

IPRO 314 Project Plan

Objectives

IPRO 314's objective is to investigate possibilities of investing wind technology to City of Chicago area

Project Background

Due to many crisis regarding energy source and the global warming, they have many effects directly and indirectly on ways of people's living. Seeking for alternative energy source is always the missions.

Wind is now our alternative energy source.

It is renewable.

It is accessible.

It is sustainable.

It is economical.

...

This IPRO will provide the extensive studies on how we capture them

Efficiently

Effective

And Creatively

Fortunately, this class is the working collaboration of Illinois Institute of Technology (IIT) and School of Art Institute of Chicago (SAIC). It provides the extents greatly of being the multi-disciplinary project. There are mixed students in backgrounds of Architecture, Mechanical Engineering, Electrical Engineering, Material Science Engineering, Chemical Engineering, Design, and Fine Arts. There have been so many lectures and discussions on directions to engage in this project. Finally, the class decided on the study in three major areas by dividing into three groups:

Wind farms: Brownfield and Industrial Interior Repurposing

Wind Energy integrated to Architecture

Wind Energy from Open space

Group 1

Wind farms: Brownfield and Industrial Interior Repurposing

- **Members**

- Lisa Smith (Des Obj-SAIC) group leader
- Olusegun David (EE-IIT)
- Charles Hassrick (MFA)
- Sooyoung Ha (ME-IIT)
- Don Kwan Kim (ME-IIT)
- Heidi Moran (BFA-SAIC)
- Supreedee Rittironk (Arch-IIT)
- Bret Schneider (BFA-SAIC)

- **Research Significance**



Our proposal involves the investigation of adopting wind technology and power generated to existing Utility grid. We look into many possibilities of optimizing energy generation with potential benefit of revitalizing and repurposing pieces of selected sites. By optimizing power, we particularly investigate large pieces of land around Chicago area and adjacency. We found that they are vacant land that may be classified as Brownfields and industrial yards. They are located both along lakefront and inside along transportation lines of the city. This will give us opportunity to shot two birds in one stone: Redeveloping unused land to profit and Generating alternative energy by Proposing wind farms.

Thus, we decide to take approaches in engaging this wind technology for City of Chicago by investigating in three different areas:

1. Redevelopment of Brownfield: lakefront
2. Redevelopment of Brownfield: Industrial corridor
3. Power generated to Grid Integration

- **Research Methodology**

1. Formulating questions and ideas

- General

Can we rethink the large, centralized wind farm for an urban environment?

Can they take a different form (tunnels? tubes?) and make use of industrial wasteland within Chicago?

Can they exist underground or in the air?

- Lakefront & Industrial corridor

What are potential lakefront sites? This group includes cribs.

Are there other industrial sites in the lake that have potential?

What are the physical characteristics of these sites (location, area, size, climate data)?

Why is this site earmarked as a Brownfield (chemical contamination, old infrastructure)?

Who owns this site?

How can we get access to it?

Is there a remediation grant that it qualifies for?

What is the current state of the site?

Are they already part of remediation programs?

- Grid Integration

How can we create a wind power system that integrates seamlessly with existing distribution grids and utility companies?

How can we recreate the existing grid to facilitate assimilation of wind-generated power?

2. Collecting data

We will use multidisciplinary approaches in obtaining our data: analog and technology: site observation, written document, personal contact & interview, GIS data inquiry, etc.

