URBAN WINDSCAPES
21st Century Office Tower

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As global energy consumption levels soar, people seek alternative production from the sun, wind, and water. Of these sustainable technologies, wind arguably proves most efficient in producing large quantities of usable energy. Historically, people harnessed the wind and controlled solar gain through architecture. While the urban application of renewable energy begins to appear in cities, it remains largely as production occurring on the periphery where the most space is available. Citing these fields of production necessitates expanding energy and infrastructure to produce energy where it is needed.

What if energy production occurred at the site of consumption?

What if production and consumption co-existed equally?

What if wind harnessing technologies began to influence architecture?

This thesis will study the feasibility and architectural potential for incorporating these renewable technologies into existing urban settings to reduce transmission loss. These buildings will not just be a traditional power plant, but will also teach users about consumption levels, turning the space into a dual-usage program. It is my intention to investigate how buildings can both produce energy and contribute to the public life of cities.
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Ivanic, 58.
“I want to make energy so cheap that only the rich can permit themselves the luxury of using candles.” -Thomas Edison

Each industrial revolution announces itself with a boom of activity. Necessary infrastructure and buildings quickly follow, creating networks to house new technology. Innovations provide quicker ways for people to complete tasks that previously took twice or three times the amount of time. People awaken to a new quality of life and retire vintage methods. Old cars rest in junkyard and new cars cruise the asphalt streets. Factories close doors permanently and linger as ghosts of past production sites. With each innovation, each task becomes simpler, and people soon forget the fascination behind what makes the world work. Every brand new motor, lamp, or vehicle evolves to a model faster, quieter, and more efficient than its ancestor. The landscape becomes a time capsule documenting the booms and busts of industries. With each recycled term of industry, the need for more land pushes the source of energy infrastructure and projects further and further away from cities, the site of energy output.

Renewable energy sources emerge as a viable alternative to the more widely used methods of extracting the earth’s natural resources. People look now to passive systems in terms of sun, wind, water, and heat to produce energy that still widely comes from fossil fuels. Of all the passive methods explored with today’s technology, the wind has proven the most cost-effective method of harnessing the earth’s power and conversion to energy. For this method to work at its optimal capacity, the new wind turbines are placed in
1 Ibid, 58-60.
rural and virtually non-inhabited landscapes. With many turbines working in an area with constant wind flow several dozens of meters off the ground, the wind can begin to generate enough power to produce electricity. However, this pattern of wind farms still hosts a number of disadvantages. Citing wind turbine fields in isolated locations necessitates expanding energy and infrastructure to transport energy produced to where it is needed. As an alternative, energy production should be located closer to the source of its use. Buildings, infrastructure, transportation, and technologies use the bulk of the world’s energy.4 With a constant stream of new innovations in all renewable energy productions, the exploration of incorporating these technologies into city buildings should be explored further. Applications exist, but the technology has yet to reach a benchmark where widespread constructions prove fruitful. In cities where wind is available, buildings today should strive to use wind to their advantage in energy production coupled with an idea of sustainable design requiring overall less energy consumption. Ultimately, these incorporations of renewable technology into the building’s structure, program, and skin should look to improve the architecture of the building itself, while also serving as an educational aspect to people on the future of building technologies.
Coal leads the nation in providing electric power generation at 56.30% of all production.

BREEZY OR GUSTY? WHAT IS WIND ENERGY?

“Tout sur terre appartient aux princes, hors le vent. (Everything on Earth belongs to princes, except the wind.)” –Victor Hugo, La Rose de l’Infante

The concept of harnessing wind to ease daily tasks predates modern times. Pasqualetti describes the wind as a challenge that has been put to thousands of years of tests and experimentations to some successes. Before machines, electricity, and air conditioning units, wind stood as the sole energy source. Following a post-industrial era, a contemporary outlook towards reliance on non-renewable and renewable sources of energy must be observed. Mid-1980s America witnessed her first successful wind farm in San Gorgonio Pass in a windy, unusable pass in southern California. Overwhelmingly negative reviews abounded and several years passed before it became socially acceptable to construct wind farms in rural America.

Fast forward a decade and wind energy, alongside other renewables, becomes a universally accepted method of harnessing wind energy across the United States. Renewable energy production accounts for 12% of America’s electricity supply. To date, wind turbines dot thirty-six states’ landscapes, with Texas, Iowa, California, Minnesota, and Washington as the nation’s leaders with installed turbine power. Wind power flexes as one might guess; the wind does not always blow at a constant velocity. Wind power varies according to altitude, season, and landscape. The size of an individual turbine, ranging from individual residential size to a large wind turbine park, determines watts of power produced. The first generates some 10 kW of power while the
11Ibid, 9.

12Glaeser, *Triumph of the City*, 1.
later generates 3 MW of power.\textsuperscript{11} Renewable energy proves a clean method of harnessing an environmental power to beneficial use for cities, so why then are energyscapes still located beyond the periphery for 243,000,000 urbanites?\textsuperscript{12}

**Light Breeze or Strong Gale?**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calm</td>
<td>Smoke rises vertically, flags hang limp</td>
</tr>
<tr>
<td>Light air</td>
<td>Smoke drift indicates direction, wind vanes don’t move but flags unfurl and begin to expand</td>
</tr>
<tr>
<td>Light breeze</td>
<td>Wind felt on face, leaves rustle, wind vanes begin to move, flags unfurl and begin to expand</td>
</tr>
<tr>
<td>Gentle breeze</td>
<td>Leaves and small twigs in constant motion; light flags extended</td>
</tr>
<tr>
<td>Moderate breeze</td>
<td>Raises dust, leaves, and loose paper; small branches move, dry sand begins to drift</td>
</tr>
<tr>
<td>Fresh breeze</td>
<td>Small trees begin to sway, crested waflets on inland waters</td>
</tr>
<tr>
<td>Moderate gale</td>
<td>Whole trees in motion; resistance felt when walking against the wind</td>
</tr>
<tr>
<td>Fresh gale</td>
<td>Twigs break off in trees, wind generally impedes process when walking</td>
</tr>
<tr>
<td>Strong gale</td>
<td>Slight damage to roof and to homes, chimney pots and slates damaged</td>
</tr>
<tr>
<td>Whole gale</td>
<td>Trees uprooted, considerable structural damage</td>
</tr>
<tr>
<td>Storm</td>
<td>Widespread damage</td>
</tr>
<tr>
<td>Hurricane</td>
<td>Devastation</td>
</tr>
</tbody>
</table>

