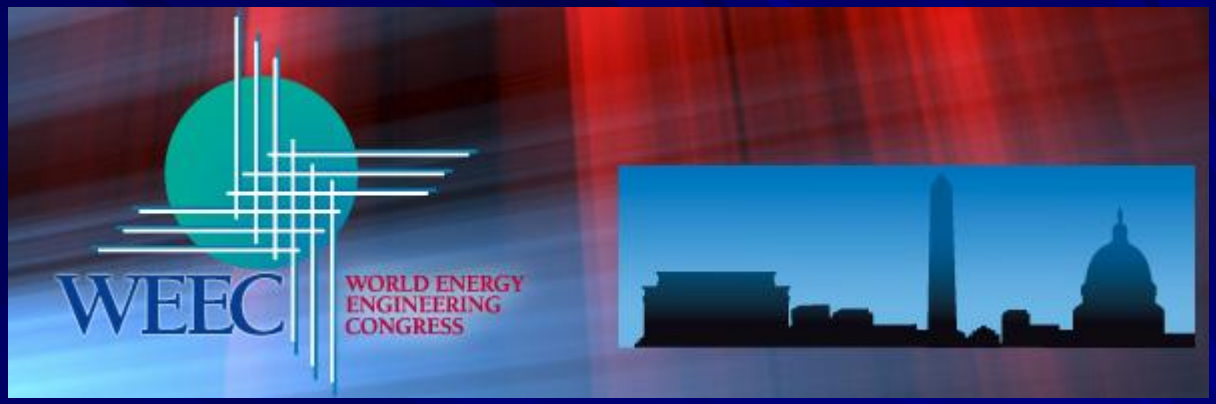

Economical Renewable Options
December 9, 2010

Presented by:

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- Facilities Throughout US, Canada and Latin America
- Totally Independent
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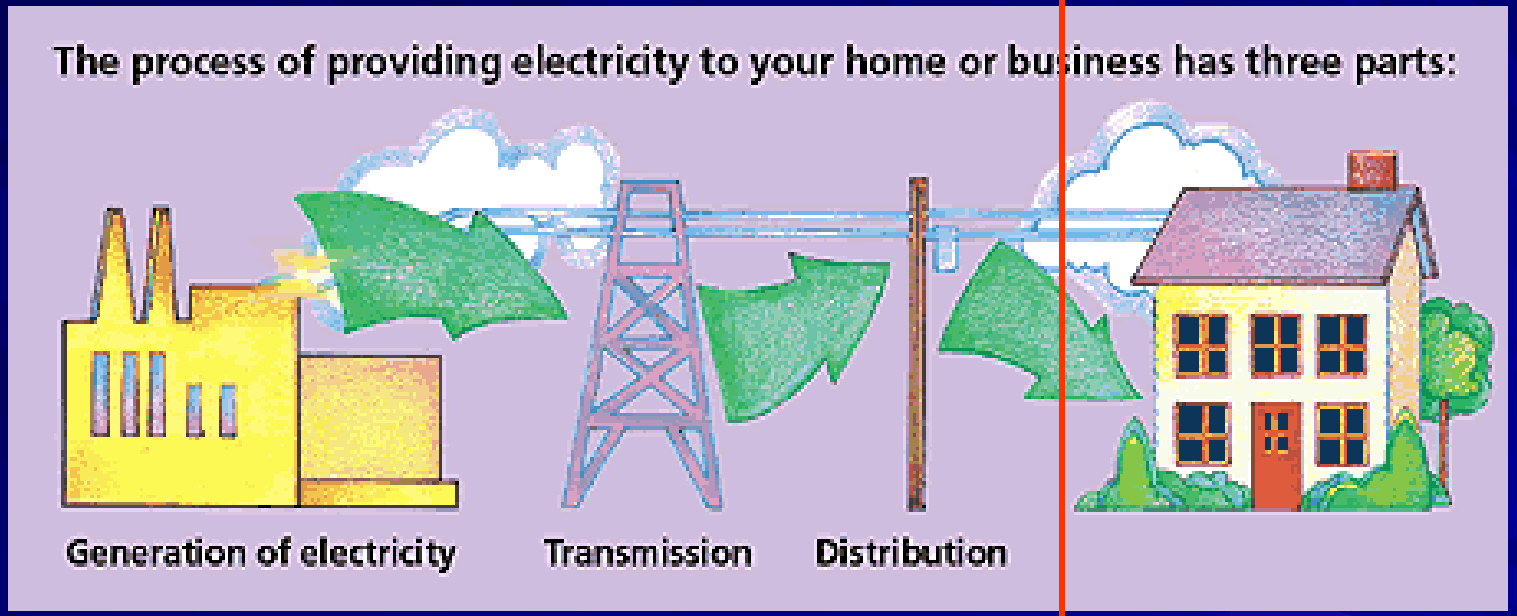
Energy Components



