May 11, 2010
Work Session
Mayor and Council
Town of Ocean City

Mayor Rick Meehan, Council President Joe Mitrecic, Council Secretary Lloyd Martin, Council Members Jim Hall, Margaret Pillas, Mary Knight, Doug Cymek and Joe Hall, City Manager Dennis Dare, City Solicitor Guy Ayres, Assistant to City Manager Kathleen Mathias, Finance Administrator Martha Lucey, Emergency Medical Services Captain Chuck Barton, City Engineer Terry McGean, Chief Deputy Public Works Director James Parsons, Members of the Press and Interested Parties.

Council President Joe Mitrecic called this Work Session to order at 12:00 p.m.; then, **Council Member Doug Cymek moved to convene into closed session to: (1) consult with counsel to obtain legal advice; and, (2) conduct collective bargaining negotiations or consider matters that relate to the negotiations; seconded by Council Member Joe Hall. The vote was 5-0 with Council Member Jim Hall and Council Member Margaret Pillas absent.**

1. Council President Mitrecic re-opened the meeting at 1:05 p.m. and reported that legal and contractual matters were discussed in the closed session. Persons present were Mayor Rick Meehan, Mayor Rick Meehan, Council President Joe Mitrecic, Council Secretary Lloyd Martin, Council Members Jim Hall, Margaret Pillas, Mary Knight, Doug Cymek and Joe Hall, City Manager Dennis Dare, City Solicitor Guy Ayres, Assistant to City Manager Kathleen Mathias and Labor Attorney Steve Silvestri of Miles and Stockbridge. **Council Member Mary Knight moved to close the closed session; seconded by Council Secretary Lloyd Martin. The vote was unanimous.**

2. Kathy Phillips, representing the Environmental Law Clinic for the University of Maryland School of Law requested a waiver to $503.90 in fees for a recent Public Information Request. **Council Member Jim Hall moved to provide the information, submit a invoice and make due when the case is finalized; seconded by Council Secretary Lloyd Martin. The vote was 6-1 with Council Member Doug Cymek opposed.**

3. Emergency Medical Services Captain Chuck Barton requested permission to sole source purchase the TargetSafety.com subscription (an internet-based educational service) for the amount of $10,290.00 (paid in full by the OC Paramedics Foundation). **Council Member Jim Hall moved to approve; seconded by Council Member Doug Cymek. The vote was unanimous.** Captain Barton introduced summer intern Dean Bush to the Mayor and Council.

4. City Engineer Terry McGean, accompanied by CQI Representative Richard Anderson, reported on the Renewable Energy Projects Feasibility Study prepared by CQI Associates (see Attachment A). City Engineer McGean advised that the State granted the Town a $41,000.00 in energy-block grants. He requested an allocation of $17,000.00 to install a solar hot water heater (the existing one is failing) at Northside Park. **Council Member Mary Knight moved to approve; seconded by Council Member Jim Hall. The vote was unanimous.** Secondly, Mr. McGean requested permission to pursue alternate funding (i.e. grants, and low-interest loans) for the Inlet and HVAC Geothermal System at the airport.

Council Member Mary Knight moved to approve; seconded by Council Member Jim Hall. The vote was unanimous.

5. Chief Deputy Public Works Director James Parsons gave a presentation and recommendation regarding participating in the Maryland Water/Wastewater Agency Response Network (see Attachment B). **Council Member Jim Hall moved to establish participation in MDWARN by resolution in the next regular session; seconded by Council Member Margaret Pillas. The vote was 6-0 with Council Secretary Lloyd Martin out of the room.**

6. City Solicitor Ayres presented a draft ordinance amending Chapter 6, entitled *Animals*, to clarify regulations on keeping undomesticated animals. **Council Member Jim Hall moved to proceed with the first reading of an ordinance at the next regular session; seconded by Council Member Mary Knight. The vote was 6-1 with Council Member Joe Hall opposed.**

Council Member Mary Knight moved to adjourn at 2:10 p.m.; seconded by Council Secretary Lloyd Martin. The vote was unanimous.

Attachment A

Town of Ocean City

Maryland

Renewable Energy Projects Feasibility Study

Submitted By

CQI Associates

April 12, 2010

Town of Ocean City Maryland

Renewable Energy Projects Feasibility Study

Table of Contents

Executive Summary

The goal of study is to provide assistance to Town of Ocean City Maryland in the assessment of the feasibility of implementing renewable energy projects at the town's facilities.

The renewable energy resources evaluated were:

- Solar PV
- Solar thermal
- Wind
- Geothermal
- Bio-mass
- Bio-fuels
- Landfill gases
- Hydropower
- Wave Power

Potential facilities that could be used as sites for the renewable energy resources were evaluated. The facilities evaluated (proposed by the Town of Ocean City) are as follows:

- City Hall
- Convention Center
- Northside Park Recreation Building
- Northside Park Athletic Fields and Winter Fest
- Public Works Transfer Station
- Inlet Parking and Sun Fest
- Airport
- Golf Course

This report outlines the recommendations for the renewable energy resource projects including proposed project budgets and implementation plans.

Based on the assessments conducted and the resulting evaluation of applicable technologies, the following are the facility locations and the proposed renewable energy project opportunities recommended for additional consideration by the Town of Ocean City.

The projects are sorted based on the amount of energy produced by the renewable project and the shortest payback period.

Geo-thermal

Airport Office Terminal Building

The technical application best suited for this location is a closed loop ground well system. The application uses ground source heat pumps located in the building with all the units connected to the same ground loop well system. The application combines five (5) heat pump/fan coil units sized from 2 to 5 tons. The system rating for the ground loop should be 15 to 20 ton capacity. The system will provide 100% of the cooling and heating requirements for the terminal. The estimated cost is $35,000 to $42,000. The project savings will payback the investment based on a simple payback calculation in three (3) years and six (6) months. The project would reduce carbon emissions by 860 tons per year.

The Town of Ocean City should provide funding project by 2011.

Solar Thermal

City Hall

The technical application best suited for this location is a vacuum tube module using tilt-up roof mountings. The application could produce hot water for the restrooms for up to 200 people per day (8,280 kWh annually) using four solar cells. The estimated cost is $10,500 to $15,000. Based on a simple payback calculation, the project savings will payback the investment in 12 years and two months. The application would reduce carbon emissions by 102 ton per year.

The Town of Ocean City should seek grant funding in whole or part for the project to be implemented by 2011.

Northside Park Recreation Building

The technical application best suited for this location is a vacuum tube module using tilt-up roof mountings. The application could produce hot water for the restrooms for up to 200 people per day (8,280 kWh annually) using two sets of three sets of solar cells. The estimated cost is $15,000 to $17,400. Based on a simple payback calculation, the project savings will payback the investment in 14 years. The application would reduce carbon emissions by 152 tons per year.

The Town of Ocean City should seek grant funding in whole or part for the project to be implemented by 2012.

Wind

Inlet Parking Lot Lighting, Ticket Booth, and Sun Fest Lighting

The annual energy use is 46,875 kWh per year. The average monthly use is 3,900 kWh.

The technical application best suited for this location is a vertical access wind turbine mounted on a 15 foot tower. The application using three 4 kW turbines could produce 22,500 kWh annually (based on the average wind speed of 9 mph per year). This is 48% of the annual consumption. The estimated cost is $60,000 to $72,000. Based on a simple payback calculation, the project savings will payback the investment in 21 years and four (4) months. The application would reduce carbon emissions by 1,320 tons per year. Implementation of this project would require grant funding from State or Federal programs.

The Town of Ocean City should seek grant funding for the project to be implemented by 2011.

Northside Park – Athletic Field Lighting and Winter Fest Lighting

The annual energy use to power the athletic field lighting and Winter Fest lighting is 145,760 kWh per year. The average monthly use is 12,146 kWh.

The technical application best suited for this location is a vertical axis wind turbine mounted on a 20 foot tower. The application using three (3), 5 kW turbines could produce 28,125 kWh annually (based on the average wind speed of 9 mph per year). This is 19% of the annual consumption. The estimated cost is $73,500 to $88,200. Based on a simple payback calculation, the project savings will payback the investment in 20 years and 10 months. The application would reduce carbon emissions by 1,650 ton per year. Implementation of this project would require grant funding from state or federal programs.

The Town of Ocean City should seek grant funding for the project to be implemented by 2012.

