Evaluation of the Feasibility of Installing a Commercial Scale Wind Energy Facility in Fresh Kills, Staten Island, New York

Prepared For:

The New York State Energy Research and Development Authority

Under NYSERDA Agreement No. 8999
John Martin, Project Manager

Submitted By:

BQ Energy LLC
20 John Barrett Road
Patterson, NY 12563-2164

Final Summary Report
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Introduction

BQ Energy, LLC undertook an assessment of the potential for development of an operating wind power facility at the Fresh Kills landfill site on Staten Island, NY. The assessment was funded by BQ Energy and, in part, by NYSERDA under Contract No. 8999 and. Various activities were conducted at the site area such as, but not limited to, the following:

- Measuring the wind resources at the site.
- Investigating if wind turbine foundations could be compatible with the site.
- Fostering community acceptance of the technology.
- Estimating electrical capacity and energy potential.
- Developing a viable Business Plan.

This Final Report contains summaries of nine of the eleven specific tasks specified in the NYSERDA scope of work. Summaries of Tasks 1 and 2, covering project management and reporting, are not included. The full Task Reports were submitted under separate cover on August 3, 2007.

Project Description

BQ Energy, LLC proposes to be the developer, owner, and operator of a wind farm at the 2200-acre site of the former Fresh Kills landfill on Staten Island, NY. The wind farm will be part of the New York City plan to convert the landfill into the Fresh Kills Park: Lifescape – a park of rolling grassy hills open for public use with an aesthetic capability of producing clean energy ("Lifescape").

The wind farm will consist of up to seven wind turbines situated on the tops of the four 100 to 300 acre mounds that were once the largest municipal landfill facility in the world. The mounds are between 90 and 225 feet in elevation and will allow the wind turbines to operate above major wind obstructions. Each turbine tower will be up to 300 feet tall and the rotor mounted at the top of the tower will be up to 320 feet in diameter. The total height (rotor plus a blade pointing up) would be less than 500 feet. The rotors, each consisting of three blades attached to a central hub, will rotate at an average speed of approximately 15 to 20 rotations per minute, depending upon wind speed.

The potential electrical output for the project ranges up to 2.5 megawatts ("MW") per turbine, for a total of 17.5 MW. Based on the average wind speeds recorded at the site, the power output of the project is estimated to 35,000 megawatt-hours ("MWh") per year. The turbines will be connected to an existing ConEdison substation by underground power lines. The substation which will then transfer electricity to the NYISO grid.

New York's Fresh Kills Lifescape is an ambitious public works project using state of the art ecological restoration techniques to create a new park almost three times the size of Central Park. The Draft Master Plan for Lifescape dated March 2006 contemplates sustainable energy demonstrations harnessing wind power, giving the park a cutting-edge identity and augmenting its educational value. BQ Energy will work closely with the Lifescape project team to make it possible for NYC to be the first major municipality to produce power from a renewable energy source on an environmental legacy site.

Task 3. Public Outreach

BQ Energy has pursued a collaborative approach with City and State agencies, the Borough President's office, and the Fresh Kills Lifescape team to facilitate project approvals and financing strategies. Our objective is to ensure all stakeholders have a firm understanding of the wind energy project.

BQ Energy's goals correlate with New York City's cutting-edge vision for the transformation of Fresh Kills into an urban park with a restored natural environmental habitat that will offer recreation, public art, and tranquil public spaces. Including a wind farm in the Lifescape will make New York the first large city in the United States to produce clean wind energy within its city limits. It also provides tangible evidence that the City is well on its way to reducing its carbon footprint and fulfilling its "Green City" renewable energy goals.

The goal of the Community Outreach program is to provide sufficient information to all individuals who are stakeholders in the proposed project. After consultation with the New York City Departments of City Planning, Sanitation, Parks and Recreation, Conservation, and Economic Development; the New York City Economic Development Corporation; and the Staten Island Borough President's office, a list of stakeholders and decision makers was developed, which so far consists of 41 public and private interest groups.

BQ Energy has had success in meeting with small groups to discuss the complexities of siting wind energy projects in populated areas. NYSERDA elected to participate in this project based partly on the strong support expressed by Borough President James P. Molinaro. Local media has produced detailed reports appearing on local television and in the Staten Island Advance, the Staten Island Register, and Gotham Gazette.

After publication of the draft report for this work, BQ Energy, NYSERDA President Paul Tonko, Staten Island Borough President Molinaro, and others from their organization met with the editorial board of the *Staten Island Advance* to support the outreach aspects of this project. A front page feature article appeared on Sunday August 19,2007. The *Advance* followed up the following Sunday edition (August 26,2007) with an editorial about the project. A copy of that editorial is shown on the following pages.

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Staten Island Live

Staten Island Advance

A wind-win situation

Sunday, August 26, 2007

For almost as long as he has been using tools, man has been using the readily available power of the wind to accomplish many tasks, from propelling boats to milling grain.

The advent of other, more efficient -- if less easily produced -- energy sources more than a century ago and emergence to the point of universal use today, however, has relegated wind power to near-novelty status. People still sail boats and kites for fun, perhaps, but oil products, natural gas, coal and electricity do the hard work.

