



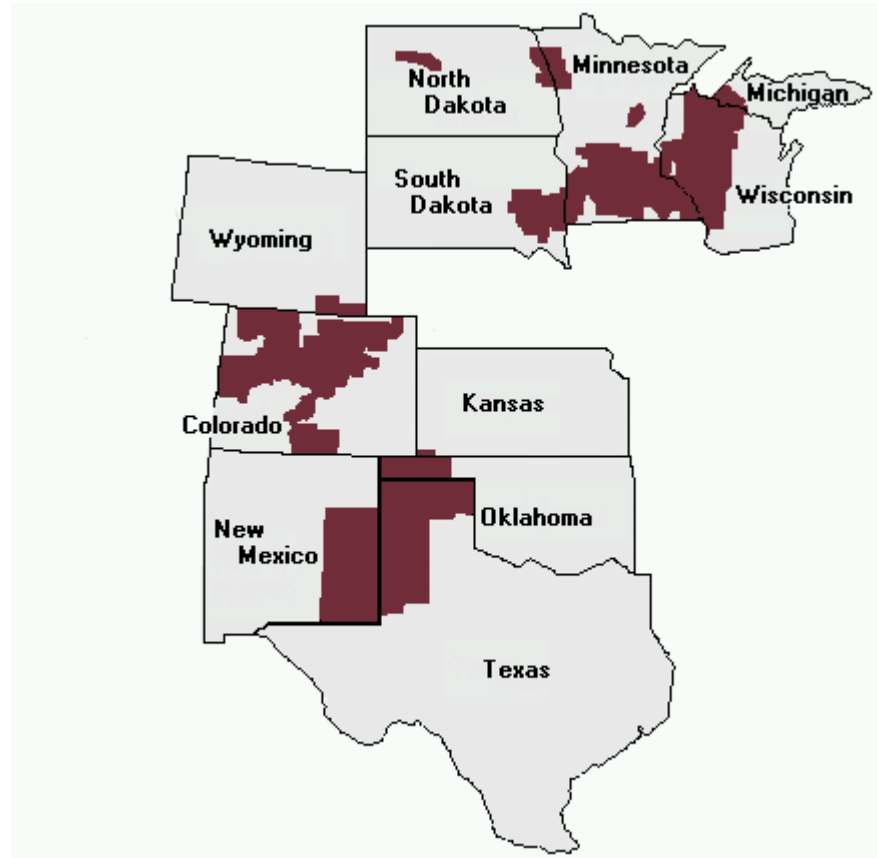
# A Utility's Experience in Renewables

August 16, 2004

# Agenda

- Xcel Energy Background
- Wind
- Biomass
- Other Renewable Resources
- Other Renewable Efforts
- Opportunities
- Conclusions

# Xcel Energy Service Territory





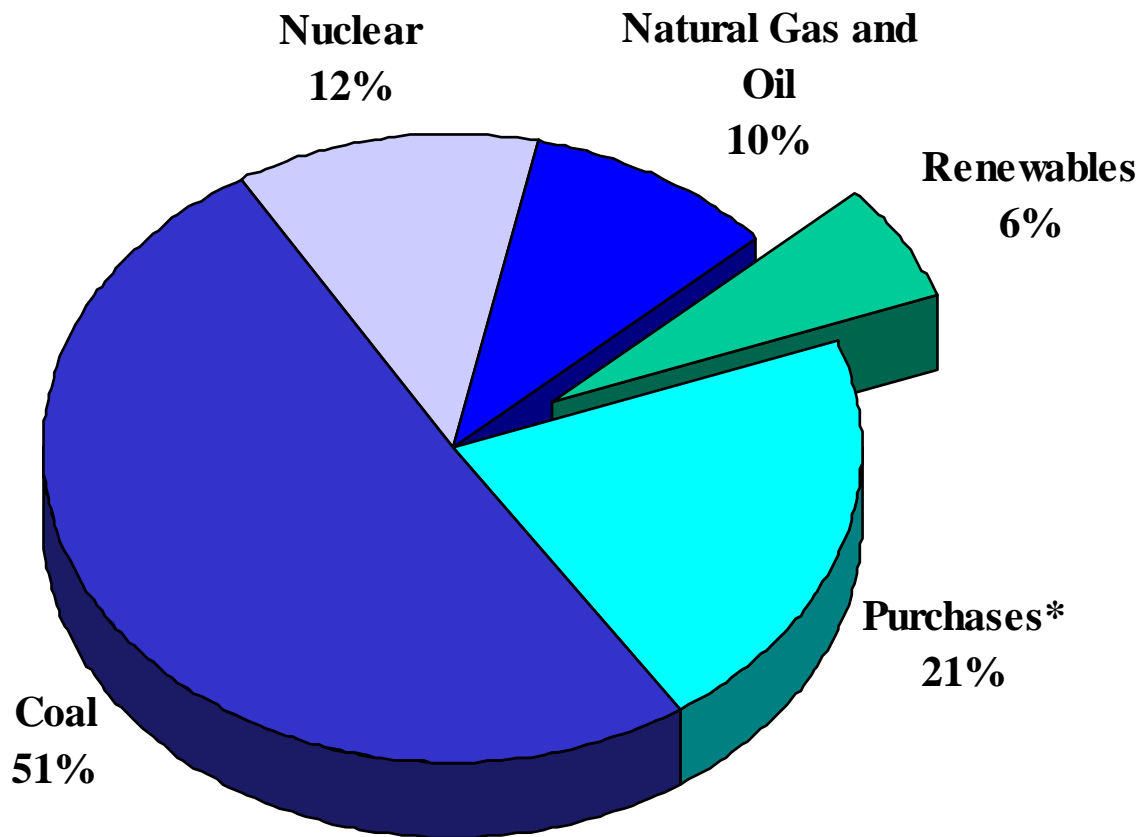
# Xcel Energy Renewables Owned and Purchases (Capacity)

