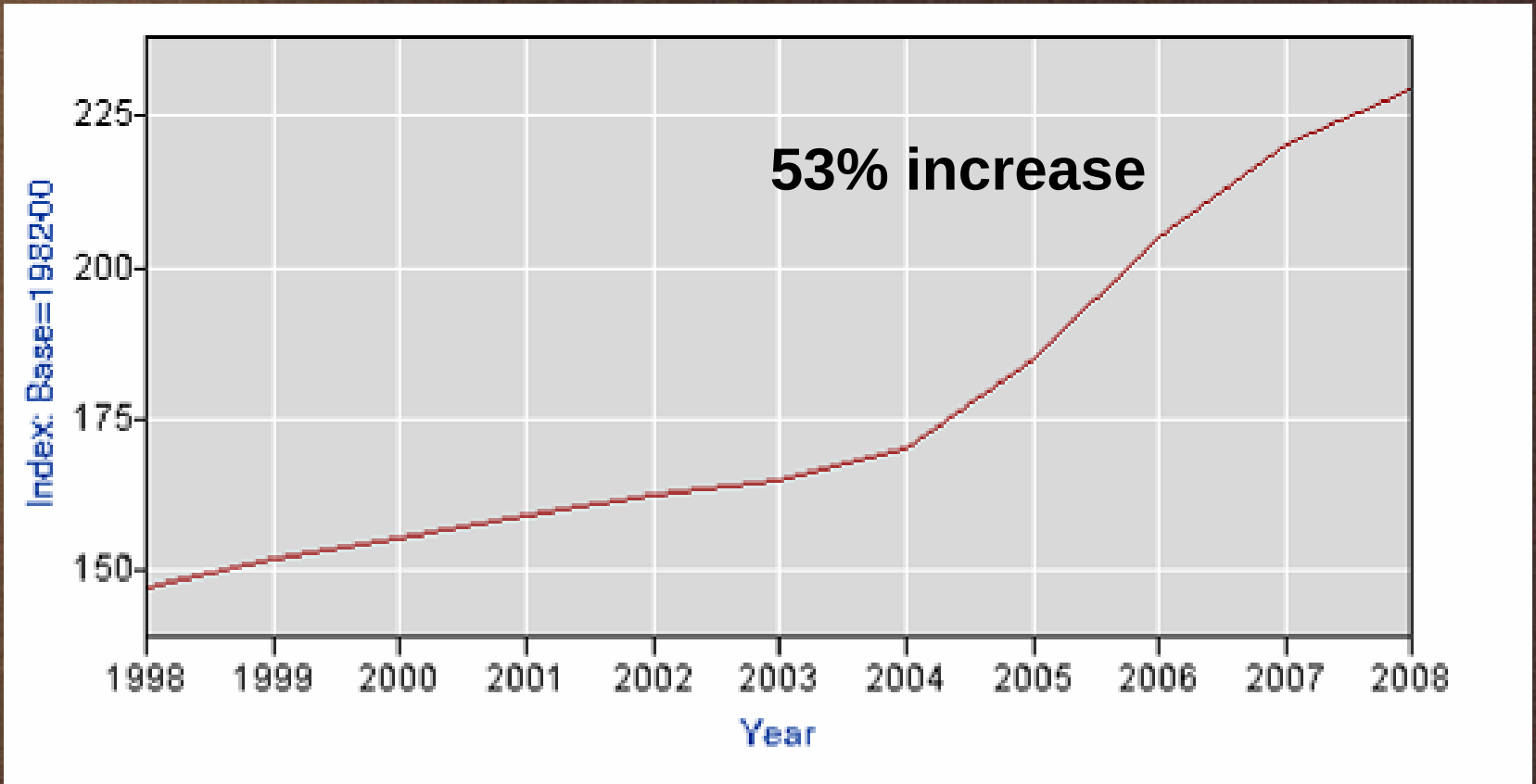


Construction Cost Trends

- **Weighted average materials & labor cost**
- **RS Means Building Index**
  - Increased about 50%
  - 1998 – 2008



