NEW YORK SOLAR INDUSTRY DEVELOPMENT AND JOBS ACT OF 2011

Workshop in Applied Earth Systems Management
MPA in Environmental Science and Policy, Fall 2011

COLUMBIA SIPA
School of International and Public Affairs

THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

NEW YORK SOLAR INDUSTRY DEVELOPMENT AND JOBS ACT OF 2011

AUTHORS
Taraf Abu Hamdan
Andi Broffman
Frances Chen
Joseph Daniel
Ursula Fernández Baca
Seonggeun Heo
Joseph Nyangon
Juan Felipe Rengifo-Borrero
Andrea Skinner
Sunserae Smith
Maria Sotero
Desmond Tay

REPORT
Joseph Nyangon, Chief Editor
Juan Felipe Rengifo-Borrero, Designer

MANAGEMENT
Andi Broffman, Manager
Desmond Tay, Deputy Manager

FACULTY ADVISOR
Professor Steven A. Cohen

Workshop in Applied Earth Systems Management
MPA in Environmental Science and Policy, Fall 2011

School of International and Public Affairs / The Earth Institute
Columbia University

Preface

This report is the culmination of the Workshop in Applied Earth Systems Management for fall 2011, a core course for the Master of Public Administration in Environmental Science and Policy at Columbia University's School of International and Public Affairs.

The document provides a political analysis of the New York Solar Industry Development and Jobs Act of 2011 and a plan for the successful implementation of this Act. The analysis and plan are based on the A5713B version of the Act considered during the 2011-12 regular session of the Assembly on February 25, 2011. This report serves as a sequel to the environmental analysis report of the Act completed in summer 2011. It is a management simulation of a statute that has been proposed but not yet enacted.

Acknowledgements

First and foremost, we would like to thank our faculty advisor, Professor Steven Cohen, for his guidance and support throughout the past two semesters. We would also like to acknowledge Shaun Chapman (Vote Solar), Toby Couture (E3 Analytics), Anne Dalton (New York State Public Service Commission) and Wilson Rickerson (Meister Consultants Group), for sharing with us their views and thoughts. Additionally, we thank Darian Logan for the logo design.

Table of Contents

Acronyms and Abbreviations

CO_2	Carbon dioxide
FTE	Full-time Equivalent Employee
GHG	Greenhouse gases
GWh	Gigawatt-hour
IPCC	Intergovernmental Panel on Climate Change
MWh	Megawatt-hour
NOx	Nitrogen oxides
NYSERDA	New York State Energy Research and Development Authority
PSC	Public Service Commission
PV	Photovoltaic
RFP	Request for Proposals
RPS	Renewable Portfolio Standard
SO_2	Sulfur dioxide
SREC	Solar Renewable Energy Credit
SREWG	Solar Renewable Energy Working Group
The Act	New York Solar Industry Development and Jobs Act of 2011

EXECUTIVE SUMMARY

New York is the fourth largest energy-consuming state in the United States. Seventy-seven percent of the state's total energy consumption comes from fossil fuels, which consist of petroleum, natural gas, and coal. The state's heavy reliance on fossil fuels contributes to environmental and human health problems caused by the extraction and combustion of fossil fuels, as well as global warming.

To reduce the state's consumption of fossil fuels, the New York Solar Industry Development and Jobs Act of 2011 aims to generate 3.0% of New York State's electricity from solar photovoltaic by 2025, which equates to an estimated 5000 megawatts (MW) of electricity generation. To realize the rapid and sustainable development of the state's solar power industry, the bill proposes the creation of a solar market by mandating that all electric suppliers source an increasing annual amount of electricity from a range of solar power generators in New York State.