Solar Electric - Photovoltaic

Public Works Transfer Station

The annual energy use is 415,439 kWh per year. The average monthly use is 34,600 kWh.

The technical application best suited for this location is a monocrystalline solar module on a tilt-up roof mounting. The application could produce 299,107 kWh annually based on the available roof area that would allow an array of 24,740 sf. This is 72% of the annual consumption. The estimated cost is $2,226,600. Based on a simple payback calculation, the project savings will payback the investment in 49 years and eight months. The application would reduce carbon emissions by 6,132 tons per year. Implementation of this project would require grant funding from state or federal programs.

The Town of Ocean City should seek grant or private investment funding for the project to be implemented by 2013.

Convention Center

The annual energy use is 4,783,764 kWh per year. The average monthly use is 398,647 kWh.

The technical application best suited for this location is a thin film solar module using a roof composite application and mounting. The application could produce

526,200 kWh annually based on the available roof area that would allow an array of 39,600 sf. This is 11% of the annual consumption. The estimated cost is $2,865,000. Based on a simple payback calculation, the project savings will payback the investment in 36 years and three (3) months. The application would reduce carbon emissions by 9,807 tons per year. Implementation of this project would require grant funding from state or federal programs.

The Town of Ocean City should seek grant or private investment funding for the project to be implemented by 2015.

Note: The cost of the solar projects is based on current technology.

Market applications are limited due to the costs. However, technology advancements improve performance by 100% every eleven months. The costs of the solar panels are dropping as manufacturing production increases at a rate of 15% per year.

The investment costs should be re-evaluated annually. By 2013 the solar PV project costs may be 45% less than the above estimates.

Bio-fuels

The use of a bio-fuel mixture in the commercial vehicles powered by diesel fuel is applicable. B-20 fuel is used throughout the region in the summer, and B-5 is applicable in the winter. This assessment focused on facilities, but the application should be considered by the Town of Ocean City over the next two years.

Bio-mass Fuels

Applications were reviewed but determined not to be applicable.

Landfill Gases

Applications were reviewed but determined not to be applicable.

Hydropower/Wave Power

Applications were reviewed for hydropower but determined not to be applicable. The research underway for water turbine applications, especially in the inlet waterways, may be commercially viable over the next five years. This option should be considered in the future.

Renewable Standard

The study recommendations for installing renewable resources are based on the definition used by the State of Maryland as the **Maryland Renewable Portfolio Standard**.

A Renewable Portfolio Standard (RPS) requires electricity suppliers to provide a certain percentage of electricity from renewable resources such as solar, wind, and biomass. RPS policies have proven to be an effective market-based tool to jump-start generation of renewable electricity.

The Maryland RPS, which was enacted in 2005, took effect at the beginning of 2006, and was amended in 2007 to incorporate separate provisions for solar power. The Maryland RPS calls for 9.5% of Tier 1 renewable (such as solar, wind, biomass, landfill gas and small hydroelectric) power by 2022.

The Maryland RPS also requires 2.5% to come from Tier 2 renewable (such as municipal solid waste and poultry litter) until 2019, after which Tier 2 is eliminated.

Therefore, this study attempts to propose projects that meet the Maryland RPS Tier 1 renewable application such as solar, wind, biomass, landfill gas, and small hydroelectric power requirements by 2022. Municipal solid waste and poultry litter were not considered applicable.

Renewable Technology Applications

The applicable renewable energy resources evaluated were:

- Solar PV
- Solar thermal
- Wind
- Geothermal
- Bio-mass/Bio-fuels
- Landfill gases
- Hydropower
- Wave Power

Each application is defined with an overview description included in the Appendix A.

Based on input of the Town of Ocean City staff and research on the applications of the renewable technology in Maryland and the Eastern Shore, the following technologies were determined to be feasible and potentially economically viable:

- Solar PV
- Solar thermal
- Wind
- Geothermal

Bio-fuels - The use of a bio-fuel mixture in the commercial vehicles powered by diesel fuel is applicable. B-20 fuel is used throughout the region in the summer and B-5 is applicable in the winter. This assessment focused on facilities but the application should be considered by the Town of Ocean City over the next two years. The following renewable energy resources were considered not applicable to any current Town of Ocean City application or viable for the facilities evaluated:

- Bio-mass
- Landfill gases
- Hydropower
- Wave Power

Facility Applications

The facilities evaluated (proposed by the Town of Ocean City) are as follows:

- City Hall
- Convention Center
- Northside Park Recreation Building
- Northside Park Athletic Fields and Winter Fest
- Public Works Transfer Station
- Inlet Parking and Sun Fest
- Airport
- Golf Course

All the facilities were evaluated and an assessment conducted at each of the proposed renewable energy options as follows:

- Solar PV
- Solar thermal
- Wind
- Geothermal

The technical feasibility to implement the proposed projects is based on the following:

Solar: Projects proposed for solar were evaluated to determine if the roof areas provided adequate sun capture area, if the roof was capable of handling the additional weight of the panels, and if existing equipment obstructed the ability to implement a project.

Wind: Projects for wind technology were evaluated to determine if space was available to locate turbine tower structures, access to existing electrical services, and evaluation of the impact of wind velocity based on the adjacent buildings and vegetation.

Geo-thermal: Geo-thermal projects were evaluated based on the condition of the existing cooling/heating HVAC systems, the availability of area adjacent to the building to locate the geo-thermal well field, and impact on the ground water aquifers.

The airport and golf course locations were also evaluated based on the potential impact on the fight path and flight access.

Investment to Energy Generated Calculator

CQI Associates sent a request to the Department of Energy National Renewable Energy Laboratory (NREL) to determine if calculation tools were available to evaluate renewable energy projects. The Department of Energy referred CQI Associates to three sites with calculator tools to assist in the development of investment cost projections and estimated energy generated by implementing renewable energy projects. As a part of the firm's work with the Northrop Grumman Corporation to establish carbon footprint goals, the Northrop Grumman staff recommended one of the three calculation tools.

CQI determined that the tool recommended by Northrop Grumman was preferred since the same calculator could develop results for solar and wind projects using the same input data.

The site is **www.find-solar.org**

This is a free, public service site providing a convenient, trusted means for estimating solar, wind, and renewable energy system costs, running payback and financial analyses, and accessing contractor, installer and other professional services in the renewable energy and energy efficiency fields. The site also provides a directory of solar and wind original equipment manufacturers and distributors.

The site was established in 2000 as "Calenergy.org" to help foster the solar and wind markets in California and over the years has helped coin the term "Solar Pro", helped millions of people learn about solar, wind and renewable energy, and profiled 3,280 solar, wind and renewable energy pros including 5,785 customer ratings & reviews.

The application of the site data is as follows:

The site requests the location postal code as the initial entry: 21843

The next page requests the name of the utility serving the location: Delmarva or Choptank Electric Coop

The page requires a designation of the project type:

- Solar Electric (PV)
- Solar Hot Water (Thermal)
- Solar Spa/Pool Heating
- Solar Space Heating & Cooling
- Wind Turbine

The site requires a designation for commercial or residential: in this case, all locations are commercial.

The next screen requests annual cost or usage data. The annual energy consumption was entered for each Town of Ocean City facility location.

The calculator generates a baseline result usually showing a 50% contribution for the renewable project option selected. The user can then modify the percentages to evaluate results. In the case of the solar project the first change was to adjust the percentage to match the available area for a solar array.

The resulting report provides details as follows:

- Solar or Wind Rating: OK, Good, Great
- Percent generated by renewable option over the course of a year
- Electricity rate established by the calculator: for all options the rate the calculator used was $0.1499 per kWh
- Estimated System Size
- Estimated System Cost
- Financial Incentives/Cost Evaluation
- Cash Flow Projection and detailed Monthly Cost Breakdowns
- Savings & Benefits (Includes an estimate of Greenhouse Gas (CO2) Saved)
- General System Descriptions

The calculator allows the user to return to switch from solar to wind projects using the same location data. The system has a solar PV project and solar thermal project calculator.

For the majority of the options described in the next section, eight to ten variations were run per facility to develop the report costs.

