

There are many different sizes and designs of wind turbines. There are small turbines designed for residential farm & small businesses, mid-sized machines, suitable for schools, municipalities, or rural communities, and commercial scale machines used to generate electricity for hundreds of consumers. The larger the wind turbine is, then the more extensive the construction phase is.



Wind Turbine Components

Wind turbines consist of four main components: the tower, the nacelle, the rotor and the foundation. In order for the turbine to work most efficient, each piece must be carefully constructed and assembled.



Tower: supports the moving parts of a turbine and can range in height from 50 meters to 100 meters.

Nacelle: this is the structure that houses all the generating components, including the generator, gearbox, and drivetrain.

Rotor, Hub and Blades: used for capturing the wind that can be made into electricity.

Foundation: cement support at the base of the wind turbine to secure it in the ground.

Wind Project Construction

Construction of wind projects can range anywhere from six months to a few years depending on the size of the project, terrain of the site, and weather conditions. Wind turbine construction projects are typical of most construction projects in that they use large equipment to make roads, bury cables, and install transformers. One exception, is that large-capacity cranes are used to install the nacelle and rotors of the wind turbine. This handout is aimed to provide landowners and farmers with an understanding of the construction phase and how they will be affected during this process.

| Task | Subtask | Duration* |
|---|--|------------|
| Site Preparation | Building Access Roads | 2-8 months |
| | Pouring Concrete Foundations | |
| | Substation/Grid Interconnection | |
| | Build O & M Facilities | |
| Turbine Installation | Tower Erection & Assembly | 2-4 months |
| | Rotor and Nacelle Installation | |
| | Bury Collector Cable System | |
| Project Commissioning | Energize Project Site and Commission Project | 1-3 months |
| *Duration is Approximate. Project Construction can vary depending on factors such as the weather and the project size | | |
| Note: Assuming fifteen 1.5 MW turbines on 80-m towers | | |

Windustry is a non-profit organization based in Minneapolis, MN. We have more than a decade of experience advocating for community wind energy.

Our mission: Windustry promotes progressive renewable energy solutions and empowers communities to develop wind energy as an environmentally sustainable, community-owned asset. Through member supported outreach, education and advocacy we work to remove the barriers to broad community ownership of wind energy.

Do you have questions about community wind energy? Call our Wind Information Hotline:

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Construction Timeline for a Commercial Scale Wind Project

Site Preparation



Pouring Concrete Foundations

Typically, wind turbine foundations are 4 ft. deep and 50-80 ft diameter. The majority of the foundation will be backfilled with native soil and you will see a 16-20 ft diameter foundation



Building Operations & Management Facilities

Wind farms often build O & M facilities on-site for the project. Typically the O & M building is located on purchased land and doesn't interfere with the landowner's property or lease.

Did you know?

That wind energy development has many economic benefits for rural communities. A study, released in June 2008, by the U.S. Department of Energy found that during the construction phase, the development of 1,000 new MW of wind energy in Michigan, could create over 1,400 new jobs and bring over \$188 million dollars to local economies

Road Construction

Three main phases are involved with road construction

- 1) Grading - prepares the land for construction
- 2) Drainage - install culverts at drainage areas
- 3) Install Base Materials - includes geo-fabric and gravel. Road profile is slightly above natural grade to promote drainage. Shoulders have a maximum 2% side slope for crane travel (land will be reclaimed after construction).



Substation/Grid Interconnection

Typically, the substation is built on land purchased by the developer, so it will not affect the majority of landowners. But it is included here because its development happens concurrently with the wind farm construction.



| | Direct Economic Impact |
|----------------------------|--|
| Payments to Landowners | \$2.7 million/year |
| Local Property Tax Revenue | \$18.6 million/year |
| Construction Phase | 1,426 new jobs \$188.5 million to local economies |
| Operational Phase | 230 new long term jobs \$21.2 million/year to local economies |

Construction Phase = 1-2 Years
 Operational Phase = 1-20 Years

http://www.windpoweringamerica.gov/pdfs/economic_development/2008/mi_wind_benefits_factsheet.pdf

Turbine Installation



Rotor and Nacelle Installation

Once the tower is complete, the nacelle (all generating components) is raised up and bolted to top of the tower. Last, the rotor (blades and hub) is carefully attached to the front of the nacelle. Generally, the blades and hub are assembled on the ground and raised into the air with the help of large cranes.



Collector Cable System

System of buried cables that connect wind turbines to one another and the transmission lines. During this phase of construction, a ditch will be dug (about 48 inches deep) to place the lines in. Once completed, native backfill will be used and the land will be returned to its original condition.



Tower Erection & Assembly-

An 80-meter tower is composed of four cylindrical steel sections. Each tower section can weigh between 35 and 50 tons. Special cranes (over 300 feet tall) are needed to lift the tower sections up and stack them on top of one another.

Project Commissioning

The project site is powered and the turbines are commissioned. At this point your wind turbines are generating clean, renewable energy.