Taking the (Sun) Initiative:
An analysis of solar installations in the New York's Capital Region: Skidmore College, Saratoga Springs, and Troy

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1. Introduction

1.1 Why Renewables are Important

Currently, the United States relies largely on nonrenewable energy sources such as coal, oil and natural gas. The combustion of these fossil fuels emit carbon dioxide, a known greenhouse gas that warms the climate, is the largest source of greenhouse gas emissions in the United States (EPA, 2014). However, renewable energy sources like solar, geothermal, wind, and biomass are available as cleaner, carbon light alternatives to fossil fuels. The adoption of renewable technologies is essential for the protection of the environment and public health as it will reduce carbon emissions, which contribute to acid rain, smog, and climate change.

Furthermore, these fossil fuels are finite and will slowly diminish with constant, prolonged use leaving the U.S. dependent on expensive, imported fuels. The implementation of renewable energy will diversify the U.S. energy supply and strengthen its energy independence. Renewable energy will also benefit economic development as it will generate employment opportunities, as well as maintain in state production. Among the cleanest and most abundant of the renewable energy sources is solar energy (SEIA, 2013).

1.2 Overview of Solar Photovoltaic Technology

According to the Department of Energy, there is enough solar energy hitting the earth every hour to power the planet for an entire year, making it the most abundant resource on earth (U.S. Department of Energy, 2013). Solar photovoltaic (PV) technology converts sunlight directly into electricity without the use of fossil fuels, therefore providing clean and sustainable energy. PV systems interact with energy emitted by the sun, called photons. The photons then strike several individual PV cells on a solar panel. This interaction creates an electric field through the positive and negative nature of the PV cells. The energy of the photons striking the cells releases electrons creating an electric current, which is captured by wires connected to the positive and negative sides of the cell. The electricity created is multiplied by the number of cells in each panel, and then by the number of panels in each solar array (Department of Energy, 2013).

Net metering is an integral component to PV solar installations. It allows the operator to feed the excess electricity back into the grid at a fixed rate determined by the meter in use. In this process, it credits the owner against the electricity that they use and they are only billed for their net electricity use (SEIA, 2014). Currently 43 states and Washington D.C. have net metering policies, but the policies vary by state (SEIA, 2014). In New York, photovoltaic and other renewable energy sources such as wind, biomass, anaerobic digestion and small hydroelectric are eligible for net metering and the applicable sectors include commercial, industrial, residential, nonprofit, schools, local government, state government, federal government, and institutional (DSIRE Solar, 2012). The system capacity limit for net metering in New York for residential

solar is 25 kW and 2 MW for nonresidential. Meter aggregation is also allowed for non-residential and farm-based customers with solar systems and in 2011, New York introduced the principle of Remote Net Metering, which allows these customers to apply the excess electricity generation credits to other meters on property that is owned or leased by the same customer and within the same load zone as the generator (NYSERDA, 2014).

1.3 Solar Photovoltaic Energy in New York

There is a common misconception that the latitude and climate of New York are not ideal for solar energy generation. However, New York receives only 35% less solar energy per unit area than the southwestern US deserts (Perez and Thompson, 2007). Furthermore, solar is perceived as too expensive and unreliable to power New York's energy consumption, yet the solar industry is rapidly growing in New York (Perez and Thompson, 2007).

In 2012, Governor Cuomo launched the NY-Sun initiative to "double the amount of customer-sited solar power installed annually in New York, and quadruple that amount by 2013…to put New York at the forefront of solar development and research, creating green jobs while containing energy costs for consumers" (Cuomo, 2012). The NY-Sun Initiative is a public-private partnership, bringing together existing programs administered by the New York State Energy Research and Development Authority (NYSERDA), Long Island Power Authority (LIPA), and the New York Power Authority (NYPA), to drive growth in the solar industry and make solar technology more affordable for all New Yorkers (NY-Sun Initiative) by increasing financial incentives for commercial PV projects. In 2012, Governor Cuomo increased existing funding from $54 million to $108 million, and by 2015, there will be $432 million available for PV solar. However, as solar has increased due to this funding, it is still only a small percentage of the state's energy sources.

1.4 NYSERDA Grant Process

Financial incentives are offered by NYSERDA through Program Opportunity Notices, or PONs. Through the PONs, cash incentives are awarded to eligible installers of new grid-connected solar PV systems that are 200 kW or less for commercial sites, on a first-come, first-serve basis (NYSERDA, 2013). NYSERDA has specific PONs for PV solar, including PON 2589 and PON 2112. PON 2589 is currently closed, but was one of the first PONs available through the NY-Sun Initiative. This PON had up to $106.9 million available for applicants in 2012 (NYSERDA, 2012). The City of Troy utilized this PON when they first applied for funding in 2012. PON 2112 is the main PON offered through NY-Sun. $191,583,678 will be available for applicants through December 2015. Each institution we analyzed utilized PON 2112. The PONs also include federal and state tax credits. According to NYSERDA's Solar PV Program Manual (2014), "Customers can be eligible for Real Property Tax Exemptions and Tax Abatement Programs, along with accelerated depreciation allowances."

In order to receive a PON and all of its economic benefits, institutions competitively submit applications to NYSERDA. However, since each of the institutions we studied is a not-for-profit, they cannot use the available tax credits. To benefit from the entirety of the PON, each institution partnered with a for-profit company. In order to find a for-profit company, each institution submits a Request for Proposal (RFP), RFPs are sent to a supplier list, and partners are selected through a bidding process. The normally RFP includes details of the solar site and the plans the institutions have for them. The for-profit company would then technically become the owner of the solar installations and be able to take advantage of the tax credits. Since the for-profit partners are the owners, they are responsible for applying for the PON. According to NYSERDA (2012), eligible applicants "will be ranked solely on the level of incentive requested by the applicant, lowest to highest, in dollars per kWh." This alone demonstrates the competitiveness of the program. For applicants who are selected, solar installations are required to be up and running within 8 to 9 months of receiving a grant.

1.5 Additional Economic Benefits of Solar

These incentives, along with rapidly decreasing prices of solar, are attractive for New Yorkers and encourage renewable energy investments across the state. In 2013, PV system prices fell 16% in the non-residential market, at an average of $2.59 per watt (SEIA, 2014). Aside from decrease in cost, there are other economic benefits that are considered when implementing solar. Renewable Energy Credits, or RECs, help to offset electricity consumption and create ownership of the renewable energy produced. According to the National Renewable Energy Laboratory (2011), "Solar REC markets are relatively young but are expected to grow rapidly in coming years as state solar requirements ramp up." RECs have also been a big selling point due to their potential profitability. If there were to be a Cap and Trade regulatory system in the future, businesses and institutions would have to cap their carbon emissions and purchase or sell RECs to maintain a specified carbon limit. Thus, if institutions have RECs, there is a possibility to sell them to other institutions or businesses.

Another economic incentive for installing solar is the potential to enter into a Power Purchase Agreement (PPA). A PPA allows institutions to make an agreement with the utility company and for profit partner to receive a fixed or stable utility cost for as long as 25 years (EPA 2014). If energy prices were to skyrocket over this time period, institutions would be paying what they paid at the time they made the agreement. This allows for predictable energy pricing and easy financial projections.

An additional attractive element of solar proliferation in New York is the positive impacts on local economies. There are currently 414 solar companies in New York that employ 5,000 workers (SEIA, 2014). By promoting a clean energy economy through solar, the resulting profits and jobs remain in New York State. The installation of solar arrays in the Capital Region would contribute to the stimulation of city and state economies.

However, in comparison to other national leaders, New York does not nearly provide as much monetary incentive. In California for example, under the California Solar Initiative (CSI)

there has been an utterly outstanding $2.167 billion available between 2007-2016 with an overall goal of installing 1,940 MW of PV before 2016 (Go Solar California, 2013). This in comparison to the mere $108 million available to New York puts New York in an impossible competitive position. Although doing better than other states, since New York has been ranked as number nine within the country for solar PV, the amount of funding money available does not allow for much movement up this ranking in the future. How can small budgets, such as the one New York has, compete with the bigger national players? Unless there is more money allocated to NYSERDA's grant funds, New York will undoubtedly remain in the same place if not lower on the national solar PV list.

1.6 Solar Arrays on Municipal Solid Waste Landfills

Development of solar on municipal solid waste (MSW) landfill sites across the United States has become a popular application due to the optimal conditions of landfill sites for solar projects. Firstly, solar development on MSW landfills is an incredibly attractive location for residents as it resolves one of the key barriers to solar implementation, NIMBYism. Landfills provide a space for large utility-grid solar projects that is out of sight and utilizes land that is otherwise unusable due to contamination. Since landfills cannot be constructed on due to the possibility of puncturing the layers of lining that keep trash contaminants contained, often times residents considered them "dead space". Landfills also provide additional conditions that are well-suited for solar development. According to the EPA, the proximity of MSW landfills to electric transmission lines and roads as well as areas with high-energy demand is essential for the installation of solar arrays. Furthermore, MSW landfills are constructed in large areas with minimal incline, which is optimal for the construction of PV structures (Kiatreungwattana and Mosey, 2013). Landfill space is also offered at lower land costs and is able to support net metered or utility scale projects due to its large vacant space (Kiatreungwattana and Mosey, 2013). In New York state there are currently no solar installations on the 920 MSW landfill sites, closed and active. However, 25 of the 920 have informally expressed interest in a solar installation (Figure 1).

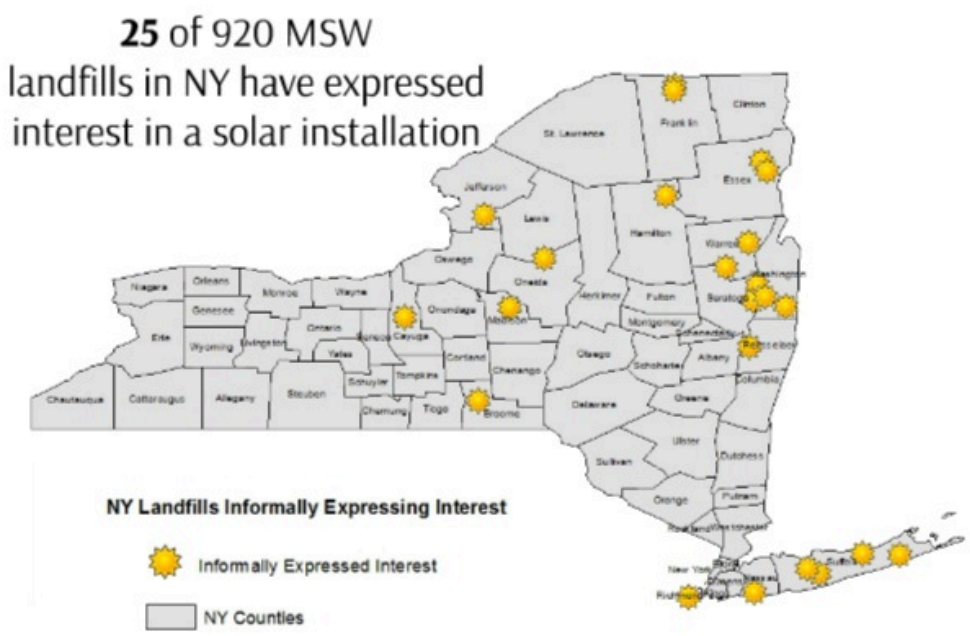


Figure 1: New York MSW Landfills Informally Expressed Interest in Solar Installations, Source: DEC, 2014.

1.7 Implementation Barriers

Despite the abundance of solar radiation available for energy production, there are a number of barriers that can prevent solar implementation. Firstly, both funding and the NYSERDA grant process are large barriers to implementation. Since projects are so expensive to construct and many municipalities and institutions don't have excess funding to invest in these projects, it is imperative that grants be received in order to complete a project. Grants can cover up to half the cost of a project, which in most cases is around $2 million. These grants however are not given to every institution who applies. In fact, it is an incredibly competitive market and most people do not have the opportunity to receive funding. An institution must bid without knowing what other institutions are bidding. This causes institutions to likely bid lower than they otherwise would in order to even be considered to receive a grant.

Time and status of a project also can be a large barrier. Whether or not an institution receives a grant significantly affects the status of the project. Although the proposal may have been completed, the appropriate partnership already made, and the institution could be ready to move forward with construction, it is utterly impossible to do so without the necessary funding. This then prolongs the timeframe for projects indefinitely until funding can be received, thus making most projects last two to three years before construction can be started and completed.

Lastly, another implementation barrier is siting. In order to install solar there must be adequate space for the arrays. Large-scale solar energy production requires extensive government stakeholder review and approval, mainly through Environmental Impact Statements (EIS) and New York's State Environmental Quality Review Act (SEQRA) under the National Environmental Policy Act (NEPA), which requires an evaluation of potential significant impact on the quality of the human environment (Department of Energy, 2012). In addition, there are codes, permits, and zoning ordinances that must be upheld when developing large solar arrays. Siting of solar installations on landfills is less difficult since there is little residential development and there is already a large, dead, open space without any sort of tree or vegetation growth.

However siting of installations, even on landfills, can lead to the Not-In-My-Backyard, or NIMBYism, mentality. Here, individuals may in fact support solar energy, however do not support solar projects that directly affect their daily lives. This concern can come from the possible threat of decreased property value or even just the mere fact that they will be able to see a solar array from their window.

2. Research Design

The state of New York is an optimal location to analyze solar policies, implementation, and barriers and incentives due to the recent growth of the solar industry under the NY Sun Initiative. We are focusing on three different solar installations in the Capital Region: Skidmore College, Saratoga Springs, NY and Troy, NY. The investigation of the solar installations for two public sector institutions, the City of Troy and the City of Saratoga Springs, will give us insight into the ordinances that exist for the public sector as well as an overview of the entire process of solar proposal to the installation. Conversely, the installation at Skidmore College will provide us with the perspective of the process for a private institution. Each of these locations are important for analysis due to their varying incentives for a solar installation.

2.1 Comparing Solar Photovoltaic Energy: Troy, Saratoga Springs, and Skidmore College

Currently there are PV solar installation proposals in Saratoga Springs, New York on the Weibel Avenue Landfill, on the water treatment plant and closed landfill in Troy, New York and a large-scale solar farm by Skidmore College. We will use these three solar installations as case studies for examining solar installation policies, challenges, and social implications.

The solar installation project on the Saratoga Springs landfill looks to incorporate solar energy to "curb the city's electricity consumption" (Toole, 2012) with the intention of selling energy back to the grid. The landfill provides "an opportunity to take land that can't be used for any other purpose and turn it into something that could become an asset to city government and the community (Toole, 2012)." The innovative project was promoted by Sustainable Saratoga, a non-profit with the goal of helping Saratoga Springs with sustainable development.

The Troy, New York solar installation is planned to be on the city's closed MSW landfill. This solar installation "could be part of the largest municipal photovoltaic facility in the world" (Wiltshire, 2012). Compared to the two megawatts produced by the Saratoga Springs solar landfill project, which could only is the equivalent to powering 2,600 homes in the city (Saratogian, 2013), Troy could eventually produce 20 megawatts of energy, which is enough to power 26,000 homes in the Troy area. The benefits for the community are a key incentive for the implementation. The solar project will convert unusable space into domestic, renewable energy and is "a way for the city to generate more revenue to pay increasing healthcare and utility costs" (Wiltshire, 2012).

Lastly, the proposal to install a 6,950- panel solar farm on an eight-acre Greenfield site owned by Skidmore College (Grey, 2013) would produce up to two megawatts of solar power. This would supply roughly 12% of the campus' energy consumption, but Skidmore College will sell this energy back to the grid to offset fossil fuel consumption at large (Hall, 2013). Skidmore's project is mid-sized compared to the Saratoga and Troy landfill projects and would produce enough energy to power approximately 2,600 homes (Hall, 2013). The solar plan has been met with social opposition from Saratoga community members claiming, "the project would spoil views and is unsuitable for a residential area" (Mina, 2013).

3. Methods

In our research we investigated the incentives, challenges and barriers that impact the implementation of commercial solar installations with relation to the MSW landfill in Saratoga Springs, the landfill and the water treatment plant in Troy, and the solar project by Skidmore College on Denton Road. We collected our data at a conceptual level and utilized a mixed methods design by incorporating semi-structured interviews, archival data, and observational data. By doing so, we gained a thorough understanding of the processes, challenges, barriers, and key decision makers involved in each solar project.

For the interviews, we spoke to the key policy and administrative officials who developed and implemented the solar project at each case to determine their perceptions about the barriers. Each of the interviewees have all worked within their institutions for a long period of time and are familiar with institutional goals and priorities. Their observations were corroborated with archival analysis of key documents such as Saratoga's SPA City Solar Park Proposal and RFP, and well as Troy's Site Report. These documents are extremely advantageous to our research as they provided the specific sizes of the solar arrays and the amount of energy they will produce, as well as the goals each institution hopes to see as a result of these installations. We also spoke with key solar policy makers both inside and outside of New York State government to understand the larger policy environment. Finally, newspaper articles were also utilized. These articles helped us reinforce certain facts about each project, such as size and location, as well as provide community opinions and input from the comments.

3.1 Semi-structured Interviews

Skidmore Solar Project

Mike Hall: Special Assistant for the VP for Finance and Administration

Mike Hall played a large role in developing the Skidmore solar installation. By spearheading the project, Mike gave insight on the decisions the college made to go solar. With experience initiating a majority of the clean energy projects on campus in the past, Mike Hall has shown incredible passion towards sustainability and making an institutional commitment to being more sustainable. Mike was responsible for extensive research going into the project with NYSERDA, the grant process, and necessary process matters as well as developing the SEQRA document.

Karen Kellogg: Associate Dean of the Faculty for Infrastructure, Sustainability, and Civic Engagement

We spoke to Karen Kellogg to gain more information about the process Skidmore went through with their decision making to plan for solar and what their plans were for implementation if the plan gets approved. Karen was very supportive throughout the process and also showed the most interest in using the installation as an educational tool. She has already been taking students on tours of the solar installation as the beginning steps of an educational process using the solar array.