But modern energy sources come with a lot negatives. They must be transported or transmitted, often over great distances, often from politically unstable, even hostile places.

Used as profligately as they have been in recent decades, they cause pollution and greenhouse gases that are changing the Earth's climate for the worse. And the exploding worldwide demand for energy has led to increased awareness that the planet's non-renewable supplies of oil, gas and coal are limited, and fast being depleted.

Suddenly, wind power, in the form of wind turbines that produce electricity, is back in vogue. Europe has taken the lead in exploitation of this free, limitless resource, as it has with so many other "green" initiatives.

Denmark, for instance, has set a goal of meeting half its national electricity demand with power produced by wind turbines by the year 2025.

Progress here has been much slower, but the increased costs and problems associated with traditional energy sources have created an incentive for new initiatives. That awareness hasn't come a moment too soon.

Borough President James Molinaro began toying with the idea of erecting wind turbines at the former Fresh Kills landfill as plans for transforming it into a mega-park emerged a few years ago. It's open, hilly, and relatively far from neighborhoods whose residents might object to turbines several hundred feet high in their "backyards." It's also a "blank canvas" -- a perfect venue for mounting such a "radical" experiment.

Characteristically, Mr. Molinaro set about seeing how he could make this good idea a reality. He reached out to the New York State Energy Research and Development Authority and BQ Energy, which built and operates a productive "wind farm" in Lackawanna, N.Y., near Buffalo, and urged them to consider his idea for Fresh Kills.

Now, after 14 months of study underwritten by NYSERDA and the private firm, the results are in. Fresh Kills mounds are as good a place for a wind farm that can be found in the metropolitan area, with an average wind speed of 14.5 miles per hour.

BQ Energy wants to spend $40 million to erect seven wind turbines on Fresh Kills' mounds. Now, the proposal must pass through the requisite environmental and land-use reviews that will coincide and have to dovetail with planning for the new park. Mr. Molinaro believes it's important to clear those hurdles before the

site is transferred from the Department of Sanitation to the Department of Parks, so time is of the essence, he says.

The Fresh Kills project, if completed, would be the second-largest urban wind power project in the nation, after the company's eight-turbine site in Lackawanna.

The towers would be about 400 feet high and would be visible from many places on Staten Island, but, in many people's opinion they're far from eyesores especially at a distance. And they wouldn't conflict with any of the recreational uses proposed for the new park.

As for noise, there's barely any, just a whooshing sound that's barely audible unless you're standing next to one. They're not like house fans. The huge blades turn remarkably slowly, 15-20 revolutions per minute, so there's no deafening thrumming noise that some critics claim.

Nor are the turbines prodigious bird-killers, as critics also charge. That's another canard put forth by people who reflexively resent such unfamiliar concepts. Yes, a couple of birds will likely be killed by each turbine in a year, but that's fewer than are killed annually on other large structures, such as the Verrazano-Narrows Bridge or Empire State Building.

The negligible downside is far outweighed by the benefits.

The project would be capable of producing enough energy for 5,000 homes, although the power might be sold to one industrial purchaser. Either way, it would be that much less power that would otherwise have to be produced by the pollution-causing methods used in conventional power plants. It would also be locally produced power that would relieve some of the strain on the metropolitan area's badly strained power transmission grid.

And, while we all might wish that wind turbines produced more "bang for the buck," we must remember that in terms of technology, wind turbines are, if not quite at the Wilbur and Orville Wright stage, then not much beyond it. If they're shown to be successful and the private and public investment is made, the technology will improve and become more efficient and cost-effective.

That's why working demonstration projects such as this are important. As Paul Curran, managing director of BQ Energy, said, "This will be the most visible wind farm anywhere in the world, without question."

Right. We won't be able to stop using coal and oil to produce electricity just yet, but the more available power produced by wind to replace coal- and oil-fired turbines, the better. Two things to remember: It's a start and every little bit helps.

It will show a lot of people that using wind power is not only theoretically but practically possible. It may give the wind-power the jump start it needs nationally to start supplanting, however gradually, dirty, non-renewable methods of power production.

To us, it's a no-brainer -- a wind-win situation, if you will. We hope city and state officials agree.

Task 4. Site Engineering Evaluation

This task was a preliminary review item with NYSERDA to ensure that site data was reviewed before any serious evaluation work was initiated. Evaluative work was reported as part of Task 9.

Geosyntec Consultants of Maryland (a member of the Lifescape team) evaluated site-specific data and characterized the physical properties of the underlying soil and waste that could affect the design, construction, and performance of the wind turbines. Geosyntec is a specialized engineering group that has been involved with more than 2,000 facilities built on landfills since 1983. They have knowledge of wind turbines, and they consult with Field Operations, Inc., NYC Dept of Sanitation, and the Fresh Kills Lifescape Team.

The wind turbines will be placed on four waste sections or mounds that vary in waste thickness from 140 to 180 feet above the substrate. The majority of the waste is municipal solid waste that was deposited at the site beginning in 1948 and ending in 2001. The performance of a foundation for a wind turbine will be affected primarily by settlement of the waste, characterized by its compressibility.