Supply Side

Demand Side

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Renewable Solutions

- Electric Options
  - Wind Generation
  - Can save 20% of the marginal electric costs
- Thermal - Steam/Hot Water or Electricity
  - Solid Waste Boilers
  - Digester
  - Gasifier
  - Plasma
  - Microwave
  - Pyrolyzer
  - New Technologies
  - Can save 80% of the heating costs and can sell energy

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Wind Generation

- Historical Wind Generation
  - Large wind farms (50MW)
  - Only the best wind area
  - Maintenance issues
  - Need major transmission lines
  - Losses (6% - 10%)

Wind Generation

- Today's Wind Farms
  - Transmission issues
    - Takes up to 2 years for ISO transmission studies
  - Turbine availability
    - Most available today but none available 2 years ago
  - Utility avoided cost of generation is low (as low as $.02/kWh)
  - Still need large wind farms to justify
  - Federal tax credits needed (ITC going away – PTC still available)
  - Site requirements (fewer available)

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Wind Generation Advantages for Industrial and Municipal Sites

- No Transmission Issues (costs and delays)
- Minimum Losses (save 10%)
- Many states mandating renewables (25)
- Fed/State incentives available
- Can obtain higher price for electricity
- Turbine availability better for small quantities
- Corporations more interested in reducing carbon footprint
- Turbine efficiencies are much better
- Green credits increasing - $.003-$.020/kWh

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Wind Financing Options

- Customer Investment
  - Less than 5 year payback (20% ROI)
  - Many industrials won't look at projects unless under 3 year payback
  - Munis guaranteed rates below today's rates for 20 yrs
- Investor Installed Turbines (Optional)
  - Charge customer a fixed electric rate
  - Charge customer a guaranteed savings over marginal energy cost

Wind Site Criteria (1-2 Turbines)

- Need Open Space for Turbine
  - Assume 50 acres per turbine or 5 for one
  - No trees/buildings nearby or reduced production
- Industrial Facilities Operating 7 Days a Week or Minimum Muni Load
- Wind Speeds/Electric Rates
- City/County Requirements
- Utility Service Territory Rules

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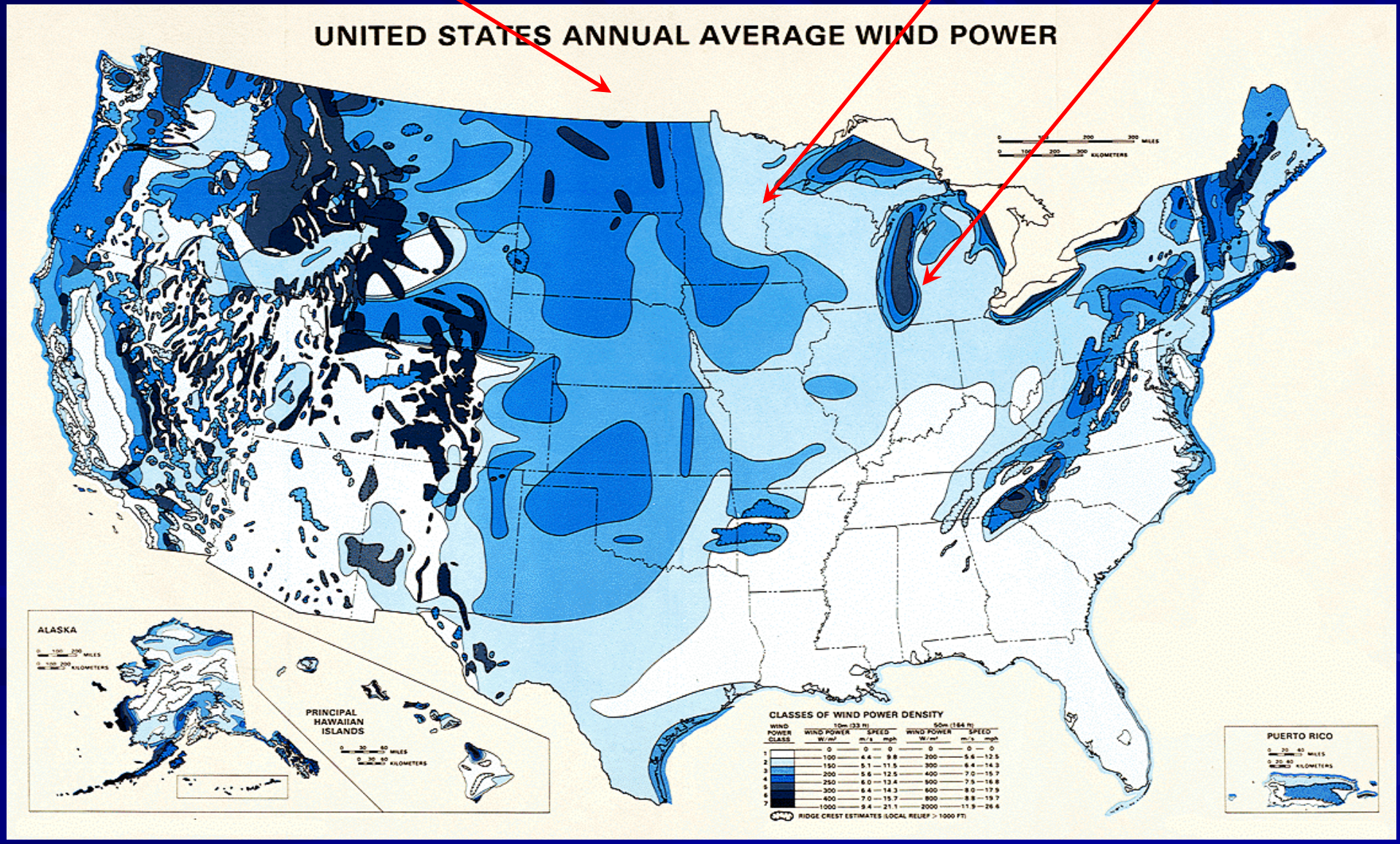
Wind Site