Renewable Project Descriptions & Evaluations:

The following is a description of each project evaluated by facility. The data is based on the use of the calculator tool. The energy costs, even though not what the town is currently paying, are set by the calculator tool as follows and were used to conduct the assessment:

DELMARVA:	$0.1499 per kWh
Choptank Electric Coop:	$0.1339 per kWh

The performance rating based on the calculator for the Town of Ocean City locations for each renewable project opportunity is:

- Solar Electric (PV) GOOD 4.53 kWh/square meter per day
- Solar Hot Water (Thermal) GOOD 4.53 kWh/square meter per day
- Wind Turbine GREAT 14.1 mph annual average*

*For this assessment CQI Associates used 9.0 mph annual average based on recommendations from industry experts and the assessment of the wind maps provided by other resources.

Convention Center

The annual energy use is 4,783,764 kWh per year. The average monthly use is 398,647 kWh.

Solar Photovoltaic

The roof area has two open areas suitable for a solar array facing south on a tilt-up mounting. The roof over the original exhibit area would allow for a 25,000 sf. array. The roof over the new exhibit hall allows for 12,500 sf. array. The total is 39,600 sf.

1. The first price option is for a traditional solar panel monocrystalline solar module on tilt-up roof mountings. The application could produce 478,377 kWh annually based on the available roof area that would allow an array of 39,600 sf. This is 10% of the annual consumption. The estimated cost is $3,560,000. Based on a simple payback calculation the project savings will payback the investment in 49 years and six (6) months. The application would reduce carbon emissions by 9,807 tons per year.

   The application is viable.

2. The second price option is the use of thin film solar module using a roof composite application and mounting. Even though a thin film is a new application, the cost to install is 42% less than traditional solar panels and the operating efficiency 15% higher. Based on the energy requirements and the size of the roof area the goal is to produce the greatest amount of energy for the lowest cost. The application could produce 526,200 kWh annually, based on the available roof area that would allow an array of 39,600 sf. This is 11% of the annual consumption. The estimated cost is $2,865,000. Based on a simple payback calculation the project savings will payback the investment in 36 years and three months. The application would reduce carbon emissions by 9,807 tons per year.

   Based on the lower cost and improved operating performance the thin film solar application is considered a viable opportunity

Solar Thermal

1. The application of solar thermal to provide hot water to support the heating system was considered. The building is heated by electricity therefore the application would require a new heating system.

   The cost was considered not viable and the option was not evaluated further.

2. The second application was to use solar thermal technology to produce domestic hot water for use in restrooms. The application is feasible and was considered for the restrooms in the new addition off of the main lobby.

   The technical application best suited for this location is a vacuum tube module using tilt-up roof mountings. The application could produce hot water for the restrooms for up to 200 people per day (8,280 kWh annually) using four (4) solar cells. The estimated cost is $10,500 to $15,000. The application would reduce carbon emissions by 102 tons per year. The application would require two sets of solar panels to handle the women's and men's restrooms. The total annual energy production would be 16,560 kWh and the overall cost $21,000 to $30,000. Based on a simple payback calculation the project savings will payback the investment in 12 years and two (2) months.

   The opportunity to cost assessment is viable for this application.

Wind

The application of wind technology was considered. Twenty–four vertical axis wind turbines are applicable at this location. The output would be 2,296,990 kWh per year which is approximately 10% of the annual energy use. The application would reduce carbon emissions by 28,243 tons per year.

1. One option would be to mount the turbines on the roof of the building on 10 foot support structures for a total length of 240 feet on the bay side of the roof. The estimated cost for the roof mounted system is $1,200,000 to $1,300,000. This option seems to have potential drawbacks. The primary concern would be the potential for vibration transference throughout the building. Additionally, the Convention Center may be renovated within five (5) years and the turbine location could hamper the facility expansion. Based on a simple payback calculation the project savings will payback the investment in 18 years and two (2) months.

2. The other option would be to mount the turbines on 35 foot towers in the parking lot in two rows with twelve turbine/towers per row, each row comprised of 120 feet. The additional tower height would add to the cost. The estimated cost for the ground mounted turbines is $1,560,000 to $1,740,000. Access to the main electrical service is feasible. Based on a simple payback calculation the project savings will payback the investment in 24 years and three (3) months.

The option is feasible but the number of turbines does not make this option a reasonable one.

3. A third option would be to install a rotary blade turbine in the parking lot adjacent to the new exhibit center. The water tower presents obstacles to a clear wind velocity. The turbine would have to be tower-mounted at a height 10 feet above the top of the water tower and higher than the adjacent hotel. The estimated 20 kW rotary blade turbine would be able to produce 1,115,867 kWh per year. The estimated cost is $2,430,000 to $3,036,000. Based on a simple payback calculation the project savings will payback the investment in 42 years and three (3) months.

This option has limited technical viability.

Geo-Thermal

To support the heating system the application of geo-thermal was considered. However, the type of the system, size of the system, and location of the heating units on top of the building make this application very difficult to implement. The installation costs would require a new heating system.

The team determined to go no further with the assessment of this option due to these factors.

City Hall

The annual energy use is 194,731 kWh. The average monthly use is 16,230 kWh.

Solar Photovoltaic

The roof area is limited and obstructed with HVAC and related equipment. The building's roof structure, primarily due to the age of the building, may not be best suited to support the weight of traditional solar voltaic (PV) panels and mountings. The structural load would need to be tied to the outside walls and support beams added to carry the load of the array over the existing roof. The resulting area would be comprised of 2,900 square feet which would provide an array that would produce 35,049 kWh. The energy produced would be 18% of the annual energy consumed. When the costs were calculated to include the additional structural support to hold the tilt-up mountings, the resulting costs were $360,000 to $415,000. Based on a simple payback calculation the project savings will payback the investment in 79 years. The application would reduce carbon emissions by 102 tons per year.

Due to the potential structural support issues the opportunity to cost assessment does not seem viable.

Solar Thermal

Two solar thermal applications were evaluated.

1. The first application is to provide hot water to support the heating system. The structural issues evaluated in the application of PV technology apply to the installation of an array sized to provide hot water to augment the heating system. The weight of the thermal solar system is 60% heavier than PV.

   The opportunity to cost assessment did not seem viable for this application due to the increased structural cost issues.

2. The second application is to provide domestic hot water for use in restrooms and pantry areas. The requirement to provide hot water for up to 200 persons per day would require four (4) standard vacuum tube solar modules mounted on a tilt-up roof structure. The center area of the roof over the main restrooms provides a clear area to mount a structural support for the array.

   The amount of heating capacity would be up to 100% of the needs when the sun is able to heat the vacuum tubes to 110 degrees. The application is suitable during summer and winter; the technical application best suited for this location is a vacuum tube module using tilt-up roof mountings. The application could produce hot water for the restrooms for up to 200 people

per day (8,280 kWh annually) using four solar cells. The estimated cost is $10,500 to $15,000. Based on a simple payback calculation the project savings will payback the investment in 12 years and two (2) months. The application would reduce carbon emissions by 102 tons per year.

The opportunity to cost assessment is viable for this application.

Wind

The application of wind technology would require a 50 foot tower and three, five kW vertical axis turbines. The additional height is needed to insure adequate wind velocity due to the adjacent buildings on Baltimore Avenue. The tower height would add 50% to the cost and would need a 40 foot long, 20 foot wide area to place the turbines/towers in series to allow the three (3) turbines to operate properly. The only other available area would be on the back side of the building and would eliminate one row of parking and the garden area. The application could produce 28,125 kWh annually based on the average wind speed of nine (9) mph per year. This is 14% of the annual consumption. The estimated cost is $73,500 to $88,200. Based on a simple payback calculation the project savings will payback the investment in 20 years and 10 months. The application would reduce carbon emissions by 1,650 tons per year.

This is not a feasible application based on the space requirements and the cost.

Geo-Thermal

The application of geo-thermal was considered to support the heating system. To avoid impacting the aquifer, the wells would have to be a horizontal closed loop system under the parking lot. The lot would be impacted and need to be repaved. Additionally, the current heating system is efficient and still within half of the manufacturer's recommended useful life. A replacement of the existing HVAC system at this time would not be cost effective.

The cost to opportunity of this project is not considered viable.

Northside Park Recreation Building

The annual energy use is 654,406 kWh per year. The average monthly use is 54,640 kWh.

Solar Photovoltaic

The roof over the gym areas is peaked and over the office is flat. The building is located on a 30° angle to the sun thus only one half of the peaked roof is appropriate for mounting solar panels on a tilt-up mounting to correct for the angle. The

available square footage is 16,000 sf. for the peaked roof area. The flat roof has obstructions but in general would allow a solar array of 6,500 sf.