Figure 3

13 Gipe, 23.


15 Ibid, 26-27.
Sustainable discourse predates industrial technologies. Passive architecture begins when civilizations learn to harness the wind. Wind is everywhere, shaping the environment however it sees fit. Cool breezes soothe summer nights. Wind wafts off the ocean waves and gives sails momentum. Martin Pasqualetti puts forth that “putting the wind to work was our first conscious use of solar power”\textsuperscript{13} allowing even the earliest civilizations to harness products from renewable energy. Before mass industrialization, vernacular buildings provide an architectural example of a time when environment and architecture engage constant conversation in urban settings. Harsh climates demanded the integration of environmental concerns into the architecture, and the two becomes seamlessly blended into a “conceptual framework”\textsuperscript{14}. Early Muslim-Arab vernacular architecture takes advantage of the wind as a climatic factor and passive ventilation in designing a building with towers that puncture through buildings’ roofs to gather wind and funnel cool breezes downwards into an interior courtyard.\textsuperscript{15}

Traditional American architecture also provides insight to the seemingly effortless involvement of wind and sun into a building’s form. Perhaps the greatest architectural example of such passive design stems from the pueblo constructions in the southwestern United States. The first example nestles itself into a canyon’s cliff side taking full advantage of the winter sun’s warmth but during the summer remains shaded throughout the majority of the day. A second, and more developed model, arranges terraces and roofs, both constructed to emit heat gain, to catch the brutal summer sun while the winter sun falls directly on walls designed for heat storage.\textsuperscript{16} As architecture becomes...
Figure 4
Photograph by Kate Peaden.


17 Kieran and Timberlake,


More on Palladio’s La Rotunda in Case Studies Research.

20El-Shorbagy, 26.

a formalization and a profession, the architect of the Renaissance becomes master builder, formalizing all aspects of a building.\textsuperscript{17} He thereby fully marries technology and architecture. The Italian Renaissance marks the renewal of the pre-modern air conditioners, or \textit{pneuma}\textsuperscript{18}. An underground network of caves, channels, and gardens collect wind currents and send them upwards through the buildings placed atop these networks. Italian architect Francesco Trento mastered the art of connecting these naturally and artificially carved underground tunnels to allow the storage of cool breezes to air condition several villas above through a system of regulating doors. Later, Italian architect Andrea Palladio references Trento in his Four Books of Architecture as inventor of the villa and comments of the ingeniousness of his “prison of winds”\textsuperscript{19}. Palladio himself designs specifically for wind ventilation in Villa Rotunda. Built caves trap winds underground where they can then be guided upwards through a well-crafted vent. Palladio arranges rooms to take full advantage of the swirling winds. An oculus directly above this same vent allows warm breezes to escape the villa. These vernacular solutions to environmental issues prove fruitful in their modern adaptations and applications in contemporary building.\textsuperscript{20}

Windmills dotted the rural American landscape and were employed by individual farmers to irrigate agricultural landscapes. These energy landscapes spanned miles across the 19th century American plains allowing people to use wind power to its then fullest advantage through using the power generated by these mills to pump water into dry crop fields. Then American industrialized. Windmills disappeared in favor of the quicker, sleeker motor. Unlike the windmills of a bygone era, these newer energy producers ran on fossil fuels extracted from beneath the ground.\textsuperscript{21} Mines, due to their toxic and unfortunate looking nature, were pushed farther and farther from the masses of people and the contemporary cycle of energy consumption begins.
Figure 5
Not until fairly recently has wind turbine technology really taken flight. Today’s windmills are formally turbines, and rest in vast open areas where wind is available and constant and the structures are generally out of the way of all people. With the innovation of the contemporary wind turbine, the ability to harness, store, and transport usable energy to masses of people becomes reality.

The attitude towards providing alternatives grows parallel to the growth of energy demand. Societies realize their consumption of the earth’s resources may constitute its demise. Users pursue alternatives such as capturing the sun’s radiation and heat or harnessing the power of wind to harvest energy. Wind farms are site specific and used to maximize the earth’s potential. In areas of high constant wind velocity, these landscapes of wind turbines are constructed to harness kinetic energy, which can then be converted to electricity, among other outputs. Wind energy proves the most economical source of producing electricity today. While wind energy, just as any other type of sustainable energy, fluctuates, its benefits for a sustainable future outnumber its disadvantages. The sun will set and the wind will stop every now and then, but the benefits of harnessing energy at its source closer to the actual source of its use triumphs these factors.

Conventional views stand in the way of total sustainability of energy resources. The 21st century lifestyle bulldozes through resources with alarming swiftness. Man uses technology as a champion over the environment because he is capable of doing so, and it is easier. He buries his telephone wires; he
Figure 6
The photograph reveals where the most electricity in the United States is used: near or in cities.


26Ibid, 389.

27Conzen, The Making of the American Landscape, 6-8.


29Ivancic, 13.
turns on the lights with a simple switch. He seeks to conceal the methods and functions behind his amenities. He does not care how his light switch works, a lengthy process of transporting fossil fuels overseas and conversion to electricity, so long as he has electricity efficiently every time. People reject wind and solar farms due to their foreign appearances. These new technologies develop an “ugly label”\textsuperscript{25} as people become more accustomed to technology at their fingertips. Whereas the wooden windmill dominated the medieval landscape, the steel wind turbine is a “new way to rape the landscape”\textsuperscript{26}. Americans reminiscence a big open country aesthetic in a period when virtually no landscape escapes human intervention.\textsuperscript{27} People invest an instinctive psychological connection to nature, and this connection is seemingly compromised by the implementation of mechanical structures into an open field.\textsuperscript{28}

The question at hand is how to resolve the negative and the positive. It is easy, and efficient, to simply place a solar panels on a rooftop and qualify the architecture sustainable. Sustainable building design then becomes a re-arrangable Lego set with a LEED product line to add onto an existing structure. Or worse, these new technologies are added to new constructions and appear as an afterthought. While implementations of sustainability are a true step in the right direction and deserve recognition, design and aesthetics must hold their role. As technologies develop, architecture should develop alongside to project not only technologies of energy harvesting into the future, but rather the relationship between architecture and its productive pieces into the future. Urban planners should “analyze [the] relationship between the world of energy transformation and the world we live in.” \textsuperscript{29}
Figure 7

30 Glaeser, Triumph of the City, 1-7.
31 Ivancic, 14-36.
32 Ibid, 16.
The migration of people to cities and the subsequent city levels of energy consumption cannot be ignored. The majority of people live in the urban landscape. People move to cities to gain the benefits the city provides. The proposal for urban energy production makes sense; produce the bulk of the energy people use where people use it. The idea is to link the source of power production and the user of the power through direct physical connections; produce energy where it is consumed. Cities themselves expend energy more than other constructed landscapes. People move to cities for their technologies, and each of these technologies, whether it is an automobile or a skyscraper office complex, an underground subway network or personal air conditioning units, cities use power in mass quantities. The “not in my backyard” syndrome must be addressed through urban energy landscapes. If people feel accountable for the amount of energy they individually consume throughout their daily routines, the energy consumption level might stand a chance at being reduced.