Detailed information on waste placement history, filling rates, and filling geometry was available but incomplete in part. Therefore, conservative parameters were adopted, in particular those related to settlement and strength, based on values used by other consultants at the site, published in the literature, and developed by Geosyntec for other sites. The recommendations for waste and soil design parameters are included in Task Report 9 – Foundation Design.

Task 5. Wind Resource and Production Estimates

To assess the wind characteristics at the site, BQ Energy obtained the required permits from the Department of Sanitation (NYC DOS) and erected a 60-meter meteorological tower, or mast, atop mound 3/4 on the northwest side of the landfill. AWS Truewind, LLC was retained to collect and evaluate data taken from April 6, 2006 to May 31, 2007. A data logger was installed at the tower which sent files containing average wind speed, direction, and temperature to AWS Truewind. The wind shear coefficient was calculated with data from the top two sampling heights. Wind speeds above the mast were determined using the power law equation.

The wind speeds and patterns observed were compared with longer-term records from JFK and Newark Liberty Airports. The consistency between the mast and reference stations suggests that the project will follow a similar pattern over the long term.

The year's mean wind speed was 6.35 m/s at the top of the meteorological mast. The long-term mean wind speed is estimated to be 6.07 m/s. At the standard hub-height for a 2.5 MW wind turbine, 80 meters, the long-term mean wind speed is estimated to be 6.57 m/s or 14.25 mph. These speeds are considered light winds or Wind Power Class 2. Sites with Class 4 winds (7.0 to 7.5 m/s) or higher are generally preferred for large-scale wind farms in rural US locations. High regional energy prices in New York City will allow wind energy to be competitive in Staten Island.

The measured wind speeds were significantly greater in winter months as compared with the summer months of July and August.

BQ Energy estimated the annual power production of seven turbine models based on the wind data collected from April 6, 2006 to April 5, 2007. The best performer was the American-built Clipper Liberty 2.5 MW turbine that was estimated to produce 6,116 MWh/year. The second best performer was the Suzlon S.88 at 4,798 MWh/year. The table below contains the results of all turbines analyzed.

Manufacturer	Turbine Model	Rotor Blade Diameter (m)	Output (MW)	80 meter Capacity Factor:	80m Annual Production per Turbine (kWh/year)
Clipper	Liberty	99	2.5	0.279	6,116,412
Siemens	B2300	82	2.3	0.226	4,595,539
Gamesa	G83-2.0 MW	83	2.0	0.285	4,476,171
GE	1.5 SL	77	1.5	0.252	3,745,054
Nordex	N80-2500	80	2.5	0.194	4,271,015
Suzlon	S.88	88	2.0	0.274	4,797,701
Vestas	V80-1800 II	80	1.8	0.242	4,241,427

Estimated Annual Power Production using Fresh Kills Wind Data

Task 6. Environmental Assessments

The Lifescape project team will prepare an Environmental Impact Statement (EIS) for the entire facility. BQ Energy has prepared comments on the potential impacts of the wind farm for inclusion in the Lifescape EIS. The assessment includes impacts on avian and wildlife populations, noise levels, traffic, television reception, and visual resources.

Avian Impact Assessment

Bird numbers at Fresh Kills have drastically decreased since the closing of the landfill. Thousands of birds that fed off the exposed waste, as well as the raptors that preyed on the scavengers, have largely moved out of the area. Direct collisions with wind turbine rotors or towers can result in injury or mortality to birds. The exact number of such collisions cannot be precisely defined. The North American average indicates that 2.3 (range 0.6 to 7.7) birds collide with any wind turbine per year. If these averages hold true, 16 (range 4 to 54) birds would annually collide with seven turbines. These numbers are realistic and reflect the fact that most migrating birds fly at altitudes higher than the maximum turbine height and a very high percentage of birds flying toward wind turbines will detect and avoid them. Of those birds that do not alter their flight path in time to avoid the rotor swept area of a turbine, a majority (84% in one study) will avoid a collision. It is possible that the fatality rates at this site may be greater than the national average because of the proximity of the Isle of Meadows on the western side of the landfill where the Lifescape team hopes to establish rookeries and stations for migrating birds.

There are many causes of avian mortality and it is difficult to compare rates from a wind site to other sources of mortality because local mortality rates from other causes are rarely quantified. On a national scale, the annual avian mortality associated with wind energy facilities is slight compared to other sources of mortality, such as vehicles, buildings, windows, power and transmission lines, communication towers, pesticides, cats, agricultural practices, and hunting.

Even the highest plausible estimates of avian impacts are orders of magnitudes less than existing local structures such as the Goethals Bridge and Outerbridge Crossings, or the chemical plants and refineries in New Jersey adjacent to the western edge of Staten Island.

Typical mitigation measures are recommended.

1. Provide the minimum allowable lighting to meet FAA requirements;
2. Install slow blinking red lights rather than steady or blinking white lights.
3. Do not use floodlights at any structures and avoid steady light sources near the turbines.
4. Do not install any guy wires on the turbine towers or transmission lines and select turbines designed to prevent birds from perching or nesting on the turbines.
5. Install power and communication lines below ground
6. Minimize paved access roads for the wind farm activities.