	2004 Estimate	2010 Estimate
Wind	921 MWs	2141 MWs
Biomass*	95 MWs	200 MWs
Hydro	1530 MWs	1530 MWs
Total	2546 MWs	3871 MWs

\* includes waste wood, landfill gas, refuse-derived fuel (RDF)

# Xcel Energy

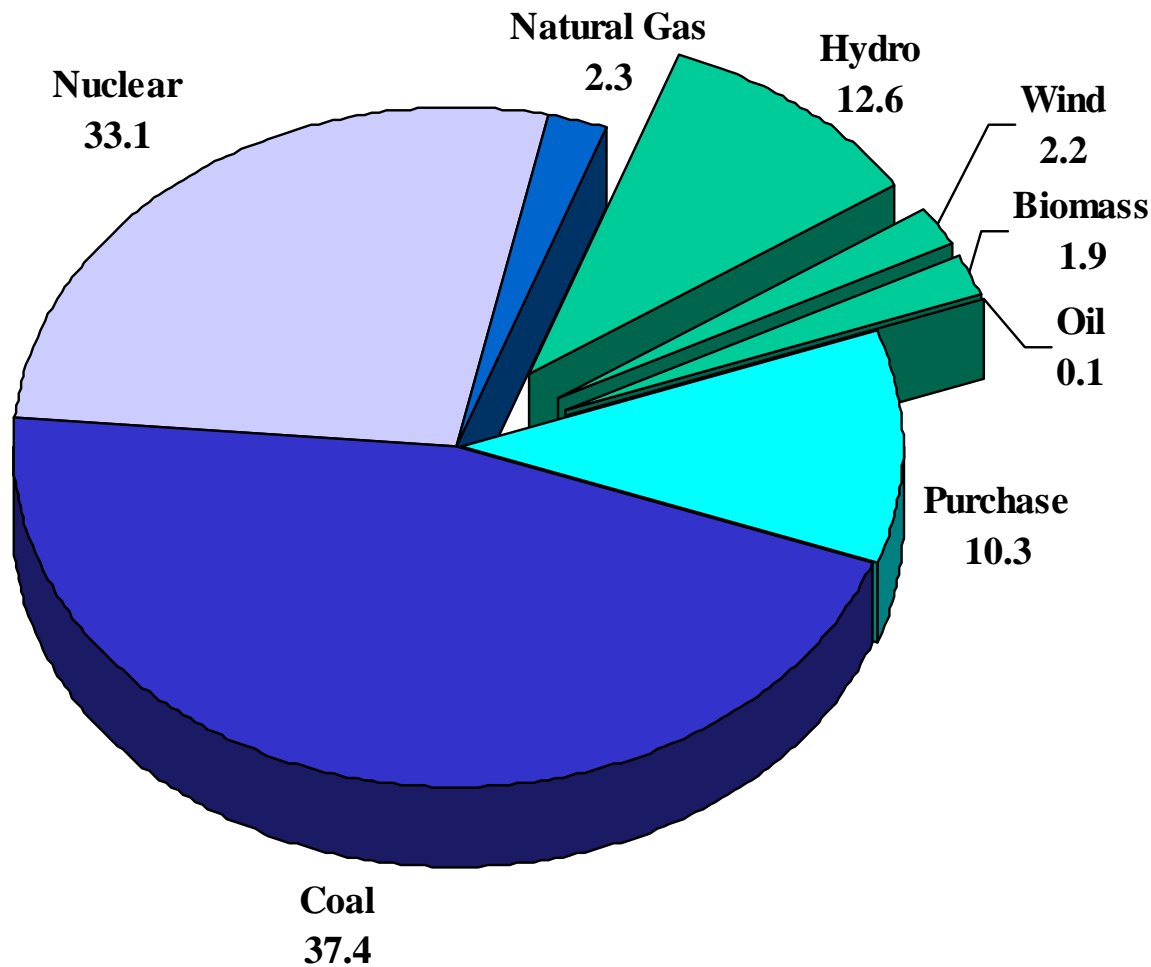
(Fuel Mix-MWHs)



