Wind Turbine Blade Recycling: An Economic Decision Framework

Introduction

There is currently no effective recycling system for wind turbine blades at end of life. The purpose of this project is to create an economic decision framework to determine which factors must change in order for a recycling system to be economically feasible.

Background and Problem Statement

- Installed capacity of wind turbines has grown drastically
- Wind turbines last about 15 years, many will soon be obsolete
- The current disposal method is landfilling
- Each blade weighs over 14,000 lbs. and can leech BPA into soil/water
- No economically feasible recycling process or market available

Research Methods

- Quantify the current costs of disposal
- Create estimates of potential recycling costs
- Develop an economic tool to help decide on landfilling vs recycling
- Sources: peer reviewed articles, company websites, interviews, equipment specifications
- Focus on mechanical recycling

Recycling Decision Flowchart

Economic Decision Framework

- Base program written in Lingo
- Sensitivity analysis and decision tool created in Excel
- Decision variable: percent of material to extract in recycling process
- Recycling costs increase with recycle yield
- Government can provide a per-ton recycling subsidy
- Costs based on running Vermeer HG8000 mechanical grinder

Sensitivity Analysis Results

- Landfilling costs $700 per blade, recycling costs over $1,000
- Government subsidy of $55/ton and/or increases in technology are required for recycling to be economical
- Additional subsidy increases the yield from recycling

Impacts and Future Work

- Economic decision making tool provides answers for “what-if” scenarios
- Companies can estimate costs and profits of recycling versus landfilling
- Government policy will likely be needed for economical recycling (already happening in Germany)
- Recycling equipment needs to be developed
- Market for recycled material needs to be found or created

References

Installed wind capacity chart: [http://www.evwind.es](http://www.evwind.es)
Email mhoefer@iastate.edu for a complete bibliography