The available square footage is 16,000 sf. for the peaked roof area. The application using a solar array on a tilt-up mounting would produce 196,317 kWh per year. This is 30% of the annual consumption. The estimated cost is $1,460,000 to $1,753,700. Based on a simple payback calculation the project savings will payback the investment in 59 years and six (6) months. The application would reduce carbon emissions by 4,025 tons per year.

The additional weight of the solar array is a concern and this option was deferred from a recommendation until additional structural studies are conducted.

Solar Thermal

1. The application of solar thermal to provide hot water to support the heating system was considered. The building is heated by electricity therefore the application would require a new heating system.

   The cost affects the viability and this option was not evaluated further.

2. The second application was to use solar thermal technology to produce domestic hot water in the restrooms. The technical application best suited for this location is vacuum tube module using tilt-up roof mountings. The array could be mounted on the flat roof section of the building or on the exterior front wall surface mounted on brackets to tilt the panels to directly face south. The flat roof area is 7,738 sf. of which 1,600 sf. is clear area for the two to four solar panels.

   Two installations may be required to serve the restrooms in the facility to reduce long pipe round from the solar array: one mounted on the flat roof and the other on the exterior wall facade. One location application could produce hot water for the restrooms for up to 100 people per day (4,140 kWh annually) using two solar cells. Each application would reduce carbon emissions by 67 tons per year. The estimated cost is $8,700 for each application ($17,400 for two). Based on a simple payback calculation the project savings will payback the investment in 14 years.

   The opportunity to cost assessment is viable for this application.

Wind

Two applications of wind technology were considered.

1. A series of eight - 20 kW rotary turbines could effectively provide 270,510 kWh annually which is 41% of the annual energy use. The turbines would need to

be on 80 foot towers to provide the wind velocity for a rotary blade turbine. The estimated cost is $736,000 to $885,000. The area required would be 200 feet in length and 20 foot wide on the bay side of the property. The application would reduce carbon emissions by 3,300 tons per year.

The cost and area required to construct the turbine towers was considered not viable.

2. A series of four - five kW vertical access wind turbines mounted on a 40 foot tower was considered as a second option. The turbines could be located at the rear of the facility in series adjacent to the pond. The area required would be 40 feet for the four turbine/towers. The application could produce 90,000 kWh annually based on the average wind speed of 9 mph per year. This is 14% of the annual consumption. The estimated cost is $98,000 to $118,000. Based on a simple payback calculation the project savings will payback the investment in 21 years. The application would reduce carbon emissions by 3,740 tons per year.

   The option is feasible.

Geo-Thermal

The application of geo-thermal was considered to support the heating system for the office section of the building. The wells would have to be a horizontal closed loop system under the parking lot to not impact the aquifer. This would require the parking lot to be impacted and repaved.

The application did not seem applicable at this time but should be considered in the future when the current heating and cooling system needs to be replaced.

Northside Park Athletic Fields and Winter Fest

The annual energy use to power the athletic field facilities, athletic field lighting, and Winter Fest lighting is 145,760 kWh per year. The average monthly use is 12,146 kWh.

Solar Photovoltaic

The facilities in the athletic area are small and do not have roof areas conducive to mounting solar panels.

A ground-mounted application located in the central field area of the complex adjacent to the play ground was considered. The area could support an array mounted on a tilt-up ground supported mounting. The approximate area is 2,000 sf. The amount of energy produced would be 29,155 kWh per year (20% of the annual consumption). The estimated cost is $435,000 to $520,000. The application would

reduce carbon emissions by 695 tons per year. However, the solar panel array would reduce the field area for activities and events, and panels could be damaged from game balls from the adjacent fields. Based on a simple payback calculation the project savings will payback the investment in 60 years.

The option, though viable from a practical standpoint, was not recommended.

Solar Thermal

1. The application of a solar thermal to provide hot water to support the heating system was considered.

   The building heating requirements are minimal thus making this option not viable.

2. A second application considered was to use solar thermal technology to produce domestic hot water for use in the restrooms. The technical application best suited for this location is a vacuum tube module using tilt-up roof mountings. The array could be mounted on the roof of the two activity/vending buildings but the roof area is obstructed.

   One location application could produce hot water for the restrooms for up to 50 people per day (2,100 kWh annually) using two solar cells. Each application would reduce carbon emissions by 30 tons per year. The estimated cost is $5,000 for each application ($10,000 for two).

   The opportunity is not viable for this application.

Wind

The technical application best suited for this location is a vertical axis wind turbine mounted on a 40 foot tower to serve the athletic field lighting and Winter Fest lighting. The turbine/tower could be located in series in the garden area adjacent to the pond. The area needed would be 50 feet long. The application using 3, 5 kW turbines could produce 28,125 kWh annually based on the average wind speed of 9 mph per year. This is 19% of the annual consumption. The estimated cost is $73,500 to $88,200. Based on a simple payback calculation the project savings will payback the investment in 21 years. The application would reduce carbon emissions by 1,650 tons per year.

The opportunity to cost assessment is viable for this application.

Geo-Thermal

The application of geo-thermal was considered to support the heating system for the activity/vending buildings. The heating requirements, even if combined to included

domestic hot water, would not provide a load sizable to make the smallest application viable. The wells would have to be a horizontal closed loop system under the ball fields to not impact the aquifer. This would require the ball fields to be taken out of play for a period of time.

This option was not considered viable.

Public Works Transfer Station

The annual energy use is 415,439 kWh per year. The average monthly use is 34,600 kWh.

Solar Photovoltaic

The roof area of the facility is sloped at a pitch of 1.12 facing north and 1.12 facing south. The south facing roof area is not obstructed and would provide an area for solar array of up to 25,000 sf.

The technical application best suited for this location is a monocrystalline solar module on a tilt-up roof mounting. The transfer station operation and activities require a durable panel application therefore a traditional solar panel is recommended since they have proven to be more durable than a thin-skin application. The application could produce 299,107 kWh annually based on the available roof area that would allow an array of 24,740 sf. This is 72% of the annual consumption. The estimated cost is $2,226,600. Based on a simple payback calculation the project savings will payback the investment in 49 years and eight (8) months. The application would reduce carbon emissions by 6,132 tons per year.

Due the number of birds that are attracted to the transfer station operation the solar array will need to be cleaned monthly. Additional water connections will have to be added and a safety rail installed to protect the workers. The estimated costs may be $50,000 to $75,000.

The application is viable and will produce energy at a level worth considering.

Solar Thermal

1. The application of solar thermal to provide hot water to support the heating system was considered but is not applicable for this facility since the office area and support areas are less than 2,000 sf.
2. The application to use solar thermal technology to produce hot water for domestic hot water use in restrooms was considered. The daily use is less than 20 gallons a day. The cost of over $3,000 is not practical for this daily use amount.

Wind

A series of four, five kW vertical axis wind turbines mounted on 40 foot towers was considered as an option. The turbines could be located on the bay side of the facility. The area required would be 40 feet by 10 feet for the four turbine/towers. The application could produce 90,000 kWh annually based on the average wind speed of 9 mph per year. This is 22% of the annual consumption. The estimated cost is $98,000 to $118,000. Based on a simple payback calculation the project savings will payback the investment in 21 years. The application would reduce carbon emissions by 3,740 tons per year.

The use of turbines in an area with a large bird population may not be the best alternative and was not considered further.

Geo-Thermal

The application of geo-thermal was considered to support the heating system for the office section of the building. The area is less than 2,000 sf. and the cost may not be practical. Additionally, the wells would have to be a horizontal closed loop system under the access roadway and transfer/delivery areas. The weight and activity of the trash collection and disposal vehicles could impact the wells over time. Furthermore, the site is located within feet of the bay and could impose other environmental concerns.

The cost to opportunity was not considered viable.

Inlet Parking Lot and Sun Fest

The annual energy use is 46,875 kWh per year. The average monthly use is 3,900 kWh.

Solar Photovoltaic

The roof area of the facilities located adjacent to the inlet parking lot is small and will not produce sufficient amounts of PV solar production.

A ground-mounted application located on the beach at the end of the parking lot near the inlet rock wall was considered. The area could support an array mounted on a tilt-up ground support. The approximate area is 2,000 sf. The amount of energy produced would be 23,430 kWh per year (50% of the annual consumption). The estimated cost is $175,000 to $210,000. Based on a simple payback calculation the project savings will payback the investment in 59 years and nine (9) months. The application would reduce carbon emissions by 480 tons per year.