City of Saratoga Springs Landfill

Michele Madigan: City of Saratoga Springs Commissioner of Finance

Michele Madigan gave us insight about Sustainable Saratoga's proposal for a solar array and how it was received by the city council. She was extremely helpful by giving us a better understanding of how using NYSERDA grants can be beneficial for local city economies such as Saratoga and the economic impacts on local taxpayers.

As the Commissioner of Finance Michele was responsible for bringing the proposal to City Council to get it approved. She has been a driving force in the project and plans on continuing to push the project until the city receives funding.

Lynn Bachner: City of Saratoga Springs Deputy Finance Commissioner

Lynn Bachner was a large player in the development of the Spa City Solar Park. She aided Michele in the process of creating an RFP, selecting a vendor and applying for a NYSERDA grant. Lynn has also been very involved in financial aspects of the project and the re-writing of the proposal for the new round of grant opportunities.

City of Troy Landfill

Rodney Wiltshire: Troy President of the City Council and Solar Guru

Wiltshire spoke to us about the specifics of the proposed solar project in Troy. He informed us of the timeline, how much it costs, the NYSERDA grant process Troy experienced, and details about the company installing the project and who will maintain it.

Rodney has spearheaded this project. As a solar business owner himself and his position as President of the City Council in Troy, Rodney has had opportune positioning for developing this project. He was responsible for developing the RFP alongside his colleague Bill Chamberlain.

Bill Chamberlain: Director of Operations for the City of Troy

Bill Chamberlain discussed with us his perspective of the solar project in Troy and gave us insight to the timeline, what processes still remained to be completed for Troy, the RFP and NYSERDA grant application, and gave us information about the benefits of a solar project for Troy.

Bill has been a key contributor to Troy's solar project and assisted Rodney along the way. His main responsibilities include submitting an RFP to select vendors as well as participation in essential decisions, such as which vendor they will work with and whether the generated energy will go to the grid or directly to public city buildings, such as police stations, fire stations and city hall.

Solar Industry Experts

Jeff Peterson: Program Manager, NYSERDA

Jeff has been a project manager at NYSERDA for 23 years. This, along with his experience on the Board of Directors at the American Solar Energy Society made Jeff incredibly knowledgeable about the solar industry and the NYSERDA grant process. Jeff provided insight on the functionality of NYSERDA and the historical changes of the organization which have led them to be in the current structure that they are.

Peter Olmsted: Regional Director at Vote Solar

Peter has worked for the past five years for an organization called Vote Solar. Their aim is to advocate and promote a long-term solar program and he is currently looking to petition in front of the Public Service Commission to extend that New York Sun Initiative through 2023. Peter has a very thorough understanding of processes such as net metering and remote net metering as well as has substantial experience in the solar industry.

Mark Jensen: Director of Market Development at General Electric

Mark has been working with GE for over four years, becoming a true market expert in the solar and renewable energy fields. He also worked developing fuel cells for three years before his work at GE. Mark aided us in further understanding the functionality of solar, economic factors, and general market trends.

In addition to interviews, we participated in direct observation for the Skidmore solar project by attending Greenfield town hall meetings, planning board meetings, visiting the solar site. Doing so allowed us to observe behaviors and the overall tone of town hall members, neighbors, and other stakeholders in the solar implementation process.

3.2 Archival: Town Agendas and Meeting Minutes, Newspaper Articles

We utilized archival sources such as agendas, meeting minutes and other public documents from city councils, town boards and planning boards. For Skidmore, we used agendas and meeting minutes from the Greenfield town board and planning board to provide us with information on the rezoning legislature as well as to illuminate the controversy surrounding the implementation of the college's solar array on the Denton Road site. Most importantly, these documents provided us with information about the specific barriers that are inhibiting the installation of Skidmore's solar project. We also investigated agendas and meeting minutes from the Troy city council to gain insight as to what ordinances needed to be followed and what the process has been like thus far. This gave us insight into why decision makers approved a proposal for solar implementation. The City of Saratoga also has available agenda and meeting minutes that were useful for evaluating public deliberation among city council members as well as the public comments on the decision to the to approve a solar array. We also read newspaper articles for information on current solar initiatives and updates on the installation projects for Skidmore, Saratoga Springs, Troy, and others in the state. Other federal and state documents such as RFPs, EIS, and SEQRA were beneficial to understand the ordinances that exist

throughout the process of a solar installation. Analysis of legislature that defines national and state policies, such as New York's Sun Initiative NYSERDA grants, and the federal tax credit were beneficial to understand the factors that promote installations of solar projects.

4. Case Studies

4.1 Skidmore College Case Study

Skidmore College

Skidmore College is a private liberal arts college located in Saratoga Springs, New York. With approximately 2,500 undergraduate students, Skidmore College aims to "prepare liberally educated graduates to continue their quest for knowledge and to make the choices required of informed, responsible citizens" (Mission Statement).

Current Energy Initiatives at Skidmore

Skidmore's Strategic Plan, *Engaged for Liberal Learning, The Plan for Skidmore College: 2005-2015*, stated, "Our goal is to become an environmental leader in our local community, state, and where possible in our nation." A significant component has been the increased utilization of renewable energy. In 2006, Skidmore installed geothermal heating for Northwoods student housing. The success of this project led to further sustainability initiatives as environmental consciousness became an integral part of Skidmore's 21st century vision. Geothermal heating spread into other areas of campus including the Murray Atkins Dining Hall and the Arts Quad including Saesselin, Filene, Bernhard and Zankel buildings. Currently, close to 618,000 ft of campus is utilizing geothermal, providing about 40% of the college's heating and cooling needs. In 2012 Skidmore received the Association for the Advancement of Sustainability in Higher Education Sustainability Leadership Award for its efforts in geothermal. Most recently, Skidmore has taken on a new sustainability project with the installation of an 8-acre solar farm that meets 12% of the college's energy needs.

Project Background

Skidmore's solar array, located on Denton Road in Greenfield, NY (Figure 2), encompasses an 8-acre solar array with 6,950 panels that will generate 2 MW of power, roughly equivalent to 12% of the college's electricity use. Skidmore chose this off-campus location primarily due to the benefit of the net metering.

Skidmore hired a company out of Pennsylvania, Dynamic Energy Solutions, to install the array. A for-profit partner, Union Grid, was necessary in order to receive the federal tax credit after the completion of the project due to Skidmore's not-for-profit nature. Likewise, it was required by NYSERDA that Skidmore partner with a for-profit company that has had substantial experience installing solar arrays at this scale. Thus, in order to find a company capable of this project's scale, the college researched companies in Pennsylvania since no local companies had

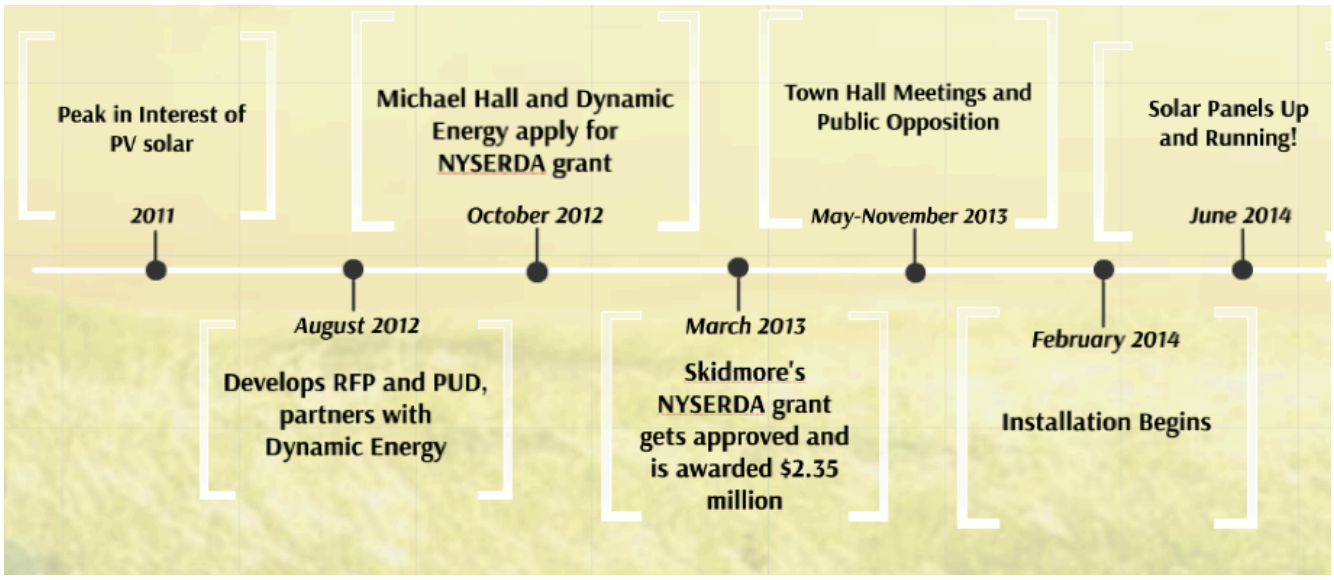
the required experience (Appendix 1). Dynamic Energy Solutions has worked on dozens of projects in various states at large scales, making them optimal for the Skidmore College solar project. In this partnership Skidmore remains the operator by law, but gives a contract to Dynamic Energy Solutions to operate and maintain the array. In exchange, the company receives three cash flow streams, the NYSERDA grant, the federal tax credit and the Power Purchase

Figure 2: Skidmore's Solar Site, Denton Road, Saratoga Springs, NY, Source: Google Maps: 2014

Agreement (PPA). Dynamic Energy began installing the array in mid February and upon completion Union Grid will be responsible for maintenance of the array.

Timeline

In 2011, Skidmore shifted focus to a different renewable energy technology—PV solar. Initially, the financial costs were prohibitive, but the launch of Governor Cuomo's Sun Initiative provided up front financing, making solar financially feasible. This initiative made solar a viable option for the college and in October 2012, Michael Hall applied for a NYSERDA grant. Within five months, Skidmore received approval from NYSERDA and was awarded a $2.35 million grant for the project



Skidmore began meetings with Greenfield's Town Board in early May 2013, however did not receive approval for the solar array zoning until December 5, 2013. Skidmore faced another setback in late January 2014 when neighbors to the Denton Road site filed an Article 78 proceeding. The neighbors accused members of the Greenfield Town Board of negotiating a $500,000 deal with Skidmore in exchange for a zoning change from residential to agricultural on the Denton property. A settlement was signed shortly after and the construction of solar array began on February 15th, 2014. After a year and half, the college is hopeful that the solar array will be completed by early June of this year.

Figure 3: Skidmore College Solar Installation Timeline, Source: Appendix 1

Decision-Making Process

After Michael Hall researched solar and applied for a NYSERDA grant he went to Michael West and President Glotzbach for approval of the project and was successful. From here, Skidmore went to the Greenfield Planning Board to apply for PUD because the Denton Road site was note zone for solar. During several meetings with the Planning Board and after the State Environmental Quality Review (SEQRA) assessment to determine the environmental impact of the solar array the Planning Board approved the PUD and recommended Skidmore's application be approved by the Greenfield Town Board. The County Planning Board and the Greenfield Environmental Commission also supported Skidmore's project. Greenfield Town Board voted 5-1 and approved Skidmore's application for a PUD. Skidmore then returned to the Planning Board to seek for approval a site plan. Upon this approval Skidmore acquired a building permit and was able to begin construction.

Incentives for Solar at Skidmore

In order for Skidmore to generate and propose a feasible solar project, various incentives were instrumental to the success of the project. Most important was the financial incentives that came from state and federal resources. On a state level, Skidmore utilized the NYSERDA grant,

which awarded Skidmore $2.35 million towards the project while the federal tax incentive allowed Skidmore to claim 30% of the project's cost. Furthermore, Skidmore received RECs, which help to offset the college's electricity consumption, and was also awarded the title of a Green Power Partner with the EPA. As stated by Mike Hall: "You need the RECs in order to claim to be green. I could build all the solar farms in the world and if someone else owned the credits I couldn't take any credit for saying I'm green because only the person owning the RECs can say I'm green. I have this many RECs and therefore I've done this good thing" (Appendix 1). As mentioned previously, owning the RECs could allow Skidmore the possibility to sell them in the future.

Siting in Skidmore's case was also a large incentive from a profitability standpoint. Due to net metering policy, different property sites may have different monetary values associated with them. Skidmore chose to site its array off campus on a 120-acre school-owned property on Denton Road instead of on a building or on a field on campus. At this location, Skidmore was able to gain double the profit due to the net meter. When explaining Skidmore's decision to locate the array off campus, Mike Hall explained: "We get charged somewhere between 13.5-14 cents a kilowatt hour [off campus on Denton Road]. On campus we get charged about 7.5 cents a kwh so having that power go through the meter on the ball field National Grid has to pay us twice as much for it if it came through our meter here. That's huge" (Appendix 1).

Another important benefit of a solar array for the college was its marketing appeal. Currently, solar energy is one of the top ten things students are looking for when they apply to college (Greenfield Planning Board, 2013). The solar installation at Skidmore could thus potentially bring in more prospective students, especially those interested in studying Environmental Studies or renewable energies in college. Likewise, the school has, and is likely to continue, getting positive publicity for the solar array and their commitment to environmental initiatives. This could generate other interest in the school that otherwise wouldn't exist.

Renewable energy projects are also valuable educational tools for colleges and universities. Not only did Mike Hall and Karen Kellogg make it possible for students to go and take a tour of the solar installation during construction to give students a chance to experience the array first-hand, but there is also hope in the future for a curriculum designed to incorporate Environmental Studies, Business, and Physics in order to teach students more about renewable energies.

Barriers to Implementation

The first barrier Skidmore had to overcome was getting approval for rezoning. The 120-acre site where the solar array is located in Greenfield was previously zoned strictly for residential development, and the zoning laws didn't recognize a solar farm, and normally entities would apply for a zoning change. However, it was suggested that Skidmore develop a Planned Unit Development (PUD). A PUD can change what is permissible for residential zoning, and solar arrays were one of those things. Under the PUD, Skidmore cannot add to the solar array, and had to complete a SEQRA (Appendix 1). Skidmore then had to get approval from the

Greenfield Planning Board. They were successful and then had to return to Town Board to review the PUD and receive additional approval.

When seeking approval from the Greenfield Town Board, it was immensely time consuming because Skidmore encountered significant opposition throughout the process. In addition to the various steps Skidmore needed to go through, town board meetings are only held monthly. This inhibited the progression of the project and other issues arose from concerned neighbors. This additionally took a toll on forward progress.

Due to the location of Skidmore's property and the placement of the solar array, neighbors in the surrounding area were opposed to the project. From the neighbors' perspective, the placement of the solar array was too close to their property and their concerns included the visibility of the array, noise from construction, environmental concerns, and a potential decrease in property value.

There ended up being a lawsuit filed since "Neighbors nearby voiced their concerns, and several even started a lawsuit against Skidmore, which was dropped without cost to the college" (Grey, 2014). This lawsuit ended up being a very big outlier in NIMBYism throughout our research. Peter Olmsted, a Regional Manager at Vote Solar expressed his surprise with the opposition Skidmore has received by saying: "You know, it's not [common]. Our organization works across the country and we haven't seen much of that honestly. I think it was a surprise for us to see that in the Skidmore case. Most places we've worked, people want to see more solar. I think there's a lot of support even in the urban areas people want to see this empowering communities in a lot of ways to take control of their own energy" (Appendix 6).

Outcomes

Although barriers were met throughout the process, Skidmore was able to continue its pursuit of the installation on the site at Denton road and successfully implement the 8-acre solar array. To alleviate concerns from the neighbors and to ease resistance, Skidmore College proposed to construct a six-foot fence and plant over 200 trees to shield the array from view. Currently, all panels are installed and energy generation is projected to commence in early June of this year.

4.2 Troy Case Study

Project Background

In Troy, New York two solar installation proposals are in progress, one for the water treatment plant as well as one for the city's MSW landfill. The solar installation on the water treatment is planned to be 2 to 4 acres, while the landfill solar array is planned to be much larger covering up to 40 acres and capable of generating up to 20 MW. However, the project water treatment plant will take priority, as it will be used to demonstrate the benefits of a solar array for Troy and hopefully alleviate the resistance from neighbors to the landfill. Troy plans on partnering with a solar company from Troy, Century Solar, who will install the array.

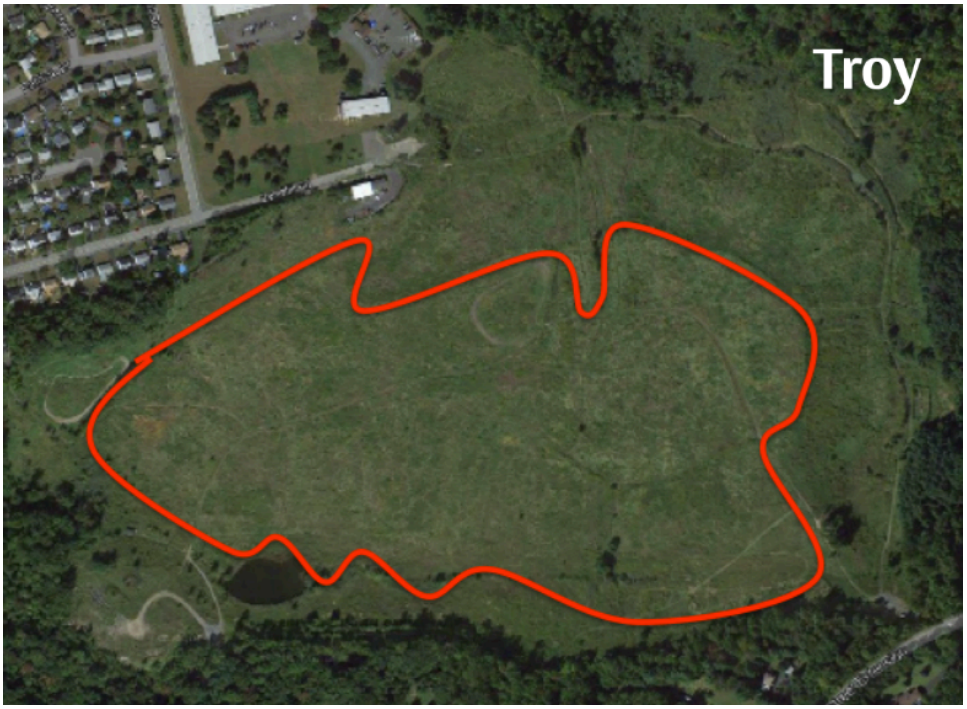


Figure 4: Troy Proposed Solar Site, Landfill Road, Troy, NY, Source: Google Maps, 2014

Timeline

In August 2012, Rodney Wiltshire proposed a solar installation for the landfill to the city council of Troy and a resolution was passed in November 2012 to submit a proposal to NYSERDA. Currently, Rodney is in the process of putting together the specifications of what Troy would want in a solar farm. Once this is completed, Bill Chamberlain will put together a RFP on Bidnet, an online bidding database, to find a vendor to install the array. From here, Troy will review the proposals that vendors submit and decide which vendor is the best fit to install their solar projects. Contingent upon receiving the NYSERDA grant, they will begin construction of the solar array for the water treatment plant in the summer, but the project remains at a standstill for now.