Bringing power production to the city poses problems. These technologies develop and expand daily, yet still remain in progress. Wind turbines are loud; they break. Their implementation in cities presents a hazardous environment in a dense fabric. Historically, industrial zones dotted the outskirts of cities because of the pollution, noise, and overall unsightly appearance affected city life. These disadvantages of power production in urban centers, though greatly improved from its industrial ancestors, still present hesitations to bring power production to the center of large cities. The answer also cannot be simply to take each LEED component and place it atop an existing building.
and award it green architecture. In order to advance urban and building design into the 21st century, they must couple architectural integrity with the available technologies.

Within the design parameters, architects should design not only for current implementations. They should design with anticipation of the same exponential development rate of these technologies so that the buildings of today do not appear haphazard with newer technologies. Any building design should strive to span across time, both functionally and mechanically. Design cannot be compromised with additive innovations.
Soren Schobel, and Andreas Dittrich, “Renewable Energies: Landscapes of Reconciliation”, 56.
LOCATION, LOCATION, LOCATION

Abandoned spaces, or vacancies, within cities showcase potentials of the productive landscape. New methods do not require a “total breakup” of existing cities but rely upon “available landscapes”\(^{33}\) much as the thought process behind the placement of wind farms. These spaces could begin to influence another type of activity to be paired within the production site. Programs that require the most energy consumption, such as airport terminals or mile-high office buildings, could be paired with actual energy production on-site. Increase level of product with the passage of time since technologies have not reached their fullest capacities yet. This type of design could begin to influence an activity that generally takes a huge amount of energy to run, for example an airport, subway station, or office building. Both technology and architecture influence each other, and a good piece of architecture will result.

If a light switch indicated the process behind the simplicity of the flip of the switch, if one could perceive the journey of fossil fuel to one’s fingertips, direct accountability becomes reality. If the journey could be documented within a building’s design, visitors to the site could enjoy the function of the building while simultaneously experiencing the building’s technology. People should be accountable for their energy consumption; over half the effort starts with the reduction of consumption. If beacons of awareness rest in cities where people generally go, they will begin to feel a responsibility towards the sustainable methods that are just now beginning to take off in popularity. The goal is an end result with architecture and engineering working together to produce a productive piece of good architecture, paired with a rising awareness and a hopeful move away from the “Not in My Backyard” mentality.
WHERE IS AMERICA’S WIND?

“Wind power accounted for 39% of all new U.S. generating capacity in 2009...”

What if energy production occurred at the source of consumption? What if production and consumption co-existed equally?
CONCLUSION

Renewable energy remains a topic of discussion, as the once hoped widespread implementation still waits to become reality. Contemporarily, their placement still remains largely on cities’ peripheries and demands more infrastructure and energy to transport its usable byproducts to places where people use the most energy: the city. As technology improves, specifically wind harnessing technologies, these applications should be incorporated into the city’s architecture and infrastructure. While still in their exploratory phase in city implementation, these technologies still do not fully work to a totally sustainable outcome, nor do they totally satisfy the traditional or conventional building aesthetic. Applications of wind harnessing technologies into buildings should strive to bridge the gap between architectural quality and the functionality of production.
The author, though unknown, begins with a series of statements concerning the integration of a building’s function and its appearance, both key to the thesis statement. He is quoted, “...nor should a building be described in terms of collectors and exotic equipment.” In this manner, he describes a passive vernacular architecture, that of the Pueblo Indians in depth, as an architecture rooted in time and place thus rendering buildings familiar or comfortable. He further criticizes the glass towers that followed passive vernacular architecture in the modern era in stating “inside those seemingly weightless, transparent buildings were hidden giant machines to make them usable...few questioned the aesthetics of bubbles with firedragons in their basements.”

Chambers describes the ins and outs, facts and figures concerning all types of renewable energy. Though the thesis topic touches on all types of sustainable energy, and of those specifically wind, incorporation in buildings. Chambers aids the thesis in a quick, clear overview of all topics concerned in their specifics such as where technologies should be located, how they work, and how actual energy output can be calculated for the layperson, or non-engineer.

De Vries explores the idea of dual-usage landscapes, or those landscapes designated to perform a two functions simultaneously much like the thesis suggests. The idea of harvesting energy in itself remains okay, but waits for the envelope to be pushed. De Vries suggests, “producing energy plus another activity”. She coins the term “productive design” which in itself implies the base argument of the thesis proposal: produce energy in a building that was already planned on being built; let a building be more than just a building. She also suggests MVRDV’s conceptual Dutch Pavilion as means to layering functions vertically, much like integration of environment, function, and production in the thesis.

As the title describes, Ivancic’s book gives a complete historical and contemporary description of all energy landscapes, both non-renewable and renewable. His in-depth research aids the thesis greatly with general statements towards how the landscape has been or can be manipulated and exploited to extract sources to produce energy. Crucial to a thesis rooted in the architectural integrity of a building that can simultaneously produce energy in some capacity, Ivancic presents a series of case studies. The case studies, while still fruitful to explore, reveal ghosts of past production sites recycled into new functions, such as the former power plant turned Tate Modern Museum.
BIBLIOGRAPHY


Necessary to the study of contemporary sustainable architecture is a look into historical passive architecture, the buildings that came before the lightbulb or the A/C unit. Kenda explains a type of passive ventilation revelation dating from the Italian Renaissance. Her study focuses specifically on underground tunnels used to funnel the direction of cool winds upwards through buildings, quite contrary to the contemporary interpretation to capture wind above ground. Her study reveals a type of pre-modern sustainability which serves the thesis study in its search for both energy production and energy reduction.

The firm Kieran-Timberlake questions the balance between architecture as a commodity or as an art suggesting contemporary architecture is neither nor. The duo questions this balance as the craft left after the master builder hangs his hat for the encroaching machine, which produces commodity? The questions raised directed the thesis towards an architecture that predates the architect who relies on technology, such as wind towers, pueblos, and Palladio. The firm suggests that architecture is much more than just a visual treat for users, but that the building should respond to how its users use it. While a different approach, the critical thinking behind processes of architectural design powered the thesis research.

