Cellular Towers in the Urban Environment
Problem
• Capacity requirements of densely populated areas is increasing.
• Current designs do not fit space, zoning, and aesthetic constraints.

Solution
• Design an innovative cell tower using IIT as the urban setting.
Mr. Charles Hayes

- South Bend, Indiana.
- Over 20 years experience
  - 40 sites located in Indiana, Michigan, Ohio, and Texas.
- Lattice, monopole, stealth, and guyed towers.
- Engineering, construction, operation and maintenance of tower.
Design Team:
• site analysis
• tower designs

Technical Team:
• stakeholders
• research

Combined tasks:
• decide on designs
• prepare deliverables

Design Team:
- Jake Design Leader
- Ron
- Dustin
- Marc

Technical Team:
- Amanda Tech Leader
- Fotis
- Mike
- Jon

Tim Team Leader
Stakeholders

- IIT Administration
- Surrounding Community
- Charles S. Hayes
- Cell Phone Carriers
Carriers, IIT Administration

**Gus Gonzalez** Recruiting Manager, T-Mobile

**Prishant Patel** Retail Manager, Clear; Associate, Sprint / Nextel

**Terry Frigo** VP Facilities, IIT

**Ophir Trigalo** CIO, IIT
Concentration of Local Towers

1 mile: Interstate 55
2 miles: Roosevelt Road
4 miles: Navy Pier
6 miles: Armitage Avenue
Students were asked to comment on the traditional monopole design

- Negative comments: too big, out of place, ugly
- Positive comments: simple, functional, minimalistic

Suggested site of tower: edges of campus

Largest issue: White Sox games
General:
- No artificial lighting
- Galvanized steel finish or neutral paint color

Freestanding:
- 150 feet
- Monopole construction
- Safety
- Six foot fence
Site Analysis

* The FCC does not require every antenna structure to be registered, and the map may or may not list all the towers in the area.
Site One:
Edge of campus, out of the way.

Site Two:
Public, open area, high visibility.
Current Problem
Base Design

First Level

Second Level

Elevation

Section
Sustainable Design

- Recycled Aluminum Mesh
- Photovoltaic Cells
- IIT or location branding
IPRO 344
Wind as Renewable Energy

Aerotecture
610V model

Helix Wind
S594 model
Wind as Renewable Energy

- Blue: Smooth laminar wind flow
- Yellow: Turbulence boundary
- Red: High wind turbulence
Solar as Renewable Energy

Heat Source
- Sunlight
- Fossil Fuels
- Radioactive Decay
- Waste Heat

Absorber/Emitter
- incoming heat
- emitted photons
- recycled photons

Photovoltaic Cell
- p-n

Spectral Filter
- optical losses

Mirror
- electrical power

Earth/Heat Sink
<table>
<thead>
<tr>
<th>Task</th>
<th>Cost ($)</th>
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<tbody>
<tr>
<td>Permits, Engineering</td>
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<tr>
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<td>Generator</td>
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<tr>
<td>Landscaping</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>260,000</strong></td>
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The Next Steps

• Obtain approval from sponsor.

• Submit proposal to the IIT Planning Committee.

• Submit design to Chicago's ordinance board.
Is There a Need?

- With the potential new developments near campus, the need for data capacity will increase.
- Multiple design options to fit the needs of most site requirements.
- Building-mounted antennas are an alternative.
- Given the site's conditions, we've determined that it fits the needs of the project's scope.
Questions?