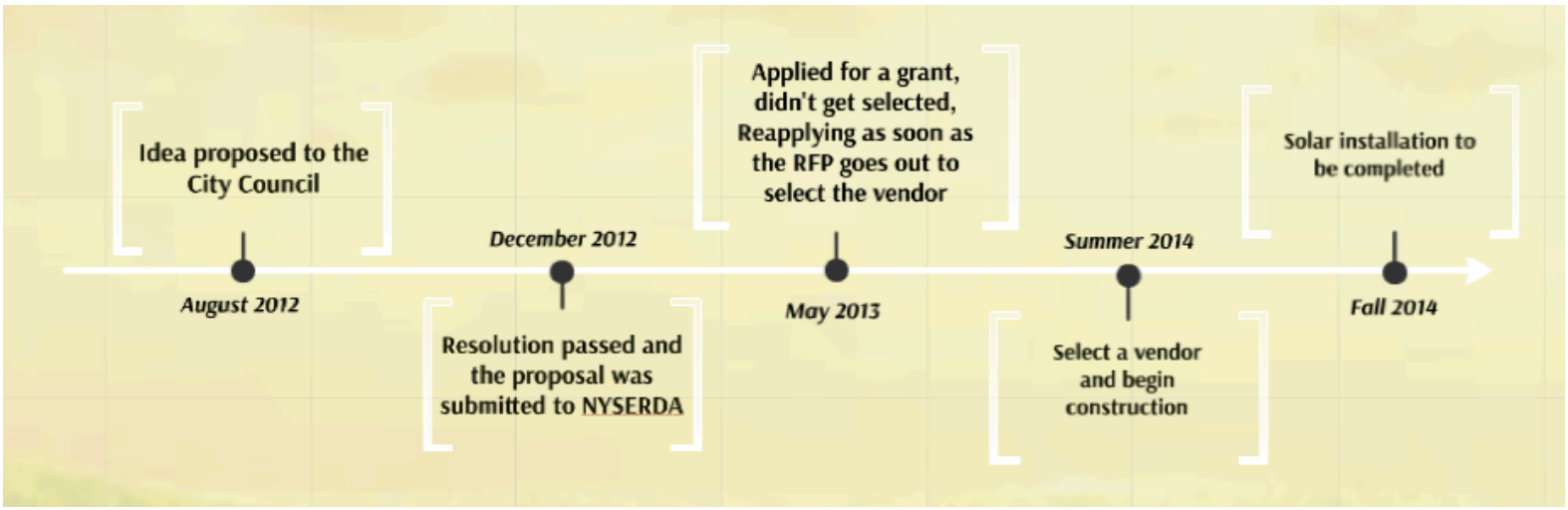


Figure 5: Troy Proposal Solar Array Timeline

Decision-Making Process

In order to construct a solar array on city municipalities, the city council requires a proposal for the project. After review and approval from the city council, a request for proposal is created and submitted to a national database to search for a vendor. From this point, Rodney and Bill will select the vendor that is best suited to construct the array and then they will submit a proposal for a grant from NYSERDA.

Incentives for Solar in Troy

Financial incentives are central to the feasibility of the solar array for Troy. A NYSERDA grant and federal tax credit will help finance the project for Troy. However apart from the grant, Troy will also receive the RECs for implementing the solar farm, awarding them green accreditation. As mentioned previously, RECs can be a future profit generator and Troy will own an immense amount of RECs due to the size of their project and how much energy they produce. This, in terms of scale, they will own around five times as many RECs as Skidmore and Saratoga and thus potentially gain five times the profit. Additionally, the city will benefit from a solar installation because they will be the first recipient of the power produced by the array and potentially lower taxes. As Rodney Wiltshire, City Council President, stated: “You can look at it a few different ways, in municipal government, you have a fiduciary responsibility to the taxpayers, to make sure they’re not overpaying. So when we have that extra revenue from the solar farm we can direct it to pay for something else or we can lower the taxes, or we can do both. So really, it becomes a more economically sustainable city to live in and that it’s just a lower cost to live” (Appendix 3). Troy also could have the opportunity to make a PPA to lock in their utility cost for the future.

Troy also plans on incorporating an educational plan for their installation. Perhaps the most intricate of all case studies, Troy plans on incorporating students who attend surrounding colleges, namely engineering schools such as Rensselaer Polytechnic Institute (RPI) and Hudson Valley Community College’s (HVCC) Technical Program. These students will be taught how to

install and maintain the array which will give students an incredibly valuable hands-on learning experience that will undoubtedly provide more than there could be about solar and renewable energies in a classroom setting.

Ideal siting was also a large incentive for Troy since they have the optimal space to implement a massive solar array. The space on the closed MSW landfill would otherwise go unused since the landfill is considered dead space. However, there have been minor concerns expressed from neighbors who do not want to installation on the landfill. In order to alleviate this resistance, as mentioned previously, Troy plans on installing an array on their water treatment plant. This will be a much smaller installation, 2 MW, and will be used to demonstrate the success in renewable energy and solar industries in Troy. This small success story will hopefully show residents how beneficial solar can be in their community and will ease any sort of concerns.

The city also plans on employing many local entities throughout their installation process. Not only is the city using a Troy-based solar company to install the project, but they also plan on hiring public workers to help install the array. By hiring a local company and local workers, Troy will help to stimulate the local economy and provide jobs for their own residents.

Lastly, a solar array for the city will make them a leader in renewable energy and sustainability. This can be used as a marketing tool, which can give Troy more publicity. Likewise, by advertising such incentives as tax decreases for Troy residents, Troy could get very positive publicity not only in the environmental arena but also the economic arena.

Implementation Barriers

Currently the main barrier for Troy's solar installation is the approval of a NYSERDA grant for funding. The NYSERDA grant process, while available, is extremely competitive and leaves many applicants waiting for the next round of grants to reapply. The time to dedicate to all the processes involved with the project has limited the installation's progress. Rodney Wiltshire is multifaceted with responsibilities in the city council, his own business and a family, which leaves limited free time to create the necessary proposals to advance the project.

Resistance from neighbors has slowed the progress of the installation as well. Neighbors are resistant to a solar project on the landfill due to the noise from construction. The city also made promises to the neighbors that after the landfill was no longer in use, it would no longer be used for anything else. Bill feels obligated to stand by these promises to the neighbors while Rodney is set on an installation for the landfill. Troy hopes that the neighbors will become supportive with a successful installation of the solar project on the water treatment plant.

Future of the Project

To date, the solar installation for Troy remains in its preliminary stages. The next steps for Troy are submitting their RFP to find a suitable vendor to install the array and applying for the PON-2112 grant from NYSERDA.

4.3 Saratoga Case Study

Saratoga Springs

Saratoga Springs is a city just north of Albany, located in the middle of the New York's Capital Region. The city is home to 26, 960 people (US Census, 2010).

Sustainability in Saratoga Springs

In the Saratoga Springs area, Sustainable Saratoga is the leading organization promoting "sustainable practices and the protection of natural resources, through education, advocacy and action for the benefit of current and future generations" (Sustainable Saratoga). Sustainable Saratoga is a non-profit organization headed by the Chair Board Member, Harry Moran and Vice Chair, Amy Durland. The organization's current projects include climate and energy, plastic bag initiative, housing and urban planning, local economy, urban forestry project, and car sharing project. Under their climate and energy project they proposed that Saratoga Springs install "a two phase, one megawatt in each phase, solar array on the closed city landfill on Weibel Avenue (Sustainable Saratoga, 2012).

Project Background

In 2012, the Saratoga Springs embarked on a renewable energy project to produce clean energy for the city. Saratoga Springs officials explored various locations for the project, but an ideal location arose to use a large expanse of unusable land; the city's landfill. The city's municipal landfill, located on Weibel Avenue in Saratoga Springs is 8 acres. The landfill has been used as an energy source for years by harnessing methane off-gassed from the landfill as a means of energy for the ice skating rink at 30 Weibel Avenue. However, the reservoir of methane has been depleted and can no longer provide energy, leaving the landfill as dead space. Saratoga Springs proposed solar installation is for a 2 MW array, which is the equivalent of powering 2,600 homes. In order for this project to be successful, the city partnered with a private company, SunEdison. SunEdison is an international, solar energy company based in Belmont, California with a number of locations across North America, Europe and Asia.

Originally, there was a two-phase process for the energy usage. The first phase was to supplement the city's energy. The second phase concerned a community solar garden. This concept was created for residents who wanted solar energy for their homes, but rather than install their own panels, they could buy into the city's solar energy because it would not be feasible for them to have solar on their property. However, since then the second phase has been eliminated, and the array will now just be for municipal use.

Figure 6: Saratoga Springs Solar Site, Weibel Ave, Saratoga Springs, NY, Source: Google Maps, 2014.

Timeline

A solar array for Saratoga Springs first emerged with a proposal from Sustainable Saratoga. The proposal was submitted in October of 2012 and Michele Madigan decided to push forward with the idea to make it happen. After determining their financial model, the city sent out an RFP to potential companies that would install and maintain the solar array. Saratoga's RFP included where the city wanted the solar site to be, details about the landfill, including the fact that gas lines were underneath so the ground could not be deeply punctured during installation, and the assumption that they would receive a NYSERDA grant.

The city received a successful bid from SunEdison, an international company based out of California. SunEdison will be responsible for the operation and maintenance of the installation. SunEdison is also responsible for applying to the NYSERDA grant. SunEdison first applied for a NYSERDA grant in July 2012, but were denied in December 2013. SunEdison will re-apply to the next PON, which is expected to be released in early May. SunEdison will submit the grant proposal by July 2014, and they will be approved or rejected by December 2014. Bachner stated that if SunEdison successfully received the grant, the solar installation would hopefully be up and running within a year to year and a half.

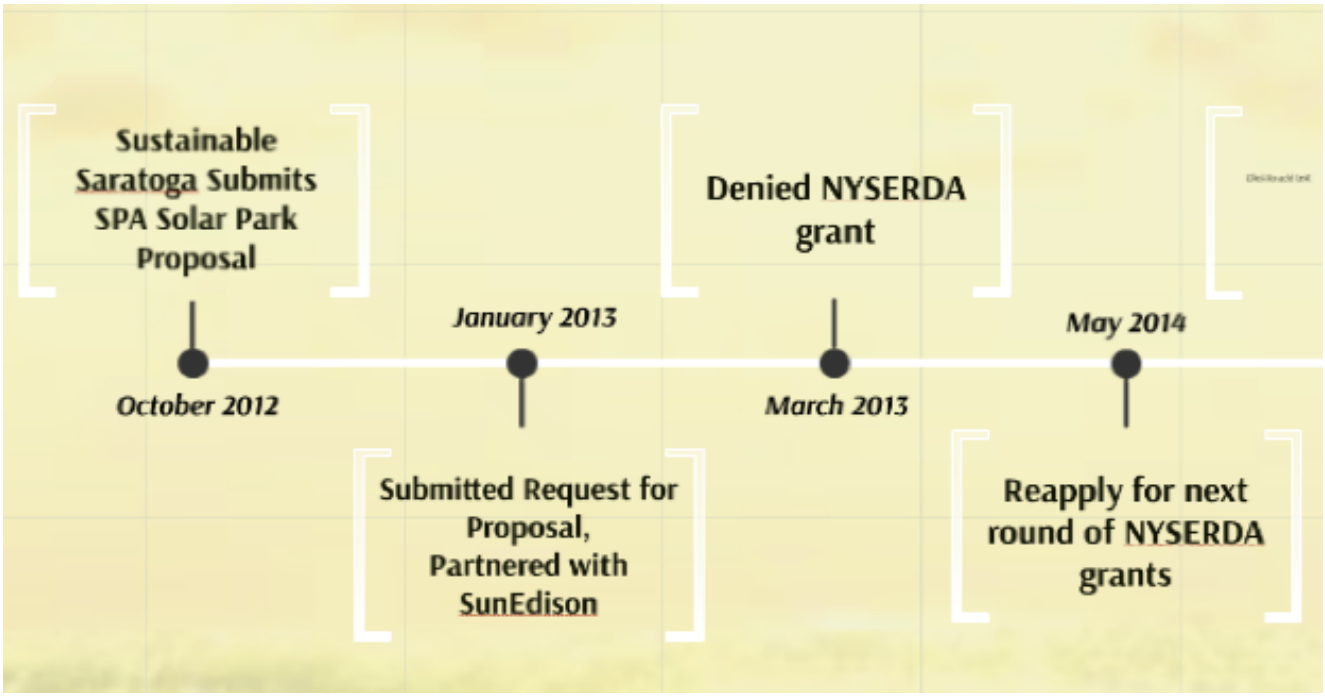


Figure 7: Saratoga Proposed SPA City Solar Park Timeline, Source: Appendix 2

Decision-Making Process

Once Sustainable Saratoga presented their proposal to the City Council, Michele Madigan decided the Finance Office would take on the project. She and Lynn Bachner developed financial models for the solar installation and determined where it would be located. They then released the RFP to vendors, and selected SunEdison. The city is still awaiting grant approval.

Incentives for Saratoga

Saratoga Springs is using solar largely as a financial incentive. The City of Saratoga is assuming that energy prices will increase throughout the next 20 years. Part of the agreement with SunEdison is a PPA, allowing Saratoga to pay a fixed utility rate for energy for those 20 years. This means, even with the possibility of an increased cost of energy prices in future years, Saratoga is locked in to a certain rate, regardless of fluctuations. Although this is perhaps a safe assumption to some, there is always a possibility that energy prices could drop, which would then leave Saratoga paying more for their energy than they otherwise would have to. As expressed by Madigan and Bachner, this price lock-in is also very beneficial to the City for financial projecting. Thus, the City's government will know for the next 20 years how much they will need to spend on energy and this will make financial projecting an easier process. During the interview, Lynn Bachner stated, "if we have a 20 year agreement, we know what we're going to be paying for energy for 20 years and it helps us budget. It's a really good tool for a stabilized budget for you energy costs."

Additionally and similar to Troy, a solar installation can be used as a marketing tool for the city, generating positive publicity and demonstrating that they are renewable energy leaders.

Barriers to Implementation

As mentioned previously, Saratoga and SunEdison applied for a NYSERDA grant in 2012 but were subsequently denied. This has created the largest barrier for the city because the project cannot move forward without significant funding. The city is hoping SunEdison will be selected to receive a NYSERDA grant during the next round of applications.

The main hurdle experienced by the City of Saratoga when looking to install a solar array on the City's municipal landfill was the financing of the project. In order to finance a project of this scale, Saratoga looked to NYSERDA to receive a grant. The grant process proved to be much more difficult than City had hoped. After providing their bid, Saratoga successfully made it to the third and final round of the grant process. However, of 80 grant applicants, only 11 applicants received grants and Saratoga unfortunately wasn't one of the recipients. This however does not restrict Saratoga from re-submitting a bid to receive a NYSERDA grant in the future. The City of Saratoga intends on re-bidding during the next round of grant opportunities, which will be in early May.

Unlike the other two case studies, Saratoga had fortunately not seen any public opposition to the solar project, and the city has received feedback from people who actually seem very excited to have the project happen. This may perhaps be due to the location of the landfill, which is not directly next to a high, densely populated residential area, as well as the shape of the landfill itself; the landfill has a sloped curvature to the landscape which allows for the placement of the solar array to be even more so out of the way from view. As Bachner said, "When you go by the landfill, they can go down by the other side where they can't be seen." This allows for an even more ideal siting area for Saratoga since there is even lower possibility for visibility.

Future of the Project

Due to the halt in financing, the Saratoga landfill solar project is currently at a standstill. However it is apparent that city governmental officials are incredibly passionate about the project and intend to do whatever is necessary to see the project happen. In order to have this happen, Saratoga will need to re-bid for a grant from NYSERDA, likely in late April. In order for this to be successful, Saratoga will need to readjust the price in which they bid in at. This will likely mean reducing the price in order to be a recipient of a grant.

5. Discussion

In all three case studies financial incentives, such as NYSERDA grants and the federal tax credits, were integral components to get the projects started. Currently, the three projects are in varying stages of the implementation process, however all were dependent upon these financial incentives, chiefly the NYSERDA grant as well as the addition of a separate partner to be eligible to receive these grants, and two of the projects have been completely halted due to

lack of funding. Without this state incentive, a solar installation would not have been an option for the institutions. In the cases of Saratoga and Troy they were not able to make progress with their project due to the denial of the NYSERDA grant, demonstrating just how important the grant is for implementation.