The panels would be located on the beach and subject to the harsh environmental impact of the ocean. The option, though viable from a practical standpoint, was not recommended.

Solar Thermal

The application of a solar thermal unit to provide hot water to support the heating system was considered for the restrooms located at the tram terminal building on the board walk. The roof area and water are both limited.

The application could produce hot water for the restrooms for up to 100 people per day (4,140 kWh annually) using two solar cells. The application would reduce carbon emissions by 67 tons per year. The estimated cost is $8,700.

This option was not considered viable due to the roof area and low water use.

Wind

The inlet's wind velocity is estimated to be 11 to 14 mph (annual average). It is an ideal location for a wind application. The electricity load requirements are compatible with small scale vertical axis wind turbines.

The technical application best suited for this location is a vertical axis wind turbine mounted on a 15 foot tower. The turbines could be located in the medium strip beyond the ticket booth toward the beach. The area required would be 40 feet long for the three (3) turbine/towers to be mounted in series.

The application using three, 4 kW turbines could produce 22,500 kWh annually, based on the average wind speed of 9 mph per year. This is 48% of the annual consumption. The estimated cost is $60,000 to $72,000. Based on a simple payback calculation the project savings will payback the investment in 21 years and four (4) months. The application would reduce carbon emissions by 1,320 tons per year.

The application is considered viable.

Geo-Thermal

The application of geo-thermal was considered to support the heating system for the adjacent buildings. The heating requirements are minimal and thus not recommended for this application.

Airport

The annual energy use is 145,500 kWh per year. The average monthly use is 12,125 kWh.

Solar Photovoltaic

The roof area of the facilities located at the airport is small and will not produce sufficient amount of PV solar production.

A ground-mounted application located on the north side of the terminal building in the open field area was considered. The approximate area is 4,000 sf. The amount of energy produced would be 46,840 kWh per year. This is 32% of the annual consumption. The estimated cost is $350,000 to $420,000. Based on a simple payback calculation the project savings will payback the investment in 67 years and (5) five months. The application would reduce carbon emissions by 960 tons per year.

The application is viable but the location of the panels would require approval from the FAA. The option would require additional study and approvals.

Solar Thermal

The application of solar thermal to provide hot water to support the heating system for the restrooms located at the terminal building was considered. The roof area is sloped and could accommodate the panels. The water use is estimated to be 40 gallons per day.

The application could produce hot water (4,140 kWh annually) for the restrooms using two solar cells. The application would reduce carbon emissions by 67 tons per year. The estimated cost is $8,700. Based on a simple payback calculation the project savings will payback the investment in 15 years and eight (8) months.

This option was not considered viable due to the low water use.

Wind

The wind velocity on the mainland side of the bay is estimated to be 9 to 11 mph (annual average), less than the beach side that is 14 mph annual average. The airport location is still an ideal opportunity for a wind application.

The technical application best suited for this location is a rotary blade wind turbine mounted on a 60 foot tower to clear the adjacent trees. The application using one 10 kW turbine could produce 16,817 kWh annually based on the average wind speed of 9 mph per year. This is 11.5% of the annual consumption. The estimated cost is

$68,000 to $78,000. Based on a simple payback calculation the project savings will payback the investment in 19 years and two (2) months. The application would reduce carbon emissions by 210 tons per year.

The application and location of the tower would require approval from the FAA. The option would require additional study and approvals.

Geo-Thermal

The heating system for the terminal building is a heat pump application. The equipment age is reaching the manufacturer's recommended point for replacement and should be replaced within the next three years. The unit sizes are suitable for a ground source heat pump system.

The technical application best suited for this location is a closed loop ground well system. The application uses ground source heat pumps located in the building with all the units connected to the same ground loop well system. The application combines five heat pump/fan coil units sized from 2 to 5 tons. The system rating for the ground loop should be 15 to 20 ton capacity. The system will provide 100% of the cooling and heat estimated cost is $35,000 to $42,000. Based on a simple payback calculation the project savings will payback the investment in three (3) years and six (6) months. The application would reduce carbon emissions by 860 tons per year.

The application is viable and the annual operating costs could be reduced by 50% per year based on experiences with similar systems on the Eastern Shore.

Golf Course

The annual energy use is 142,827 kWh per year. The average monthly use is 11,900 kWh.

Solar Photovoltaic

The roof area of the facility is small and will not produce sufficient amount of PV solar production. A ground-mounted application was considered but no area outside of the airport flight path could be located without disrupting the course layout. The application was not developed due to the lack of area.

Solar Thermal

The application of a solar thermal system to provide hot water to support the heating system was considered for the restrooms in the club house building. The roof area could accommodate the panels. The water use is estimated to be 60 gallons per day.

The application considered could produce hot water for the restrooms, producing 4,140 kWh annually using two solar cells. The application would reduce carbon

emissions by 67 tons per year. The estimated cost is $8,700. Based on a simple payback calculation the project savings will payback the investment in 15 years and nine months.

The application to cost does not seem applicable.

Wind

A location to place the wind turbines was considered but no area outside of the airport flight path could be located without disrupting the course layout. The application was not developed due to the lack of area.

Geo-Thermal

The technical application best suited for this location is a closed loop ground well system. The location of the wells would need to be considered in detail since the installation would impact either the parking lot or the course. The application did not seem applicable at this time but should be considered in the future when the current heating and cooling system needs to be replaced.

Energy Performance Assessments and Cost Estimates

An assessment of the energy generated by the renewable project on an annual basis was conducted to determine the project feasibility for further consideration by the Town of Ocean City.

CQI Associates included a factor to take into consideration the potential technical difficulties that are posed by the implementation of the proposed renewable energy project. The result was a percentage that represents the amount of energy produced for the investment. The projects highlighted produce the largest amount of energy for the investment.

The evaluations follow:

Convention Center	**Annual Consumption kWh**	**Annual Cost - Based on Estimator Calculator**	**Annual Production Potential kWh**	**Percent Contribution**	**Annual Cost Savings Production kWh - Based on Estimator Calculator**
Solar PV - Panels	4,783,764	$717,086.22	478,377	10%	$71,708.71
Solar PV - Thin Skin	**4,783,764**	**$717,086.22**	**526,200**	**11%**	**$78,877.38**
Solar Thermal	4,783,764	$717,086.22	16,560	0.35%	$2,482.34
Wind - Roof	4,783,764	$717,086.22	480,000	10%	$71,952.00
Wind - Ground	4,783,764	$717,086.22	480,000	10%	$71,952.00
Wind - Tower	4,783,764	$717,086.22	480,000	10%	$71,952.00
Geo-thermal	NA	NA	NA	NA	NA

Convention Center	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Investment to Savings Cost Payback Percentage**	**Average Contribution To Return Percentages**	**Reduction Due to Technical Concerns**
Solar PV - Panels	$71,708.71	$3,560,000.00	2%	11.0%	11.0%
Solar PV - Thin Skin	**$78,877.38**	**$2,865,000.00**	**3%**	**12.4%**	**12.4%**
Solar Thermal	$2,482.34	$30,000.00	8%	4.5%	4.5%
Wind - Roof	$71,952.00	$1,300,000.00	6%	12.8%	6.4%
Wind - Ground	$71,952.00	$1,740,000.00	4%	12.1%	7.3%
Wind - Tower	$71,952.00	$3,036,000.00	2%	11.2%	2.8%
Geo-thermal	NA	NA	NA	0.0%	0.0%

City Hall	Annual Consumption kWh	Annual Cost - Based on Estimator Calculator	Annual Production Potential kWh	Percent Contribution	Annual Cost Savings Production kWh - Based on Estimator Calculator
Solar PV - Panels	194,731	$29,190.18	35,049	18%	$5,253.85
Solar Thermal	**194,731**	**$29,190.18**	**8,280**	**4.25%**	**$1,241.17**
Wind	194,731	$29,190.18	28,125	14%	$4,215.94
Geo-thermal	194,731	$29,190.18	0	0%	$0.00