The Public Service Commission (PSC), in conjunction with New York State Energy Research and Development Authority (NYSERDA), is responsible for the implementation of the Act. To achieve the goals of the Act, PSC will design and implement a program consisting of four primary pillars:

- Provision of model solar power purchase agreements with optional flexible terms to facilitate the purchase of solar power by electric suppliers from generators of various capacities;
- Imposition of a moderate monetary penalty on electric suppliers that fall short of their annual purchase requirements;
- Creation of the "Solar Champion" incentive program to recognize and reward electric suppliers that exceed their annual purchase requirements;
- Utilization of a Solar Renewable Energy Credit (SREC) tracking system to monitor compliance and solar market development in New York State (note: NYSERDA will establish and operate the tracking system).

To implement the program effectively, a new permanent unit – the Solar Renewable Energy Working Group (SREWG) – will be created within PSC's Office of Electricity and Efficiency. This new group, consisting of four full-time employees, is responsible for the startup and continued operation of the program. Throughout the program, a comprehensive performance management system will track a variety of outcome indicators to inform PSC's decision-makers, enabling them to evaluate and improve program implementation.

In the first-year of the program, PSC will engage external economic analysis and public relations consultants to support them in getting the program off the ground. The estimated operational budget for the first year is $6.39 million, of which about 90% is allocated for the establishment of the tracking system, creation of the solar incentive program, and analysis of the solar market.

The Act represents a small but solid step to steering the state's energy consumption patterns in a more sustainable direction. **While generating 3% of electricity from solar power will not solve all of the state's environmental problems or entirely eliminate its carbon footprint, it is expected to catalyze solar power investments and create 22,000 direct and induced jobs in the New York, and help the state avoid 4.9 million tons of CO_2 emissions annually by 2025.**

INTRODUCTION

The purpose of this report is to simulate the implementation of the New York Solar Industry Development and Jobs Act of 2011 (version A5713B of the Act that was considered during the 2011-12 regular session of the Assembly on February 25, 2011).

Under our simulation, we assume that New York State legislature passed the Act just before the 2011 summer recess, and PSC has commenced implementation of the Act immediately following its passage.

This report is divided into three sections. The first section presents New York State's energy consumption, the associated environmental consequences, and the solution proposed by the Act. It also highlights the political background of the Act, provides a legislative timeline, and discusses potential political outcomes.

Addressing the management questions in detail, the second section provides the program design structure, identifying both the mandatory and discretionary elements of the program.

Finally, the third and last section presents our recommended implementation plan for the Act, including an organizational and contracting plan, budget, calendar, and performance measurement system.

PART I:
THE ACT AND ENERGY SITUATION IN THE STATE OF NEW YORK

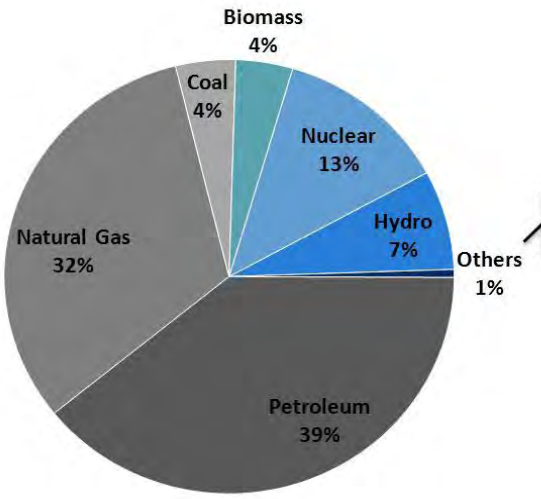
New York State Energy Consumption

New York is the fourth largest energy-consuming state in the United States – consuming 1,119,092 gigawatt-hours (GWh) of energy annually – with commercial, residential and transportation sectors accounting for the highest energy consumption. While New York State's energy consumption profile mirrors that of many other states, its energy consumption pattern has two relatively unique features: low per capita energy consumption due to its infrastructure and substantial renewable energy sources in its energy mix.

