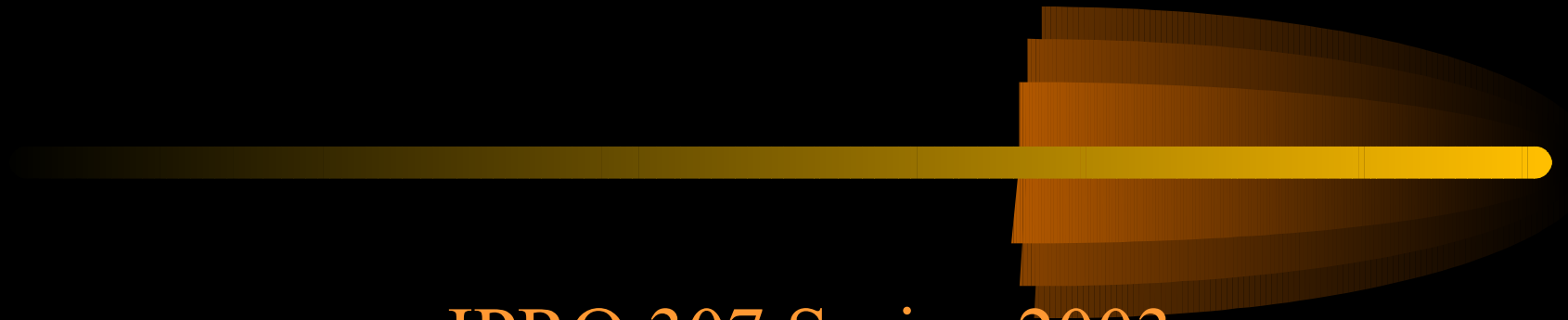
An Illinois Wind Generator System in Chicago



IPRO 307 Spring 2003

Team Members

- **Business Team**
  - David Gosnell, Tom Malewicki, Kristofer Mertes, Atul Talwar
- **Technical Team**
  - Kavin Ammigan, Antonio Arenas, Joseph Dillard, Margarita Dimitropoulou, Robert Meyer, Christie View

Topics

- Technical Team : TurbodynamX
- Business Team : TubodynamX
- Technical Team : Iroquois Landing

Review

The Previous Semesters

- Installed weather monitoring device on former USX site (87th and Lake Michigan)
  - Included permit submission and approval
- Collected data from USX site and analyzed
- Conducted market research for Illinois
- Worked on permit package

Features and Benefits

Generator:

Type	Synchronous
Drive	Direct
Excitation	Permanent magnets
Nominal power	12 kW
Nominal rotation speed	282 rpm
Rotation range	0-325 rpm

Turning system:

Type	Active, 2 geared rotors
Rotation speed	3.6 degrees /s
Control	Microprocessor

Performance:

Operating speed	
Start-up wind speed	6.71 mph
Nominal wind speed	30.32 mph
Cut-out wind speed	67.11 mph
Survival wind speed	201.33 mph

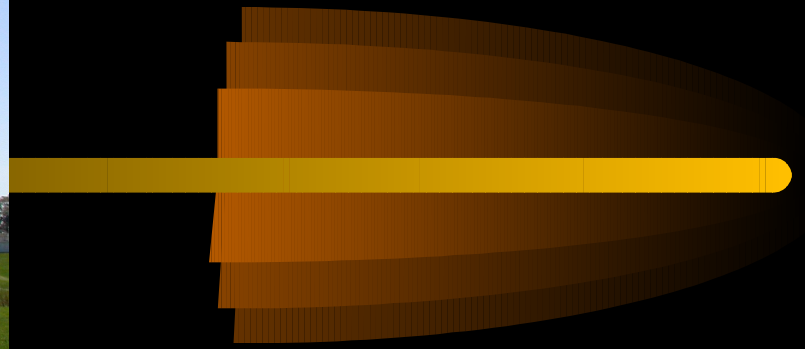
Fairing:

Overall diameter	17.30 ft.
Leading edge diameter	15.09 ft.
Materials	GFP Epoxy Resin

Rotor:

Diameter	14.44 ft.
Number of blades	3
Blade materials	GFP Epoxy Resin

Located at the Field Museum



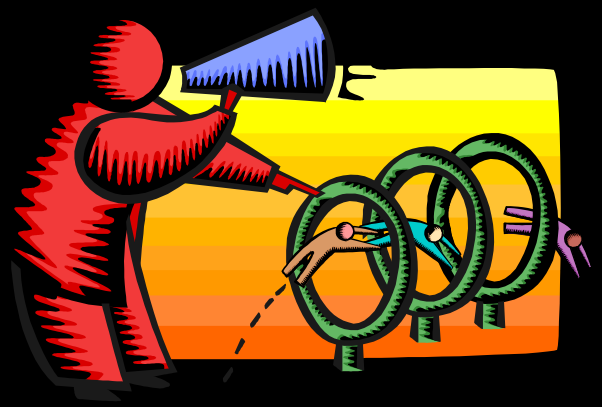
- Provides an ideal environment for the effective demonstration of this particular turbine as an effective, clean and renewable source of energy.
- Provides a high profile setting with abundant opportunities for many Chicago area residents to observe this new technology.