Wildlife Impact Assessment

Overall, a wind farm has a beneficial impact on plants and animals as its renewable energy replaces generation from fossil fuel power plants. The highly engineered and active Fresh Kills site is not a high-quality habitat at this point. A Lifescape goal is to restore diverse habitats and reintroduce a variety of wildlife species. The wind turbines would not impact ground wildlife because there are no moving parts or exposed electrical equipment at ground level and all power lines will be underground.

Noise Assessment

During operation the revolving blades of a wind turbine most commonly produce a broadband noise usually described as swishing or whooshing sound. Wind turbines operating at a distance of 750 to 1,000 feet are generally considered no noisier than a kitchen refrigerator or a moderately quiet room.

Noise generated during the six to nine month construction period may temporarily exceed background levels, but the site is relatively isolated and activities will comply with all noise ordinances.

Traffic Disruption Assessment

Except during construction, the wind farm will have no impact on traffic distribution, routing, or future infrastructure design. All power lines will be placed underground and no roads will need to be opened off-site. The proposed tower locations already have developed infrastructure so no new access roads will be required during construction or operation.

Television Interference Assessment

Interference from modern turbines is unlikely because blades formerly made of metal are now made from composites.

Visual Impact Assessment

To simulate the wind farm in the Staten Island landscape, 29 photomontages were prepared by superimposing typical wind turbines on photos taken in the field. Photos were taken from populated areas, highways, and overpasses and within the Lifescape site. The photomontage on the cover of this report is from a photo taken on Route 440 looking north.

Eight randomly selected photos are included on the following pages for illustration.

The towers and turbines will be a non-glare light gray so as to blend into a gray or light-colored sky. Electrical lines connecting the turbines to the existing substation will be placed underground, eliminating the potential visual impact of the new electrical lines.