Despite its high-energy consumption rates, New York State's per capita energy consumption is the lowest in the continental United States. In 2009, New York State accounted for 6.3% (19.3 million people) of the country's population but only 4% of the total primary energy consumption in the US. The state's public transport and home heating systems are among the various factors that contribute to its relatively higher energy efficiency. For instance, as comparatively few households in New York use electricity to heat their homes, they consume 50% less electricity than an average U.S. household. Most of these greater energy efficiencies are obtained in New York City; when you remove the city from the state's data, New York is one of the least energy efficient states in the nation.

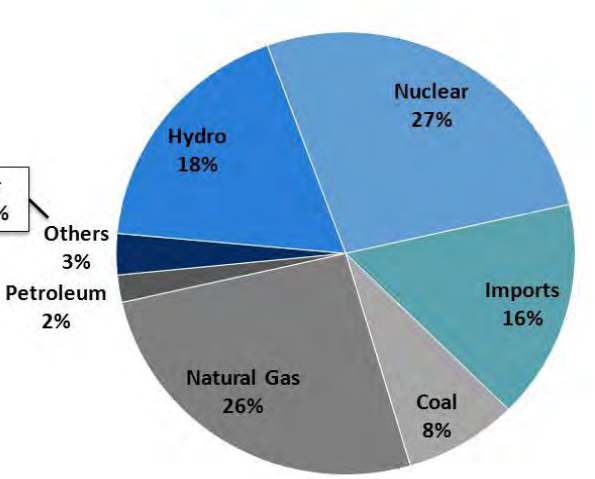
Unlike many other states, New York does not depend on one single fuel to generate electricity; it produces electricity from a variety of sources. In 2009, 27% of the state's electricity was generated from nuclear, 26% from natural gas, 18% from hydropower, 16% from net electricity imports, 8% from coal, 2% from petroleum, and 3% from other sources (see Figure 2). This mix of electricity sources renders New York State's power grid relatively flexible and more resilient to price fluctuations in energy markets. Therefore, experts believe that New York State may have considerable potential in the realm of renewable energy. The state is currently the largest hydroelectric generator among states east of the Rocky Mountains; it is also one of the top generators of power from municipal solid waste and landfill gas in the nation.

Notwithstanding its relatively diverse energy profile, as seen in Figure 1, more than 77% of New York's total energy consumption is still fossil fuel based. Such a reliance on fossil fuels carries with it significant environmental



1,119,092 GWh

FIGURE 1: New York State's total energy consumption by fuel type, 2009[1]



393,815 GWh

FIGURE 2: New York State's electricity generation by fuel type, 2009

implications. The extraction and combustion of petroleum, natural gas and coal damage ecosystems, pollute air and water, and contribute to global warming.

Recognizing this, New York State is striving to modify its energy portfolio through various initiatives, such as the Renewable Portfolio Standard (RPS) adopted by PSC in September 2004, which requires 30% of the state's electricity to be generated from renewable sources by 2015. Another such initiative is the New York Solar Industry Development and Jobs Act of 2011, the focus of this report.

Electricity transmission tower

The Environmental Problem of Fossil-based Energy Consumption

Fossil fuel extraction and combustion processes impact the environment in three main ways: they cause ecological damage, pollute air and water, and induce climate change. To fully appreciate how reliance on fossil fuels causes these environmental problems, one needs to dissect the fossil-fuel extraction and combustion processes.

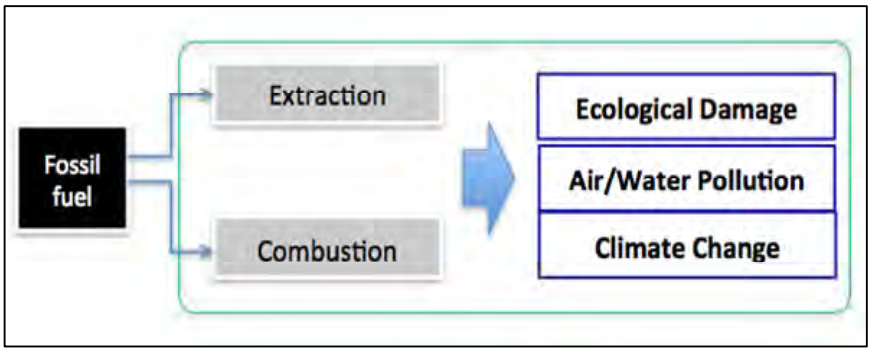


FIGURE 3: Concept map for environmental problems caused by fossil-based energy use