In addition, across the case studies we noticed solar policy entrepreneurs as an important driver for the progress of the installations. For Skidmore, Michael Hall was the key proponent for a solar installation for the college. Michele Madigan and Lynn Bachner have spearheaded the Saratoga Springs SPA City Solar Park. In Troy Rodney Wiltshire has been the important driver of the solar installation. Policy entrepreneurs held opportune positioning with in their respective institutions that gave them the appropriate leverage and resources to make the projects take off. Each of the entrepreneurs also contained a strong personal incentive to do implement renewable energy technology, as they believed it was the morally right thing to do.

We originally thought that NIMBYism would be a main implementation barrier for all three projects, however the NIMBYism affecting the Skidmore project proved to be a significant outlier. There was little to no NIMBYism seen for the Troy and Saratoga projects, which was contrary to our predispositions. In Saratoga people are excited to see the solar panels up on the Weibel Avenue landfill. As explained by Michele: "A lot of residents lately have been asking me what's the status of this project and proposal because they see the solar array there now and we're getting to a point like they can't see anything else, we need to see that there" (Appendix 2). In Troy, thus far there has been only a small amount NIMBYism for the project on the landfill, however the proposal for a solar installation on the water treatment plant has been developed in order to ease this opposition.

The use of solar installations for non-market factors was essential for the projects as well. We determined that although NYSERDA offers funding for projects and markets themselves as being very progressive in making projects happen, their funding was not nearly enough of an incentive for institutions to decide to implement solar. Thus, other financial incentives such as RECs and PPAs were incredibly value for the future in all of our cases. Using the solar arrays as educational tools is a component of projects that has been mentioned in every project, however it appears to be an additional incentive to make the installations more favorable. This was seen most in the Troy and Skidmore cases but could potentially also apply to Saratoga. Although not mentioned, Saratoga could chose to incorporate residents or their local schools with the project.

Another non-market factor that all three locations were considering when deciding whether to construct solar arrays was marketing. For Skidmore especially, marketing is a very big and effective component of the project, however we did see this as a big incentive for both cities as well. From the standpoints of Saratoga and Troy, they can use their projects similarly in becoming more well-known as a more sustainable community and could maybe even cause people to want to make changes on their own (i.e. residential solar installations) to be more sustainable. Finally, other smaller incentives such as creating local jobs, was also influential.

6. Conclusion

The analysis of the three case studies provided us with novel information beyond the theoretical model that exists for commercial PV solar installations. It was apparent in each project that financial incentives were necessary and installations could not happen without them, but they were not sufficient for solar implementation as other incentives played influential roles in order for projects to be carried out. Despite how appealing and simple these incentives seem, they are actually quite difficult to obtain. The competitive nature of the program does not guarantee funding for all projects.

However, there were many positive aspects we discovered. Although funding is a certainty, the solar policy entrepreneurs behind these projects wanted them to happen for reasons other than the economic benefits—because it was the right thing to do and is a moral responsibility. We also found how solar truly is a local job creator, and can be an extremely beneficial and informative educational tool for both educational institutions and public workers. Since funding in New York is expected to increase in the coming years, solar will be more readily available, and projects such as the ones we examined will become more frequent across the state. As this occurs, New York will become a leader even further in the solar industry.

Appendix 1
Friday, February 14th, 2014
3:00pm
Assistant to the Vice President for Business Affairs

Mike Hall Interview

Mike: They are leased to the polo association they use them for practice fields. These are the tenants that are giving us problems and the guy over here. This guy owns both these pieces of property and this guy owns Prestwick Chase.

Team Solar: And are there homes on these properties?

Mike: Yes homes on these and homes on those. It doesn't appear so but if you go from his home to the nearest point of the solar field it's a 1,000 feet and the 900 feet from here to the road. This thing is not right here in your face. It's pretty remote. There's a 6 foot fence around it and somewhere around 60 trees 12-20 feet high. You will not be able to see this thing. It's still big that's the problem.

Team Solar: What is Skidmore's main incentive to implement solar?

Mike: It was socially initially. Solar was not economically feasible to do in the northeast, in New York state, because there were no state incentives to do it. Vermont, Pennsylvania, Massachusetts maybe some of the other states in New England had incentives and they were building solar fields because the state was providing some of the money.

I've been looking at solar for maybe three or four years and I've had guys give me quotes at the end of two years ago and the prices for the panels were still at over $5 a panel, $5 a watt, not a kilowatt a watt and it just did not make sense economically, but the price has come down. They are about half of what they were two years ago and governor Cuomo had the foresight to issue his sun initiative back in the summer of 2012 and that's what made the difference.

So now there are three things that help one to put a solar installation in. There is a federal investment tax credit incentive which is 30% goes to the owner, put a question mark after this accelerated depreciation four slash five years accelerated depreciation put a question mark there because congress has not yet renewed this yet this year. They have renewed it for a number of years they have not yet renewed it so it might not be there, and the third thing of course was the grant from NYSERDA which was part of the sun program and we were awarded 2.35 million dollars from NYSERDA. If you add all these things together now what started off to be a social item now economically viable it would actually save us money so it turned from a previously social which we weren't able to do because of the high cost. We were prepared all along to pay a little bit more in order to be a little bit green but there was no little bit it was a very large amount that we would have had to pay. Governor Cuomo made it work.

Team Solar: What about the social aspect? What was so was it social to draw students into the school, to be on the radar for?

Mike: Both of those. It's the right thing to do. We believe, I believe that we can't go on you know messing up the earth. We've been doing a pretty good job of it the past fifty sixty years. My generation has fouled it up pretty good and so you guys have to fix it. I want to try to help before I ride off into the sunset. I think its I think it's morally the right thing to do. If we can reduce carbon generation why not? I will tell you though nobody in their right mind without incentives would try a solar project at this latitude. They are only about 15% efficient at this latitude and its not a real good deal but if someones going to put the money out there why shouldn't we take a shot at it just like anyone/everyone else.

Team Solar: Do you think thats part of the reason other colleges aren't jumping on these initiatives. Why aren't other colleges doing solar?

Mike: I think it's pretty new. I think they will. If they've got the room. I think, I think they will. It's matter of education. We are way out in front of this thing. There is no other college that I know that is as far as we are on this and we still have problems. The Sun Initiative is tied to a law called, Virtual remote net metering and that allows one to own piece of property somewhere generate power on that property and then get credit for that power at your main meter so Denton Road is not contiguous to our campus and there are no power lines between Denton Road and the campus so when we generate power out there we have to be the owner or operator of that solar installation and then we will get credit for every kilowatt hour that is generated out there, well get credit on our bill at the rate of the meter that exists in the field out there.

We will not own the facility. All the hardware will belong to our investment partner. By the way, it became obvious from what I was talking about upfront, we can't do this alone we need a for profit partner who can take advantage of the tax credits because we can't use them tax credits don't mean anything for us. So that's why we have a for profit partner and thats why that partner has to own it he has it own it because he has to own it to take the credits from it. But the law says we have to own or operate and boy we don't know much about operating it so what do we do? We turn around and say okay we're the operators heres your contract to run it for us so we turn around and give them a contract to run it so we are the operators only on a very thin line on a piece of paper. There's a company called, well I'm not sure what they're called right now. It's going to be a new company that would be formed just for this venture I think so it will be the operator and owner.

We trying to get started on construction this Monday.

The thoroughbred farm and the people who work on his farm live here. They are very nice houses, multimillion-dollar houses.

Team Solar: We were just trying to wrap our heads around the for profit partner and how the tax credits work for that so you partnered with someone so they could get the credits?

Right, they get the credits.

Team Solar: How do you guys benefit from that?

Mike: We're gonna get the power for 20 years and thats how we benefit. We've cut a agreement with them that gets us reasonable rate for power for 20 years and so.

The tax credits, the grant, and the power purchase agreement payments that we make. Those three cashflow streams to them give them the sufficient money that they're willing to invest in this thing and build it. Without all of those parts it doesn't work. And then we will pay them at a rate of, its a material, its about the same rate were paying for power now and we've assumed that its going to escalate at an escalator for the next 20 years and thats where the risk is for us. No risk for them because we have that escalator built into the contract and we're gonna pay them 3% more every year and thats in the contract. Our risk is that now we get paid from national grid based on the meter rate on that property. We have assumed that it is also going to escalate 3% a year. There's a big margin between what we're paying them and what national grids paying us, a favorable margin to us. As long as that meter price escalates at 3% we do very well, we make it out fine. It can escalate at zero as long as it doesn't go below what is now and still in 20 years we'll be okay but if it should drop to something lower than it is now it will be unfavorable to us. This isn't a power transaction as much as it is a financial transaction. Were paying for power because the power on our campus never changes. I'm buying my power from somebody tomorrow. I'll buy the same amount of power as I buy today it just this financial transaction.This transaction, I pay somebody and national grid pays me and as long as what national grids pays me greater than what I pay someone, I'm a happy camper and were generating green energy. Even though were not using it here its being generated tt's offsetting somewhere. Enough of these things go into effect and they shut off some big power plant somewhere. It's real and by the way we own the RECs, which is a huge, huge difference. Most people on deal like this It's taken a lot of...I had to walk away from this deal twice in order to get the RECs but we own the RECs. You need the RECs in order to claim to be green. I could build all the solar farms in the world and if someone else owned the credits I couldn't take any credit for saying I'm green because only the person owning the RECs can say I'm green. I have this many RECs and therefore I've done this good thing.

Team Solar: Why did they not want you to own them?

Mike: Well they wanted them. Someday there's going to be a market for them, financial market for them. There's not a big one in New York today they are worth 2 cents a piece or something like that, but wind RECs in Pennsylvania right now are selling for 17 dollars a REC. We're gonna get roughly 1.2 million dollars in RECs for this project.

Team Solar: Do you think that will go up as oil and other energy sources become more scarce, like coal and...?

Mike: Yes, yes it will go up when the state of NY puts restrictions on emissions. Other states have already done that. When the state of NY says to a big industrial plant like globalfoundries you must keep your emissions below this level. Now All of sudden those RECs become valuable because if they want to be able conform they either have to need to a, reduce the carbon they produce somehow or buy the RECs. If they buy the RECs they don't have to change their emissions, so there will be a market someday for those RECs. I don't know when it is, but it will be there.

Team Solar: So that's why it was important for us to own the RECs?

Well it was important because in order to claim, that's the most important thing, in order to claim that we've something sustainable we had to have the RECs. Now what I am thinking and turn off your recording at this point in time because this is sheer speculation.

What I'm thinking is that in 10 years from now…

The specific project was conceived in October of last year, two years ago October of 12, 2012. When we put together a plan with Dynamic solar and applied to NYSERDA for the grant we received approval for the grant in March and we went to the town board in early May with plans and it took us until December 5th to get the approval.

You were at some meetings. Well there were countless meetings with countless hours. We finally got the approval and immediately we were sued by the people who didn't want it. We have been told that they are signing off on a settlement agreement today that will drop the lawsuit. We intend to start construction on Monday so we are almost there.

Team Solar: So you knew you were gonna face some sort of resistance, but did you think it would be a lawsuit?

No we didn't think the opposition was that great because honestly as I sit here I swear I believe you won't know thats there. When those trees take root and are, within a year I think it will be so totally hidden unless you fly over it an airplane. No one will know its there.

Team Solar: The trees won't affect the sun?

They have to be so far away so that they won't cast a shadow. I think its 30 feet, maybe 40 but that's all factored into this. The fence is so many feet from the edge of the array and the trees are several feet from the edge of the fence.

Team Solar: Who is involved with developing the solar plan like at the school beside Dynamic Solar, Whose initiative was it to get this ball rolling?

Mike: It was mine. Other people were thinking about it. Karen Kellogg has been extremely supportive, wherever she could be supportive she was. Dan Rodecker has helped with some of the technical stuff, he's the director of facilities.

Mike West has been amazing. We got to the point where this thing got very heavy and he stepped in and used the weight of his office to get stuff done. He convinced the president that it was a good thing.The presidents cabinet wasn't for it. Rochelle Calhoun owns the property out there. "Owns" if you will, it's student space and so she didn't want to take it up for anything. She didn't want to lose the student space. She didn't know what she wanted to do with it in the future, but she might want to do something so if we put a solar field there she can't do anything for 20 years. She finally came around, so it wasn't a slam dunk. But Phil has been very supportive and Mike has done a lot of heavy lifting, Mike West, to get this thing to where it is.

Team Solar: Within the school?

Mike: Yes. We paid an incredible amount of money to lawyers and landscape architects and folks like that to get the permitting done but I mean it's been worth it in the end. We agreed to share some of our savings with the town of Greenfield in order to make it more attractive for them. We don't pay any taxes on this land because we are tax exempt and if any other taxable entity move in there and put a project up that was going to make money for them they'd have

pay taxes to the town of Greenfield and we don't. So we agreed upon a payment to the town over the next 20 years in order to compensate them for there loss of any revenue on this property.
Team Solar: And what was that number?
Mike: 500,000 dollars over 20 years. We are paying 200,000 dollars up front and the rest will be I think it works out to be 15,000 dollars a year.
Team Solar: Were you keeping an eye on all the initiatives like how did you do your research?
Mike: I keep my eye on NYSERDA.
Team Solar: Something you just follow regularly?
Mike: Yes
Team Solar: What about the RECs and net metering?
Mike: It took a lot of time talking with our attorneys to learn the language and what's it all about. I've still got a lot to learn.
Team Solar: Did you find talking to people was the most effective way?
Mike: Talking to people and reading about it. I've talked to all kinds of people in the industry. They have different takes on it. People are trying to sell us solar in all kinds of ways. I'm talking to two or three people next week about thermal solar for some small possible installations on campus. These guys they know the language they explain what the good things are what the bad things are and what to look out for. So its other folks in the industry that have educated me and reading.
Team Solar: Karen had mentioned something about doing it on campus but something with the net metering it wouldn't be beneficial to us?
Mike: National grid pays us for every Kwh generated based on the rate charged at the meter where the solar goes into. We have a meter at the ball field that we use to run some pumps and some lights. A very very small load on it. We probably paid about 25 dollars a month for the power that we use there. There is an existing meter it had a known rate, it was the known rate class, an SC2 meter. An SC2 meter right now is, we get charged somewhere between 13.5-14 cents a kilowatt hour. On campus we get charged about 7.5 cents a kwh so having that power go through the meter on the ball field National Grid has to pay us twice as much for it if it came through our meter here. Thats huge, huge. To quote the car guy. It's huge.

The other piece of that was if we had this kind of arrangement on campus it requires a net metering arrangement even though it's not a remote net metering arrangement because in theory if the entire campus shut down and used not one drop of power and then all this power would then have to go somewhere from these panels. They don't stop producing so they have to go to the grid so we would be net metering with Niagara Mohawk from national grid form here.They have a rule that you can't net meter into a net meter so that would preclude us from doing anything off campus ever if we set the campus up as net meter. So that precluded my water project, my hydro project. so that is why it has become absolutely essential to have the main meter on campus not called a net meter. It couldn't do anything else and again you learn this as you go along. National Grid tells you things like this and vendors.

Team Solar: Did the net metering aspect, having that net meter on the baseball field effect where you were going to install the solar?
Mike: Yes, because originally it was interpreted that. Let me go back one step. When we found out about the grant opportunity we looked for a vendor in the area to partner with and there was no body in upstate NY, nobody who had ever done a project of this size and NYSERDA required people who had constructed projects of this magnitude to be the partner. We had to go out of state and we went to Pennsylvania and the first guy we found is the guy we working with, Dynamic. Now, we've subsequently found other guys and talked with them as well. But one of the other guys was the one who explained to us about net metering because Dynamic didn't know that. As soon as we found that out I just made the push to put it off campus and found the baseball field meter and said this is where we're gonna do it.
Team Solar: I know, you speculated other locations off campus?
Mike: We did speculate a bunch of locations on campus too. We had found enough for probably half of it on campus, we thought. But then as we investigated further. One of our biggest places was the sportscenter roof and it couldn't take the weight so that went away so we still could have done something on campus but so we looked at locations off campus and this just kept coming out the best one, the best location.
Team Solar: And when there is a lawsuit against Skidmore is it also against Dynamic solar?
Mike: And against the town board, the planning board as well. The four defendants are us, Dynamic and the two boards.
Team Solar: Karen had mentioned that you expected something so you prepared in your plans, she said something that you read through the contract sentence by sentence kind of as a public disclaimer?
Mike: I'm not sure what shes thinking about. We knew that what happens in the event of a, uh. Is she thinking about the SEQRA form? There's an environmental form.
Team Solar: Yes
Mike: That's part of the process of getting approved. The town board, the planning board had to go through the whole SEQRA process with us. We had to answer hundreds of questions and they had to determine that either there was no negative impact as a result of what we were doing or The impact was so small that it was not major or that we could mitigate it someway. If they didn't make that determination then there would be a positive, not a negative SEQRA and then have required us then to do a full environmental impact statement which would have taken us six to nine months and the grant money would have gone away. So that's why it was important that we not get into that situation and we did not. In the end we had a negative SEQRA declaration which is positive.
Team Solar: Ya because the neighbors were trying to say that there would be storm water run off and warming the rivers in an article that they posted recently.
Mike: We did testing and showed there was no impact. They were worried about the noise the inverters were going to make at night and guys there's no sun at night, they don't work at night.