\* Includes some renewables

# Xcel Energy-NSP

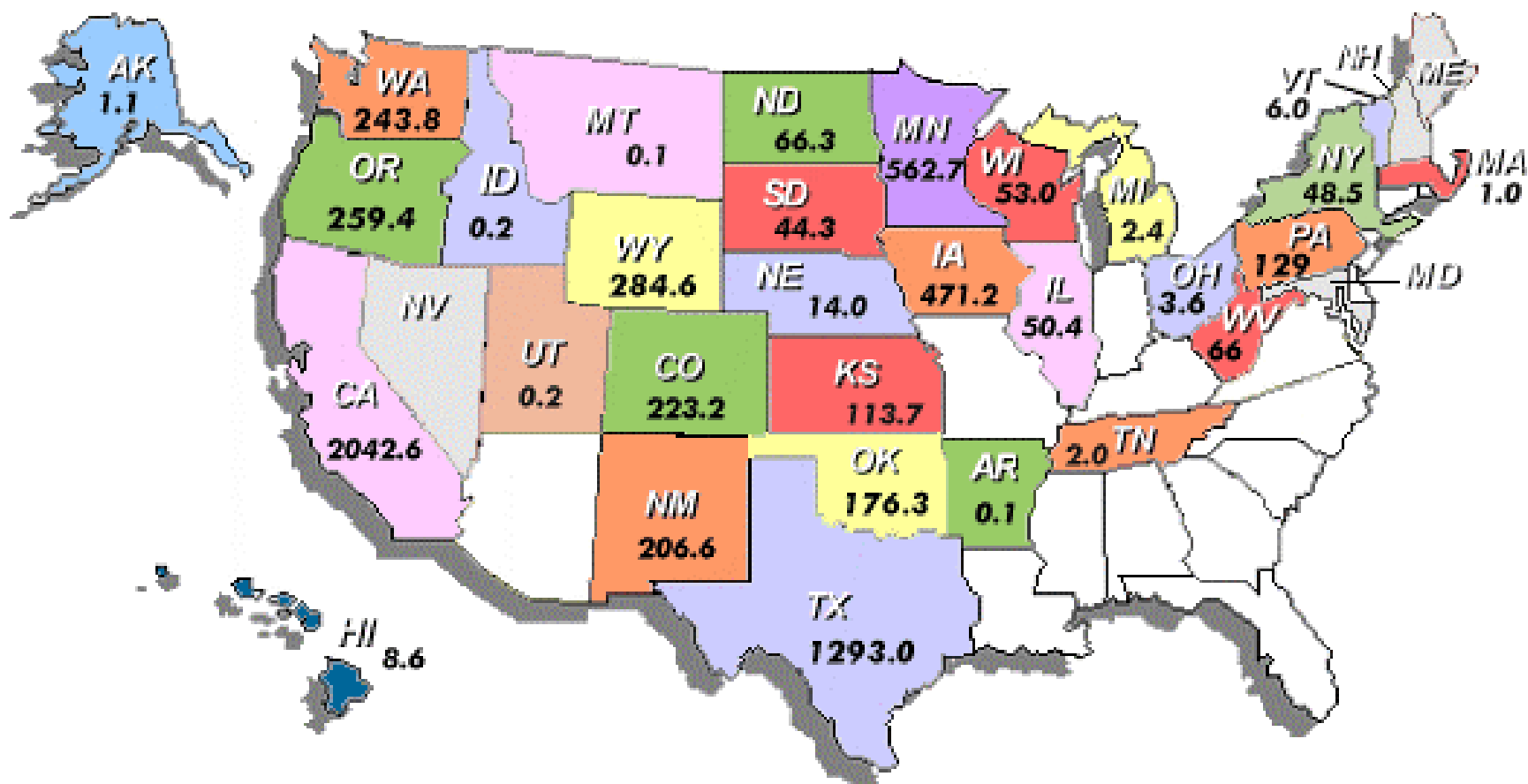
(Fuel Mix-MWHs)