Extraction of Petroleum

Extraction, which entails drilling, pumping, and transporting petroleum from onshore and offshore underground oil fields runs the risk of accidents such as leakage and major spills. Oil leaks release toxins such as benzene into the immediate environment. Further, oil is chemically toxic to plant and animal life and can drastically reduce oxygen in aquatic environments and extensively disrupt ecosystem functions.[8] The 2010 Deepwater Horizon oilrig spill demonstrated the potential consequences triggered by oil extraction. The Deepwater Horizon explosion killed 11 people and released millions of barrels of crude oil into the Gulf of Mexico.[9] This spill polluted the Gulf's aquatic ecosystems and had devastating economic impacts on the region (especially its fisheries).[10]

BP "Deepwater Horizon" oil spill in 010

Extraction of Natural Gas

Hydraulic fracturing (also known as "hydrofracking") is one of the main methods used to extract natural gas today; about 90% of the natural gas wells in the United States deploy hydraulic fracturing to enhance gas recovery.[11] This method of natural gas extraction disrupts the environment by fracturing the lithosphere and introducing toxins into the subsurface of the Earth, including groundwater aquifers. Pressurized fluids are pumped deep into the subsurface to fracture the rock layers, thereby forcing natural gas to the surface. The fluids deployed are a mixture of water and approximately 750 chemical compounds including methanol, lead and benzene. A report by the United States House of Representatives Committee on Energy and Commerce disclosed that some of the chemicals used in hydrofracking

fluids are regulated under the Safe Drinking Water Act for their health risks.[12] Natural gas extraction via hydrofracking therefore increases the risks of these toxins seeping into the soils and groundwater, and ultimately compromises ecological systems and human health.

Extraction of Coal

The mining of coal, namely via the mountain-top removal method, drastically alters topography and deposits large amounts of debris and particles into the atmosphere and hydrosphere. The process destroys wildlife habitats and vegetation, and allows acids, chemical mining by-products, and particulates to seep into waterways and aquifers through run-off. Carbon monoxide and hydrogen sulfide gas are also produced during surface coal mining processes, threatening ecological systems and human health.[13]

Combustion of Fossil Fuels

The combustion of fossil fuels emits a host of harmful compounds, including greenhouse gases (GHG), nitrogen oxides, sulfur oxides, and mercury, into the environment causing environmental and human health problems.

Nitrogen oxides released from fossil fuel combustion react with ammonia, water vapor and other small particulate compounds in the air to form smog. Apart from impairing visibility and causing eye and nose irritation, small particles from smog penetrate deep into the sensitive parts of the lungs and can cause respiratory diseases such as asthma and lung cancer.[14]

When nitrogen oxides and sulfur dioxide emissions react with water molecules in the atmosphere, acidic precipitation is created. Acid rain acidifies water bodies, damages vegetation and sensitive forest soils, and accelerates the decay of building materials and paints.