OMA’s report, published for public viewing during the research of the thesis argument, provides an overview, even if opinionated, of where the world stands today on the brink of resource depletion. The report is most useful in its propaganda, both in provocative quotes and photographs, to relay the message of a call for a total switch of reliance from non-renewable resource dependence to renewable resource dependence. The firm is Dutch, and the Netherlands is one of the leading countries in explorations of renewable energy making the argument bold in its potential as a working thesis and projection. While the report is useful for the thesis argument in favor of renewable energy, the report speaks to governmental involvement of which the thesis does not.


Pasqualetti, in both his works used for research purposes, questions the aesthetics and popular opinion of wind turbines. He traces several wind farms and their following critiques, all usually negative in visual aesthetic. The thesis searches to mend this gap between technology implementation and visual acceptance. Whether this acceptance is left to the subjective aesthetic or if it searches to fix the gap through teaching users about the benefits of renewable, and specifically wind, energy productive landscapes is left to be discovered. Pasqualetti also breaches from a NIMBY to a PIMBY (Please In My Backyard) speculation of opinion, maybe even a utopian opinion, like the thesis statement.

Tim Sharpe reaffirms the potential of wind energy in building mounted approaches, as the title suggests. He calls the wind the most “mature” of the rest, but asks why only are the most mature applications located in rural districts. He raises the obvious answers, (1) detriment to people’s safety, (2) technical technicalities, (3) construction costs and structure of existing constructions, and (4) “aesthetic barriers”. The author provides various urban applications in a series of precedent studies, then goes further to suggest an application, the Crossflex, which can be applied vertically or horizontally. The author still seeks total technology performance, and suggests that the reason turbines are not widespread is due to their loss of performance peaks. But, what if, as architects, the applications are allowed reduced performance numbers in gain of a more widely popular visual appearance? If these applications are not 100% productive, do they offer something else to the building’s design?


DESIGN PRINCIPLES

Architecture reaches beyond the building’s wrapper and contents; architecture influence the cultural and historical context of its environment. This environment includes the interior and exterior realm.

Through this response to surrounding environment and landscape, architecture invokes sensory responses beyond just the visual response.

Architecture is dynamic. Spaces inform another horizontally and vertically simultaneously. The architectural experience of a building should improve the experience of a building or built space.

Architecture creates a visual time line documenting cultural and social change. In this sense, architecture itself becomes an artifact. Reusing and recycling should honor the artifact as well as creating new.
Zaha Hadid // Maxxi // painting

Zaha provides process drawings revealing the thought process leading up to her design concept, a crucial piece of the design process in architecture. The painting to the left reveals the conceptual field of line work meshing to blend the exterior and interior pieces of program at the Maxxi.

Bernard Tschumi // Acropolis Museum // Athens, Greece

The museum successfully highlights both the historical and contemporary architecture at the acropolis. In this way, the building becomes a time line showcasing both the old versus new. Neither new nor old become dominant.

Lewis.Tsurumaki.Lewis // Park Tower // competition drawing

The project conceptually transforms the typical parking garage into a new visualization where boundaries between exterior and interior are blended as exterior landscape is interwoven between parking floors thus heightening the environmental quality simultaneously.
**Herzog + deMeuron // Signal Box // Basel, Switzerland**

The careful consideration of materials and tectonics reveals a simple twist in material to blend the exterior and interior boundaries. Light can filter inside providing an enhanced environmental quality.

**Diller Scofidio + Renfro // The High Line // New York City, NY**

An old highline is recycled and reused as an elevated pedestrian walkway across New York City. Within the walk itself, materials are pushed and pulled with careful consideration to create patterns of hard and soft surfaces along the experience.

**OMA // Dutch Embassy // model photograph**

Koolhaas carves a circulation route as a void through the cube form to symbolize the space as both a callout and a method of seeing through the building as to blur exterior to interior boundaries. Verticality and horizontality work together to create dynamic sectional views and situations.
Figure 1. Painting by Zaha Hadid, Maxxi Musuem in Rome.

Figure 2. Acropolis Museum.

Figure 3. Park Tower.

Figure 4. Central Signal Box.

Figure 5. The High Line.

Figure 6. OMA's Dutch Embassy, model photograph.

DESIGN RESEARCH // Case Studies

SITE // LOCATION
re:Vision Dallas
Trinity River Project: Dallas

THEORETICAL INTENTIONS // PRINCIPLES
Waste-to-Not Energy Plant
Park Tower
Dutch Pavilion
Tar Creek

PROGRAM // USE
Shenzhen Office Tower
Pearl River Tower
New Algiers Point

MATERIAL // TECHNOLOGICAL INNOVATIONS
Piezoelectric Leaves
Harbour Brain Building
Wind-Scraper

HISTORICAL // CULTURAL CONTEXT
Windcatchers
La Rotunda
DESIGN RESEARCH

SITE // DOCUMENTATION

Atlier Data + MOOV// Re:Vision Dallas // competition

The project is a proposal for an off-the-grid urban community with multiple uses in a single proposal. The form is derived from a familiar landscape, the hill, and provides vegetation as elevation increases with energy harvesting through both wind and solar forms at the hill’s pinnacle. The importance of re:Vision Dallas is both the location of the project, a forward-thinking city of Dallas, and the idea of sustainability through a reintroduction of urban landscape in vertical form and renewable energy production. The idea of a sustainable block also suggests that the thesis may formally not be a tower, but a series of smaller towers that allow light to penetrate into the interior.

City of Dallas // Trinity River Project // Dallas, Texas

The image to the right, zoomed to highlight the convergence of interstates at the tip of the downtown corridor, reveals a forward-thinking Dallas ready to revitalize and restore the Trinity River to a series of urban lakes. The proposal anticipates stages of completion. The thesis is interested in revitalizing the downtown corridor of Dallas much like the river project.
Bjarke Ingels Group // Amagerforbraending // Copenhagen, Denmark

It is interesting to note that BIG places this building, an energy plant and office building, under the “Body Culture” design category.

The project aims to rebrand the power plant into a piece of architecture, rather than a stereotypical power plant. BIG successfully turns a stereotypically well-known but rarely visited destination into a popular recreational activity. In his own words, Bjarke Ingels describes “most of the recently built power plants are merely functional boxes wrapped in expensive gift paper,” disguising an ugly dot on the landscape. Instead of merely disguising and covering the power plant, the design uses the wrapper to add another layer of function, creating a dual-usage space. A ski slope drapes the entire factory, and as one skis down the slope, he comes face-to-face with a glass wall exposing the factory’s interior functions. It is a “new breed” of factory serving to house both activities while teaching visitors about energy consumption.