City Hall	Annual Cost Savings Production kWh - Based on Estimator Calculator	Cost Estimate Based on Estimator Calculator and Industry Data	Investment to Savings Cost Payback Percentage	Average Contribution To Return Percentages	Reduction Due to Technical Concerns
Solar PV - Panels	$5,253.85	$415,000.00	1%	18.6%	1.9%
Solar Thermal	**$1,241.17**	**$15,000.00**	**8%**	**8.4%**	**8.4%**
Wind	$4,215.94	$88,200.00	5%	16.8%	4.2%
Geo-thermal	$0.00	$0.00	0%	0.0%	0.0%

Northside Park Recreation Building	Annual Consumption kWh	Annual Cost - Based on Estimator Calculator	Annual Production Potential kWh	Percent Contribution	Annual Cost Savings Production kWh - Based on Estimator Calculator
Solar PV - Panels	**654,406**	**$98,095.46**	**196,317**	**30%**	**$29,427.92**
Solar Thermal	654,406	$98,095.46	8,280	1.27%	$1,241.17
Wind	654,406	$98,095.46	37,500	6%	$5,621.25
Geo-thermal	654,406	$98,095.46	0	0%	$0.00

Northside Park Recreation Building	Annual Cost Savings Production kWh - Based on Estimator Calculator	Cost Estimate Based on Estimator Calculator and Industry Data	Investment to Savings Cost Payback Percentage	Average Contribution To Return Percentages	Reduction Due to Technical Concerns
Solar PV - Panels	**$29,427.92**	**$1,753,700.00**	**2%**	**30.8%**	**7.7%**
Solar Thermal	$1,241.17	$17,400.00	7%	4.8%	2.4%
Wind	$5,621.25	$118,000.00	5%	8.1%	4.1%
Geo-thermal	$0.00	$0.00	0%	0.0%	0.0%

Northside Park Athletic Fields & Winter Fest	**Annual Consumption kWh**	**Annual Cost - Based on Estimator Calculator**	**Annual Production Potential kWh**	**Percent Contribution**	**Annual Cost Savings Production kWh - Based on Estimator Calculator**
Solar PV - Panels	145,760	$21,849.42	58,310	40%	$8,740.67
Solar Thermal	145,760	$21,849.42	4,200	2.88%	$629.58
Wind	**145,760**	**$21,849.42**	**28,125**	**19%**	**$4,215.94**
Geo-thermal	145,760	$21,849.42	0	0%	$0.00

Northside Park Athletic Fields & Winter Fest	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Investment to Savings Cost Payback Percentage**	**Average Contribution To Return Percentages**	**Reduction Due to Technical Concerns**
Solar PV - Panels	$8,740.67	$520,000.00	2%	40.8%	6.8%
Solar Thermal	$629.58	$10,000.00	6%	6.0%	3.0%
Wind	**$4,215.94**	**$88,200.00**	**5%**	**21.7%**	**19.5%**
Geo-thermal	$0.00	$0.00	0%	0.0%	0.0%

Public Works Transfer Station	**Annual Consumption kWh**	**Annual Cost - Based on Estimator Calculator**	**Annual Production Potential kWh**	**Percent Contribution**	**Annual Cost Savings Production kWh - Based on Estimator Calculator**
Solar PV - Panels	**415,439**	**$62,274.31**	**299,107**	**72%**	**$44,836.14**
Solar Thermal	415,439	$62,274.31	0	0.00%	$0.00
Wind	415,439	$62,274.31	37,500	9%	$5,621.25
Geo-thermal	415,439	$62,274.31	0	0%	$0.00

Public Works Transfer Station	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Investment to Savings Cost Payback Percentage**	**Average Contribution To Return Percentages**	**Reduction Due to Technical Concerns**
Solar PV - Panels	**$44,836.14**	**$2,226,600.00**	**2%**	**73.0%**	**65.7%**
Solar Thermal	$0.00	$0.00	0%	0.0%	0.0%
Wind	$5,621.25	$118,000.00	5%	11.4%	5.7%
Geo-thermal	$0.00	$0.00	0%	0.0%	0.0%

Inlet Lot & Sun Fest	**Annual Consumption kWh**	**Annual Cost - Based on Estimator Calculator**	**Annual Production Potential kWh**	**Percent Contribution**	**Annual Cost Savings Production kWh - Based on Estimator Calculator**
Solar PV - Panels	46,875	$7,026.56	23,430	50%	$3,512.16
Solar Thermal	46,875	$7,026.56	4,140	8.83%	$620.59
Wind	**46,875**	**$7,026.56**	**22,500**	**48%**	**$3,372.75**
Geo-thermal	46,875	$7,026.56	0	0%	$0.00

Inlet Lot & Sun Fest	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Investment to Savings Cost Payback Percentage**	**Average Contribution To Return Percentages**	**Reduction Due to Technical Concerns**
Solar PV - Panels	$3,512.16	$210,000.00	2%	50.1%	12.5%
Solar Thermal	$620.59	$8,700.00	7%	12.4%	6.2%
Wind	**$3,372.75**	**$72,000.00**	**5%**	**49.4%**	**49.4%**
Geo-thermal	$0.00	$0.00	0%	0.0%	0.0%

Airport	**Annual Consumption kWh**	**Annual Cost - Based on Estimator Calculator**	**Annual Production Potential kWh**	**Percent Contribution**	**Annual Cost Savings Production kWh - Based on Estimator Calculator**
Solar PV - Panels	145,500	$19,351.50	46,840	32%	$6,229.72
Solar Thermal	145,500	$19,351.50	4,140	2.85%	$550.62
Wind	145,500	$19,351.50	28,320	19%	$3,766.56
Geo-thermal	**145,500**	**$19,351.50**	**87,300**	**60%**	**$11,610.90**

Airport	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Investment to Savings Cost Payback Percentage**	**Average Contribution To Return Percentages**	**Reduction Due to Technical Concerns**
Solar PV - Panels	$6,229.72	$420,000.00	1%	32.9%	8.2%
Solar Thermal	$550.62	$8,700.00	6%	6.0%	3.0%
Wind	$3,766.56	$72,000.00	5%	22.1%	5.5%
Geo-thermal	**$11,610.90**	**$42,000.00**	**0%**	**73.8%**	**36.9%**

Golf Course	**Annual Consumption kWh**	**Annual Cost - Based on Estimator Calculator**	**Annual Production Potential kWh**	**Percent Contribution**	**Annual Cost Savings Production kWh - Based on Estimator Calculator**
Solar PV - Panels	142,827	$18,995.99	0	0%	$0.00
Solar Thermal	**142,827**	**$18,995.99**	**4,140**	**2.90%**	**$550.62**
Wind	142,827	$18,995.99	0	0%	$0.00
Geo-thermal	142,827	$18,995.99	0	0%	$0.00

Golf Course	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Investment to Savings Cost Payback Percentage**	**Average Contribution To Return Percentages**	**Reduction Due to Technical Concerns**
Solar PV - Panels	$0.00	$0.00	0%	0.0%	0.0%
Solar Thermal	**$550.62**	**$8,700.00**	**6%**	**6.1%**	**3.0%**
Wind	$0.00	$0.00	0%	0.0%	0.0%
Geo-thermal	$0.00	$0.00	0%	0.0%	0.0%

Cost Assessment and Payback Period

The investment cost and estimated annual savings were used to develop a simple payback calculation for each project. The projects highlighted produce the largest amount of energy for the investment.