SNOWPLACE

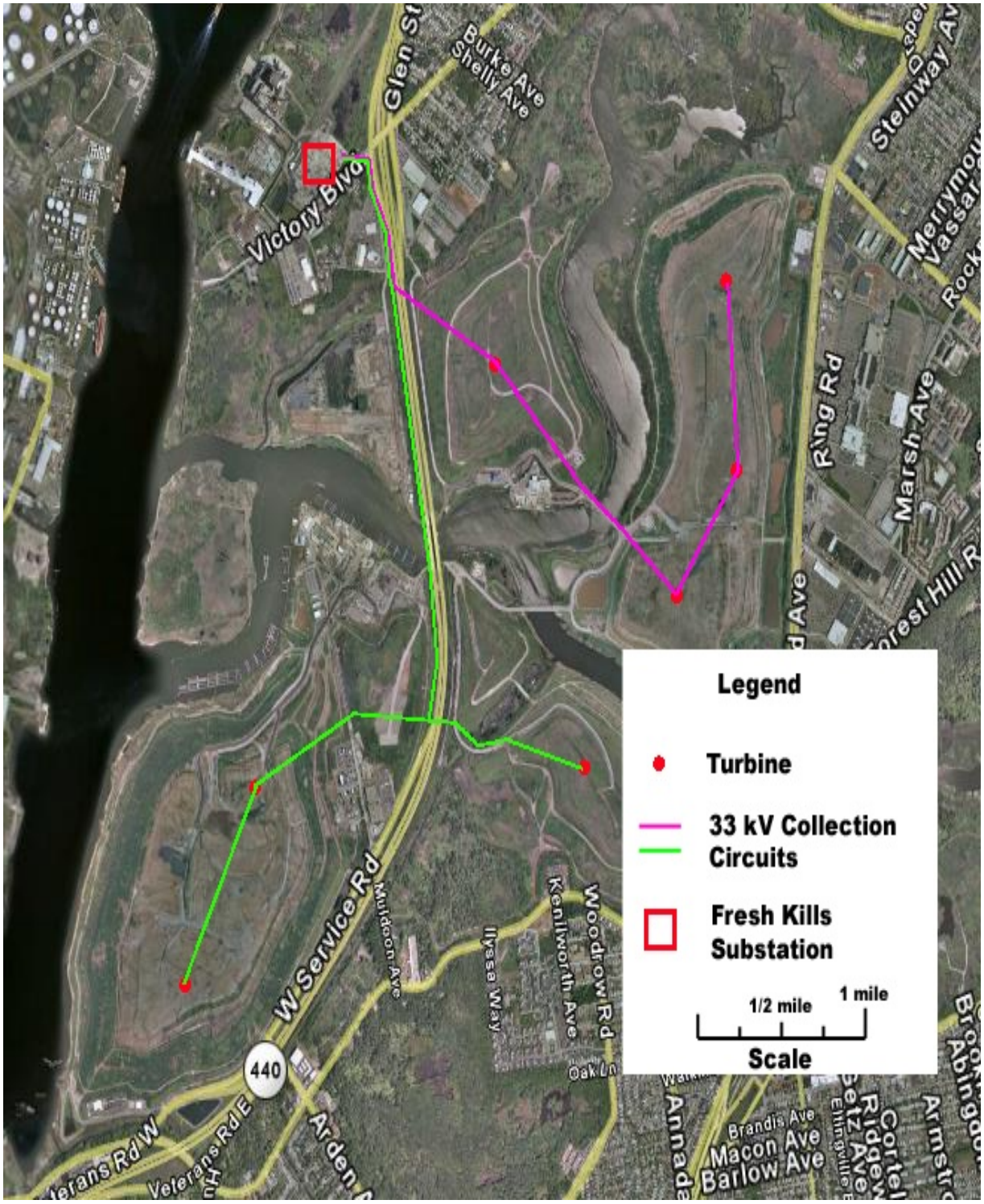

Arthur Kill Rd
Arthur Kill Rd

Task 7. Transmission Interconnections

Transmission interconnections to the New York Independent System Operator (NYISO) grid for new generators no larger than 20 MW are governed by the NYISO Small Generator Interconnection Procedures (SGIP). Before an interconnection agreement is executed with NYISO, studies may be required to determine if there will be any adverse impacts on the distribution system and if upgrades to area power lines will be required.

Con Edison owns and operates the Fresh Kills 33 kilovolt ("kV") substation which is situated a quarter mile northwest of the Fresh Kills landfill. Con Edison is open to interconnecting the 17.5 MW Fresh Kills Wind Farm at this substation and will maintain the interconnection and perform internal breaker management. BQ Energy will maintain its own breakers and turbine interconnection. Con Edison will be responsible for any upgrades that may be necessary for a 17.5 MW interconnect and will run 33 kV service to the wind farm breakers. The wind turbine locations are up to several miles from the substation and transmission losses of about 1% can be expected.

An illustrative layout diagram for the power collection system (lines) is shown on the following page.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Fresh Kills Substation
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1 mile
Scale
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Glen St
Burke Ave
Shelly Ave
Steinway
Merrymou
Vassar
Rock
Ring Rd
Marsh Ave
Forest Hill R
W Service Rd
Muldoon Ave
Ilyssa Way
Kenilworth Ave
Woodrow Rd
Oak Ln
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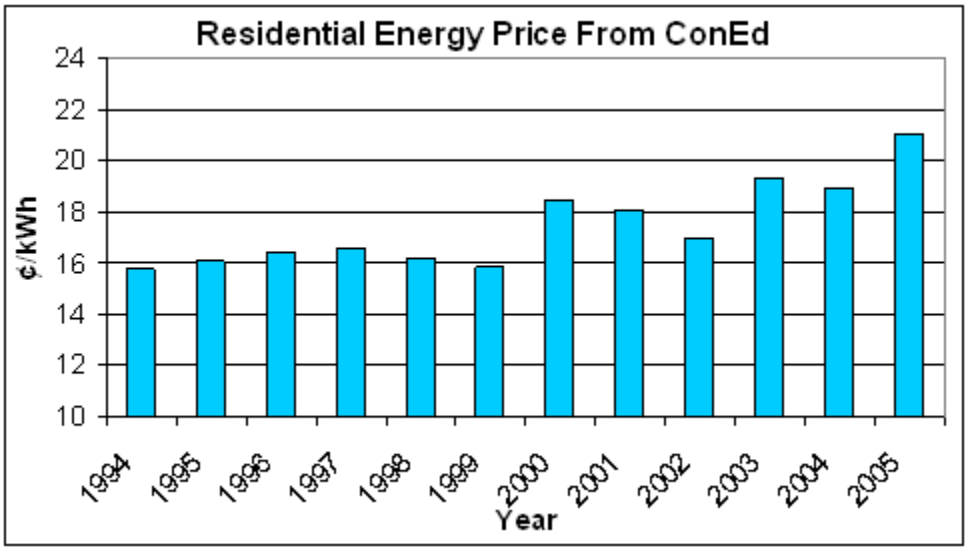
Veterans Rd W
Veterans Rd E
Arden
Brandis Ave
Macon Ave
Barlow Ave
Annad
Cortel
Ridgew
Abingdo
Armstr

Task 8. Power Sales Planning

The economic model of the project is based on 17.5 MW installed with a net capacity factor of 23% for the generation of approximately 35,000 MWh/year. There is a clear market for additional renewable power in the state and a growing demand for power in New York City. State energy policy calls for reducing the dependence on natural gas and oil.

The Power Purchase Agreement (PPA) establishes the fixed long-term price. The PPA will be offered to potential off-takers within the public or private sectors at price of $100 to $150/MWh.

Retail prices for electricity vary with several factors including the costs of fuel and other factors governed by the New York State Public Service Commission. The chart below shows historical NYC power rates.



BQ Energy requires site control in order to draft a preliminary offer memorandum to solicit investment and proceed with Phase II development activities, including electricity marketing. Site control decision making resides with either the NYC Parks Department or Department of Sanitation. BQ Energy has presented the results of this feasibility study to the Office of the Borough President and the Departments of Parks, City Planning, and Sanitation to facilitate a cooperative site control strategy.