Team Solar: The payback period, how long is it going to take for Skidmore to get their money back on this project? How does the grant work in terms of payback period?
Mike: The grant goes to the company that builds it. We don't see the grant.
As far as the payback period. If you think about it in normal terms. If it weren't for the money that we had to put upfront for the permitting which is not normal and the money we gave to the town. We have no investment in this. Its like we're building a... If you take the hydro project we have no investment in it. The payback period is instantaneous. The first day we get power from it we are gonna pay 7 cents to somebody and we're gonna get 14 back. That first day. There's no payback period. With this it is a little bit different because of the money we had to put into the permitting and the money we have to pay to the town. I'd say the payback period is probably 4-5 years because of that after that everything is positive.
Team Solar: So the permitting process that happened through the planning board of the town?
Mike: Yes
Team Solar: And that took obviously almost a year?
Mike: Almost a year
Team Solar: And they were the ones who went through the SEQRA?
Mike: Yes
Team Solar: What other things happen in the permitting process you approved for rezoning and?
Mike: In order to have this built there nothing in the zoning recognized a solar farm so one could have just gone and applied for a zoning change. But we were told by the towns lawyer that the right way to do it was to develop something called a PUD, a planned unit development. So this whole thing is now a Skidmore planned unit development and there's all kinds of regulations. There actually is a law that establishes this so instead of a zoning law change there is a law change that says this is the PUD and on this PUD certain things are permissible and one of those things are solar arrays. And the language in there says its not to be any bigger than what it is right now so we could never add to it. It's part of the restrictions. They worry about things in a PUD like traffic how much traffic is this gonna create? Sound. Environmental impacts of all kinds, warming stormwater or hurting the vegetation. They aren't as concerned about us cutting down trees. We had to cut down a number of trees down this end where its located, but were gonna replant them in a different place, but they didn't worry as much about that. We had to go through an environmental study by an environmental committee, which is not the environmental impact statement, but there's an environmental committee that we had to go before and parallel and they met and they approved the project. It went to a county board who reviewed it and they approved it and then it had to go through the planning board for approval. Once those three things were done it was recommended to the town board and the town board approved it. There were a bunch of public meetings along the way. I think you guys were at some of those.
Team Solar: What was the environmental committee you had to go through?

Mike: It was like five people in the town of Greenfield, just volunteer people. The planning board are volunteer people too. The town board is elected.

Team Solar: You said they start construction on Monday and thats if they plan to drop the lawsuit. If they don't its gonna be later?

Mike: It gets more complicated. Theoretically it wouldn't be later because just because they are sueing us it doesn't have to stop, but the town could drag their feet on issuing permits. So It could go longer if they don't drop the lawsuit. Now they could seek an injunction to stop us which is a different legal thing, but they haven't done that.

Team Solar: Now what is that? An injunction?

Mike: If you want someone to stop doing something you go to court and say I want you the court to adjoin them from doing whatever they're doing. They could have done that. Then the court would have to review it and see if there was any basis to the injunction. We don't think they would have found any basis. This is something they could have done, but they did not do.

Team Solar: Could they still do that going forward?

Mike: No when they sign off on the settlement agreement it will prevent them from anymore. Those two people will be prevented from anymore lawsuits against us.

Team Solar: Do you foresee any more hurdles?

Mike: We don't. We see one hurdle and that's the weather. We waited so long to get started that the ground is likely to thaw before were gonna get down. It's gonna get really wet out there. So we want to poles in the ground and the panels mounted before the ground unfreezes. So that's gonna be a race to get that done because it will be very wet.

Team Solar: Considering how much snowfall how does that affect the array?

Mike: If it snows on the array it will melt off in relatively fast fashion, you know in a matter of hours and it doesn't affect it.

Team Solar: So what are the next steps, are there anymore approval things you need to go through everythings set, you're just installing at this point?

Mike: Yes and we have a target date of April 30th with NYSERDA. NYSERDA would like it up and running in order to get the funding, we think we can make that date but they have also told us they would work with us. The original date was November, November 12th was the original date when it was supposed to be completed.

So that answers one of your questions how long does a project like this usually take.

It shouldn't have taken anymore from January to, so 6 months should have been enough from start to finish.

We were expecting some resistance, but not what we got.

We talked about RECs. The plot of land is 120 acres and the array is 8 acres.

Team Solar: How many panels is it?

Mike: 6,950

It should generate about 2.6 million kwh a year.

Team Solar: What will it power? I know it will be a percentage of campus. Are there certain buildings you have in mind?

Mike: It won't power anything. It never gets to campus remember. But it's equivalent of about 11% of our load, but it doesn't actually power anything and we've been very careful the way we worded it.

Once this thing gets done it should just hum for the next 20 years. It will lose about half a percent of efficiency per year. So at some point in time the owners may decide they want to replace some components in order to make it more efficient. About 15 years the inverters may need to be either upgraded or at least maintained with some significant maintenance. They think they will only have to visit the thing once every quarter to do any significant maintenance on it. It's not like you've got to be at it a lot.

Team Solar: For maintenance, does Skidmore have to or Dynamic solar?

Mike: Ya they will do it. The partner that is going to remain after. Dynamic solar won't be the partner in the end. There a construction company. The partner I think they are called Union Grid. I can check for you. The actual company behind it is a utility called Washington gas. It's in Maryland The have formed a sub to own this.

Team Solar: Do you think…Has there been any discussion about making this an educational tool for students?

Mike: Yes. We've tried all along if there were places we could bring students in to catch pieces of what was going on. It was really difficult to figure out how to do that. You guys came out to see a few things going on. It was such a long drawn out process but the construction I know we want to make the site available under strict regulation for students to go out and watch some of the construction. That is planned to happen. Dynamic Solar has said they would try to put together some sort of material that could be used for educational purposes. I don't hold a lot of hope for that, but they've promised that.

It could be a case study going forward. Put this thing together and it could be something studied in one of the environmental courses. This is how the thing worked, this is what it took to get it going, talk about the regulatory aspects, the legislative aspects, the legal aspects, the social barriers. This is a perfect example of "not in my backyard". These guys some of them were so... The primary opponent not only said not in my backyard he said I don't give a damn if you put a solar panel anywhere, I don't believe in any of that stuff. He was a tough one and he had money.

Team Solar: We're just kind of doing a case study for our capstone. I think I mentioned in the email we're doing this, the array that's hopefully going on the Saratoga landfill and there's one on Troy in landfill. We're kind of analyzing the differences.

Mike: I don't know how Saratoga Springs is gonna do it. I talked to the former mayor about it and as a matter of fact as was the one who made him aware that there was funding available. But I don't know where…. It doesn't work without the tax credits and they can't use them the same way we couldn't use them so they may have to have a for profit partner somewhere in there that's being able to use it.

There are some differences between ours and what goes in on top of a landfill. They can't drive posts into the ground because they don't want to put a hole in the so they have to use what the call ballasted amounts so it would be like table that has weight on it a lot of weight, but with

enough effort you could push it over. It will be balanced so you can't do that. It's not attached to the ground, that's the same way you do it on roofs, a mounting system.

So if you guys when you put this together you might want to give it some thought about putting it together in such a way that lesson plans can be developed out of it for future use in somewhere in environmental studies as a case study.

None of you guys were involved 3 years ago a group of students were very interested in putting in a small solar array. On property near the school.

I gave them all kinds of reason why they couldn't do it, shouldn't do it and the reason was because the NYSERDA grants weren't in place. You couldn't financially do it and just that one little tiny thing 2.35 million dollars made it all possible. It's more than half the cost of this thing. Although we have never seen costs from our partner. They've been very adamant about not showing us the costs. We estimated by talking with other contractors its about is between 4.2 and 4.7 million is what it should cost so the 2.35 million is half of the total cost. The investment tax credit is another huge chunk so the amount of money the had to actually put in terms of actually cash is low.

Team solar: The sun initiative kind of makes these NYSERDA grants available?

Yes, the sun initiative chose NYSERDA grants as the method for distributing the money

Team solar: Didn't Cuomo just dedicate more money to solar projects?

Mike: I haven't seen that. We can't use that. Just a little known fact, I got a second grant I applied in the next round and I got another one for 1.8 million but we had no place to use it. Between this initiative and initiative on the hydro we already had too much money coming back. Shame on that one.

Appendix 2

Wednesday, March 26th, 2014
1:30pm
Meeting at Saratoga City Town Hall
Commissioner of Finance and Deputy of Finance
City of Saratoga Springs Deputy Finance Commissioner

Michele Madigan and Lynn Bachner Interview

Madigan: Not successful with our proposal to NYSERDA under their cleaner, greener energy program. There were from what I understand 80 applications it was quite a disappointment to us but we are hoping the governor is going to initiate more programs like this and we are planning to keep moving forward we are planning to reapply.

Team Solar: When does that happen?

Madigan: It has not been announced

Madigan: So our role in developing a proposal. Lynn Bachner, the Deputy Commissioner of Finance, with Sustainable Saratoga and the finance department, we played a pretty significant role, we were pretty much the sponsors as the city goes for this project. I would say that in order to do this project we did have to look for bids from a private company. A successful bid from SunEdison.
Bachner: To back up, Sustainable Saratoga, which is a nonprofit, pitched an idea to the entire city council about having solar out on the landfill. Anybody on the council under our form of government could grab that idea and say I want to push it forward. Michele grabbed the idea so we took the proposal and turned it into an RFP, that said to people we want to put solar on the landfill, its a brown space its essentially unused it's essentially enough acreage to do this. So the project was built around with certain assumptions, the assumption being you have to do a financial model, there's lots of ways to put these projects together the things to understand is you're going to ask some company to come in and spend anywhere from $2-4 million dollars to build this things. Well how does that make any sense to them? What they do then is sell us the energy. Well how does that make any sense to us? They have to sell us the energy either for less than we can already buy it, or for about the same if you believe in the good deed of the project, or for more if you believe in the good deed of the project. However, there is still a question at the public level about whether believing in the good deed of the project justifies spending more. Remember we're not spending our money we're spending your money and it is not universally accepted that this is a good deed.
Madigan: But it should be! When we submitted our proposal we actually went in thinking about saving the city money.
Bachner: Yeah and there were a lot of financial analyses done. Well if it costs them this much and they can get this much of a grant and the city only has to pay this much blah blah blah. So all these financial models were run through computer programs to figure out which one was the best fit for this project. So that's done, that goes into an RFP, the RFP says "ok companies, pitch us a deal. This is where we want it to happen, these are the things you have to be careful about (because we have gas lines underneath our landfill) we're assuming you're gonna get a grant from NYSERDA, pitch us a project. How big? What's it gonna look like? How long is it gonna take? How much might we have to pay? What's your model?" So part of this (RFP) that went out assumed that a grant from NYSERDA would be part of the process. And part of that reason is because the city's financial investment under this RFP was to pay for the energy only. We are not going to help them build it, for instance. We're not going to go do a bond to help them build it. That doesnt make sense, it makes it too expensive for the city.
Madigan: And that was our partnership
Bachner: So there's lots of ways you can do it, this is the way we did it. Fortunately on our side we own the landfill. Lots of places actually have to buy the land. That changes your financial model. So those are all considerations. So the RFP goes out and says "ok companies come in and tell us what it would look like if you did it." And what you do with these companies is you give them a lot of assumptions so that everyone is starting in the same place. And then tell us what it

would cost and tell us how you would do it and tell us whether you'd have a public education piece and tell us all these different things. And we had x number of people apply and we had a team of people evaluate the proposals and we picked the one that seems like the best fit for the city and then you award your bid. and then we say "ok you guys are the ones we're gonna let hammer out the details of this project." It's not the same as saying "ok you can build." Because there were a lot of steps that had to happen before they could build.

Madigan: And it was contingent on they needed the grant funding, it's a very expensive project.

Bachner: One of them was they had to go get the grant money. So what they won was the privilege of being able to go to NYSERDA and say "we have a customer we need your money this is how it's gonna work." Another thing they won was going on the city property and determining if this project was even feasible, you know that's the first step, because we have gas lines under there.

Madigan: So we did do that, we're through several steps. So we know that we can do a solar array out on our city landfill.

Team Solar: So now it's the whole grant piece is that's the issue?

Madigan: Yeah it's the grant at this point.

Bachner: So we came in on the third round of that PON. NYSERDA calls them PONs. I should know what that means cause I worked there. So each round it became a little more competitive.

Madigan: Third and final round at this point in time. So one of the things I think we saw in our analysis was some of the people in who were in on the first round of the PON and the second round they were able to come in a little more competitively priced. So we've seen sort of through these three step processes is that the price is going up for people who want to be involved in these projects.

Team Solar: So is it all price based? Or do they factor in like how big?

Bachner: Strictly PON priced based

Team Solar: So not how many people it affects?

Bachner: NYSERDA can write their PONS any way they want, but these were bids straight out the person that bid the lowest one. There was no weighted thing. In fact I think at one point we wondered if there would be a weighted thing because building solar on a landfill can be a little bit more expensive but it was just straight out bids

Bachner: So one of the things, you probably understand this, so say they got their money. Then the next step is for the city and this company is to come to an agreement, it's called a PPA agreement so we need to agree on the cost, on how much we are willing to pay them. We sort of had to conceptually agree on that before they went to NYSERDA. BEcause how much we're willing to pay affects how much they'll be able to ask for and what their bid price is. But if they get their bid then you have to hammer out the details. So for this PPA in our case it was going to be a 20 year agreement, they're usually long over time. So you have to build in a lot of safety nets. What if the price of gas goes up so crazy and we bid this really low and we're going to put this company out of business. But if the price of gas goes down so crazy we're paying 4 or 5 times as much with taxpayer dollars. So there's circuit breakers all the way through. What if they

thought in their feasibility study they could do it and they start to dig and they strike bedrock or oil it's not what they thought it was, so you have to be sure you build in circuit breakers and safety nets all the way along. Buy-out clauses are not uncommon so that you can terminate. 20 years is a long time, you never know what could happen, solar could be obsolete in five years if one of you thinks of something better. Fortunately the company that we chose has been doing this for a long time and has a lot of experience, so they have a PPA that they've worked through, but it still has to pass through the city. Because having an agreement with Kohls to put solar on their roof is not the same as private organization. It's not the same as doing it through public.

Team Solar: If you don't mind me asking what company did you guys choose?

Bachner: SunEdison

Madigan: So you know NYSERA when you say, "will Saratoga utilize NYSERDA grants," a grant is key to this project. We have to have the funding source, on the model that we're using. We may try to explore additional models, it's something we're thinking about, but what we're hoping is that there will be another round of this type of applications at NYSERDA. There's supposed to be.

Team Solar: Are there other options of getting funding besides NYSERDA? Because that's what we've been seeing NYSERDA NYSERDA.

Madigan: Through the state government it would really come through NYSERDA.

Bachner: We ran a lot of financial models and not that we were aware of.

Madigan: NYSERDA, if you go to their website, you know they've got different programs within NYSERDA that they award to different projects.

Bachner: If you're a private company you may decide to just pay for it you may not need the grant. For us the grant made this business model work. If it's gonna cost $3 million and they're willing to put $2 million and NYSERDA pays $1 million that puts our PPA, that allows them to recoup their $2 million over the 20 years. If there's no NYSERDA then they've got to recoup more and we've gotta pay more. So the NYSERDA grant actually goes to the company as opposed to the city.

Team Solar: Because they can get the benefits? Because that's what we're seeing with Skidmore. Skidmore itself since they're a non-profit model couldn't take the same benefits as a private company could.

Bachner: Those I think are the federal and state tax credits. The city can get a NYSERDA grant, in fact we've got one right now. In this case, we are not the applicant for the grant. SunEdison applies, we are the client under the blah blah blah. But that is another piece to the financial model are the federal and I think state (I'm not 100% sure) tax credits. Then there's a question of how long those are gonna last and go. And I believe they were just renewed, which breathed a little new life into the program.

Madigan: It was a fairly competitive process at third round, it was 80 different organizations that applied and it was 11 or something like that that were awarded. It was extremely competitive that third round, I don't know how competitive the first and second rounds were. I know at what price points we saw coming in at the third round were much higher than price points in the first

and second round. So that's something for us to be aware of as a client, if indeed we go forward if there's another round of grants, how willing is the city really going to be willing to pay to make projects like this happen. You know, this is a great project. It's clean, it's green, it reduces your carbon footprint, you can have a solar array on this landfill but always in the back of our mind is going to be how much are we willing to pay. We're talking about 20 years and it's taxpayer money we're using to pay for the energy.

Team Solar: Has there been a lot of resistance from taxpayers about that?

Madigan: No we've had zero resistance. And one of the things we've done in anticipation, you know we were hoping this would be successfully awarded to us, is we even met with the people that might own some of the surrounding property. xxx has a development out there on Weibel Ave and even they were quite supportive of it. Their main concern was make sure we're not pointing the solar panels directly in their windows. You want to make sure you're meeting with your neighbors and making sure you know what their concerns are. If the panels are facing a certain way, and then he can't sell his property because no one wants all this glare or traffic glare.

Bachner: Now we have a couple issues that were different than Skidmore. First of all, the city owns most of the land around where they're putting this. So there were only a couple neighbors and only one of them that really had the issue.

Madigan: So the payback period would have been 20 years. It was a 2 MW solar array that we were looking at.

Bachner: Can I go back to the neighbors thing because that became a little contentious at Skidmore. Land use issues are something to contend with. Because the city owns the property and is doing public work on it's own property it is exempt from it's own zoning rules. We want to be respectful of our own zoning rules, because people do care, they will speak up, and we want to make nice with our neighbors. And we have reached out to ask and it was met favorably in part because we were willing to meet with the guys and see what way the panels should go and the other thing is the shape of our land. When you go by the landfill, they can go down by the other side where they can't be seen because shockingly enough some people think solar is ugly. I don't quite get that, it doesn't look ugly to me.

Madigan: It doesn't look ugly to me either and I don't think it's just a generational thing, I think it's a mindset thing and when you think about they way you're gonna get new energy or this kind of clean energy, it just doesn't look ugly to me. The wind turbines don't look ugly to me. It doesn't bother me. Just embrace it.

Bachner: We're sitting in a slightly different place than Skidmore is in that regard (neighbors complaining about how panels look)

Madigan: A lot of residents lately have been asking me what's the status of this project and proposal because they see the solar array there now and we're getting to a point like they can't see anything else, we need to see that there.

Bachner: We're also lucky because it's a dump. It's different. Solar is tricky because solar takes a lot of land, and that's a hard thing to weigh. Do you grow food? Or do you grow energy?

That's the choices you have to make when it comes to solar. It's not quite as efficient as some energy efficiencies are. Now when you put it on a dump it doesn't matter, when you put it on a roof, it doesn't matter. But if you put it on a field out in the plains, where there's a lot more sun than we have, they become really interesting issues.