$.040/kWh

$.050/kWh

$.070/kWh



Wind Example

- Existing Industrial Plant
  - Peak Load of 7,500 kW
  - Wind 2 - 1.5 MW Turbines
  - Marginal Electric Costs $.055/kWh
  - Wind Availability – 38%
  - Cost of Wind Turbines $6,000,000
  - Green Credits - $.008/kWh
  - Iowa State Tax Credits - $.015/kWh

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Wind Economics

- Customer Owned Plant
  - Save $1,186,500 per year
    - Plus depreciation credits
    - Simple payback – 5.0 years
- Investor Owned Project
  - Guaranteed savings 20%
  - Plus green credits
  - Save $200,000 per year with no investment
  - Need to provide land
  - Investor rate of return 18%-23%

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Renewable -Thermal Steam/Hot Water Production

- Several Options – Based on Available Waste and Flexibility
  - Solid Waste Boiler (dry wood)
  - Digester (organic)
  - Gasifier (wood, seed, more moisture)
  - Plasma Burner (anything - larger volume)
  - Microwave (anything but only one composite)
  - Plasma (anything – large volume)
  - Pyrolyzer…

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Industrial Site Requirements

- Constant Thermal Load or Convert to Electricity
- Complete a Waste Resource Analysis
  - 150 mile radius
  - Also look at internal waste streams
- Waste Stream Contract (5 years)
- State/Fed incentives
- Select Conversion Equipment to Handle Waste Stream with Flexibility
- Fuel Handling – Space Availability

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Potential Fuel Sources

Description	MMBtu/Year	$/MMBtu	Annual Savings	Equipment $
Natural Gas	200,000	$ 5.00		
Waste Wood	200,000	$ 0.50	$ 900,000	$ 2,000,000
Construction Waste	200,000	$ 2.00	$ 600,000	$ 3,000,000
Seed Corn	200,000	$ (0.25)	$ 1,050,000	$ 3,000,000
Glycerin	200,000	$ 2.00	$ 600,000	$ 4,000,000
Ethanol Syrup	200,000	$ 1.00	$ 800,000	$ 4,000,000
Ethanol DDGS	200,000	$ 6.00	$ 400,000	$ 4,000,000
Garbage	200,000	$ (20.00)	$ 5,000,000	$ 15,000,000

Industrial Examples

- 26 MMBtu Thermal Load
- Waste Streams in Area Include
  - Waste wood
  - Construction wood material
  - Seed corn
  - Internal waste
- State Tax Credits ($4.5/MMBtu)
- Selected Flexible Boiler $3,500,000

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Economics

- Savings in Fuel $900,000
- Tax Credits $800,000
- Total Annual Savings $1.7 Million
- Total Cost of Project $3.5 Million
- Return of Investment 40% Plus Depreciation
- Need to Lock in Fuel Supply
- Could also generate electricity if enough waste stream and high electric costs

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Summary

- Great opportunities to reduce supply energy costs with renewables
- Many state mandating renewable portfolios (MN 25% by 2025)
- Federal Mandate (Energy Diversity, RPS)
- Each site needs to be analyzed
- Potential for 10% – 30% reduction in electric costs
- Potential for 50% - 100% reduction in thermal costs
- Major potential to reduce carbon footprint
- Corporations can be socially responsible while improving the bottom line

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Any Questions?

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