# Wind



# Wind in the U.S.



TOTAL INSTALLED WIND ENERGY CAPACITY: 4,719 MW as of Aug 1, 2003

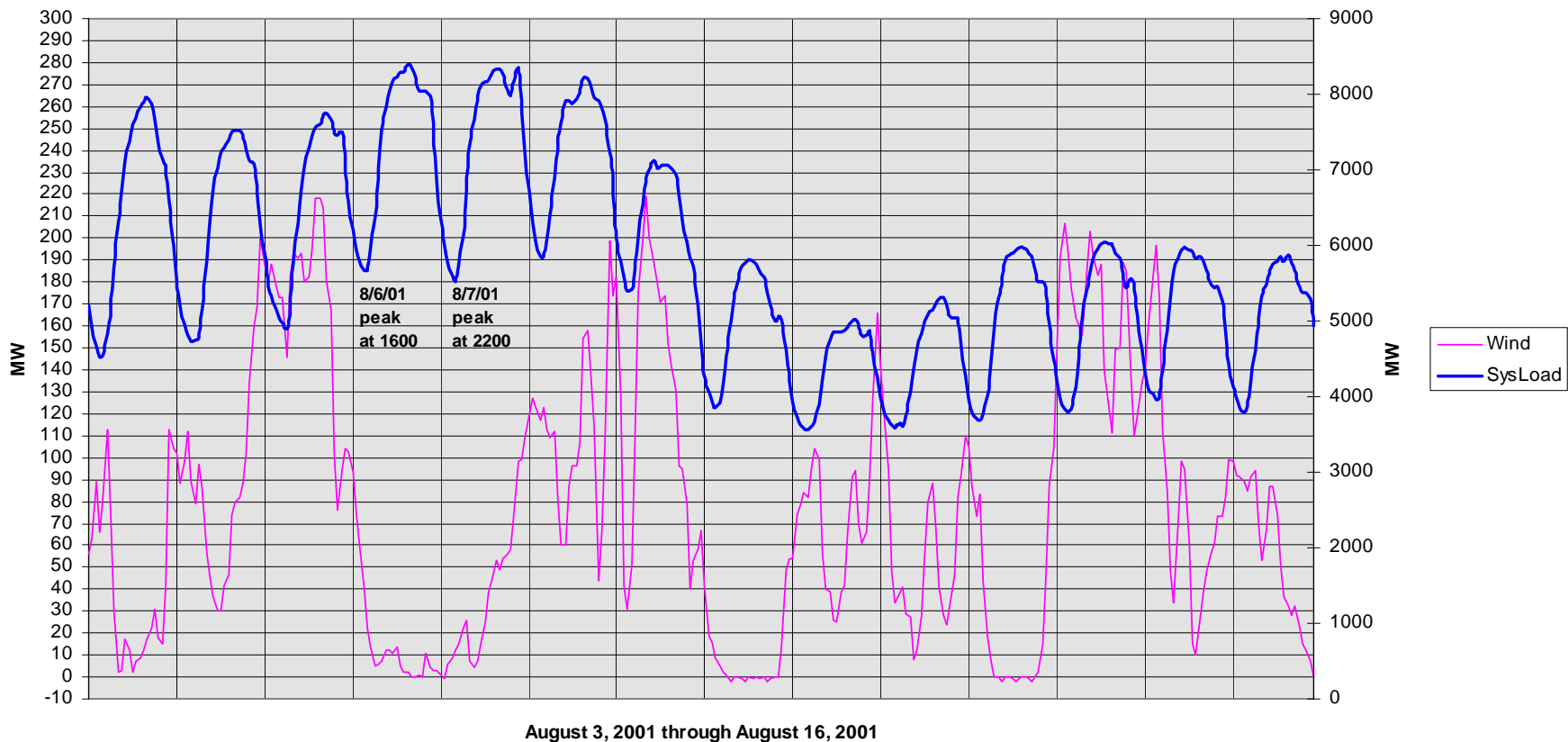


# Wind

- +900 MWs by end of 2004 (estimate)
- +2100 MWs by 2010 (estimate)
- Cost: < 3¢/Kwh (with subsidies)
  - Good hedge for natural gas
- Intermittent resource
  - Imposes costs to our system
  - Ongoing studies, evaluation

# Wind Patterns

TOTAL WIND GENERATION (MWH)



# Wind Summary

- Xcel Energy is in the top 5 utilities in the country for utilizing wind and the largest in the region.
- Wind can be cost-competitive and is being selected in Xcel Energy's RFP process
  - Wind is a good hedge against natural gas price volatility
  - It provides fuel diversity in our portfolio of resources
- Cannot provide base load power.



# Biomass



# Biomass

- 95 MWs Existing
- 200 MWs by 2008 (estimate)
- Cost: 8-12¢/Kwh (with subsidies)
- Intermediate/Base Load Resource

# Biomass

- Current Biomass Resources