3. Organizing & analyze data, answer questions

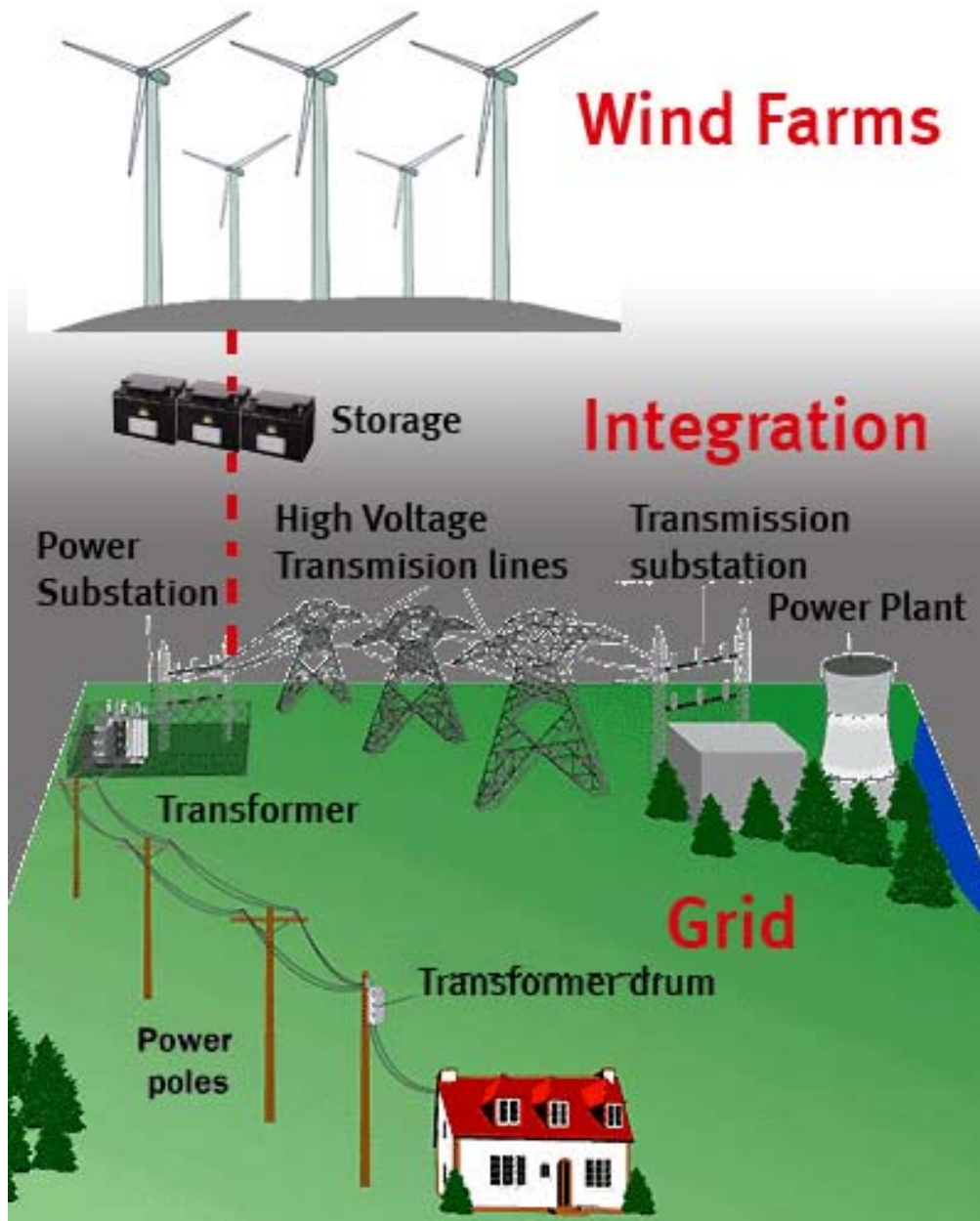
4. Selecting site: Case studies

5. Wind farms design

6. Calculating energy generated

7. Evaluate benefits

8. Final design proposal



- **Expected results**

Wind power must be seamlessly integrated with the grid.
 Wind power will not be adopted unless it becomes widely accessible and lifestyle independent.
 This technology will provide simple result to the end-users, and being independent of an environmental lifestyle.

Group 2 Wind Energy Integrated with Architecture

- **Members**
 - April Chen (Arch-SAIC) group leader
 - Abdoulaye Diao (CHE-IIT)
 - Steve Henry (Arch-IIT)
 - Think Nguyen (Arch-IIT)
 - Joon Park (ME-IIT)
 - Janusz Pula (EE-IIT)
 - Matt Stewart (Arch-SAIC)
 - Noel Wessely (MSE-IIT)

Wind and Built Environment Project Program

Location

The selected site is part of the Lake Park Crescent development. The overall development is bordered on the north by E 40th Street, on the south by E 42nd Place, on the West by Lake Park Avenue, and on the East by the Metra tracks. Within this development, the project site consists of the area designated for Phase 2 development, a portion at the southern end, noted in Figure 1.

Figure 1



Current Conditions

At present the site is a vacant lot scheduled for imminent redevelopment by a private development company contracted by the CHA. One building currently stands: a mid-rise public housing facility (present on the satellite image above). Site was previously occupied by single family homes, which were demolished and replaced by high rise public housing developments, which in turn were demolished in 2003 to make way for the Lake Park Crescent development.

Future Conditions

Lake Park Crescent will feature approximately 490 units of mixed income housing in a variety of building types. Beginning in Spring 2007, a park will be added with an architecturally significant pedestrian bridge crossing the Metra tracks and Lake Shore Drive to the lake front. The development's streets will be gridded with the city. Public transportation will be available at the 39th street Metra station. Building styles for Phase 1 will be updated Victorian with high quality masonry. The look will reflect the diverse and rich architectural heritage of the surrounding neighborhood.