The key to understanding this project in the scope of the urban renewable energy thesis is to understand how the architecture is used to teach visitors about energy consumption and the future of energy production. Every time a certain level of energy is consumed, the giant smokestack at the paramount of the ski slope lets off a ring of smoke as a visual symbol of consumption. At night, the puff is lit and can be seen by many people as the factory is located on the periphery of Copenhagen and not hidden by a series of tall buildings.

Lewis.Tsurumaki.Lewis // Park Tower // competition

LTL proposes a transformation of the typical parking garage by intertwining programmatic functions into levels of the garage. Beyond program, the tower suggests a new interpretation of vertical inhabitation. Within these layers, ease of mobility is coupled with a focus on eliminating the undesired pieces that come with the automobile: noise, pollution, etc. The project proposes a new, sustainable, renewable piece of horizontal program reconfigured into a vertical tower with a hint at the reversal of sprawl. The thesis aims at looking towards sustainable solutions in vertical form. The project also suggests re-envisioning the typical urban high-rise as construction beyond the typical slab, column, skin construction. By pushing and pulling programmatic pieces in and out of a parking helix, natural light and ventilation, exterior spaces, and curbside parking can all be possible within one block of a city built vertically.
**DESIGN RESEARCH**

**THEORETICAL INTENTION // PRINCIPLES**

**Clint Langevin, Amy Norris // Tar Creek // Thesis Proposal, Oklahoma**

The idea behind Tar Creek involves using an old production site, of which there are many in the United States, and have it (1) produce energy, and (2) form a structure for inhabitable and usable spaces.

The project’s success to combine these two functions is done by formally constructing levels of program, an image with which a city dweller is quite familiar. In the case of Tar Creek, a rural brownfield was selected for renewal, but one could imagine this system of layering habitation, renewal, and production as a mode for addressing areas of a city that have been largely abandoned due to removed industry, such as canals, shipyards, and the like.

This project removed to an urban context could be a realistic projection of how a city’s infrastructure may begin to address these urban patches of abandonment and dilapidation. Along a waterfront, layers could begin to renew polluted water and nearby ground, suggest a multitude of layers for activity and program, and a multitude of layers of energy production. The layers could begin to form a pattern that influences the architecture that is greater than just a mirrored showcase of interior and exterior conditions, but rather the project could provide a different experience depending on one’s path and viewpoint through the structure, or series of structures.

**MVRDV // Dutch Pavilion // World Fair Hanover**

MVRDV asks the questions, “Can increasing population densities coexist with an increase in the quality of life? What role will nature, in the widest sense, play in such an increase in density? Is not the issue here new nature, literally and metaphorically?” The Dutch entry, levels of nature are built to form a vertical pattern. The levels create nature artificially and intertwine this natural palette with public spaces. The proposal suggests that rather than technology taking over nature, or nature taking over technology, a lifetime struggle of architectural design, the two can cohabitate. “The building becomes a monumental park. It takes on the character of happening.” The significance of this project is the ability to combine an (artificial) eco-system, energy production, and habitable spaces into a vertical tower. The use of the levels suggests a plan for city growth vertically, halting the rapidly increasing horizontal footprint.
MVRDV // Shenzhen Guosen // Shenzhen China, competition

MVRDV redefines the 20th century slab and floor to ceiling glass façade with a twist: rotate the floor plates to provide an energy-saving solution. By using angles within the 35 – 55 degree range, shadows cool the floor directly below. Each façade’s skin also receives a louver system customized to each orientation’s needs. Another energy saving solution places solar cells on these louver systems contributing further to the building’s energy savings. That’s not all; louvers are angled to collect greywater and funnel it down the tower’s façade, while the solar cells simultaneously heat the water. The suggestions put forth by MVRDV will aid the thesis in a creative and collaborative way to incorporate renewable energy technologies into a building’s production without subtracting from the aesthetic.

SOM // Pearl River Tower // Guangzhou, China

SOM brings the prototypical tower, a high energy consumer, up to date in model for the 21st century that addresses both human comfort and environmental strategies. The “experiment” typology for the office begins with reduction of energy consumption, using orientation and envelope in order to reduce. The building is also designed to reclaim its own energy output by redirecting exhaust back into the system in passive dehumidization. The building’s consumption is reduced by as much as 60% by these two methods alone. The building’s total sustainability; however, comes from the two wind tunnels incorporated into the building’s facade. The tunnels provide a way to incorporate design and technology. According to SOM’s sustainable M.E.P. director, Roger Frechette, “ the more we can blur lines, the closer we can get to true integration”.

Michael Sorkin // New Algiers Point // New Orleans, Louisiana

The goal of the project is to build the levee walls of Algiers Point into a multi-programmed space. First, the buildings act as residential communities on the Mississippi River. Second, the buildings act as a levee wall, breaking the 20th century engineering tradition of building a wall or other unattractive levee types to prevent flooding. Third, the building serves to teach users about energy and environment. The structures themselves feature layers of intertwined program and technology. It is important to the thesis programmatic study in its use of production as a programmatic component while also using the building to house another function.
DESIGN RESEARCH

MATERIAL // TECHNOLOGICAL INNOVATIONS

Shu-guang Li, Hod Lipson & Francis C. Moon // piezoelectric leaves // Cornell University Creative Machines Lab

The team from Cornell desinged the leaves to flutter in the wind generating electricity from the vibration of the piezo leaves. The leaves are engineered to capture the wind’s movement even during low and uneven wind speeds, and could be used in some capacity in a building’s facade. The leaves are an alternative to wind energy harvesting from rotary turbines.

C + S Associati // Harbour Brain Building // Venice, Italy

The Venice Arsenale houses the “brain” of the naval center, the computer controllers, in what was historically a center of shipbuilding. Shipbuilding requires large spaces, so the shell of the building wraps several large voids to provide ample room to house and repair ships. The building’s original structure and materials remain in tact, preserving the history and story of the building. The architects introduce a new technology, small photovoltaic cells, in a well-designed roof pattern to provide a “lantern of light” in the upper spaces. The light is allowed to pass through and creates a type of dynamic play of shadow and light throughtout the entire void space. In this way, a new technology is used to enhance the architecture of the building and the experience of the space and does not only seek to improve thermal conditions. According to Archdaily, C + S Associati uses these cells as a “contemporary layer able to play with the lights and shadows of the existing space”.