Mercury, another byproduct generated by fossil fuel combustion, is a neurotoxin. It damages the functions of the brain and causes other neurological problems.[15] As mercury bio-accumulates in living organisms, it can be transmitted to humans when they ingest contaminated aquatic organisms or water. Coal fired electric plants account for between 13-25% of the atmospheric mercury found in the environment.[16]

Change in landscape induced by mountain-top removal practices in Kentucky

Climate Change

The combustion of fossil fuels releases carbon dioxide and methane into the atmosphere. These gases absorb and re-emit infrared radiation, hence trapping energy in the lower atmosphere and Earth's surface. While this "greenhouse effect" occurs naturally, anthropogenic activities since the Industrial Revolution have greatly increased the amount of greenhouse gases (GHGs) in the atmosphere. The Intergovernmental Panel on Climate Change (IPCC) has confirmed that "warming of the climate system is unequivocal," and GHG emission concentrations "have increased markedly as a result of human activities since 1750… [and] are due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture."[17]

The impacts of climate change include biodiversity loss, extreme weather patterns, and rise in sea levels due to the melting of glaciers. Rising sea levels and extreme weather conditions, such as the growing intensity of hurricanes, are likely to occur at higher frequency and with greater intensity. An increase of extreme weather and climatic patterns will affect sensitive ecosystems such as tundra, mangroves, coral reefs, and high-altitude habitats. The degradation of these ecosystems can lead to extinction of certain plant and animal species.

Climate change threatens plant and animal species

Greenhouse gas emission related to energy production and consumption

Toward a Solution: A5713B - New York Solar Industry Development and Jobs Act of 2011

To address the environmental and human health concerns associated with fossil fuel use, New York State needs to progressively reduce its reliance on fossil fuels as its main energy source. As a step towards this goal, the New York Solar Industry Development and Jobs Act of 2011 provides a market mechanism that creates a diverse and competitive solar energy market in New York State. The legislation is designed to stimulate the growth of the solar energy industry in New York State, create jobs, and reduce the long-term costs of electricity generation.

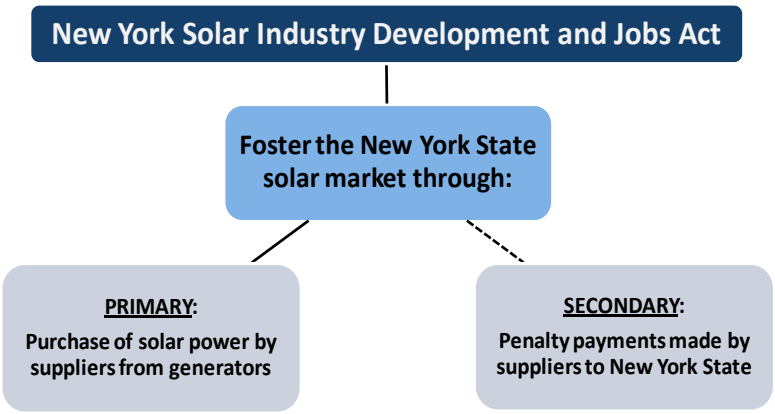


FIGURE 4: Solar market development through mandating demand for solar power coupled with penalty payments

A Market-Based Solution

On the demand side, the Act requires private electric suppliers in New York State and state utilities i.e. the Power Authority of the State of New York and the Long Island Power Authority to source a portion of their power from solar PV generation. Private electric suppliers in New York State will purchase a determined amount of Solar Renewable Energy Credits (SRECs) accounting for a certain percentage of the suppliers' total annual electricity sales. A SREC equates to the green benefits that come from producing and using one megawatt-hour (MWh) of solar powered electricity instead of one MWh of energy produced through fossil fuel combustion.[18] The percentage of SRECs purchased by private electric suppliers will increase annually from 0.15% in 2013 to 3.0% in 2025. The state utilities have slightly more ambitious targets to meet. The ultimate result of these targets allows for at least 3.0% of New York State's electricity to be generated from solar PV by 2025.

Revenue from compliance payments will be invested in solar research and development

If a private retail electric supplier fails to meet their Solar Renewable Energy Credits (SREC) purchasing obligation, it must make Solar Alternative Compliance Payments to cover the shortfall of its annual target. The compliance payment level will be priced higher than SRECs to encourage retailers to purchase solar credits instead of making the alternative payment. While the state budget process may act differently, the bill's intent is that all revenue from the compliance payments will be invested in the solar industry to increase the future supply of SRECs by generating additional supply and demand of solar power. According to this statute, state utilities, unlike private retail electric suppliers are not allowed to meet their annual percentage obligations by making Solar Alternative Compliance Payments.