Permitting Process

What's the hold up?!

- July 2002 – began permit application
- September 2002 – submitted permit application
- April 2003 – permit finally approved

- What codes to use?
  - Tower? Sign? Antenna?
  - Answer: all of the above



Groundbreaking

- Unveiling
  - June 20th
  - Chicago Midwest Renewable Energy Conference
    - 3rd annual conference sponsored by IIT

Purpose of this Turbine Project

- Validate the performance as claimed by the manufacturer

- Provide exposure for renewable energy in urban environments and particularly in the Midwest

TurbodynamX, Inc.

- Mission
- Current company status
- Business Plan

TurbodynamX
renewable energy now

Business Plan – Part I

- Customers
  - Residential
  - Corporate
- Products
  - CH CAP HORN 12/5.3

Business Plan – Part II

- Competition
  - Direct
  - Indirect
- Pricing
  - Base Price: $60,000
  - Incentives: $30,000
  - Net Cost: $30,000

Wind Farm in the city

- Goal
  - To develop a wind farm in the Chicago Land area.
- Problems
  - FAA Issues
  - Visual Impacts
  - Land Issues
  - Environment Issues
  - Miscellaneous Issues

FAA Issues And Fixes

- Perceived Turbine Problems
  - Proximity to Hanger Facility (Air Sea Rescue)
  - Lighting Problems
  - EMI Problems
  - Rotor- Clip
  - Flight Plan Interruption
- Solutions
  - Property Lines not a Issue for Development
  - Lighting Solutions by Turbine Manufacturer
  - EMI/Rotor-Clip/ Flight Plans All Covered By FAA Study

Visual Impact

Relative Size

The blades on the wind turbines at the FPL Energy Gray County Wind Farm are the length of a wing on a commercial jetliner.

