WIND FARM DESIGN & ENGINEERING
Wind Farm Design Considerations

- Establish contiguous block of wind leases.
- Evaluate community attitudes toward wind farm.
- Open communication with community leaders and government officials.
- Hold informational meetings during design, construction and operations.

Strong Wind Resource

- Multi-year measuring campaign (MET Towers).
- Use results to inform turbine siting.

Low Impact

- Conduct desktop level environmental and cultural resource studies early on.
  - Preliminary risk assessments.
  - Multi-year avian and bat surveys.
  - Sensitive habitat assessments.
  - Cultural resources studies.
  - Noise and flicker modeling.
  - Final risk assessments.
  - Use results to drive design.

Community Support / Land Base

- Apply for electrical interconnection.
- Conduct interconnection studies.
- Payments to transmission operator.

Transmission / Interconnection

- Multi-year measuring campaign (MET Towers).
- Use results to inform turbine siting.
Wind Farm Planning Process

Site Selection & Preliminary Evaluations

Land Leasing

Interconnection

Project Design & Engineering

Multi-year detailed studies
(wind resource, environmental, cultural, etc)

Desktop Evaluations
(wind resource, environmental, cultural, etc)

Permitting

Construction

Operations

Effective Communication & Periodic Project Evaluation
Environmental Due Diligence

- **Avian and Bat Studies** - Results are used to design project to minimize impact to these species. Consultations with US Fish and Wildlife and DNRE.

- Key preconstruction studies performed at our wind farm sites by independent scientists may include:
  - Spring and Fall Migration Avian Surveys,
  - Migrant Songbird/Small Bird Surveys,
  - Nesting Rare Species Survey,
  - Bat Activity Surveys,
  - Eagle Use Surveys.
Environmental Due Diligence

- **Other environmental studies** - Provide guidelines for turbine sitting to avoid impacts
  - Wetland determinations at potential turbine sites
  - Sensitive plant and animal species determinations
  - Consultations with US Fish and Wildlife and DNRE
Wind Farm Siting Guidelines

- Turbine locations are determined taking into account the following factors:
  - Federal, state and local regulations,
  - Maximize energy production considerations,
  - Minimize impact to farming and other activities,
  - Determine setbacks from natural and cultural features,
  - Minimize potential noise levels and shadow flicker,
  - Consider landowner and community input.

- After considering the above factors, the land available for turbine siting (or buildable land) is reduced by 70-80%!
Site Analysis & Engineering

• GOAL: Maximize energy production while minimizing environmental, cultural and community impacts

• Civil Engineering
  ✓ Geotechnical investigations
  ✓ Site surveys
  ✓ Foundation design
  ✓ Access road design
Site Analysis & Engineering

- **Access Roads**
  - Shared usage for landowners
  - Minimize impact to ag/forest activities

- **Electrical Infrastructure**
  - 4 feet below surface
  - Minimized disturbance to ag/forest lands
  - Underground collection lines between turbines
  - Collection and Step-up Substation design
  - Grounding Grid – Substation to Turbines