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61st Montana Legislature
Energy and Telecommunications Interim Committee

"INTEGRATING WIND ENERGY"

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Integrating Wind Energy

Definition: Adding or increasing the quantity of wind energy generation to the interconnected electrical system.

- **Factors Affecting Integration**
- **Priorities and Challenges**
- **Benefits of Wind Integration**
- **Costs of Wind Integration**
- **Needs & Recommendations**

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Factors Affecting Wind Energy Integration

- **Dilution – Percentage of Wind Energy to be Integrated**
  - Varying Effect Based Upon Percentage of Grid Saturation
  - 3% to 15% of Wind Generation is Managed with Relative Ease
  - Over 15% Requires More Sophisticated and Complex Management
- **Diversity – Widely Distributed Generation**
  - Wide Geographic Distribution of Generation Minimizes Effect of Ramping Events and Provides Natural Offsets
- **Availability & Cost of Ancillary Services**
  - Services Scarce Within Montana
  - $5 - $16 per MWh (plus required transmission)
- **Ability to Curtail Wind Generation**
  - Precise Forecasting Required to Avoid Curtailment
  - Technology Not Perfected
  - Worst Case Option
- **Ability to Shed Load**
  - Requires Automated Management Tools and Formal Offerings
  - Limited Effects
  - Expensive
- **Energy Storage Available (?)**

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Priorities and Challenges of Integration

- **Moving Energy to Market(s) Where it is Used**
  - **Wind Generation Facilities are Seldom Built Where Energy is Used**
- **Minimize Lost Energy**
  - **Distance to Market Increases Transmission Loss**
  - **Lost Energy is Lost Revenue**
  - **Curtailment Losses**
- **Maintain Grid Stability**
  - **Continuous Operational Controls**
  - **Output Monitoring & Management**
- **Regulatory Compliance**
  - **NERC, FERC, WECC, etc.**
  - **Constant Frequency and Volume Balancing (7x24)**
- **Cost**
  - **Transmission – Often Multiple Carriers**
  - **Ancillary Services**
  - **Balancing Authority Operations**

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Benefits of Wind Energy Integration – Projects Get Built!

(figures based on a single 100MW wind farm over 20 year period)

Local Benefits

- ✓ Jobs:
  Over 350 "man-years" of jobs created
- ✓ Retail Growth:
  Housing, shopping, dining, etc. proportionate to jobs
- ✓ Education/Training:
  Skilled jobs need to be filled
- ✓ Taxes, Fees & Landowner Payments:
  Over $70,000,000 paid within local community

Broader Benefits

- ✓ Long-Term Electricity Price Stability
- ✓ Reduced Dependency on Imported Fuels
- ✓ Domestic Manufacturing Jobs
- ✓ Increased Demand for Transportation Industry
- ✓ Commodities Market Growth
  - Raw Materials for Manufacturing

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Cost of Wind Energy Integration (current $ / MW)

Project Construction.....$2,400,000

Wind Firming Services.....$5 to $16

Transmission (out of Montana).....$4 to $14

Curtailment.....$4 to $7

Scheduling & Balancing Authority.....$1 to $2

Forecasting Service.....$0.5 to $1

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Needs & Recommendations

1. Public Information Campaign
   a. Is Energy Generation and Export a Montana Industry or Not?
   b. No new transmission = little-to-no renewable energy growth.
   c. New transmission can enable (000's) of MW of new
   d. Spread the facts cost/benefits
   e. Renewable energy projects cannot bear 100% of the cost of transmission infrastructure development and construction
2. Transmission Infrastructure
   a. Identify best wind resource areas
   b. Establish infrastructure corridors for collection and export of electric energy
   c. Subsidy for transmission construction
      - Federal grants
      - Federal loan guaranty
      - Temporary (partial) re-allocation of County tax funds
3. Establish Incentives to Develop on State Lands
   a. Optimize transmission corridors
   b. Clear easy permitting guidelines or Pre-permitted land parcels
      - Land Use
      - Environmental
      - Cultural & Historical
   c. RFP for land use by renewables

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