Mandated Market Supply from Electricity Generators

On the supply end, the New York Solar Industry Development and Jobs Act aims to create a diverse, competitive solar power market. To do so, the legislation demands that electricity generators of all sizes

provide solar power for New York State. As stipulated by the bill, electricity suppliers will acquire 20% of their SRECs from small solar power generators, whose capacity is less than 50kW. The scale of small solar generators can range from individuals who install PV panels on the roof of their house to small businesses that generate less than 50kW of electricity with solar PV technology. Electricity suppliers will then procure 30% of their SRECs from mid-sized solar generators, such as farms that install PV cells on different structures, whose capacity exceeds 50 kW. The legislation intends to stimulate demand for solar at these different scales to ensure broad investment and participation in the state's solar industry.

The bill also requires electricity suppliers to produce separate plans for purchasing SRECs from different size generators. Once established, the solar purchase agreements between electricity suppliers and solar power generators will last fifteen years. To ensure the competitiveness of small solar generators in New York State, electricity suppliers and distributors will pay a predetermined tariff to small-scale solar generators. This tariff aims to adequately cover initial solar-related costs, including the purchase and installation of solar PV equipment, incurred by small solar generators. The state will determine the tariff rate based on considerations for solar industry expenditure differences between varying market segments, the cost of solar equipment, and existing federal incentives that favor small solar electricity generators.

Other Economic Benefits

Advocates estimate that more than 22,000 direct and induced jobs will be created and approximately $20 billion will be generated from the creation of a solar market in New York State.[19] The legislation requires that all employees contracted through the solar purchase agreements to install solar equipment be paid a fair and standard industry wage, which creates an additional attractive element for New York State's solar electricity industry.