  - Refuse-derived fuel
  - Landfill gas
  - Waste wood
- Future Biomass
  - Turkey litter
  - Waste wood

# Biomass Summary

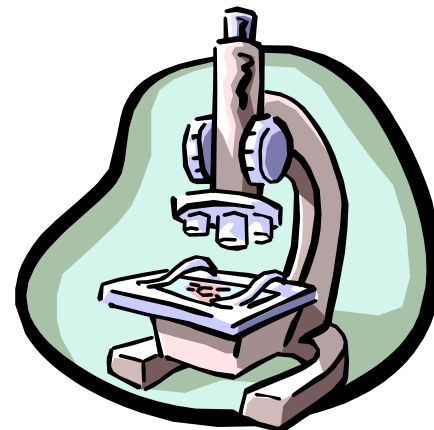
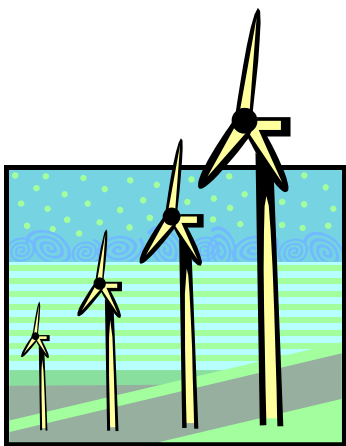
- Costs of new biomass are high
- Technologies still developing
- Expect growth in this area
  - Not all areas rich in wind
  - Agricultural crop opportunities
  - Waste management benefits
  - Economic Development

# Other Renewable Resources

- Hydro Electric
  - 30 dams and large hydro purchases
- Solar
  - Renewable Energy Trust
  - RDF, CIP
- Biogas
  - RDF, CIP, Purchases
- Hydrogen
  - CIP, RDF



# Other Renewable Efforts





# Renewable Development Fund

- \$15.5 million awarded to 17 projects in 2001-2002
- \$25 million awarded in next few weeks
- Funds energy production and research and development projects for renewables
- Annual funding of \$16 million from Xcel Energy
  - \$6 Million for small wind and biogas incentives