Madigan: In our situation, we didn't consider any other location. Our main concern was methan gas, making sure that the weight of the solar array doesn't collapse. That part of the project was completed, so that's good. We're very ahead of the process so we can be ready to go if indeed another line of funding opens up from NYSERDA, which is good, except we have to figure out what our price point would be.

Team Solar: Just to help us understand about the energy, does that go directly to residents or the town?

Madigan: It was a two phase process, the first phase of it was going to be for the city.

Bachner: It can't go to residents at this point. There's laws. The second phase was the community solar garden, and that requires some legislation to get passed with NY state. It was designed so that when and if that legislation pushed through that we could have a second phase.

Madigan: Kind of a buyback piece. Like people with huge trees in the yard. So it was part of our plan, but we were going to have to have some legislation change or enacted. The main part of this, the first phase, was to supplement city energy.

Bachner: And it supplements, it doesn't do all of our energy, but it's still a good supplement and it's a net metering concept. When you net meter you have to hook into the transmission point where the solar is located and that's the credit you get. We had the good fortune to be hooking into a point that made it very palatable and then we get credit for what we create and then that money then comes to us and then we pay for the energy. So it's not like the energy itself that's generated actually gets used by the city. We give it back to National Grid and then we get the credit for it and that's the way it works. National Grid only let's you do so much net metering at a particular point at a particular transmission site. In the beginning this was a competitive dig to them. If people were building solar arrays and they don't have to buy from NG you know that's not good for them. So in the beginning, if there was any resistance to be had, it would be from NG. They're also a quasi-regulated industry, so there's only so much they can do. So they have a very interesting love-hate relationship with solar but they've come a long way. Their process is protracted. Once you decide you're going to do this and get your contracts all figured out, then a company like SunEdison has to go deal with NG. And there's several levels and layers to getting your permits to do this with them.

(project in Halfmoon, Watertown?)

Bachner: (difference between solar array on landfill and normal plot of land) In our case, it has gas pipes underneath it because it was used for that methane to power the ice rink, so it's a little delicate, so you don't want to go down too deep.

Team Solar: The landfill is pretty much out of methane though right?

Bachner: There's not enough generated anymore to make the program work and now they're deciding to burn off to close it down.

Team Solar: Is there an option to remove the pipes if it's not in use anymore?
Bachner: I don't think so
Madigan: It might be very expensive
Bachner: Solar doesn't go that deep so everybody's that looked at it has said it's ok you just have to be aware of it. The other thing is there's this question of weight and how much weight. The real difference is, it's not so much difference in solar on a landfill versus normal land, it's solar on a landfill versus rooftop. And of course the other thing with land is there are many other useful, environmentally correct things to do with the land that start to compete with solar. As with rooftop there's not much to compete with.
Madigan: And with a landfill there's not many uses at this point in time for what you can do on a dump. Which is good for us.
Bachner: I don't know how long a dump has to sit there before it's safe for other uses (parks, rec fields, etc.)
Bachner: Saratoga is not going to get the RECs, SunEdison will keep the RECs. It would have been a nicer part of the project if we could because then we could retire them but this one didn't work out that way. And I suspect that's part of SunEdison's financial model. RECs I feel are like bitcoins. It's anybody's guess at how valuable they're gonna be in what market. They're gonna be redefined, they're gonna be remarketed.
Madigan: I think we've answered most of your questions.
Team Solar: Are there documents that we'll be able to access?
Bachner: gives the RFP blah blah
Madigan: (running through questions). Incentive: economic. There is a social, "good energy" part of it, but we were looking to save the city and taxpayers money.
Bachner: If we have a 20 year agreement, we know what we're gonna be paying for energy for 20 years and it helps us budget. It's a really good tool for a stabilized budget for you energy costs.
Madigan: Current status--not successful bid. Waiting to reapply, hear there is going to be another round. Will make changes to proposal. Barriers to overcome--price point. I do not make that final decision, I will make that in consultation with the council. The council will have to decide yes or no to go forward based on whatever price point. The council could decide no, it's not going to save the taxpayers money for us to do this project based on the economics. The whole sustainable piece. I will probably pitch both sides to get the council to agree, but the most important factor for me as Commissioner of Finance is the price point.
Bachner: SunEdison has to go and re apply for the grant.
Madigan: But there will be input from us. And the council will have to vote to approve it.
Madigan: So I guess our array is sort of a public private partnership. If indeed we become successful. We have not encountered any resistance towards the project. What was the build time?
Bachner: The projects are required by the NYSERDA grant to be shovel ready basically 8-9 months to put them together. So basically within 8 months to a year you have to have this thing

up and running. Payback? That's not our concept, that's SunEdison's concept. So I can look in there spreadsheet to see when they start making money to pay back the $3 million it cost them to build the thing, but that's their question, because we're not putting money into it up front. We're hoping our payback will be that the price point we agreed to will be under what's out there or equal to and we get the benefit of constant budgeting. And even if it's a little more we get the benefit of constant budgeting. And at least in our camp we think we've done something good. Over a 20 year period, I can't imagine we won't see a savings of some kind.

Team Solar: Does SunEdison do all of the maintenance? So will they be up here if there's any repairs?

Bachner: We wrote the proposal so that they are responsible for what we call O&M--Operation and Maintenance. So yes, they do the maintenance. All of the proposals came in with different ideas of what O&M meant, and that was part of our decision making process. On-call. Some of them do it remotely it's all computerized, some of them have a local person.

Madigan: Other people to talk to--National Grid. The financial incentives are very strong. Strong for us, strong for SunEdison, you know you've got to have the grant funding. You want to come in at a reasonably good PPA price. So that was part of the reason for the proposal to be formed I mean very strong financial incentives. We need them to make the project successful. At least with this model.

Madigan: I see a solar array on that landfill.

Appendix 3

Wednesday, February 19th, 2014
1:30pm
Troy City Council President

Rodney Wiltshire Interview

Rodney: What's your capstone project on?

Team Solar: We're looking at three different case studies, including the solar installation at Skidmore. Have you heard about the Skidmore's solar project?

Rodney: Yeah, how's that going

Team Solar: A lot of resistance from town members, there was a lawsuit but I think they're dropping it

Rodney: Who's doing it?

Team Solar: Dynamic Solar

Rodney: They're the ones that put in a proposal a few years ago right?

Team Solar: NYSERDA made them go with a company that has done a project of this size before. Proposed solar installation from landfill in Saratoga and one in Troy. We don't

know much about the one in troy so we were hoping you could fill some gaps. Did you have a role in that at all?

Rodney: Yeah so I proposed the concept of doing the solar project on the capped landfill because we do have roughly 90 acres of dead space. 80 acres is within the city limits and its a capped landfill, its a brownfield we'll never do anything on it worth while at all and within the city limits Troy does not have a lot of property for use of any …. so that was something we could try to reuse and do something beneficial for the city**.** And given my expertise with solar this was probably the only thing you could do on it. You can't put wind turbines on it, no one is going to live there, you're not going to put a park on it, I mean you can walk through it and people do but you're not going to do anything reasonable there. There's an 18 inch cap over the top of a plastic cap on top of a landfill, when trees start to sprout they have to cut them down, literally just grass because you can't puncture the membrane and that's why it's useless for anything.

Team Solar: **Does it still produce methane?**

Rodney: It produces an insignificant amount at this point. Hudson Valley Community College was in a lease with the landfill for its methane because they have a cogeneration system. Prior to that we were flaring it off, and its gas and we're wasting it so piped it to Hudson Valley, only accounted for 10% of HV energy demand but it was still useful, did it for about 15 years but now it's at such a low point, the balloon is deflated, there's no more decomposition and there's nothing that you can do with it so it's really dead, dead dead dead. So i had suggested we look at a solar project on the landfill and the city council thought it was a good idea, the mayor thought it was a good idea, and we wrote a resolution and we started that process about two years ago.

Team Solar: Is there any way we can access those documents?

Rodney: Yeah send me an email I'll make sure you have it. (Did he send us these?)

Now there's the hiccup, in the meantime, similar to the oppositions Skid is having, there are a lot of people who live near this landfill that were upset it's a landfill and they deemed it, we don't want any sort of development on it whatsoever, they're ok with this (the solar), but there's still some potential opposition to it so what we're going to do is switch the initial installation to the top of the landfill to the top of a buried water treatment facility, which isn't as large. It's a 4 acre site which can account for about 2 MW of energy production if we go with that. The 80 acre site has 40 acres of useable land on it.

Team Solar: Could you do a 40 acre installation on it? That's huge though!

Rodney: Yeah we could, it's huge, that's enormous you could fit roughly 20 MW of PV on it and that's a tremendous amount of power production. Something like that would generate more electricity than all of the city building's demands

Team Solar: When does it have to be decided that it will go on the landfill or the water treatment?

Rodney: Well we're gonna do both, but I think we want to start with the water treatment facility because it's a site with no objections it already has a fence around it, and it's more direct we can just do it. With the landfill, here's where politics can come into it, you want people to support it, you don't want to fight all the time, if we show that we had a success here and it works and this

is what it's gonna look like, then we'll have more buy in for people to say yes, we want to expand it. From a language standpoint saying we're going to have a solar powered water treatment facility, that's not a bad thing either.

Team Solar: Is the main incentive a social one?

Rodney: No, my main incentive is to have sustainable production of energy. I love solar, we should be doing it. I'm not for hydrofracking, I'm not for other forms of nonrenewable energy, and we've got this land so I want to do the right thing, I think this is the right thing. The selling point for the city of course is economics, we spend about $5 million a year in electricity and every year that goes up another 5% on average. We have a reservoir that the city of troy owns and bought 110 years ago, it's 8 miles away from Troy, they piped the water down, it supplies all of our water, and we pay for it of course (citizens) but we also sell it to other communities. So our reservoir generates about $8 million a year in profit for the city, that's not taxpayer money, that's making money. The solar farm, after we meet all of our demand and shrink our bill to zero, then we also have excess electricity we can can be selling as a power producer to surrounding communities. It's clean, and it will make the city of Troy a more economically sustainable community.

Team Solar: So with these installations, who actually gets the power? Or are you just selling it back to the grid and getting money?

Rodney: Primarily the city would get the power, that's the first recipient of it. And then it goes back to the grid and then the grid takes care of distributing it to whoever. We could make power purchase agreements with other communities directly but probably the most economically efficient would just be to let the grid handle it and let the market determine it.

Team Solar: How did Troy finance the project? Was NYSERDA involved?

Rodney: Yeah, so, NYSERDA is involved for a small percentage, small portion of it, they have a cap at 200,000 W but the rest of it is through a power purchase agreement. We're able to do things in a very cost effective manner because we do have access to Hudson Valley and RPI. We are incorporating the installation as a teaching component for the schools, so the labor is going to be handled by trainees. So there's a grassroots effort to it, an academic effort and a lot of people are just pulling together to make this thing happen.

Team Solar: What's the payback period for it?

Rodney: 7 years

Team Solar: And is that a long time compared to the payback period realm?

Rodney: Well, let's put it this way, but I believe your term for Skidmore's is 30 years.

Team Solar: Mike Hall said five. He said we might need new ones in 20 years.

Rodney: Most power purchase agreements are 20 or longer, but that's interesting.

Team Solar: 7 years is also pretty good then.

Rodney: Yeah, those are pretty aggressive terms.

Team Solar: This might be a weird question but once those 7 years are completed and say I guess you wouldn't be getting all of your energy from solar right? What does the money the town saves, where does that money go?

Rodney: You can look at it a few different ways, in municipal government, you have a fiduciary responsibility to the taxpayers, to make sure they're not overpaying, you have thresholds that's like 2.5%, so you can't charge the taxpayer more than what you want to spend. You can have what's called a capital plan and say we want to build a sports complex and that's gonna cost $5 million so we're gonna need a little extra money to save up to do that. But if you don't have a plan, you can't just charge more money, so everything has to be balanced. So when we have that extra revenue from the solar farm we can direct it to pay for something else or we can lower the taxes, or we can do both. So really, like I said, it becomes a more economically sustainable city to live in and that it's just a lower cost to live. It's lower taxes, electricity costs might be lower if that's what we want to do, but there are some municipalities around the state that have access to cheap hydroelectric and they have all electric heating in their houses, and their electric bill is just a lot lower so it's just a lot cheaper for them to live there.

Team Solar: So that's if it's done in the public sector, the private sector wouldn't be the same way right?

Rodney: No the private sector might be a revenue generator, and then you're just making money and profiting, but the city is a not for profit.

Team Solar: Who is installing the solar?

Rodney: Most of the labor is gonna come from HV students and RPI students and then there's a company called Century Solar which is a Troy based company that's going to be the general contractor on it. Trust me I'll be involved, but I'm not making any money on it.

Team Solar: Does Troy own the RECs for it?

Rodney: Yes

Team Solar: Was that a big part of the agreement?

Rodney: Yes, yes absolutely.

Team Solar: Do you think with cap and trade that's what will happen?

Rodney: Yes

Team Solar: When do you think that will happen?

Rodney: My political gut tells me this year. I'll tell you why--Andrew Cuomo is a political machine, he wants to run for president, but he's up for reelection this year. If he runs for president it would be 2016 so he would need to get reelected and he would need to have things that he can go to and say look what I did. In politics, if all you do is talk it's nothing you have to have something that you get done and for him, every year it's been something. And every year, they've been controversial but it's been big. The first it was a 2% tax cap, which showed his fiscal conservatism. Then it was gay marriage. Then it was the Safe Act. And this year it's like what can you do? And being in the industry and I have seen what's been going on and we've talked about SRECs (solar RECs), and every state around us has SRECs but NY state does not. He (Cuomo) has been very bullish as in NY being the champion of solar and all of these things and I think that's the one thing that would blow it up. If RECs come onto the table, everybody and their brother is gonna do it. Right now, residential systems that we're selling pay for

themselves in savings alone like three years. So you put RECs into the equation it's a slightly faster, but it's a profit generator. That's my gut. I don't know that to be a fact.
Team Solar: So is there a battle between Troy owning the RECs and Century Solar?
Rodney: No we didn't have a battle. I said don't even bother talking to us about getting the RECs. This is our land, our equipment ultimately, our power and we want the rights over it.
Team Solar: Maybe talk about the timeline of the project?
Rodney: Yeah it's long. But I'm looking at the resolution right now, and it was November 2012 that we actually passed the resolution. And it is...2014..and we should be beginning construction this summer on the water treatment plant.
Team Solar: Do you know anything about the proposal on the Saratoga landfill here?
Rodney: Not really to be honest. You'd have to tell me more.
Team Solar: Completely different structure, up in the air whether people can buy into it or if it's all companies etc etc.
--Caitlin leaves for work--
Team Solar: If you start the water treatment plant, what would the timeline be for the landfill? Do you have to resubmit everything?
Rodney: That's an unknown because, here's the thing, NYSERDA's incentives are dwindling and going away, and NYSERDA is literally gonna be out of the solar business as far as controlling and directing it by the end of 2015 so there's a point where they're gonna be irrelevant to the point where there's still gonna be stuff going on.
Rodney sending docs to Annie
Team Solar: So there's no resistance to the water treatment plant?
Rodney: No
Team Solar: And that's not the same location as the landfill?
Rodney: No they're like opposite ends of the city. The landfill is all the way on the south end and the water treatment plant is all the way on the north end. Nobody lives near the water treatment plant. Literally there are trees buffering people's houses in the landfill.
Team Solar: Yeah that was the main problem with the Skidmore one there were houses right next to the installation door were very unhappy
Team Solar: What kind of solar array are you going to do?
Rodney: Ground mount.
Team Solar: Mike Hall was telling us that for arrays on landfills you can't puncture the ground so where will it go on the water treatment plant? Will it go on the roofs?
Rodney: It's on a grassy section that is basically just ground. There's a big tank buried.
Team Solar: **So will Troy take care of all the maintenance stuff?**
Rodney: Yep
Team Solar: Do you think it will be 40 acres?
Rodney: Yeah it will grow little by little but eventually will be 40 acres
Team Solar: Do you know if we can find these kinds of documents for Saratoga online?
Rodney: I would google it.

Team Solar: Do you have anyone else we can talk to in Troy about this?
Rodney: You could talk to Bill Chamberlin. He's our Director of Operations.

Appendix 4
Tuesday, February 25th, 2014
11:45 am
Troy Director of Operations

Interview with Bill Chamberlain

Bill: Even he is still putting together the request for proposal which will come to me and I'll pretty much manage the procurement to get a contractor to do this. We haven't even started this yet.
Team Solar: Right, I think we know that before we interviewed Rodney we thought it was done but now we know it's not.
Bill: We haven't even begun to do this yet. Our intention is to put out a request for proposal out for contractors that would be willing to come in and do the installations and the set up at no cost to the city.
Team Solar: So you guys have not picked a company yet?
Bill: No, but I guess Rodney's in the business so he's got more inside information on the vendors than I do. But we don't have anybody under contract with the city yet to do this.
Team Solar: **He mentioned about a proposal in November 2012. Thats still, you guys are just basically waiting to start to a solar project proposal?**
Bill: What he did was he went in and solicited a vendor while before he was council president and the whole process he went through was wrong so we couldn't use. For a municipality there's a very specific process that you have to use under general municipal law and under our procurement policy to hire outside contractors for any kind of work. Rodney basically called this guy up and the guys oh yeah we'd love to do it and Rodney said great lets do it and you can't do it that way. It has to be a competitive sealed proposal, there has to be a review, there has to be a concealed bid. What Rodney's in the process of doing right now is putting together the actual specifications for what we would want in a solar farm and then once he gets that done, in fact I just talked to him the other day, he's gonna hand that to me and I'll put together a solicitation that will go out. We'll probably do it on a thing called bidnet that covers the entire country so you could end up with a vendor from you know Michigan or somewhere who knows that would submit a proposal and from there we would review the proposals and the financial impacts of the proposals and basically what the vendors are proposing as equipment, what the return financially is of the city and then we make the decision there who we want to do the project. But none of that has happened yet.
Team Solar: So have you guys put out a proposal to NYSERDA for a grant?