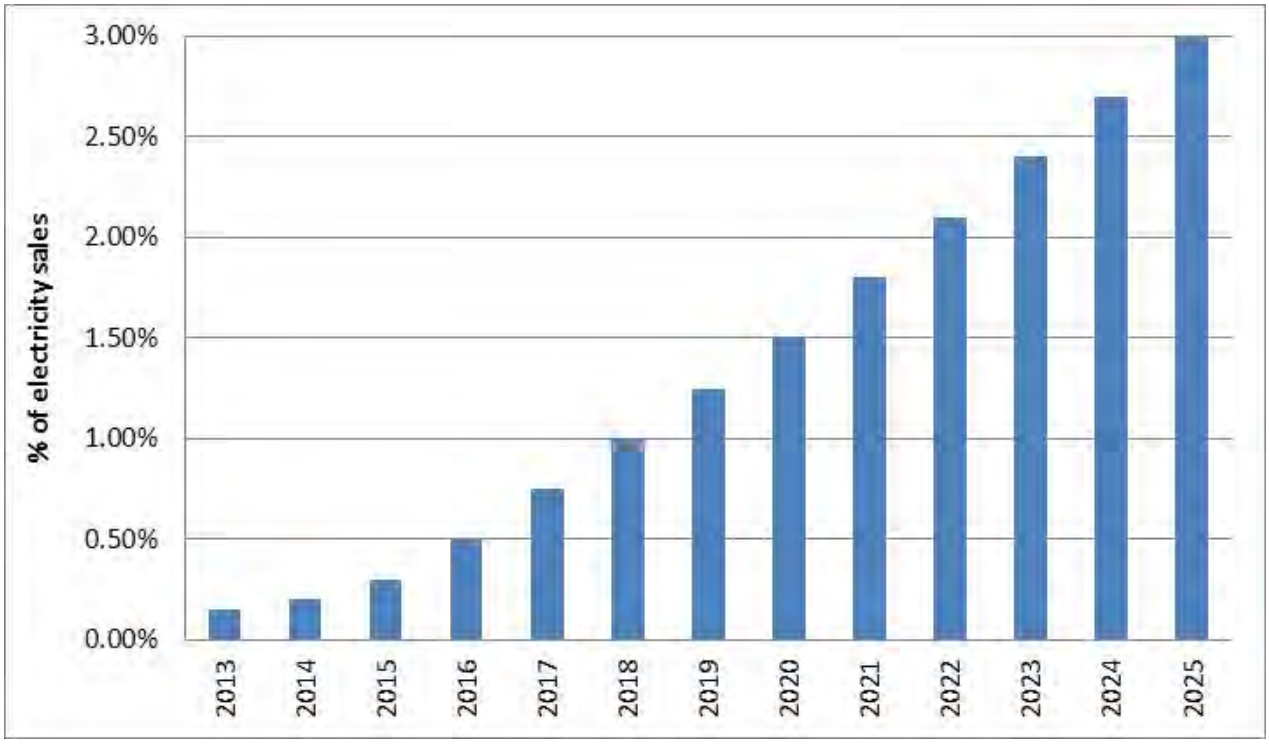


FIGURE 5: Annual suppliers' obligations to purchase SRECs

Legislative and Political Situation

This report assumes the successful passage of the legislative bill (A5713B; June 1, 2011). In actual fact, the bill saw another revision on June 16, 2011 and was ultimately not put to a vote by the state legislature in Albany before the summer recess. This section examines the bill's political prospects.

Getting onto the political agenda

Democrat Steve Englebright authored the bill in the New York State Assembly. Mr. Englebright has a science background as well as a legislative history of supporting the renewable energy market in New York State. Meanwhile, Republican State Senator George Maziarz also introduced the same legislation in the Senate, and in both houses the bill garnered strong bipartisan support. Thirty-one of the Senate's 62 members signed on as sponsors or cosponsors of the bill.[20] Moreover, the bill ostensibly has significant public support. According to the Vote Solar Initiative, a nonprofit research and advocacy group, the bill is seen as a response to the public recognition of the benefits of energy independence as a result of generating electricity from solar power, job creation and combating global warming.[21]

Assembly (Bill: A5713-2011)	**Feb 25, 2011**: Introduced to Assembly; referred to the Committee on Ways and Means
	Mar 2, 2011: Reference changed to Energy
	Apr 13, 2011: Reported referred to the Committee on Ways and Means
	May 13, 2011: Amended to 5713a; and recommitted to the Committee on Ways and Means
	Jun 1, 2011: Amended to 5713b and recommitted to the Committee on Ways and Means
	Jun 16, 2011: Amended to 5713c and recommit to the Committee on Ways and Means

FIGURE 6: Legislative process in the Assembly

Senate (Bill: S4178-2011)	**Mar 22, 2011**: Referred to the Committee on Energy and Telecommunications
	May 18, 2011: Amended to 4178A; recommitted to the Committee on Energy and Telecommunications
	May 24, 2011: Meeting of the Energy and Telecommunications; reported and committed to Finance

FIGURE 7: Legislative process in the Senate

Notwithstanding the apparent bi-partisan and general public support for the bill, the Senate failed to vote on it in August 2011 because of other political interests and issues that dominated the session.

Sources of support or conflict

In general, the proponents of the bill support the idea that government action is needed to create a solar market to reduce our dependency on fossil fuels. Moreover, there is general recognition that government could facilitate innovation and change consumer behavior through public policy tools such as market mechanisms, and there is scope for the public sector to make solar energy cost competitive at an accelerated rate.