Greek Architects & DuPont // Windscraper // Athens, Greece, competition

The tower turns the concept of collecting wind energy though a dynamic facade element into reality. This facade precedent helps the theis project in beginning to realize which areas of the building the energy production will focus on; in other words, where exactly will energy harvesting take place. The facade also goes further to suggest the dynamism of the moving panels, or small turbine like structures, suggests leaves fluttering in the wind. Circulation is removed to the exterior spaces of the building, as seen in the rendering, to allow another interpretation of typical high-rise core circulation completely removed from natural light.
HISTORICAL // CULTURAL CONTEXT

Windcatchers // Middle East // venacular architecture

A quick overview of the traditional “windcatchers”:
A malqaf is a unidirectional windcatcher that is formally a grand reception hall, for a daughter’s most eligible suitors. These men are led past the informal meeting-the-daughter courtyard and into a tall room with a wooden lantern at its pinnacle. The lantern marks the height of the room and also allows hot air to escape. The malqaf itself is much taller than the rest of the building, and allows cooler air to be funneled down the hall into habitable spaces.
A badgir collects wind from multiple directions. Instead of facing in only one direction, the lantern at the top of the hall has four sides and can collect wind from all directions and filter it down into the habitable space.

Andrea Palladio // La Rotunda // Vicenza, Italy

Like other villa architecture that began to dot the Italian countryside during the Renaissance, la Rotunda incorporates the idea of wind and passive ventilation into design. Palladio in his Four Books mentions the “prison of the winds”, or eiola. These prisons of winds are in actuality a series of underground caves designed by the architect or found locally and then incorporated into the architect’s design, to maximize wind in the hot and humid climate. The winds are funneled underground and can then freshly ventilate the rooms directly above.

Palladio, according to Barbara Kenda, probably studied the cave designs and engineering of the winds by Trento. Villa Rotunda uses the same geometry of an octogon with four entrances. When open, the winds are allowed to climb through the octogon at the center of the villa from a series of underground networks. Palladio places a rosetta stone at the center of his octogonal recepting hall that allows fresh air to pass from underground up through the hall accompanying winds from the four entrances. Air is allowed to circulate through spaces occupying the four corners of the octogon before exiting the grand hall through an oculus.
Figure 1. re:Vision Dallas.

Figure 2. Trinity River Project.

Figure 3, 4. Amagerforbraedingen Waste-to-Not Energy Plant.

Figure 5. Park Tower.

Figure 6, 7, 8. Tar Creek Thesis Project.

Figure 9. Dutch Pavilion.

Figure 10. Shenzhen Tower.

Figure 11. Pearl River Tower.

Figure 12. New Algiers Point Terreform Proposal.

Figure 13. Piezoelectric Leaves.

Figure 14. Harbour Brain Building.

Figure 15. Windscreaper Tower.

Figure 16. Windcatchers.

Figure 17. La Rotunda.
THE VEHICLE // URBAN WINDSCAPES
This urban setting is found through a set of criteria based directly on the thesis topic. First, a series of wind maps were located from the USGS databases showing wind speeds at both 80m and 90m. This study was used to narrow the location of states that can collect the most wind at a steady pace. In this case, wind is studied as a local resource, or a local building material, and three distinct locations were identified as being states that have the potential to produce the most power based solely on wind generation: Montana, Texas, and Kansas.

The thesis projects wind generation, among other renewable energies such as thermal, solar, and hydro, as means to produce energy at the source. Three types of urban environments can be distinguished at this point: the almost-rural, the mid-size city, and the super-large city. So, for example, between Bozeman, Montana; Wichita, Kansas; and Dallas, Texas, Dallas becomes a focal point of study due to the wind and super-urban criteria.

The project will take place in a currently vacant lot in the downtown district. Dallas is also one of the United States' great examples of a sprawling city. A vertical solution to building at the city’s center would be useful as a prototypical study.
The University of Texas at Austin’s Perry-Castañeda Library Map Collection offers Sanborn Fire Insurance Maps in an extensive online collection. The years of 1885, 1888, 1892, 1899, 1905, 1921, and 1922 are available publicly online. Years 1885, 1905, and 1921 are represented here for a study in the growth of the city at the turn of the century but all maps can be easily collected and represented in the same manner.

USGS Topographic Maps available for Dallas, County in the years of 1889, 1918, 1954, 1963, 1968, 1973, 1995, and 2008. Several years are collected and in hand but all years can be easily collected and represented in the same manner.

All building heights of skyscrapers are on hand; GIS map to be compiled with 3D buildings and heights over break.

Photographs of Dallas taken by the user are to be collected at the first of the year 2012. These will be taken first-hand in Downtown Dallas as a study of the individual blocks, the city culture as a whole, and a study on contemporary versus modern or historical architecture in the city's core.
SITE DOCUMENTATION

LOCATION ANALYSIS MAPS
1. United States Wind Resource Map
2. United States Top Wind Energy States
3. Installed Wind Capacity at Year End, 1999-2011
4. Texas Wind Resource Maps
5. Texas Solar Resource Maps
6. U.S. Electric Grid
7. U.S. Sources of Power
8. U.S. Power Plants

HISTORICAL MAPS
1. Bird’s Eye View of Dallas, 1885
2. Sanborn Maps, 1885
3. Sanborn Maps, 1905
4. Sanborn Maps, 1921
5. USGS Topographic Map, 1889
6. USGS Topographic Map, 1918
7. USGS Topographic Map, 1973

CONTEMPORARY MAPS
1. USGS Topographic Map, 2008
2. Autocad File, County Scale
3. Autocad File, City Scale
4. Autocad File, Block Scale

SUPPLEMENTARY CONTEMPORARY MAPS
1. Downtown Dallas Amenities Map
2. Tall Buildings of Downtown Dallas
3. Trinity River Project
4. DART Rail Transit Map
5. Map of Current Parking Lots

SECTIONS
1. Sections through site

PHOTOGRAPHY
1. Elevation Photographs
2. Flickr Images
3. Contemporary Architecture Photographs
**United States Annual Wind Speed at 80 m**
original size 8.5" x 11"

**Top 5 Wind-Energy Producing States, 2011**
original size 8.5" x 11"

Texas Annual Wind Speed at 80 m
original size 8.5" x 11"

Kathleen Peaden, with reference to
Top 5 Wind-Energy Producing States, 2011

Kathleen Peaden, with reference to
U.S. Energy Information Administration, Table 1.17.B,
Kathleen Peaden, with reference to
U.S. Energy Information Administration, Table 1.17.B,
Electric Power Monthly 2010, http://www.eia.gov/ener-
yexplained/index.cfm?page=wind_where (accessed 23
November 2011).