Bill: No. We haven't done anything yet. See the thing with NYSERDA is you gotta be able to tell NYSERDA. Well we've got a couple of issues that I've been discussing with Rodney. Number one Rodney wants to sell the energy back to the grid. I would prefer not to sell the energy back to the grid. I would prefer that we if were gonna of a solar farm and one of the locations for the solar farm is our water treatment facility, which is a huge energy user. I mean we got through millions and millions of gallons of water a year and you know through our pumping system, our filtering system and it's all electric so one of the things I would like to do, my argument with Rodney is why are we selling the energy back to the grid when we can reduce our own costs by more if we hook these solar panels into our own system. so that's something we've got to hash out. My other thought we own about, for example 6 firehouses in the city of Troy, there are 2 police stations and 2 police substations, the public works garage, we have two ice rinks, we have the remainder of the entire water treatment facility. I'd like to see us put solar panels on those buildings and reduce our costs. I mean the reality is, I don't know if you saw there was a thing on the news last night or the night before I forget what school district has gone to solar farm to reduce their energy costs and the estimated reduction in energy costs is about 162,000 dollars over the next ten years. You don't save...this is more of a PR green thing than it is a financial thing because you just don't. Contrary to what people want you to believe about green energy, you really aren't saving that much. You're not making a lot of money and you're not saving a lot of money, but from a municipal standpoint, from an operating budget standpoint, which is one of the things I'm responsible for, anything that we save is a good thing so you know if we save $162,000 over the next 10 years well thats a good thing. So from where I'm sitting it's an economic thing more than anything else. and the way the economics work as far as I'm concerned if a vendor is willing to come and do it at no cost to the city. If we have to pay for it we have to take a second look at it.

Team solar: So you would say that the main incentive from your standpoint is economic, but do you think for the city it is more social and good...?

Bill: I think it's a very good public relations thing and environment, social environmental thing, position to take, I don't have a problem with solar panels I mean I think its a good idea. The idea that were gonna save all, tons of money because we putting solar panels up I'm not seeing. I'm not seeing it from the analysis from the state. The perfect example is the story last night, I wish I could think of the school district it might have been Cohoes, I forget, it was on last night. They're doing their entire high school and over 10 years there gonna save 162,000 dollars. Over a ten year period thats not a lot of money. In the grand scheme of the things and what you're operating budget looks like that's not a lot of money but on the flip side I guess if by the city doing if that sends a message to other business in the city or certain residential property owners that have multi unit apartments facilities or whatever and it sends a message to them that they should try it too then you know everyone doing it. Then I suppose in the grand scheme of things it helps the grid by using the renewable energy.

Team Solar: So would you say the process is taking longer than expected?

Bill: No I don't think it's taking any longer than I expected. The issue is that from my standpoint, I mean Rodney has gone from being a council person to the president of the city council and once you get into that position even though it's a part time position it's really a full time job and you're dealing with you know every aspect of city government so his timeline got extended because he's the council president. From my end I'm the waste management coordinator but also the Director of Operations so you know I cover everything from the police and fire departments to garbage collection so I don't think once I have the RF, once I have the specifications from him as far as what he thinks we should have as far as putting an RFP out it shouldn't take more than an hour. Ya to get it out by law you have to leave it out for a 30 to 45 day period and you get responses and then from there you probably have another 2 to 3 weeks of review so by the time we get a contractor ready to go or ready for an outside vendor to sign to do this from we're probably looking at maybe June. It doesn't take that long as long as you get a vendor that responds to giving you what you're asking you for and then again it has to work as far as the location you wanna put it in like Rodney wants to do one on the Troy landfill and I'm totally opposed to that.

Team Solar: What's your reason for not wanting it on the landfill?

Bill: Well, I've been here 29 years and I closed, in 1996, 97, 98 I was responsible for closing the landfill and if you're not familiar with where the Troy landfill is, we have residential homes, single family res homes that are within 150 feet of the landfill and there was, it was an on going battle for years between the city and the residents up there. Again you have to keep in mind the landfill opened in 1868 and most of these homes were built in the late 70s early 80s so these people kind of moved in, knowing full well that there was a 5 acre landfill, 150 feet from their property line but regardless they put up with a lot of a long time so when we got to the point where we were getting ready to close the landfill the administration at the time promised the residents up there that there wouldn't be anything built on the landfill. There would be no more utility to the landfill, in fact we don't even mow the landfill. We just let it grow wild, We comply with the DEC requirements for leaching and testing and we maintain the property but that's all we do. We just let it grow wild because years ago that was kind of the agreement with the neighborhood. You know they had had their fill of trucks and people and smells so we've had people come to us over the years and they've wanted to put in a golf course and parks and all this other stuff and we keep going back to the neighbors and I personally to council people over the years I'm not going back to these people. I took a beating enough this group I'm not going back to them and telling them we want to put a golf course up there, we wanna put a park up there, we wanna put a you know up there ski slopes or whatever and every time I've talked to the neighbors and said hey here's what we are thinking about they absolutely go right off the deep end so I'm more inclined to just let the landfill part of this slide and I told Rodney that. Now the other location which is the water treatment plant, which is at the very north end of the city and at the very north end as you come to a certain theres you're facing the water treatment plant and there is an open field that is our property its all fenced in and its probably the length and width of 3 football fields. Underneath this property are water tanks that are reached through the water

plant through tunnels and they are encased in concrete. tHey've been there for 30 years. nothing is gonna happen to them. The perfect location for a solar farm is in that field because you can set the panels with a true southern exposure which is what you gotta have. The landfill on the other hand is never gonna be a true southern exposure so its gonna require one or two things its gonna require the panels to be turned manually or its gonna require them to be on some type of a motor that will turn the panels to get them to get the southern exposure that it needs to generate as much energy and from what I understand while the manual is just gonna be man power hours to go up and adjust panels and if you have to put motors on the panels thats gonna drive the cost up so that's another issue with the landfill. I think the water treatment plant site is really the best site for a solar farm and then from there, like I said, we own a number of city building and I think doing solar systems on those buildings that tie directly into the energy use at that particular facility is a better way to go.

Team Solar: Would the, I know that it wouldn't, but if the solar array were to go on the landfill would you basically be selling electricity to the grid?

Bill: If we did it on the landfill, that's what we would have to do, we would have to sell it directly to the grid because right now where the landfill offices used to be what we did was a construction project up there probably 15,18 years ago and now our police department's narcotics unit work they out of that building and its a good area for them because its secluded. The neighbors like it because there's always cops up there, you know, there's always marked cars and always unmarked people up there, uncover people up there from all kinds of agencies from you know our own guys to the state police to the FBI, the DEA so the neighbors really like it and the other thing is since there's police officers up there all the time they kind of keep an eye on the property. That would be the only facility that you could take the energy from solar on the landfill directly to a city facility and that building is incredibly small so even if tied into that building and tried to drop the energy costs there you're still gonna have I would think you're still gonna have a pretty good amount of energy to sell to the grid. But I don't know if we could sell to Hudson Valley Community College probably 300 yards away, 400 yards. We might be able to work something out with Hudson valley to sell to them. but there again we first started looking at this you know the first year return on a solar farm at the landfill. I forget the size how many panels it would be, was 11,000 dollars and its just again its a good thing environmentally and from a public relations standpoint but economically its not its not lighting up the world.

Team Solar: So would you say that the vendor that would install a solar farm for free is more an incentive for you guys than the NYSERDA grants or is it both kind of playing a role in deciding whether or not to install solar?

Bill: Well I think the NYSERDA grants we would have to look at what the NYSERDA grants would allow for. The vendor comes in particular, see what my feeling would be for a solar farm. If we were doing a solar farm at the water treatment plant site and there was going to be say 150, 200 panels then that would be, I would say that would be an outside vendor, we would want an outside vendor to come in set that up, manage that, run that for us and then for whatever energy savings we realize from that solar farm we would have a contract with that vendor to for that

vendor to paid a percentage of our savings. The NYSERDA grants I would look to them for to put panels into solar panel system into our buildings because most of our buildings for example are police stations, our firehouses would be the better example except for central stations, firehouses are usually just one bay you know one apparatus in each house. There's a couple of houses where there's two pieces of apparatus but the building themselves are not huge so you might have, I don't know maybe four five six panels on each of the firehouses. I would look to a NYSERDA grant to pay for that rather than an outside vendor because with those particular buildings the energy savings is gonna be tied directly to that particular building so when we look at our national grid bill we're gonna know exactly how much were saving on that particular building and it's gonna be a direct tie into the energy system in that building where the solar farm if you have 200 or 250 panels at the water treatment plant and you know there may still be a percentage of energy left at the size of a farm to sell to the grid. With the solar panels I would tie everything to our facilities first because the other thing is from a public relations standpoint taxpayers like nothing better than to know that the city is doing something to reduce the costs of government and if we just turn around to them and say we're doing this but we're selling it to national grid whose gonna turn around and sell it back to you that's you know, that's not exactly how it would go but it's pretty close. So but if you turned around and you said to people were doing a solar panel program, were putting them on all city facilities and the goal there is to reduce our operating cost annually people generally, the general public is gonna find no problem with the city doing that because even though it may not have an immediate or direct impact on their wallet at least the impression is that the city is doing something to cut operating costs which we are, but its from a public relations standpoint that would be a good thing.

Team Solar: So is there anyone else involved in this solar project proposal that we should talk to?

Bill: For Troy no, it's pretty much just Rodney and I. I think probably once we get and depending on how, I'm only a couple years from retirement. I think when I retire it may go to more people. But for right now before its started it would just be Rodney and I. And Rodney really is the guys, from the technical end, he's the guy to talk to. I'm not an engineer and so what I know about the solar farms and how it works in NY and NYSERDA grants is from what I've read and the people I've talked to at NYSERDA and the DEC. Rodney is the technical guy, he's in the business.

Team Solar: So the if there would to be a solar farm it would be run by workers in Troy or?

Bill: No with the farm, the solar farm again Rodney and I haven't really hashed this out but my recollection from when we first met about this was there would be a vendor that would come in and install the solar farm on our property and that vendor would be responsible for both the installation, maintenance and operation of the solar farm and then the way that vendor makes his money, there maybe a little bit of an upfront cost to the city I don't know I have to take a look at that and see how that would work. But the way that vendor would make his money is say the city, say the vendor has, I don't know, call it a 10% return from the city so if the city showed a

reduction in their energy bill from the solar farm in 100,000 dollars then vendor gets paid 10. Then in addition to that I think that the vendor would also a share a percentage of the energy sold to the grid and I think, I'm not sure, maybe you can call Rodney back, I think the vendors percentage would be higher. The vendor might get say 60% of what's sold to the grid and 10% of our savings something like that. I think that's more how it would work but Rodney knows more about the contractual issues with the solar vendors.

Appendix 5
Monday, February 24th, 2014
12:45pm
Director of Operations for Troy, NY

Jeff Peterson Interview

Jeff: I don't have a lot of details on those projects.
Team Solar: Yeah that's fine. We just want your viewpoint as a NYSERDA representative for the role NYSERDA has in providing grants and things like that. (Grant process, competition, and whatnot.)
Could you describe your role in recent projects with solar that have been given grants from NYSERDA?
Jeff: For a number of years I managed the PV incentive program.. well maybe I should back up.. Do you know much about NYSERDA and how it's organized?
Team Solar: Umm.. a little bit. We've looked at the website and we realize that there are a bunch of different sectors, but a little overview would actually be great.
Jeff: So I'm in the research and development program at NYSERDA. And you can think of two broad programs: one is R&D one is Deployment. The deployment program is generally taking technologies that are ready for the market that are commercially available technologies that need some help in getting them to actually be deployed. In the research program we develop new technologies or we address really more technical or market risk associated with a technology. So I started our PV program a number of years ago and just now transitioned to our Deployment program. We now think it will be kind of mainstreamed. But we first started really actively promoting PV about 10 years ago. We looked at the PV market and addressed a couple of different things: the price of PV, at that time it was significantly more expensive than it is now, the access to qualified installers of PV, Back a decade or even longer your PV installer, there

were only few of them in the state that could do this. Most of PV went in to off-grid applications. And so our approach to that was starting a significant kind of workforce program and also to bring in a certification program to for PV installers. The North American Board of Certified Energy Practitioners. To create a standard for installers, so you could know that the person installing your PV system has met some sort of standard. And we also started developing decision-making tools. So say a purchaser of PV could make some assessment based on some tools. One of these is called a Clean Power Estimator, which is on our website somewhere. And then we have an incentive program through the installers. So you as a homeowner were not directly contacted through NYSERDA, we were contracting with an installer and were providing some quality review and some oversight on the installations. Which was important in the beginning. These were all new technologies, there were a lot of lessons that needed to be learned in putting the systems in place, and we needed to educate the local code officials and building officials in what this all meant. So we put a lot of oversight there. Now as the industry has matured, and it has matured rather rapidly, we haven't had to do that as much anymore. So you went from having large number now small installers to consolidation in the marketplace where you have more mainstream-type businesses installing PV systems. So we've now moved our PV program to Deployment which is now providing nominal incentives, one time we provided perhaps $5 per Watt for installation and now we're less than $1 per Watt. The prices have come down dramatically and the need for us to have such quality control and oversight has come down and the quality of installers has gone up. A couple of years a go we did a program, we had stimulus money, from American Recovery (ARA??) And one thing we started looking at there was a challenge in running a PV incentive program was what kind of incentives do you want to give? We want to give just enough incentive to stimulate the installations we don't want to over-incentivize this. We're not really looking to help the installer profit, we're just looking to help them make sales. So we started a program there which they could pay a bidding program where the installers from larger blocks of incentive bid the price that they were looking for their incentive. So instead of us having a standard incentive of say $1 a Watt, or $1.50 a Watt, they would come into us saying "We will install a Megawatt of PV for $.75 a Watt." So we're trying to get qualified installers to compete at the incentive level. And then that program kind of transitioned into a program we have using RPS funding which is a competitive PV program. So where installers are feeding in on an AWH basis, so now instead of just on a capacity-based basis like in dollars per Watt, they are now bidding in based on energy output. So that forces the installer to take the performance risk of the installation.

Team Solar: So you've definitely seen [solar] evolve into a more competitive market over the past 10 years you would say? Especially with the new Sun Initiative and things like that?

Jeff: I don't do it anymore though. I don't manage that program anymore.

Team Solar: What does the average grant process look like? Do companies or institutions approach NYSERDA and research about grants/grant opportunities or is there any sort of marketing from NYSERDA's grants to institutions and companies?

Jeff: Well for the smaller installations, our marketing is through the installer community. Now it's really changed a lot over the years. Now if you're in the business of installing PV or you want to be in New York State, you tend to know us. Because we've been doing this now for a long time. You don't really need to market the availability of our funding. But the installation community, our relationship with the installation community, they will inform their clients of the availability of NYSERDA incentives to try to encourage them to make a sale. The competitive program, we're trying to inform the community in a lot of cases the solar developer community is relative known. And so we can directly contact those communities by building a distribution list and we try to pass word as far and wide as we can.

Team Solar: How long does it typically take for projects to be completed that get grants from NYSERDA. And we know there is always some sort of timeline for the grants since Skidmore received one from NYSERDA and it was extended a couple of times. Is NYSERDA usually flexible with that kind of stuff or how does that typically work?

Jeff: So timeline for the installation? I don't know the details on the projects you're doing. So you might have to find a person who's doing those projects to know. Usually it's a fairly well defined target date. But in reality things change. So it's not like we walk away if someone's a day late on an installation. There's a time period with this.

Team Solar: And I don't know if you'll know the answer to this but how is the amount of the grant decided? Based on scale of projects, etc.

Jeff: Given the size of the Skidmore project, the other ones were probably part of our competitive program. So the way that program works is it's essentially based on the bid price. A developer, it could've been Skidmore but most likely it was the developer of the project, would come in and bid. Proposals get ranked and get ranked on two different sets of criteria. First is they get looked at based on technical quality of the proposal and so who is bidding in and installing the project at Skidmore and are they qualified and does the project make sense. And then that creates a score. And then you look at what they're bidding in and you can look at that at a different time because you don't want to influence your technical score and then you combine those two (the technical review plus the bid price) and come up with a overall ranking. So Skidmore and the others came in and were picked because they were probably asking for less dollars per kWh than someone else.

Team Solar: And how many people are typically bidding in on the same grant at a time? Or is that not how it functions..?

Jeff: So the RFP process you make announcements and get proposal and get about 20-30 proposals that come in for that. And some programs are done on a regular basis. Which some people may decide that they're not ready yet and are not going to bid this time but they'll bid 6 months from now in the next round.

Team Solar: Say Skidmore bid and then didn't get it, could Skidmore re-bid at a different time?

Jeff: Sure. If you look at our website under "Funding Opportunities" you could probably see the solicitation that they responded to. So that really outlines the rules, both for the Competitive one and the non-competitive one/the incentive-based one.

Team Solar: I know you say you haven't been involved recently, but do you think the reason that more places haven't taken advantage of NYSERDA and all of the money that has been put in with Governor Cuomo's initiatives has been because of the size of the grants available or do you have any insight as to why business are or aren't taking part in these grants?

Jeff: I guess maybe because I would say they are. It could be because I was around in the beginning when there were only a few companies interested but now that we're getting a lot more PV installers it seems more exciting. It's still becoming common but it's still a relatively unique and new technology. So if you look at our website under Funding Opportunities and then Closed Opportunities and you pick 2013, you can scroll down to see the New York Sun Competitive Program and you can open that up to see if it's open now. It shows you the amount that's available. Looking at the current funding opportunities, it does list the solar project initiative incentives.

Team Solar: Generally with the NY region and solar, we are trying to figure out if the Skidmore, Saratoga, and Troy projects are coincidental for this area or if people think that this is going to be a new booming place for solar installations. So we were wondering what your opinion was on that. Because upstate NY isn't exactly the prime spot for solar arrays.