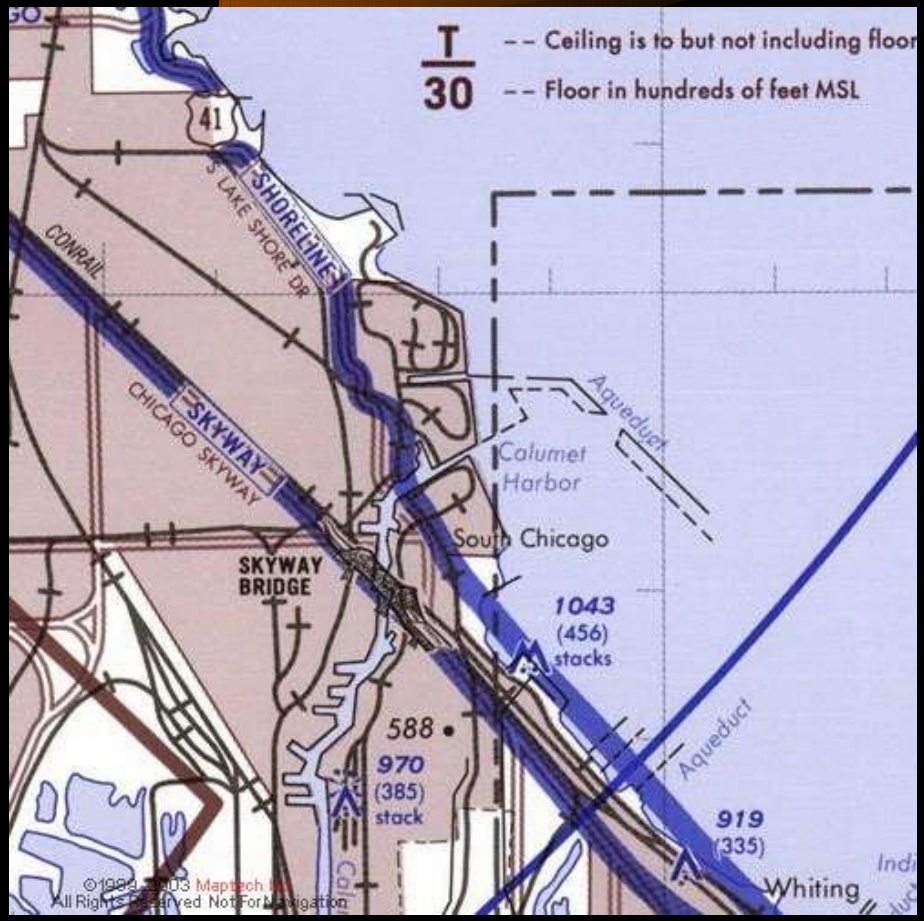
Industrial Grade Turbines

- 1.5 – 2.0 Mega Watt
- Appropriate Grid
- 60 - 66 meter Rotor Diameter
- Hub height of 60 to 80 meters
- 30 - 40 meters Minimum Rotor Height
- 90 -100 meters Maximum Rotor Height

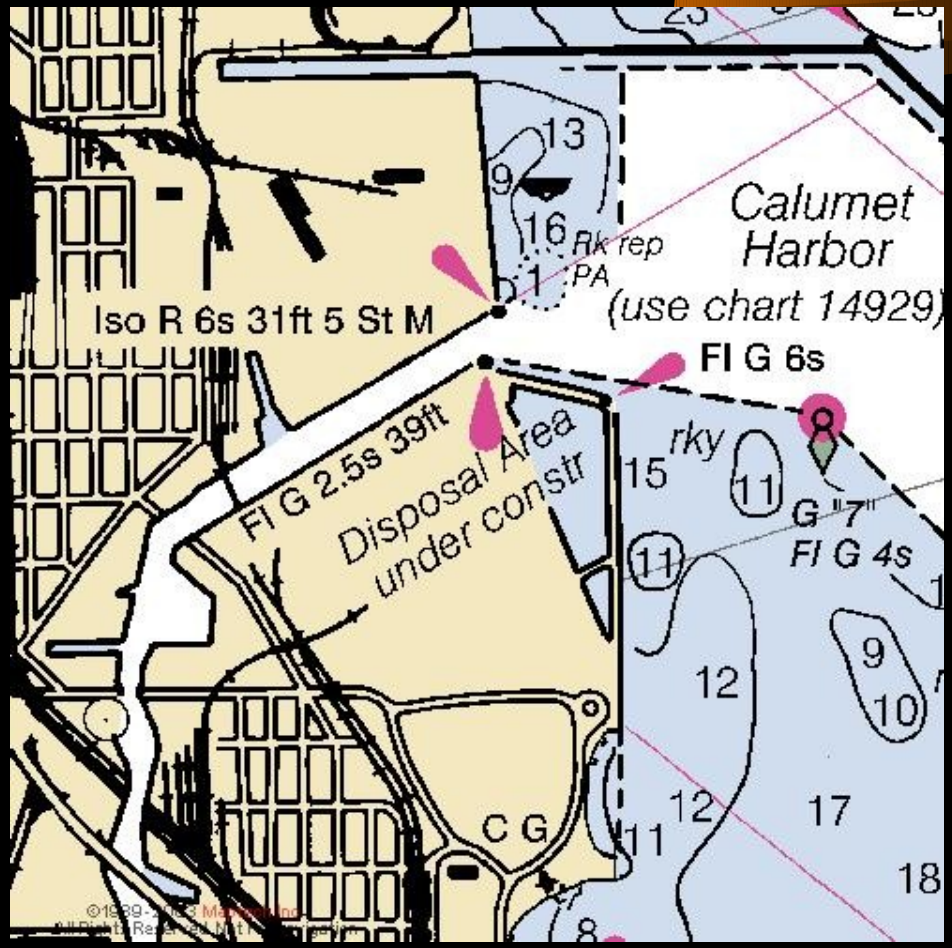
Foundation Problems

- Unconfirmed Land Type
  - Surveys Have Not Been Made Available
  - If Refill, After Extraction, Problem
  - Else Not
  - Possible Higher Cost Due to Fill Type

Aeronautical Maps



Navigational Maps



Topographical Maps

Environmental Issues

- Bird Deaths
- Impact on Land
- Conservation of Current Environment

Bird Deaths Continued

- Flight Patterns Avoid Proposed Property
- Majority of Birds in Chicago Area are Non-Endangered Species
  - Pigeons
  - Sea Gulls
  - Etc.

Other Issues

- Ice Build Up
  - 650ft Safe Distance
  - Preventive Measures
  - Ice Types
    - Rime Ice
    - Solid Ice