Right: Sanborn Map & Publishing Co., Dallas 1885 Sheet 1, April 1885, Dolph Briscoe Center for American History, University of Texas Austin.
--------., Dallas 1885 Sheet 2, April 1885, Dolph Briscoe Center for American History, University of Texas Austin.
--------., Dallas 1885 Sheet 3 April 1885, Dolph Briscoe Center for American History, University of Texas Austin.
--------., Dallas 1885 Sheet 4 April 1885, Dolph Briscoe Center for American History, University of Texas Austin.
--------., Dallas 1885 Sheet 5 April 1885, Dolph Briscoe Center for American History, University of Texas Austin.
Maps 2-5 pieced together, original size 8.5" x 11"; created by Kate Peaden

Sanborn Map Index, 1885; and Sanborn Maps 2-5 pieced together, 1885
each map original size 11" x 13"
SITE DOCUMENTATION // Historical Maps

Sanborn Map Index Volumes 1-2, 1905; and Sanborn Maps 3-6 pieced together, 1905
each map original size 11" x 13"
Sanborn Map Index Volumes 1, 1921; and Sanborn Maps 1 - 7 pieced together, 1921
each map original size 11” x 13”
SITE DOCUMENTATION // Historical Maps

**USGS Topographic Map, Dallas County 1889, 1:125,000**
original size 8" x 10"

**USGS Topographic Map, Dallas County 1889, zoomed to city of Dallas**

Above:
Gannett, Henry, R.U. Goode, Chas. F. Urquhart, and H.S. Wallace, Dallas 1889, ed. 1893, reprinted 1909, Map Room, General Libraries, University of Texas Austin.
USGS Topographic Map, Dallas County 1918, 1:125,000
original size 8” x 10”

USGS Topographic Map, Dallas County 1918, zoomed to city of Dallas

Above:
Stokey, Col. W. P., Dallas 1918, 1918, Center for American History, University of Texas Austin.
USGS Topographic Map, Dallas 1973, 1:24,000
original size 9" x 11"

USGS Topographic Map, Dallas 1995, 1:24,000
original size 9" x 11"
USGS Topographic Map, Dallas 2008, 1:24,000

original size 23” x 30”, zoomed into downtown Dallas for clarity in thumbnail

Above:
United States Geological Survey, Dallas 2008, Perry_Castaneda Library collection online, University of Texas:
Dallas County, Downtown Dallas identified as area of study

AutoCAD .dwg; can be scaled to any size

Above:
Downtown Dallas Base Map
AutoCAD .dwg; can be scaled to any size

Above:
.dwg compiled by Kate Peadan; building footprints from:
North Central Texas Council of Governments. “DFWmaps,”
November 2011).
Above:
 autoimmune .dwg compiled by Kate Peaden; building footprints, DART line, parks from:
Within Dallas, a number of ground parking lots still exist within the downtown core. These abandoned spaces should be seen as potential for growth, specifically vertical growth, in a sustainable capacity. The fact is that Dallas will continue to expand just as other urban centers around the world. The American southern pattern of horizontal growth should be halted and urban centers should be revisited, whether that be within vacant and abandoned lots or buildings.

The chosen site becomes a crossroads between the Historic District and the contemporary business districts making this location a very visible site for many working and traveling through downtown Dallas. The site is situated between the main automobile traffic line from outside the downtown area and the Dallas Rapid Transit Rail Line’s hub West End Station. The site becomes visible both to quick wheel traffic and slower pedestrian traffic. The Bank of America Plaza is directly south of the building, offering a challenge to design for maximum wind potential.
SITE DOCUMENTATION // Site Analysis Maps

Wind Rose Diagrams for Dallas, Texas
original size 8.5” x 11”
Dallas Elevation Montages
Downtown Dallas Aerial Photograph, with 3D modeled buildings

original size 20” x 20”

Above:
Image compiled by Kate Peaden. To be further analyzed with index of building heights to compile 3D GIS file.

Right:
Downtown Dallas Land Use Map

original size 17" x 22"
Commercial Building Floorspace by Region, 2003

Source: Energy Information Administration, 2003 Commercial Buildings Energy Consumption Survey, Lighting in Commercial Buildings, Figure 16 (December 2008).

Total Energy Consumption in Commercial Buildings by Region, 2003

Source: Energy Information Administration, 2003 Commercial Buildings Energy Consumption Survey, Lighting in Commercial Buildings, Figure 18 (December 2008).

Energy Use by Type of Commercial Building, 2003


http://www.eia.gov/energyexplained/index.cfm?page=wind_where
PROGRAM // Sustainable High-Rise Office

Office Tower for the XXI Century

The 20th century city becomes the symbol for the workplace and sees the living-place move to the suburb. As a study on horizontally growing urban cores, the solution to harnessing the growth pattern in hopeful reverse pattern would be to suggest vertical growth. Office towers will continue to be built, and they will continue to use energy. A suggestion of a total incorporation of architecture and renewable energy in an office tower would suggest an office tower of the 21st century. The project aims to heighten the work experience, a form of production, with energy production.

The goal is to design a totally sustainable urban high-rise building or set of buildings that house a function while using the architecture to showcase the sight, sound, and function of renewable systems. Subjectively speaking, people generally perceive these technologies as a distraction from the architecture, landscape, or both. The thesis seeks to resolve the widespread dissatisfaction of the experience and hopes to use the technologies as an architect with the goal of improving the sensatory experience of a building both from the interior and exterior.
**PROGRAM // Sustainable High-Rise Office**

**Office Tower**  
500,000+ SF; 700-1000' high

**Primary Spaces**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td></td>
<td>20,000</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td>TBD</td>
</tr>
<tr>
<td>Other*</td>
<td></td>
<td>TBD</td>
</tr>
</tbody>
</table>

**Secondary Spaces**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive Offices</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Enclosed Large</td>
<td></td>
<td>7800</td>
</tr>
<tr>
<td>Enclosed Small</td>
<td></td>
<td>3200</td>
</tr>
<tr>
<td>Large Office</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Open Workstations</td>
<td></td>
<td>750</td>
</tr>
<tr>
<td>Reception</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Reception Seating</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Conference</td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>Informal Breakout</td>
<td></td>
<td>80 each</td>
</tr>
<tr>
<td>Supply Room</td>
<td></td>
<td>160</td>
</tr>
<tr>
<td>Work Room</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>File Area</td>
<td></td>
<td>290</td>
</tr>
<tr>
<td>Documents Room</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>Server Room</td>
<td></td>
<td>175</td>
</tr>
<tr>
<td>Conference/Classroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reception</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Toilets</td>
<td></td>
<td>280</td>
</tr>
<tr>
<td>Large Lecture (seating 20)</td>
<td></td>
<td>2400</td>
</tr>
<tr>
<td>Multiple Purpose Room</td>
<td></td>
<td>3800</td>
</tr>
<tr>
<td>Meeting Room Storage</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Computer Training Lab</td>
<td></td>
<td>1350</td>
</tr>
<tr>
<td>Food Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Areas</td>
<td></td>
<td>3700</td>
</tr>
<tr>
<td>Kitchen</td>
<td></td>
<td>1020</td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Employee Areas</td>
<td></td>
<td>440</td>
</tr>
<tr>
<td>Office</td>
<td></td>
<td>115</td>
</tr>
<tr>
<td>Private Restrooms</td>
<td></td>
<td>100 each</td>
</tr>
<tr>
<td>Fitness Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lobby</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Lockers</td>
<td></td>
<td>1400</td>
</tr>
<tr>
<td>Exercise Facilities</td>
<td></td>
<td>4300</td>
</tr>
<tr>
<td>Support Spaces</td>
<td></td>
<td>320</td>
</tr>
<tr>
<td>General Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical/Electrical Rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mail Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Dock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The primary spaces should seek to heighten experience using natural light and natural ventilation with the goal of improving the workplace and the work being produced by the workers. Circulation can begin to inform other spaces, and since people must pass through them these routes should begin to offer something more than a dimly artificially lit interior corridor in a maze through office spaces. If the building’s envelope is defined as an interior and exterior condition, one could imagine being able to inhabit both, and not solely the inside looking outwards to the city (i.e. exterior balconies). Important space attributes include the functional/operational aspects, productive flexibility, comfort and safety, and energy efficiency or sustainability.