Concrete Price Index
Digester Tank



Source: Bureau of Labor Statistics

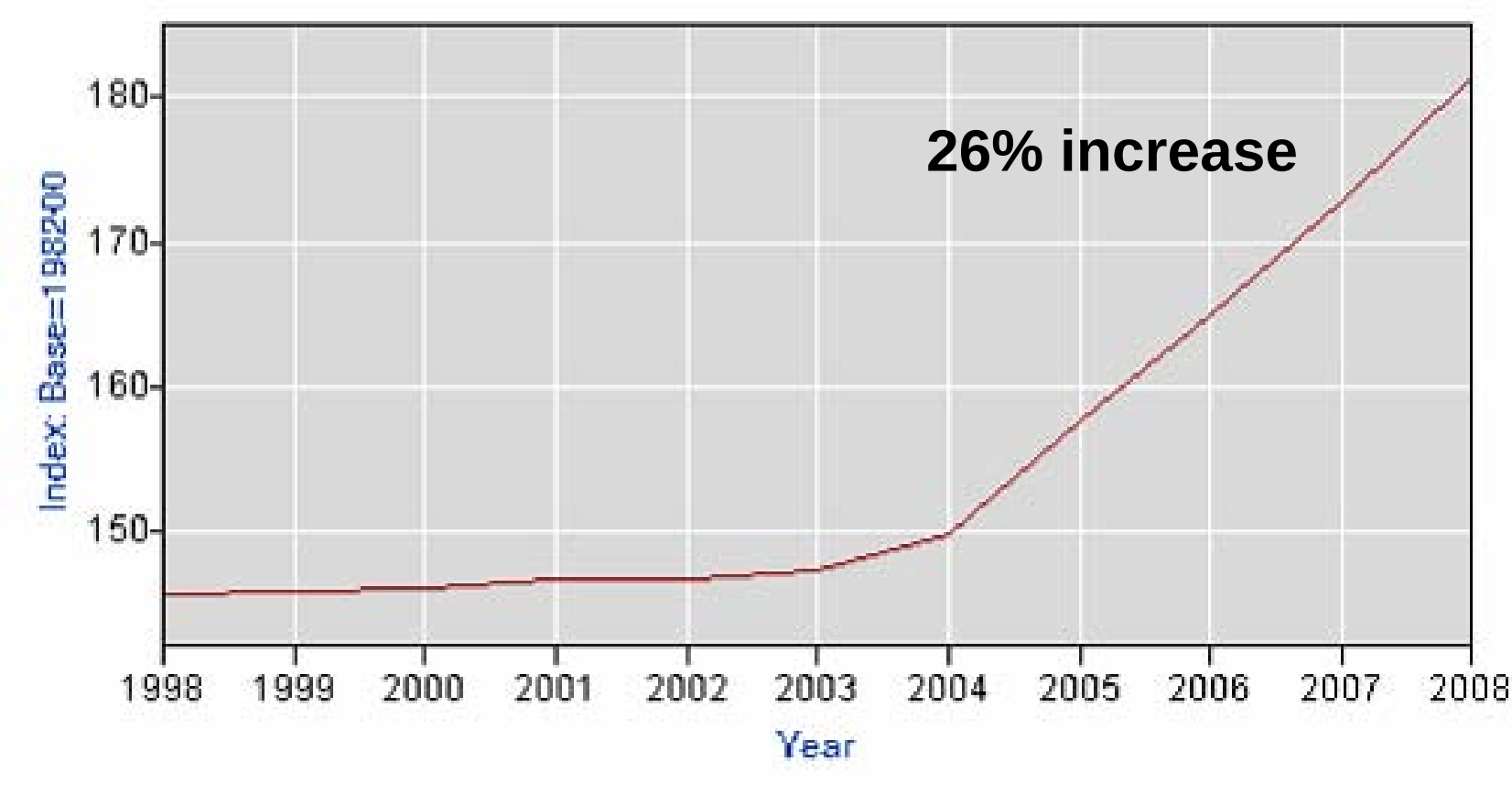
Steel and Iron Price Index

Framing & Equipment

Source: Bureau of Labor Statistics

Engine & Generator Price Index

20-40% of Project Cost



Source: Bureau of Labor Statistics

Summary of Trends

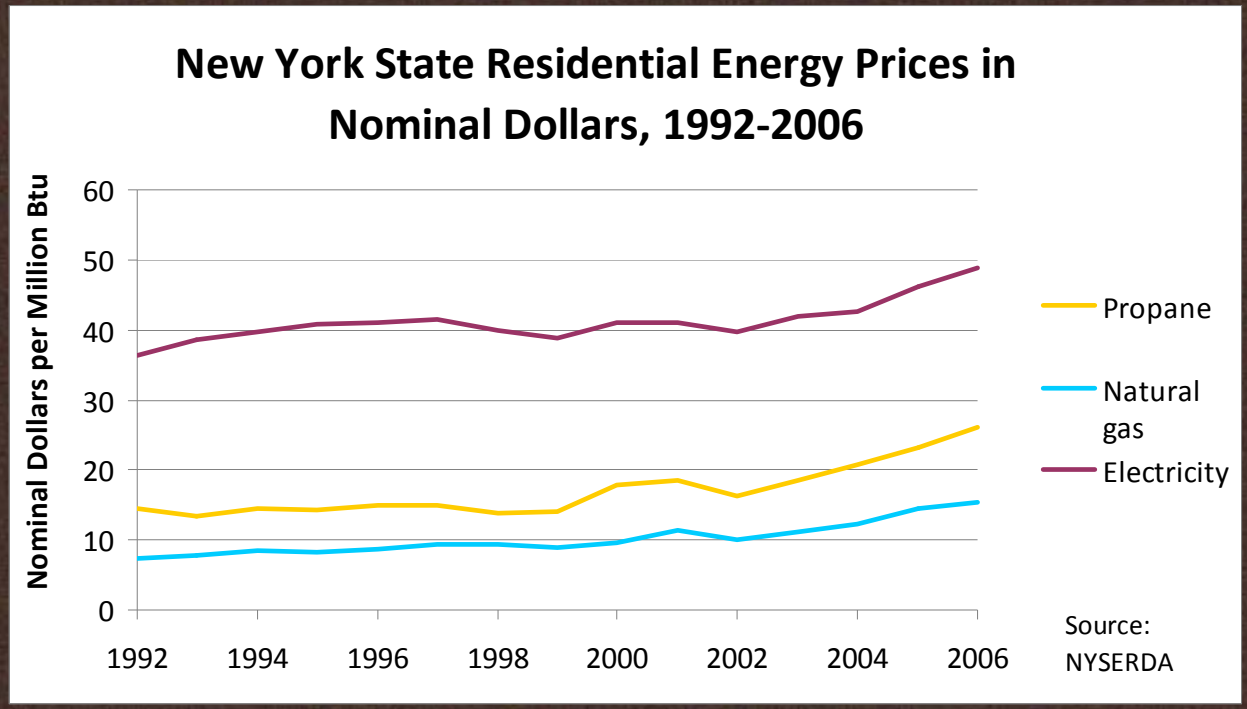
- **Increases in electricity price have not kept pace with construction costs**
  - Much larger price increases in natural gas and propane
- **More grants and credits available**
  - USDA and DOE programs
  - Carbon credits
  - Renewable energy tax credits

Key Economic Drivers:
New York State

- **Tipping fees for using food wastes**
- **Net-metering / cost of electricity**
- **Grants**
- **Carbon credits**
- **Other critical factors**
  - Odor
  - Renewable energy portfolios
  - Dedicated management

Energy Price Trends: New York

- 2nd most expensive electricity rates in the U.S.
  - 18.8 ¢/kWh



On-Farm Anaerobic Digestion:
38 Case Studies

- **Approximately 36% of capital costs are from electrical generation equipment**
- **Only a few digesters are cost competitive with current U.S. average electricity cost**
- **Most provide biogas at similar or lower cost than current natural gas price**
  - Need year-round heating requirement

Bracmort et al., 2008

Digesters: Looking Ahead

- **More use with systems having high heat and power demands**
  - Use biogas directly to replace LP or natural gas
  - Reduced capital and O&M cost
- **More reliance on tertiary economic factors**
  - Tipping fees
  - Gov. incentives (tax credits, grants, cost-share, loans, etc.)
  - Carbon credits

Questions?

For more information:

- **Handouts available:**
  - Original 2003 economic studies:
    The Economic Potential of Methane Recovery
  - Economic update
  - *Carbon Credits for Livestock Production* factsheet
- **Go to <manure.unl.edu>**