Task 9. Foundation Design

Geosyntec Consultants conducted a feasibility assessment of several foundation designs and developed recommendations for the site conditions evaluated in Task 4. A total of eight types of shallow and deep foundations were considered that would be suitable for the large towers at the Fresh Kills landfill. All foundation alternatives involve construction techniques readily available in the U.S.

The feasibility assessment consisted of:

- evaluation of site data;
- development of preliminary foundation alternatives;
- evaluation of foundation alternatives;
- and development of recommendations

The effects of waste decomposition on the strength of ground support and settlement of waste were controlling factors in the design performance. Waste strength and compressibility are among the most critical quantities in the assessment. Several conservative simplifying assumptions were made about the waste properties and design loads due to the limited site data available. Therefore we anticipate the calculated design estimate to be conservative by a safety factor of approximately 2 to 2.5.

Eight (8) alternatives were evaluated in terms of geotechnical resistance, settlement, and distortion. The majority of foundation alternatives involve construction within the waste layer and avoid penetrating the bottom liner.

Both shallow and deep foundations are feasible for wind turbine tower foundations and, even with a significant level of conservatism, all foundation alternatives can provide sufficient geotechnical resistances.

Feasible shallow foundations are those that have a settlement-control device or involve a shape optimization to control potential excessive ground distortion. Shallow foundations are attractive because of their lower impact on the cap system during construction. However, they do settle more and this may affect the cap system in the long run. All deep foundation options provide adequate geotechnical capacities and a reduced level of settlement and distortion.

Site-specific data for soil and waste engineering properties were reviewed to conduct the evaluation of and long-term foundation performance as a response to tower added loads. Subsequently, candidate foundation alternatives were evaluated and pre-selected based on two considerations:

- satisfactory, long-term static and dynamic performance of the towers (i.e., structural impacts) and
- short term and long term impacts on the landfill cap, waste layer, and bottom liner in which environmental implications were carefully evaluated.

A matrix summarizing the alternatives has been developed as part of this assessment.

Option 1 (shallow foundation) and Option 6 (drilled shaft with liner penetration) might not be as attractive as other options. While Option 1 is the least expensive and one of the least invasive of all options, it may result in large total and differential settlements in the

long-term. While Option 6 is the alternative that exhibits the least total and differential settlement, it does penetrate the bottom liner.

Other options are more balanced in their technical advantages/disadvantages and cost. These options include Options 2 and 3 (shallow foundation with settlement-control device) and Option 5 (non-penetrating drilled shaft underlain by pressure grout columns).

Option 4, 7, and 8 are also attractive.

Option 3 is particularly attractive because it is not highly invasive and allows for settlement control. In addition, it is the only option that is being considered for the Fresh Kills site that has been successfully deployed in the construction of wind turbine towers built on a landfill

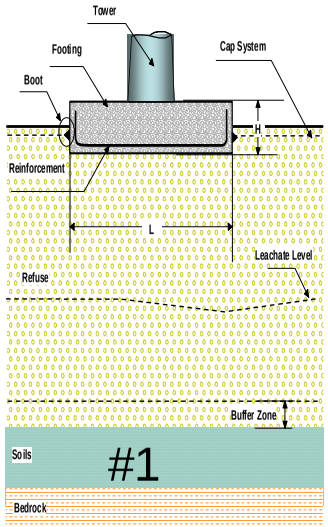
The shallow foundations considered are easy to construct and do not need to penetrate deeply into the waste. Some designs use shape optimization or hydraulic systems between the footing and the tower to counteract uneven settling or are formed with a concave bottom to spread the load to the periphery. BQ Energy identified two wind farms constructed on landfill sites. A dialogue was established with the designers and operators of that facility more similar to Fresh Kills. It has been operating successfully since 2000 in Germany. The turbines are supported on shallow foundations without settlement control systems.

The deep foundations considered are supported on drilled shafts or driven piles that are advanced into the waste to within ten feet or more of the bottom liner except for one alternative that does penetrate the liner. The advantage of a deep foundation is that settlement is reduced. All deep foundation options provide adequate geotechnical capacities and a reduced level of settlement and distortion.

The costs of the designs vary, but a project of this type is technically and financially feasible. The existing data is insufficient to complete a full design. It is recommended that, at a minimum, the composition of the waste from the surface under the towers to the base of the landfill be studied prior to detailed design.