The results by location by renewable project evaluated follows:

Convention Center	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$71,708.71	$3,560,000.00	49.6
Solar PV - Thin Skin	**$78,877.38**	**$2,865,001.00**	**36.3**
Solar Thermal	$2,482.34	$30,000.00	12.1
Wind - Roof	$71,952.00	$1,300,000.00	18.1
Wind - Ground	$71,952.00	$1,740,000.00	24.2
Wind - Tower	$71,952.00	$3,036,000.00	42.2
Geo-thermal	NA	NA	0.0

City Hall	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$5,253.85	$415,000.00	79.0
Solar Thermal	**$1,241.17**	**$15,000.00**	**12.1**
Wind	$4,215.94	$88,200.00	20.9
Geo-thermal	$0.00	$0.00	0.0

Northside Park Recreation Building	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$29,427.92	$1,753,700.00	59.6
Solar Thermal	**$1,241.17**	**$17,400.00**	**14.0**
Wind	$5,621.25	$118,000.00	21.0
Geo-thermal	$0.00	$0.00	0.0

Northside Park Athletic Fields & Winter Fest	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$8,740.67	$520,000.00	59.5
Solar Thermal	$629.58	$10,000.00	0.0
Wind	**$4,215.94**	**$88,200.00**	**20.9**
Geo-thermal	$0.00	$0.00	0.0

Public Works Transfer Station	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	**$44,836.14**	**$2,226,600.00**	**49.7**
Solar Thermal	$0.00	$0.00	0.0
Wind	$5,621.25	$118,000.00	21.0
Geo-thermal	$0.00	$0.00	0.0

Inlet Lot & Sun Fest	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$3,512.16	$210,000.00	59.8
Solar Thermal	$620.59	$8,700.00	14.0
Wind	**$3,372.75**	**$72,000.00**	**21.3**
Geo-thermal	$0.00	$0.00	0.0

Airport	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$6,229.72	$420,000.00	67.4
Solar Thermal	$550.62	$8,700.00	15.8
Wind	$3,766.56	$72,000.00	19.1
Geo-thermal	**$11,610.90**	**$42,000.00**	**3.6**

Golf Course	**Annual Cost Savings Production kWh - Based on Estimator Calculator**	**Cost Estimate Based on Estimator Calculator and Industry Data**	**Payback Period**
Solar PV - Panels	$0.00	$0.00	0.0
Solar Thermal	**$550.62**	**$8,700.00**	**15.8**
Wind	$0.00	$0.00	0.0
Geo-thermal	$0.00	$0.00	0.0

Project Recommendations

Based on the site assessments, technology evaluations, and cost estimates a short list of project and location recommendations was developed.

The following projects are proposed for consideration by the Town of Ocean City.

The list is sorted based on payback periods.

		Investment	Annual Savings	Payback Period
Airport	**Geo-thermal**	**$42,000**	**$11,611**	**3.6**
City Hall	**Solar thermal**	**$15,000**	**$1,242**	**12.1**
Northside Park Recreation Building	**Solar thermal**	**$17,400**	**$1,242**	**14.0**
Northside Park Athletic Fields & Winter Fest	**Wind**	**$88,200**	**$4,215**	**20.9**
Inlet Lot & Sun Fest	**Wind**	**$72,000**	**$3,373**	**21.3**
Convention Center	**Solar PV**	**$2,865,000**	**$78,877**	**36.3**
Public Works Transfer Station	**Solar PV**	**$2,226,000**	**$44,836**	**49.7**

The following is the percentage of annual energy produced by the implementation of the projects:

Airport	**Geo-thermal**	**60% (100% Heating & Cooling**
City Hall	**Solar thermal**	**5% (80% of Hot Water Demand)**
Northside Park Recreation Building	**Solar thermal**	**7% (80% of Hot Water Demand)**

Northside Park Athletic Fields & Winter Fest	**Wind**	**19%**
Inlet Lot & Sun Fest	**Wind**	**48%**
Convention Center	**Solar PV**	**11%**
Public Works Transfer Station	**Solar PV**	**72%**

The estimated reduction in carbon emissions in tons for the projects is as follows:

Airport	**Geo-thermal**	**860 tons**
City Hall	**Solar thermal**	**102 tons**
Northside Park Recreation Building	**Solar thermal**	**152 tons**
Northside Park Athletic Fields & Winter Fest	**Wind**	**1,650 tons**
Inlet Lot & Sun Fest	**Wind**	**1,320 tons**
Convention Center	**Solar PV**	**9,807 tons**
Public Works Transfer Station	**Solar PV**	**6,132 tons**

Implementation Plan Recommendations

The recommended order of implementation is as follows subject to funding:

		Investment	Timeframe
Airport	**Geo-thermal**	**$42,000**	**Fiscal Year 2011**
City Hall	**Solar thermal**	**$15,000**	**Fiscal Year 2011**
Inlet Lot & Sun Fest	**Wind**	**$72,000**	**Fiscal Year 2011**
	Total 2011	**$129,000**	

		Investment	Timeframe
Northside Park Recreation Building	**Solar thermal**	**$17,400**	**Fiscal Year 2012**
Northside Park Athletic Fields & Winter Fest	**Wind**	**$88,200**	**Fiscal Year 2012**
	Total 2012	**$105,600**	

		Investment	Timeframe
Public Works Transfer Station	**Solar PV**	**$2,226,000**	**Based on Funding After Fiscal Year 2013**
Convention Center	**Solar PV**	**$2,865,000**	**Based on Funding After Fiscal Year 2015**

The project details and timelines for implementation of the projects are as follows:

FISCAL YEAR 2011

Airport – Geo-thermal Heat Pump Project

Seek Funding- $42,000: March to July 2010

Issue Request for Proposal for a design build approach and selection of contractor	July to September 2010
Design phase and acceptance:	Nov. 2010 to Dec. 2010
Well installation:	March 2011
HVAC equipment replacement:	April 2011
Acceptance:	May 2011

City Hall – Solar Thermal Project

Seek funding- $15,000:	March to July 2010
for design build approach and select contractor	July to September 2010
Design phase and acceptance:	Nov. 2010 to Dec. 2010
Material order and production:	Jan. 2011 to March 2011
Installation:	April 2011
Testing:	May 2011
Acceptance:	June 2011

Inlet Parking Lot and Sun Fest – Wind Project

Seek funding - $72,000:	March to July 2010
Issue Request for Proposal for a design build approach and select contractor	July to September 2010
Design phase and acceptance:	Nov. 2010 to Dec. 2010
Material order and production:	Jan. 2011 to March 2011
Installation:	April 2011 to May 2011
Testing:	June 2011
Acceptance:	July 2011

FISCAL YEAR 2012

Northside Park Building – Solar Thermal

Seek funding - $17,400:	July 2010 to June 2011
Issue Request for Proposal for a design build approach and select contractor	July 2011 to Sept. 2011
Design phase and acceptance:	Nov. 2011 to Dec. 2011
Material order and production:	Jan. 2012 to March 2012
Installation:	April 2012 to May 2012
Testing:	June 2012
Acceptance:	July 2012

Northside Park Athletic Field and Winter Fest – Wind Project

Seek Funding- $88,200:	July 2010 to June 2011
Issue Request for Proposal for a design build approach and select contractor	July 2011 to Sept. 2011
Design phase and acceptance:	Nov. 2011 to Dec. 2011
Material order and production:	Jan. 2012 to March 2012
Installation:	April 2012 to May 2012
Testing:	June 2012
Acceptance:	July 2012

FISCAL YEAR 2013 - 2015

Public Works Transfer Station – Solar PV Project

Seek Funding- $2,226,600:	July 2011 to June 2012
Issue Request for Proposal for project design	July 2012 to Sept. 2012
Select design firm	October 2012

Project design and structural evaluation	October 2012 to Jan. 2013
Complete final construction bid specifications, drawings, and recommended solar panel application	February 2013
Issue Request for Proposal and select contractor	July 2013 to Sept. 2013
Material order and production:	Nov. 2013 to March 2014
Installation:	March 2014 to May 2014
Testing:	June 2014
Acceptance:	August 2014

Convention Center – Solar PV Project

Seek Funding- $2,865,000:	July 2012 to June 2013
Issue Request for Proposal for project design	July 2013 to Sept. 2013
Select design firm	October 2013
Project design and structural evaluation	October 2013 to Jan. 2014
Complete final construction bid specifications, drawings, and recommended solar panel application	February 2014
Issue Request for Proposal and select contractor	March 2014 to July 2014
Material order and production:	July 2014 to October 2014
Installation:	Nov. 2014 to March 2015
Testing:	April 2015 to May 2015
Acceptance:	June 2015

Funding

The three options to fund the project investments are:

- Town of Ocean City Capital Improvement Funding
- Grants and Loans
- Private Financing

Town of Ocean City Capital Improvement Funding

The following project could be implemented within the next two years if funds are available through the Town of Ocean City Capital Improvement Budget:

		Investment
Airport	**Geo-thermal**	**$42,000**

The Airport geo-thermal heat pump project payback period is three (3) years and six (6) months. The project may not fit the grant and loan payback criteria due to the shorter payback period.

The Town of Ocean City should seek funding in whole or part from state or federal sources for the City Hall and Northside Park Recreation Building solar thermal projects for implementation by 2011. The city may have to provide 50% of the funding through the Capital Improvement Budget. See chart below.

Grants and Loans

The Maryland Empower Grant Program may have a new application round in FY 2011 that would provide 50% to 100% of the cost for renewable energy projects.