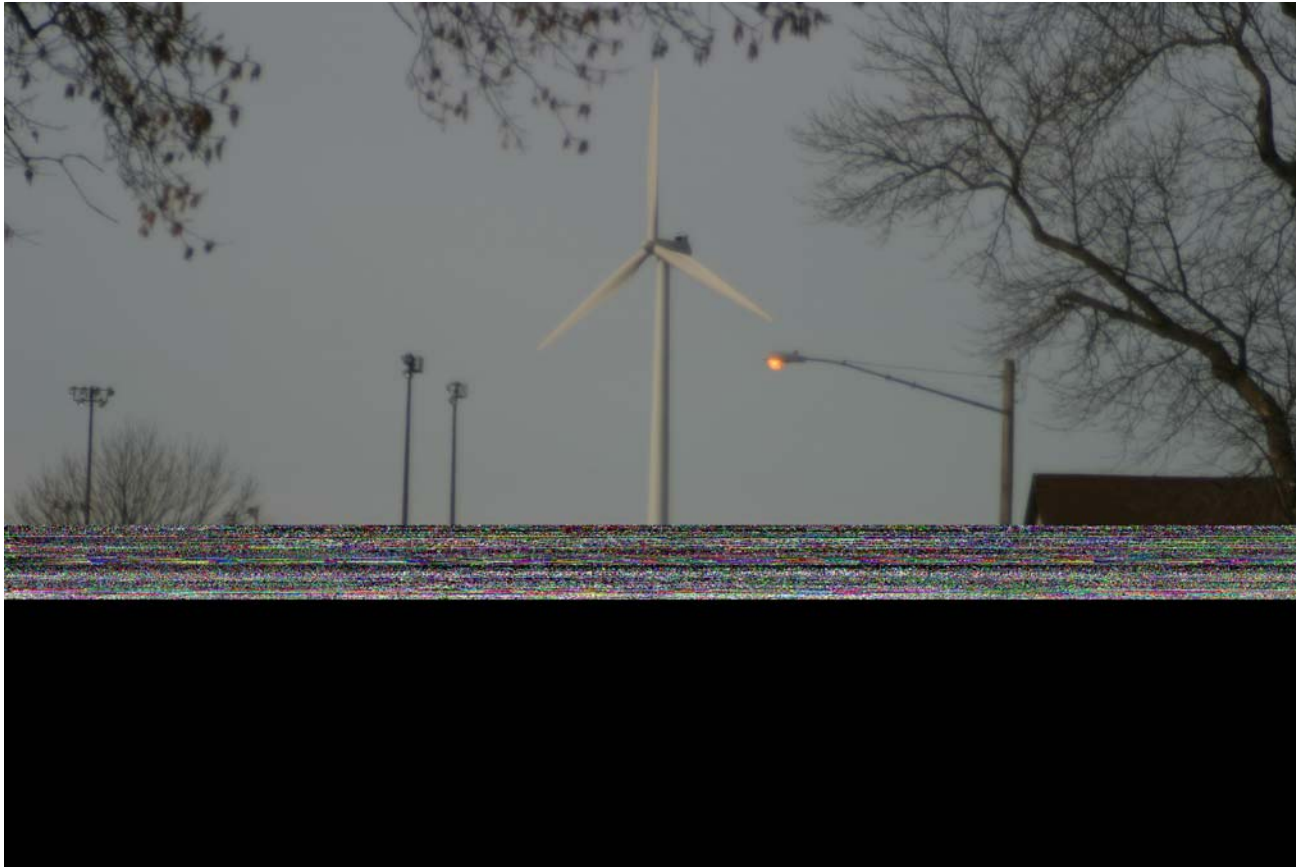


# Renewable Development Fund

1<sup>st</sup> Cycle

- Sample of projects funded:
  - Crown Hydro project
  - Self-erecting wind turbine technology
  - Biomass co-firing with “next generation” technology
  - Department of Commerce solar rebates
  - Pipestone-Jasper school district turbine
  - Science Museum of MN solar project