The primary spaces should be a blend of work + production + another activity, to be further explored.

Note
Other primary spaces could include a hotel, residential apartments, a parking deck (as opposed to underground parking), or a higher percentage of retail and restaurants.

The secondary spaces should strive to achieve the same design goals and functions as the primary spaces. However; some of these pieces of program will undoubtedly encounter setbacks. An example will be that security needs maximum privacy for video screening, etc. so this room or rooms will not be located on the exterior of the building. Hopefully in the design stage, some of the secondary spaces, typically isolated will become incorporated. Why does the restaurant always have to be on the ground floor? Does it then have to be on the roof?
PROGRAM // Sustainable High-Rise Office

- Public // Private
- Group // Individual
- Static // Dynamic
- Sunlit // Shaded
- Artificially Lit // Naturally Lit
- Work // Play
- Interior // Exterior
- Manufactured // Natural
- Exposable // Recyclable
- Professional // Client
- Served // Service
- Monotony // Spontaneity
- Structure // Skin
- Secure // Non-secured
- Loud // Quiet
- Functional // Operational
- Secured // Non-Secured

The Entrepreneur
The Small Office
The Medium Office
The Large Office
**PROGRAM // High-Rise Case Study**

**Shreve, Lamb and Harmon // Empire State Building // New York, New York**

<table>
<thead>
<tr>
<th>Typology</th>
<th>Office, observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>1929 - 1931</td>
</tr>
<tr>
<td>Cost</td>
<td>$40,948,900</td>
</tr>
<tr>
<td>Antenna Height</td>
<td>1,454 ft</td>
</tr>
<tr>
<td>Roof Height</td>
<td>1,250 ft</td>
</tr>
<tr>
<td>Top Floor Height</td>
<td>1,224 ft</td>
</tr>
<tr>
<td>Floor Count</td>
<td>102</td>
</tr>
</tbody>
</table>

Known as an international icon in the world of skyscraper chronology, the Empire State Building earned the title “World’s Tallest Building” from the years 1931 - 1972 designating NYC as the world’s skyscraper capital. The study of floorplans and sections reveals a modern, but still contemporary, approach to high-rise office building layout with cores centrally located and a typical floorplan floor after floor. The thesis will seek to amend the traditional workplace and bring it up to date with the twenty-first century.
Projects, competitions, and buildings observed for design value:

International Competition Winner of Government Building // Tomoon Architects & Engineers

Thematic Pavilion of Yesou 2012 // Archi[te]nsions

‘Nine Dragon’ Housing Complex // YKH_LAB

Alternative Car Park Proposal // Mozhao Studio

Market Valley // HWKN

Metreopolis // HWKN

LOZP: Delhi Recycling Center // Atlier CMJN

Reimagining the Hoover Dam // Yheu-Shen Chua

Tropicana Tower // Wei Gu, Pi-Lin Quek, Qiao Yang

C_NET 2 // Tom Stroud, Mark Hall, Wing Ngai, Ben Stuart

Symbiosis Tower // Dommu Krishna Chaitanya, Jeevan Mohan

Tall Structures & Energy Studio, Illinois Institute of Technology // Professor Peter Land

In.Corporate // Jason M. Neves
APPENDIX A // Projections Fall 2011

The proposal to harvest renewable energy, with specificity on wind energy, comes with several challenges. Like energy landscapes in the rural landscape, the urban landscape will still pose questions of subjective sensual appeal, such as sight and noise obstruction and interference. Urban applications still have not reached an affordable benchmark, also rendering their current applications sparse. Additionally, existing buildings cannot handle the loads of applications while new buildings can afford to design with applications in mind. Additional research and study of technologies and challenges will continue in the design phase.

It is also important to note that the design phase of the thesis will not only seek some energy production within the building design, but also will emphasize a more efficient building design itself in regards to lower energy usage in hopes of total sustainability.
Where does energy come from?

"...wind power accounted for 39% of new U.S. generating capacity in 2009...."
- Scientific American, 2010

"30% of energy lost in transmission...."

243 million Americans live in cities...
- Edward Glaeser, 2011
The final vehicle becomes a sustainable skyscraper, aimed at educating Dallas local and visitor about consumption levels through visual and audible architecture. The building becomes a total beacon, with a large wind tunnel winding its way through the offices for the larger Dallas to observe. On the pedestrian level, interaction becomes small scale, as one enters the building. The offices also interact with one another in a split level program, virtually wrapping the wind tower to form a work tower.

Wind Tower + Work Tower = Energy Tower

Instead of simply placing a wind turbine on the building, the building in essence becomes a wind turbine. Pairing general wind patterns with site specific wind analysis from Visari 2.0, exact nodes of maximum wind velocity can be derived. The mass of the site is carved away until wind is allowed to pass through the wind tower at key points on the building’s facade, giving the building wind gardens informing form. Wind also passes from the underground tunnel system of Dallas and is allowed to enter and escape through the building’s roof. Instead of placing a wind turbine(s) on the building, a mesh system with piezoelectric leaves and LED light bulbs winds through the wind tower’s curves. As the leaves flutter in the wind, wind power converts to electricity and lights up the LED lightbulbs to educate people both within and outside of the building on consumption levels.
Everyday Interaction
Entry Level Interaction with Wind Tower

Pedestrian Interaction
Entry Level Interaction with Wind Tower

Flexible Workplaces
Circulation functions as Conference Room, Meeting Place, Work space