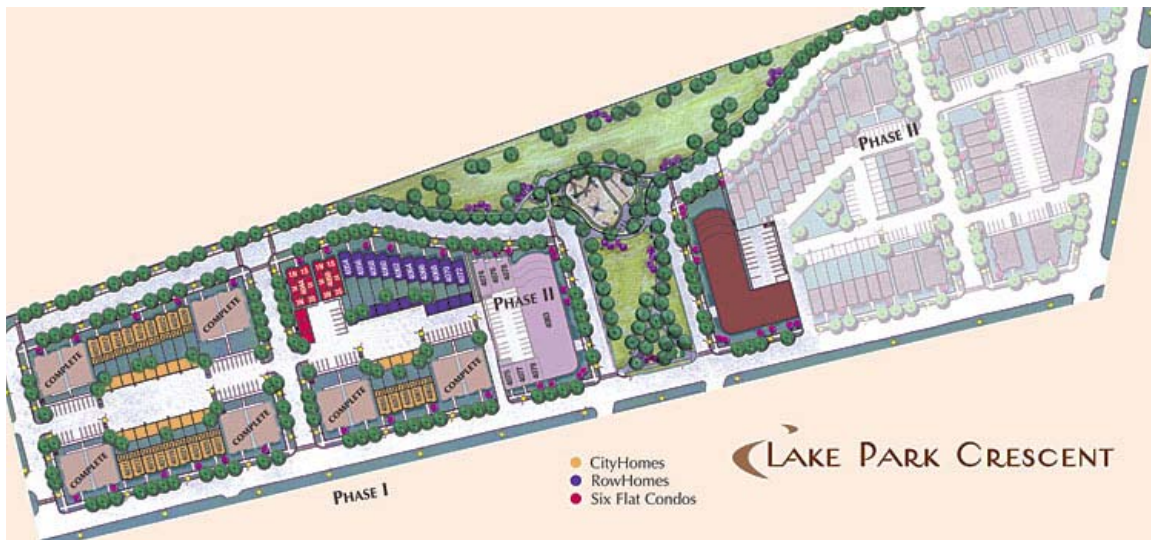


Figure 2: Program area noted as Phase 2 above.

Program Area

Using Google Earth, the total area of the development was approximated as 381,720 square feet, with the dimensions noted in Figure 3. Note: dimensions are estimates only, critical dimensions should be obtained from accurate orthographic site plans.

Scope of design

Design should address the following:

- Layout of site, including streets and pathways
- Placement of buildings within the site
- Basic building typologies and occupancies
- Access to transportation, park, surrounding neighborhoods

Design requirements

- Design will maximize production of wind power through site orientation and building configuration
- The site will read as an appealing, pleasant place to have a home
- Building typologies will reflect neighborhood heritage and dialogue with Phase 1 Development

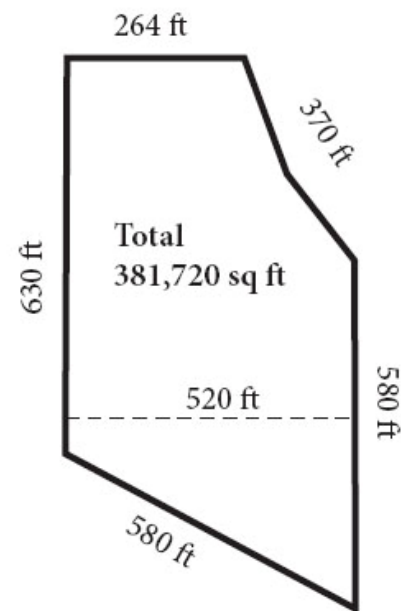
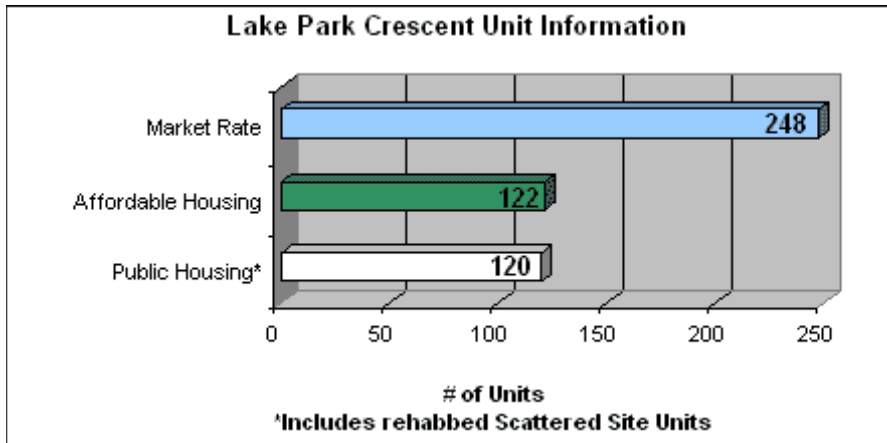