# Pipestone-Jasper

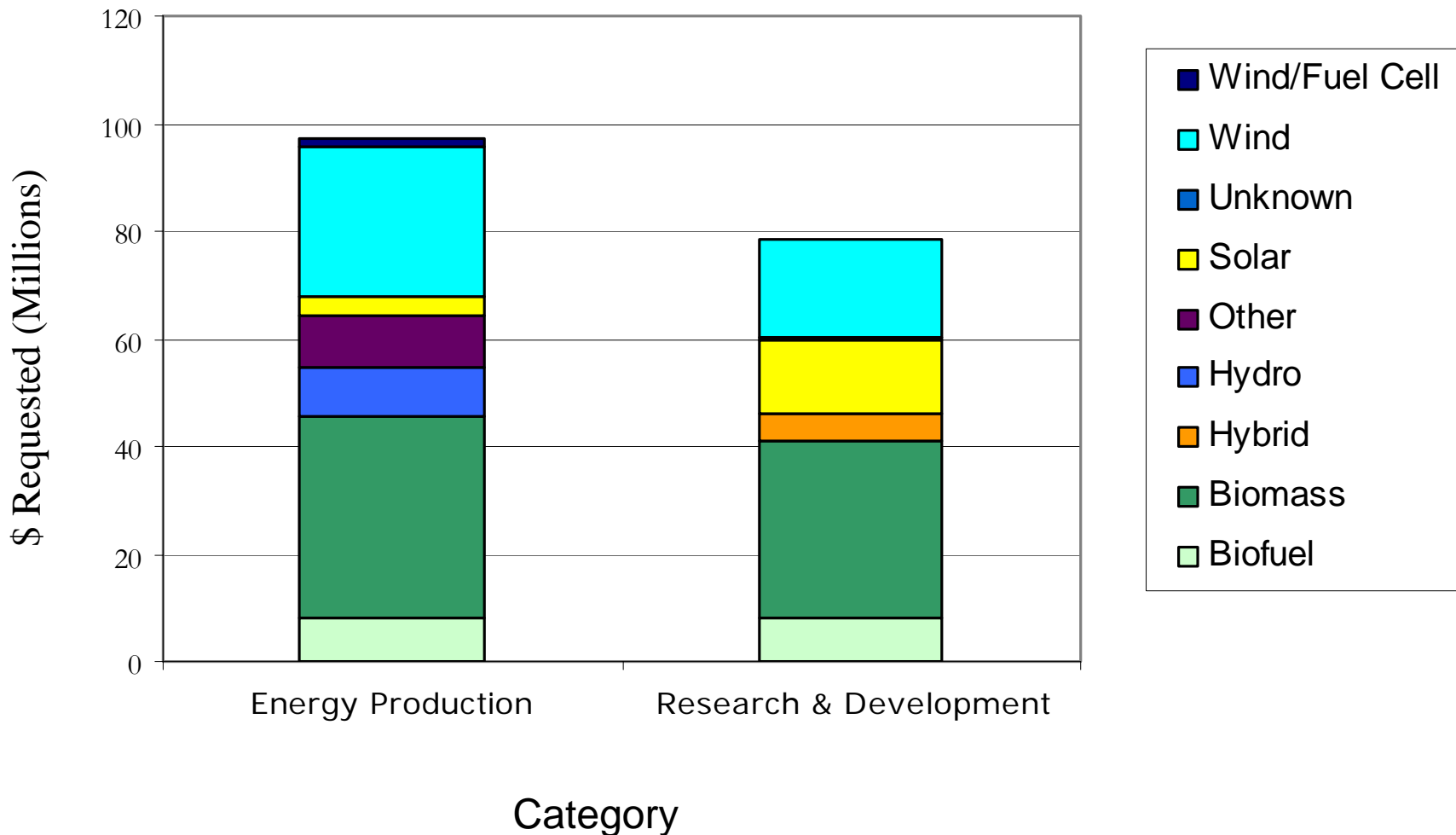


# Science Museum of Minnesota



# Renewable Development Fund

2<sup>nd</sup> Cycle – Bids Received



# IREE

- Institute for Renewable Energy and the Environment – University of Minnesota
  - Received ~ \$10 million from RDF funds in 2003
  - Will receive \$10 million over next 5 years from Xcel Energy CIP funds
  - Goal: applied and basic research on renewables, including hydrogen

# CIP

- Conservation Improvement Program
  - Targets some funds toward renewable distributed generation (DG)
  - 2002-2004 will spend \$1.1 million on DG
  - Instituting distribution generating technology program: \$450,000 this year, proposed same for next two years



# CIP

– Examples:

- Photovoltaic system at University of Minnesota (\$118,000)
- Anaerobic digester – Northern Star Potato Products (\$308,000)
- Wastewater/Microturbine with CHP project with Local Government (\$206,000)



University of Minnesota

# Northern Star Potato



# Local Government



# Opportunities

- Lower biomass costs
  - Home grown, closed loop biomass is expensive
  - Improve economics of biomass
    - Example: whole tree burn technology
- Add value to wind
  - “Storage” of wind via hydrogen
    - Wind becomes dispatchable

# Opportunities

(continued)

- Investigate combinations of renewable technologies that add value and lower costs
  - Example: wind/biomass technologies
- Investigate opportunities for biofuels to generate electricity
  - Example: Can old coal facilities be retrofitted to burn ethanol to generate electricity?

# Conclusions

- Renewables play an important part of our resource portfolio
- Must balance affordability, reliability and environmental aspects
- Xcel Energy is a leader in renewables:
  - Deployment
  - Research and development
- Renewables must be able to compete on an economic basis
  - Wind can be competitive with other resources
  - Other technologies will continue to develop
  - Mandates are not necessary