The following projects should be submitted for the maximum available funding but may require the Town of Ocean City to provide 50% of the funding.

		Grant Request 100%	Grant Request 50%	*Town Funding at 50%*
City Hall	**Solar thermal**	**$15,000**	**$7,500**	*$7,500*
Northside Park Recreation Building	**Solar thermal**	**$17,400**	**$8,700**	*$8,700*
		$32,500	**$16,200**	*$16,200*

The following projects should be submitted for the maximum available funding:

		Grant Request 100%
Inlet Lot & Sun Fest	Wind	$72,000
Northside Park Athletic Fields & Winter Fest	Wind	$88,200
		$160,200

Maryland Energy Administration Lawton Loan Program

An alternative to fund the above projects is to apply for a Maryland Energy Administration Lawton Loan. The loan program is available for projects up to $1,000,000 per application. The interest rate is 2.5%.

The projects best suited for the loan program are:

		Loan Request	City Interest Payment
Airport	Geo-thermal	$42,000	$1,050
City Hall	Solar thermal	$15,000	$375
Northside Park Recreation Building	Solar thermal	$17,400	$435
Inlet Lot & Sun Fest	Wind	$72,000	$1,800
Northside Park Athletic Fields & Winter Fest	Wind	$88,200	$2,205
	Loan Request	$234,600	$5,865
		Total Loan Cost	$240,465

Department of Energy grants are also pending for FY 2011 and could provide 30% to 80% of the cost for renewable energy projects with no project size limit.

In addition to the above list of projects, the following projects are also best suited for the grant program:

		Project Cost	Grant Request 80%	City Investment 20%
Public Works Transfer Station	Solar PV	$2,226,000	$1,780,800	$445,200
Convention Center	Solar PV	$2,865,000	$2,292,000	$573,000
	Totals	$5,091,000	$4,072,800	$1,018,200

Private Financing:

Investment and construction companies will provide programs to finance solar projects. The program commonly referred to as a "rent a roof" solar financing plan allows the company to construct the system they feel will meet the need of the owner (town). The owner agrees to buy a fixed quantity of energy for a fixed rate for 20 years. A typical plan requires purchase of energy generated by the solar system at 9.5 cents per kWh per year with a 3% per year escalation rate for 20 years.

		Investment	Re-payment Estimate 20 Years
Public Works Transfer Station	Solar PV	$2,226,000	$2,337,300
Convention Center	Solar PV	$2,865,000	$3,008,250
	Totals	$5,091,000	$5,345,550

Specifications

The specifications to be referenced in the Request for Proposal are for products equal to the following for each project.

Specification reference data is included in Appendix B.

Airport – Geo-thermal Heat Pump Project

Funding - $42,000

The technical application best suited for this location is a closed loop ground well system. The application uses ground source heat pumps located in the building with all the units connected to the same ground loop well system. The application combines five heat pump/fan coil units sized from 2 to 5 tons. The system rating for the ground loop should be 15 to 20 ton capacity.

Manufacture: Carrier

Designation: Ultra-high Efficiency Geothermal Unit

Size: 4.6 COP closed loop system Heating 21,000 to 77,000 BTUH Cooling 2 to 6 tons

Well Technology Basis: EarthLinked Technologies

City Hall – Solar Thermal Project

Funding - $15,000

The technical application best suited for this location is vacuum tube module using tilt-up roof mountings. The application could produce hot water for the restrooms for up to 200 people per day which is 8,280 kWh annually using four solar cells.

Manufacture: Thermo Technologies

Designation: Stibebel Eltron Flat Plate Solar Collector

Size: SOL 25 Plus (29.06 square meters)

Inlet Parking Lot and Sun Fest – Wind Project

Funding - $72,000

The technical application best suited for this location is a vertical axis wind turbine mounted on a 15 foot tower. The application using three 4 KW turbines could produce 22,500 kWh annually based on the average wind speed of 9 mph per year.

Manufacture: Urban Green Energy

Designation: UGE – 2nd Generation VAWT

Size: 4 kW

FISCAL YEAR 2012

Northside Park Recreation Building – Solar Thermal Project

Funding - $17,400

The technical application best suited for this location is vacuum tube module using tilt-up roof mountings. The application could produce hot water for the restrooms for up to 200 people per day which is 8,280 kWh annually using four solar cells.

Manufacture: Thermo Technologies

Designation: Stibebel Eltron Flat Plate Solar Collector

Size: SOL 25 Plus (29.06 square meters)

Northside Park Athletic Field and Winter Fest – Wind Project

Funding - $88,200

The technical application best suited for this location is a vertical axis wind turbine mounted on a 40 foot tower to serve the Athletic Field Lighting and Winter Fest Lighting. The turbine/tower could be located in series in the garden adjacent to the pond. The area needed would be 50 feet long. The application using three 5 kW turbines could produce 28,125 kWh annually based on the average wind speed of 9 mph per hour.

Manufacture: WEPOWER, 32 Journey Suite 250 Aliso Viejo, CA 92656

Designation: Falcon Series – Vertical Axis Wind Turbine

Size: 5.5 kW

Public Works Transfer Station – Solar PV Project

Funding- $2,226,600

The technical application best suited for this location is a monocrystalline solar module on a tilt-up roof mounting. The transfer station operation and activities would be best suited for a traditional solar panel that has proven to be more durable than a thin-skin application. The application could produce 299,107 kWh annually based on the available roof area that would allow an array of 24,740 sf.

Manufacture: Sharp

Designation: Multi-purpose Monocrystalline Solar Module

Size: 235 Watt Solar Panel Sharp NU-U235F1

Mounting: Tilt-Track Mounting by Tilt Trac

Convention Center – Solar PV Project

Funding - $2,865,000

The technical application best suited for this location is a thin film solar module using a roof composite application and mounting. The application could produce 526,200 kWh annually based on the available roof area that would allow an array of 39,600 sf.

Manufacture: Uni-Solar

Designation: Solar Laminate PVL-Series

Size: PVL-144 Wp

Who and What is WARN?

- Water & Wastewater Agencies Response Network
- Network of utilities helping utilities.
- United by common “enemies”
  - Natural disasters
  - Human-caused disasters
- Not a corporation or a government unit
- Utilities organized within a state
  - By agreement
  - To help each other with personnel and resources

Why Consider a WARN?

- **Past disaster response & lessons learned tell us:**

  - Utility operations are specialized

  - when assistance is needed utilities require specialized skills, certified operators and unique equipment. Utilities must be self sufficient to sustain operations.

  - Utilities must fill the gap between disaster onset and arrival of other government aid.

  - FEMA has “muscles” but it is far from agile.

Why Consider a WARN?

- **Past lessons learned continued…**
  - **– Maintenance of service of basic utility needs is essential:**
    - Government response agencies rely on the utility – fire fighting, sanitation at hospitals, etc…
    - Safe and reliable water and sanitation facilities are essential to provide hope and confidence in the midst of a disaster.

  - **– Disasters can quickly overwhelm a utility:**
    - The local workforce and contractor pool is insufficient or unavailable.
    - Large events impact regional areas, making response from nearby utilities impractical
    - Disasters impact utility employees and their families, creating greater need for relief.

Why Consider a WARN?

- **Past lessons learned continued…**
  - **Federal initiatives support/promote intrastate cooperative agreements:**
    - Homeland Security Presidential Directives
      - Management of Domestic Incidents – NIMS & NRP
      - Critical infrastructure protection
      - National Preparedness Goal
    - Federal disaster relief funding:
      - Agreements must be established pre-event for federal reimbursement

Key Points About a WARN Program

- **One utility helping another based on a written agreement.**
- **Assistance is provided across jurisdictional boundaries.**
- **Participation is voluntary – No obligation to respond.**
- **No cost to participate.**
- **The WARN system increases emergency preparedness and cooperation.**

More Key Points About a WARN Program

- **A WARN system provides a utility access to specialized, knowledgeable and certified personnel.**
- **A WARN system provides a utility access to heavy equipment tools and supplies used during normal events/operations.**
- **WARN expedites the arrival of aid.**
- **Program is patterned after private power company programs.**
- **A single agreement to access resources statewide.**
- **Indemnification and worker compensation provisions (just like MAA) to protect participating utilities.**
- **Deployed resources remain under the authority of the sending agency and can be recalled at any time.**

MDWARN

- Questions?