A sketch of all 8 foundation concepts is shown on the following page

As this aspect will be a critical to the environmental review, and evaluation of all feasible alternatives is an important part of any NYS DEC review, BQ Energy intentionally did not seek to eliminate potential alternatives at this point in the project development. All foundation alternatives presented in this report are represented as “feasible” by Geosyntec in their report.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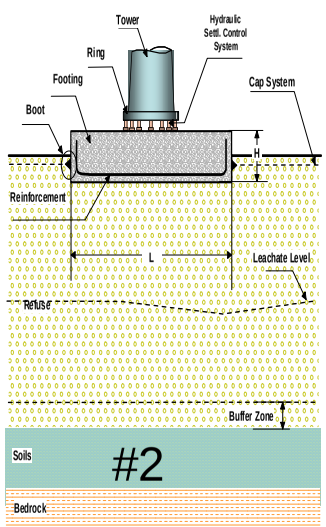
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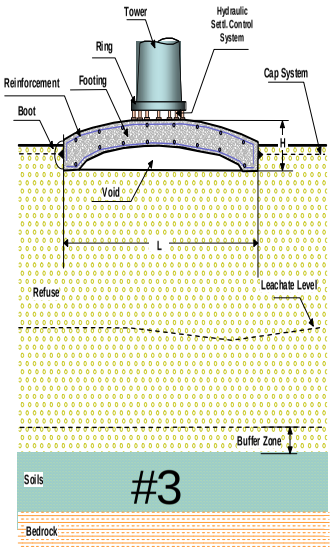
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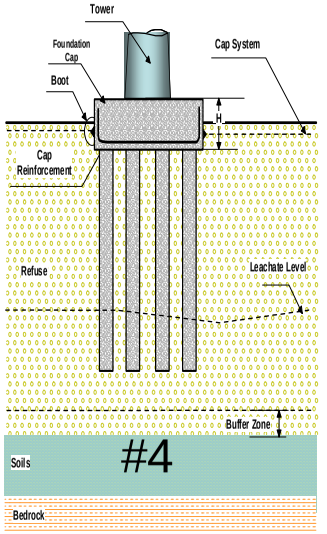
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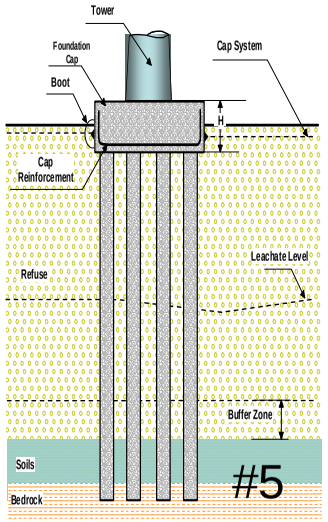
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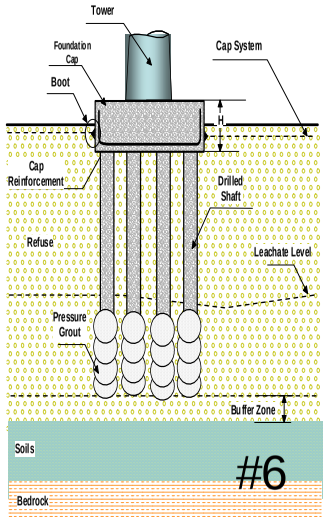
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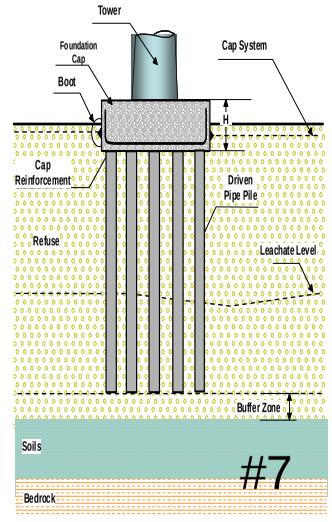
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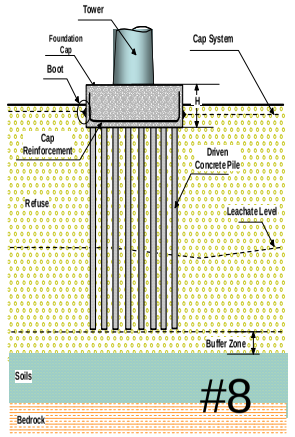
Tower
Foundation
Cap
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Boot
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Cap
Reinforcement
Driven
Concrete Pile
Refuse
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Buffer Zone
Soils
#8
Bedrock

Task 10. Site Regulations

The Lifescape team plans to provide parkland and recreational areas as well as potentially an Olympic venue for cross country racing. The wind farm will not affect the health or safety of participants in these activities. The turbine blades rotate high above the ground at a maximum speed of 15-20 rpm. The lowest point of the blade sweep is approximately 115 feet off the ground. In addition, the wind turbines will be located on the tops of hills, elevating them even farther away from public activities.

Wind turbines produce their power from naturally flowing air currents that pass over the site. They do not emit any waste, exhaust or pollutant. All power lines will be buried to address any public concern about aboveground high voltage power lines.

Wind turbine entrances are located at the base of the towers, usually up a few stairs that may be constructed of concrete or steel. The entrance door will be locked and if fencing is required around the turbine base it will also contain a locked gate. A fence is not always required since the turbine tower housing provides adequate protection against forced entry. All electric transformer boxes and controls will be housed inside the turbine tower. A 360-degree security camera will be mounted at the top of each turbine and can be monitored twenty-four hours a day.

Task 11. Business Plan

BQ Energy is pursuing a collaborative approach with City and State agencies, the Borough President's office, utility operators, and the Fresh Kills Lifescape project team for project approval and financing strategies. The objective is to give all stakeholders full knowledge and understanding of the project before applying for required regulatory approvals, financing and contracts.