Figure 3: Approximate program dimensions

Housing types

The CHA provides the following breakdown of housing types for the development:



The following are estimates of the number of units and unit types based on the site map in Figure 2:

Phase 1:

#	Type	Total units	Income breakdown	Unit type	Apprx SqFootage
10	RowHomes	10	10 Market Rate	SFH	2750
14	Six Flats 84		70 Market Rate	Flat 2 level	1450/2000
			14 Affordable	Flat	1200
23	City Homes	46	23 Affordable	Flat	850
			23 Market Rate	Flat 2 Level	1750
1	MidRise 88		88 Public Housing	?	?
Totals for Phase 1			103 Market Rate		
			37 Affordable		
			88 Public		

Based on Phase 1 estimates and the CHA's numbers, we can project the following (corresponding to building types plotted on site map in Figure 2) for Phase 2:

#	Type	Total units	Income breakdown	Unit type	Apprx SqFootage
11	RowHomes	11	11 Market Rate	SFH	2750
9	Six Flats 54		9 Affordable	Flat	1200
			45 Market Rate	Flat 2 Level	1450/2000
24	CityHomes	48	24 Market Rate	Flat 2 Level	1750
			24 Affordable	Flat	850
1	MidRise*	80	40 Public	?	?
			40 Affordable	?	?
1	Tower	70	60 Market Rate approx		
			10 Affordable approx		

Project should accommodate these numbers (*Note: MidRise tower is located outside of Phase 2 site boundaries.)

Group 3

Wind Energy from Open Space

- **Members**
 - Cara Ellis (Arch-SAIC) group leader
 - Michael Kruss (Arch-IIT)
 - Tor Kyaagba (EE-IIT)
 - Jae Min Lee (MFA-SAIC)
 - Brendan Hudson (BFA-SAIC)
 - Robert Fleming (ME-IIT)

- **Introduction and Objective**

We are interested in creating a wind power installation for Chicago that is integrated into the urban and architectural fabric and serves as a functional energy source as well as a powerful demonstration of the city's commitment to a sustainable future.

We believe it is important, when designing for an urban context, to deeply consider the issues of scale and public interaction. In a city, it is not sufficient to deploy well-engineered machines without considering how they will be received. It is equally insufficient to simply paint them pretty colors or try to camouflage them.

Alongside the efficiency (both productive and monetary) and engineering factors, we believe a comprehensive design approach is needed, one that addresses questions of user interface and safety, aesthetic impact and communication of function.

It is our objective to design such an approach and outline the necessary steps towards implementation for a specific site in Chicago.

- **Site Identification**

We have at this point identified the lakefront as a prime site for wind energy development. In specific we have focused on the loop and near-loop lakefront, with an approximate southern boundary at Burnham Harbor and northern boundary at the end of Lincoln Park (Hollywood Ave). We intend to pick out several prime locations along this route for development. Our hypothesis is based on the following assumptions / considerations:

- The Lakefront has (in many areas) sufficient setback from buildings and other obstacles to receive frequent wind exposure and greater average wind velocity.
- The Lakefront is a popular area, with a high level of pedestrian traffic and public exposure.

- The Lakefront is already a site for public, cultural, educational, and recreational activity, thus enhancing the plausibility and effectiveness of a civic installation dedicated to wind power.
- The Lakefront is public property, which should help alleviate accessibility issues.
- The Lakefront is an important site for Chicago's civic identity.

IPRO 314: Task Schedules

- 3/7 Site analysis, Collecting Wind data and GIS investigation
- 3/14 Midterm Report Review
- 3/23 Submitting Midterm report
- 3/28 Wind turbine design and energy generated in selected site
- 4/4 Field Trip to Adopted wind technology sites
- 4/11 Design Development 1
- 4/18 Design Development 2
- 4/25 Recap and Finalize design proposal
- 4/27 Final Proposal

Expected Results

Our IPRO team will provide extensive amount of research and design to support proposals that we come up with in these three different ideas.

The proposals include

- Site analysis
- Selected sites
 1. Site planning & Design for Brownfield and Industrial areas
 2. Architectural Design to integrate wind technology
 3. City planning in open space
- Wind turbine design for selected sites
- Amount Energy generated & calculations
- The integration of proposals to the Grid
- Evaluation of environmental values