Jeff: Why do you think that?

Team Solar: Just from people we've talked to, having solar at this latitude it's not always feasible. But we were wondering if you agreed or what your thoughts were on this.

Jeff: Yeah well the question really comes down to value. So PV works when the sun is shining, so being in the downstate NY area (NYC/Long Island) there tends to be a high coincidence of when the sun is shining and peak power demand. It's not quite as close with Upstate NY and the peak pricing is high in NYC than it is in Upstate NY. But it really comes down to what value PV can play in relationship to the energy market. That tends to be the next important question that people look at. Have you looked up any of the work of Richard Perez? He is a professor at SUNY Albany and he has a number of papers on his web page. He is well known, he takes satellite images and takes the information and translates that into solar installation values at any given point in a geographic location. He can tell you based on satellite imagines how much sun is hitting your block in your neighborhood. And he's been working on using that data to forecast. So he can forecast fairly accurately how much sun and energy your PV system could produce tomorrow.

Team Solar: I don't know is NYSERDA directly deals with this but in terms of opposition people have towards projects, like with the Skidmore project, does NYSERDA have to deal with any lawsuits or anything of that matter?

Jeff: It really hasn't been a big deal with solar. I also did the wind program and we had a lot of challenges with large wind projects. Sometimes you get some solar issues with a neighborhood

that has a homeowners association and that can be an issue with solar but generally it's not an issue. It doesn't mean it won't be But PV is usually well accepted. Generally it's not an issue.

Appendix 6
Monday, March 24th, 2014
3:00pm
Phone Interview
Regional Director at Vote Solar

Peter Olmsted Interview

Team Solar: We would love your input on policy stuff in NY and incentives or different trends that NY has been seeing with solar from your experience. We have a list of questions and we'll probably just start off of that and we might stop you if we aren't sure what you're talking about for a different term or whatnot. So in your opinion, what are the main incentives to implement solar in NY?
Peter: Okay. So my organization has been working on NY in the past five years and I think the primary thing or aspect that we were advocating for was a long-term solar program. And NY had a variety of incentives in place over the years but nothing was really indicating that there was going to be the support for solar over the long term and I think that was really a hurdle for people looking to invest in projects and also for both local companies and national companies for investing in the long term. So that was really one of the fundamental pieces that we've been after for a really long time and I'm happy to say that we're finally there, or close to being there. So in 2012, as I'm sure you probably already know, Governor Cuomo established the NY Sun Program so I think for many years we had been advocating for this long term policy certainty through legislation so we've been working with the senate and assembly in Albany to enact legislation and we never got there but I think the Governor heard sort of that noise loud and clear and the initiatives themselves to initiative the Sun Program. This was initiative conceived as a four-year incentive program, so from 2012 through the end of 2015, and comprised of two primary incentive vehicles: the first one was an upfront rebate for smaller systems (residential customers and small businesses) and then there was a larger incentive opportunity for systems such as the one Skidmore is pursuing. There was a competitive solicitation where projects would bid in for the incentive and the incentive was paid out over a period of three years. We were advocating something for market participants that would be available through the end of the decade that would really build momentum and confidence in the market. And so what we are looking at right now is a petition in front of the public service commission to extend that NY Sun Initiative through 2023 and they should be voting on that in April and that would be a victory for

us. That would be what we've been going after for years and would really instill that market confidence over the long term.

Tam Solar: So do you think people group incentives together? So there's always that economic piece but people will also… So for Skidmore there's also a marketing and education tool. So do you often see that people aren't just looking for an economic incentive?

Peter: Yeah I think it depends on the entity to be honest. We sort of have a saying at our organization that we don't really want to tell people why they love solar, we want to let them figure out for themselves why they love solar. So for Skidmore or other educational institutions across the state, I think the educational and marketing component is very important and I think that holds true for businesses that are investing in solar to offset their energy demands as well. When you get down to the residential level there are so many different reasons why people would want to go solar but yeah, I think you hit on an important aspect which is that the NY Sun incentives aren't the only thing that's driving people to install solar. There are other policies whether state or federal that are also very important as well. It is very much a package deal for project developers to look at. Whether it's these hard, direct incentives or some of the other motivations for going solar.

Peter: Have you guys looked into the remote net meter policy that's in place in NY?

Team Solar: Umm I think we know a little bit about net metering. This may be a dumb question but is net metering different than remote net metering?

Peter: Yeah slightly different but the concepts are sort of the same. Net metering is a policy that enables somebody that has solar on their roof or on their property to capture te full output of that system. So for a residential customer the panels are producing energy during the day but they might be at work so that output is going right on to the grid since they're not able to use it instantaneously so net metering is a way to get credit for that so they can use that to offset their consumption from the grid in future months. Remote net metering is sort of the same principle but it doesn't have to be on site. So Skidmore is using this remote net metering because their facility is going to be off-site yet they'll still get the credit for that generation. So you might as if you're having conversations with people involved in each of these projects, I would ask to what degree they're using remote net metering because I think some of these larger projects in NY it is really important just because not every building or property is ideal for solar either it's shaded or it's not precisely where the electric demand is. So I think that would be an interesting questions because my understanding is that that has been one of the policies or incentives, if you will, that's been pretty critical alongside the direct incentives offer in the NY Sun Program.

Team Solar: There's a lot of discussion about RECs for the Skidmore project, it was really important that Skidmore owned the RECs. What has your experience with RECs and how important they are when installing solar?

Peter: So RECs are sort of a different beast in NY than they are in other states. Less familiar with how different entities will use them or not use them. So because basically that's essentially what Skidmore's being incentivized for (those RECs), so if they're being incentivized for those

RECs, basically the state is purchasing those RECs from them, the environmental attributes, then does Skidmore have a right to claim the environmental benefit because they own them? Well I think there's the argument that if they didn't sell them and just retired them then that would be the proper way to quantify the environmental benefits that the system is bringing. I don't know a whole lot about the different perspectives around that issue, I think it is fairly significant for the economics of the project, but I don't really have much understanding other than that it was a big sticking point for Skidmore early on. It's probably much more of a concern for an entity like Skidmore who's really focused on sustainability and focused on being successful in that regard. I think for some companies in NY I think it's just total bottom line for them. If solar makes economic sense then they'll do it, if it doesn't then they won't. I think it's obviously different for Skidmore. I would be curious to see how other colleges across the state have dealt with the issue of RECs (Cornell, Clarkson, SUNY Buffalo). I'm curious to see how other schools have dealt with that issue.

Team Solar: Thinking more about the grant side of solar policy, how easy is it for a school like Skidmore to get a grant substantial enough to do a project that's worth doing?

Peter: I think now it is a really promising opportunity. I'm not sure if Skidmore necessarily applied directly or if they did it through the project developer who applied for the grant directly but it's really competitive out there right now, while there are limited funds to apply for that program that will be continuing through the end of the decade, there will be continual opportunity for more and more entities whether they're public or private to really get a solicitation from a developer and see what that looks like on their bottom line and if it makes any sense to bid in. So like I said, the incentives that Skidmore got they're headed in solicitation so developers had to bid in with hundreds of other projects and NYSERDA will then go through and evaluation process where they have a series of set criteria where they will scrutinize each project with. And usually that culls out a group of projects and at the very end it's about who has the most cost-competitive bid.

Team Solar: What do you think the biggest barriers are to implementing solar for businesses or institutions?

Peter: I would think interconnection for the larger projects so just understanding from an engineering standpoint to connect the facility to the grid. Especially when you're talking about projects where there's no energy demand right on site (Skidmore's project on the baseball field). I wouldn't say it's a barrier necessarily; it's just a challenge. The state has what's called Standard Interconnection Procedures and they sort of guide the interconnection of these facilities based on their unique characteristics. So it's not like you're going in blind when installing these projects but it certainly is time and resource intensive to figure out if there are any upgrades needed to the grid, to enable in connections, things like that. So that's one. I think probably the second is just general financing. There are so many different financing options out there, a lot of different solar companies in the space. I think for someone who's looking to invest in solar on the larger scale, I think just having the capacity to understand different value propositions that are proposed and to

be able to make an informed choice… Again I wouldn't say it's a barrier but it's certainly a challenge. I think those would be the primary ones at this point.

Team Solar: How about anything with public opposition? (The lawsuit against Skidmore) Is that common?

Peter: Ya know, it's not. Our organization works across the country and we haven't seen much of that honestly. I think it was a surprise for us to see that in the Skidmore case. Most places we've worked, people want to see more solar. I think there's a lot of…even in the urban areas people want to see this empowering communities in a lot of ways to take control of their own energy use. So I was kind of surprised, I mean my understanding of the Skidmore situation was that maybe there was a select group of neighbors that was really opposed to it.

Peter: I know wind development dealt with this. But I guess from my perspective they're different scales of energy development. A 2 MW solar system is small but compared to a large wind farm, they're different in my mind. I haven't really seen much of that NIMBYism in NY so I thought that was sort of unique. We did polling in NY I think two years ago and it was just hands-down 70-80% of the people we would poll wanted to see more solar. Ya know even in their own neighborhoods whether or not it was residential or commercial development. Pretty compelling. That's typically what we see.

Peter: Have you guys connected with Marion Triste? She works in Saratoga for a solar developer but for a long time she had her own consulting company and a lot of the wind developers would use her as community outreach and it might be interesting to get her perspective since she is a Saratoga native and has experience with that particular issue opposition.

Appendix 7

February 27, 2012
1:00 pm
Sustainable Saratoga Member

Lawrence Toole Interview

Team Solar: What was your role in developing a proposal for the Weibel Ave Solar Park?

Larry: I was the primary author of the Weibel Ave proposal. I have attached the initial document that outlines the concept. My educational background includes a B.S. in Meteorology and Masters in Agronomy. My youngest son, who is completing his Masters in Environmental Policy also helped me with the financial analysis. Together we completed the initial concept paper and then I asked Sustainable Saratoga (I'm on the board) to consider endorsing the concept. They agreed and with that backing we presented the concept to Saratoga Springs City Council last year. I don't work for the city. My involvement has simply been as a concerned citizen.

Team Solar: What was the main incentive to implement solar in Saratoga (economic, social, etc.)?
Larry: I would argue it is a combination of economic, social, and financial. The goal has been to reduce the carbon emissions of the City and at the same time help the city save money long term on electricity costs.
Team Solar: What is the current status of the proposal?
Larry: The City issued an RFP last year. I helped them convert my stuff into the RFP. We had 14 companies respond and the City selected Sun Edison to develop the solar array. For the project to move forward, part of the financing needs to come from NYSERDA's solar financing incentive program. We are waiting to hear whether we will be awarded financing based on an award round last year. If we don't get financing from that round, the city will probably resubmit their proposal for consideration in a financing round this year.
Team Solar: Would the array be private, public, or a mixture of both? (We were slightly confused when reading articles that talked about this)
Larry: Please see attached documents. The basic concept is that Sun Edison finances the entire project, builds the solar array on the city's landfill, and the city agrees to sign a long term Power Purchase Agreement with Sun Edison to purchase electricity at a given price for a given period of time. That price has to be acceptable to Sun Edison from a ROI perspective and the City for a cost perspective. We believe with funding from NYSERDA a price point can be reached that is good for both Sun Edison and the City.
Team Solar: Was or is there any resistance towards the project?
Larry: So far there has been little resistance. Unlike the Skidmore project, the location of the Weibel Ave landfill helps to reduce community resistance. On the east side is 87 N, the north and south ends have no development, and the west side has a new development. However, the landfill is elevated and will not be very visible to the new development. It is unclear whether resistance will develop as the project evolves.
Team Solar: How long would the project take? Any barriers/hurdles to overcome?
Larry: We need to get NYSERDA financing. Then the integrity of the landfill needs to be confirmed so that a solar array can be built there. Preliminary analysis looks very promising. Interconnection to the grid must also be spec'ed out and costs finalized, but it looks like costs will be on the low end given existing infrastructure nearby. Sun Edison will be responsible for all the costs.
Team Solar: Would Saratoga utilize NYSERDA grants?
Larry: Yes, the finances of the project are much better with NYSERDA funding for a portion of the installed costs.
Team Solar: Were there other locations considered other than the landfill? Why did Saratoga end up choosing the landfill?
Larry: Our focus has always been on the landfill.
Team Solar: Did you model the proposal off of the proposed solar array on a landfill in Troy?

Larry: No we did our own modeling. We used a solar analysis tool called, SAMS, from the National Renewable Energy Lab to complete our own feasibility analysis. We wanted to first prove to ourselves that with the proper amount of funding and solar array size, the concept could work from a financial and energy production perspective.

Team Solar: What company installed the solar array?

Larry: Sun Edison was selected as the company to finance and build the solar array. The City will buy back all the electricity produced by the array at an agreed upon price set by the Power Purchase Agreement (PPA).

Team Solar: How long would the payback period be?

Larry: Contract will be most likely for 20 years. Payback period would occur before that, but this is not a payback project from the City's perspective. We do think there will be opportunity for the City to save money on their electricity costs compared to business as usual scenarios.

Team Solar: What is the potential size of the array?

Larry: 2 MW (note the original plan was 1 MW, but that got increased to 2 MW)

Team Solar: Would Saratoga get the RECs? Does the city currently have any?

Larry: We believe the City would still have opportunity to get the RECS. I'm not sure if City has RECs now.

Team Solar: What other people can we talk to about this project?

Larry: Until the City sees where it stands with NYSERDA funding, I'm not sure it would make sense to talk to anyone else. Once a funding award occurs, you may want to talk to the City's Finance Department. They sponsored the RFP and have been strong advocates of the project.

Team Solar: How strong are the financial incentives to implement solar in NY? Is this part of the reason a proposal was formed for Saratoga to install solar?

Larry: Yes, NYSERDA funding helps to bring costs down to a level where a developer can take on the project and offer back to the City an electricity price that creates a win-win situation.

Team Solar: What is the process like for a town to get a grant from NYSERDA?

Larry: You simply complete an application form and submit your project in for consideration. It's a competitive process. The state looks for projects that need the least amount of incentive funding per installed kWH. You compete against potential project across the state.

Team Solar: What are the main differences between a solar array on a landfill and a solar array on a normal plot of land?

Larry: You have to be careful that you don't puncture the landfill cap with any structures added to the surface. Solar on landfills has been occurring all over the country, so the technology to do this is proven and works. Construction costs can be slightly higher, but not a barrier.

Appendix 8

Interview: Email

April 16, 2014

12:00 pm
Bard College Energy Efficiency Coordinator

Daniel Smith Interview

Team Solar:What was your role in Bard's solar project?
Dan: I participated on project development team (i.e. contract vetting/edits, review of site planning and technical documents), was the Bard liaison for construction logistics, and am responsible for conducting data analysis to verify performance.

Team Solar: What are Bard's main incentive to implement solar (economic, social, etc.)?
Dan: There are several main reasons contributing to Bard's decision to implement solar: Economic & Operational (we are paying less than grid prices per kWh for the electricity produced by array, and aim to benefit from reduced power demand); Social (demonstrating viable technology to increase awareness of renewable energy systems) and Environmental (standing by Bard's commitment to implement renewable energy systems and reduce our energy and greenhouse gas footprint)

Team Solar:Has there been any resistance towards the project?
Dan: Like any large capital project that utilize economic and land resources, the project needed to clear various forms of approval, including approval by Bard's financial team and board of trustees, plus building-site approval and building permitting. All and all, the project moved fairly smoothly through development and planning phases.

Team Solar:How long will the project take?
Dan: Initial conversations and development of the project began in early Spring 2012, with agreements secured at the end of Summer 2012. Construction of array & electrical infrastructure began, in stages, in June 2013 and was completed in December 2013.

Team Solar: Have there been any barriers/hurdles to overcome?
Dan: There are always logistical barriers, in some form or another, to overcome in any construction project; however, likely the most notable barriers to this project were construction-based. Archaeological analysis and site approval (parts of Bard College's "rural" campus have known archaeological sites, and therefore we take special consideration to screen and approve sites) and unfavorable weather conditions during construction (Summer 2013 was very rainy, making site conditions difficult and delaying construction progress, as did large Fall/Winter snow storms)

Team Solar:How and when did the idea emerge and who are the key players in researching/forming the plan for the array?

Dan: Various members of Bard's administrative, sustainability, and operations team had roles in researching, developing, and approving the project, as well as overseeing the construction process.

Team Solar: How is Bard financing the project?
Dan: The project was financed using a Power Purchase Agreement, and paid for using the BardCollege "Green Fund"-- an account created to fund campus sustainability and energy efficiency projects. The Green Fund is fed by monies collected from campus parking fees, revenue from paper & electronics recycling, and reinvestment of NYSERDA incentives from other energy upgrade and new construction projects. Affording the solar project came as a result of several years of saving into the Green Fund.

Team Solar: Will Bard utilize NYSERDA grants?
Dan: NYSERDA incentives were awarded, via a competitive bid process, to various solar developer companies in the state and greater region. These companies in turn pass along the incentives to clients in the form of attractive economic terms and reduced paybacks.

Team Solar: Were there other locations considered other than the one proposed?
Dan: We looked at a handful of other possible sites on campus, but settled on final location due to its solar resource (limited shading), proximity and ease to connect to existing electrical infrastructure, and because its was unlikely to be needed for future campus development projects.

Team Solar: What company is installing the solar array?
Dan: SolartTech Renewables, LLC (Kingston, NY)

Team Solar: How long is the payback period?
Dan: Simple payback is 8 to 10 years. After that, Bard will enjoy all electricity produced by array for free.

Team Solar: What is the size of the array?
Dan: The nominal, nameplate capacity rating of the system is 280 kW-DC. After conversion by inverters to AC-electricity and transmission losses, the system has a peak power output of about 234kW-AC.

Team Solar: Does Bard get the RECs?
Dan: No, Bard does not receive any RECs for this project. Don't quote me on it, but I believe NYSERDA keeps and sells the RECs from solar projects that receive NYSERDA incentives.

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