A full scope of activities necessary to develop a wind project is shown in the list below. The most critical tasks are Site Control and the Formal Permitting Sequence. Without site control, the developer cannot solicit investors in the form of a preliminary offering memorandum, which will also delay procurement of long lead items such as the wind turbine generators.

- Preliminary Feasibility Study
- Economic Model
- 3rd Party Meteorological Assessment
- Discussion with Neighboring Industries
- Permit Feasibility Work
- Site Selection
- Interconnection Process
- Plant Layout
- Preliminary Waste Core Sampling and Analysis
- Final Foundation Design
- Site Development Plan
- Financing Plan
- Partnership Discussions
- Turbine Selection
- Meteorological Study
- Site Lease
- Media Plan/Community Relations
- Formal Permitting Sequence + Tax Abatements
- Equipment Purchase
- Construction Plan
- Crane Commitment
- O&M Plan
- Geotechnical Survey
- Construction Start
- Construction
- Commissioning
- Commercial Operations Date (COD)

Capital Costs

The main variable in capital cost for the 17.5 MW wind generation facility is the cost of turbines. Turbine costs are calculated on a per megawatt basis. Recent project reports have been analyzed for capital cost trends and range from $1.2 million/MW to $1.6 million/MW depending upon the scope of supply. Construction costs are approximately

$600,000/MW to $900,000/MW. This puts the cost of the Fresh Kills Wind Farm of approximately $40 million.

Government Incentives

Government incentives may be available in the form of Property Tax Abatements, Renewable Energy Credits, and Production Tax Credits which are offered by local, state, and federal governments respectively. Clearly a wind farm would need an arrangement with the City to define longterm lease and tax considerations.

New York State has an active Renewable Portfolio Standard (RPS) administered by NYSERDA that requires a certain quantity of generation from renewable resources. In order to satisfy the renewable generation requirements, utilities or government agencies are required to purchase certified Renewable Energy Credits (RECs). Each REC certifies 1 MW of generation from a renewable source as defined under the state RPS.

Production Tax Credits (PTC) are offered by the federal government as an incentive to renewable energy developers. The PTC applies to all energy sales from a renewable resource for 10 years following commercial operation with annual increases based on a published Inflation Adjustment Factor (IAF). With the IAF, the value of the credit increased to $19/MWh in 2006 and to $20.10/MWh in 2007. To qualify for the PTC the ownership of the wind farm must be separate from the purchaser of the power.

The Internal Revenue Service and New York State Department of Taxation and Finance allow wind energy projects to use accelerate accelerated depreciation.

Economics

Project economics for the potential installation of a 17.5MW wind farm were analyzed using a discounted cash flow model, taking into consideration the effects of the time value of money. On an unleveraged basis, a preliminary phase after-tax project IRR in the range required to secure financing from private sector sources.

Taxable losses are observed during the early years of operation due to a standardized MACRS, accelerated depreciation schedule, specific to assets that are placed into operation during the first quarter.

Project return sensitivities to deviations in the base case assumptions have been modeled through the use of a tornado diagram that ranks these effects in decreasing order of magnitude. The Fresh Kills Wind Farm IRR is most sensitive to changes in capital cost, annual power production, and power purchase price.

The project analysis has not included the impacts of municipal bond financing or other enhanced financing alternatives. It was assumed that the Fresh Kills windfarm would be entirely privately financed.

Phase I Development Activities

Phase I includes the NYSERDA feasibility study, discussions with stakeholders, and ownership options. Significant stakeholders in this project include the Borough of Staten Island, City of New York Departments of Parks and Recreation, City Planning, Sanitation, the NYS Department of Environmental Conservation, any taxing entities, government regulatory bodies, and surrounding property owners. This phase is substantially completed.

Proposed Phase II Development Activities

BQ Energy requires site control and a power purchase agreement in order to draft a preliminary offer memorandum to solicit investment and proceed with Phase II development activities.

Site control resides with either the New York City Parks Department or New York City Department of Sanitation. BQ Energy has presented the results of this feasibility study to the Staten Island Borough President's Office and to the New York City Departments of Parks, City Planning, and Sanitation, in order to facilitate a cooperative site control strategy. In the interim, BQ Energy has prepared the following scope for Phase II development activities. An additional $5 -10 million of private investment will be required for completion of these tasks.

- Finalizing layout options
- Developing a scope and initiating grid interconnection requirements
- Developing a scope and initiating the required permit studies
- Developing and issuing an RFP for wind turbine supply
- Developing a scope and initiating required power offtake agreements
- Initiating financing discussions- both debt and tax equity
- Finalizing the project pro forma
- Setting project scope with NYC and possibly area industries
- Contracting for wind turbine supply, including a turbine supply down payment
- Contracting for geotechnical analysis
- Pursuing other activities as might be required

Once site control is granted, BQ Energy will initiate financing discussions to source debt from commercial banks and local industrial development authorities and equity from strategic and tax equity investors. In parallel, power purchase agreements will be scoped with potential off-takers within the public and private sectors. The power purchase agreements will be for approximately 35,000 MWh/yr at price of $100-150/MWh.

BQ ENERGY, LLC
20 JON BARRETT RD
SUITE 2
PATTERSON, NY 12563