Over a hundred industry associations, businesses, environmental and public health groups support the bill and signed a memorandum of agreement. The business corporations include Wal-Mart, Dow Chemical and Mitsubishi; public organizations include the Union of Concerned Scientists, the Natural Resource Defense Center and the New York Solar Energy Industries Association. Notably, General Electric (GE), who wrote the first page of the memoranda in support, felt that "the bill will give the industry the confidence to make long-term investments in solar in

New York" by "providing a long term demand signal."[22]

On the other hand, opponents of the bill can be categorized as follows: those who deny the environmental problems the bill is intended to solve and those who generally oppose government's role in developing the solar energy market. Opponents who deny the problem have special interests in maintaining the continued dominance of fossil fuels. They discount the impact of air pollution, health hazards and ecological damage due to extraction, while often arguing that there is too much uncertainty related to the science of climate change.

Critics of government involvement in creating a solar energy enterprise in New York State argue that the market should work on its own. Additionally, they maintain that the interference of government creates an imbalance in competition, causing some entities to lose market share and affect their profitability.[23] Various utility companies, as well as a utilities trade association the Independent Power Producers of New York, signed a memorandum opposing the bill precisely for this reason. The utility companies consider the existing renewable energy program, the Renewable Portfolio Standard, to be sufficient in promoting and developing clean energy technologies in the state without further legislation. Con Edison even indicated that the Act would result in a significant increase in the cost of electricity for consumers stating, "we don't have a breakdown for the [electricity] bill for our customers, but there are estimates that it would cost customers investor-owned utilities [a total of] $29 billion through 2039."[24]

Reasons for the impasse

Despite the apparent bipartisan support from the legislators, Governor Andrew Cuomo, Speaker of the Assembly Sheldon Silver and Majority Leader of the Senate Dean Skelon remained silent on their positions in regards to the bill. Their combined reticence on the issue has likely influenced the bill's stagnation.

At the time of tight budget constraints in state legislatures across the nation, passage of any unfunded legislation is challenging. Silver has faced some challenges with the new budget and has been relatively passive on various issues of spending. Fearful of further criticisms, the legislature is unlikely to act on this bill unless led by Governor Cuomo.

Potential outcomes

While waiting for a favorable political climate to arise, the bill was nonetheless revised to address some of the concerns expressed by private utilities. The revisions include the reduction of SREC obligations on the private utilities.

Governor Cuomo has the political clout to influence the enactment of such a bill due to his bully pulpit. Additionally, he possesses significant oversight powers regarding PSC. It is not unreasonable to expect him to eventually support this legislation. Prior to being Governor, he had a strong track record of advocating for renewable energy, including supporting solar initiatives in the state. Furthermore, during his campaign, his second top contributor was a clean energy company that provided 0.29% of the total donations his gubernatorial campaign received.[25] However, after his election, he has not been a strong vocal advocate for solar energy, and has remained, as previously mentioned, conspicuously silent on this bill. He has however, articulated his preference for the current Renewable Portfolio Standard policy, which happens to be the same position as the utility companies.[26] He has also signed the New York Power Act that provides for a cost benefit analysis of this bill.

PART II:
PROGRAM DESIGN

Program Design

Notwithstanding this political impasse, the workshop assumes the successful passage of this bill and simulates its implementation. One major task of the workshop was to develop a feasible program design to implement the New York State Solar Industry Development and Jobs Act so as to achieve the goals stated by the bill. The program design process translates the details and requirements within the Act into activities to be completed by PSC with support from NYSERDA. Because the statute is silent on a number of key issues, our design of the operation required a fair amount of discretionary choices. While some specific requirements are present in the Act, deciding how to meet them in the best way will be left to PSC and NYSERDA.

The Act assigns most of the implementation tasks to PSC. In the first year of implementation, PSC is responsible for (i) formulating a template for SREC purchase agreements, (ii) setting the solar alternative compliance payment level, and (iii) establishing an incentive program for suppliers that exceed their minimum SREC purchase requirements[27]. Throughout the program, PSC is also responsible for all administrative and reporting duties. While the majority of the work was assigned to PSC, we note that NYSERDA is assigned the task of creating a SREC tracking system – monitoring the exchange of solar credits between generators and suppliers - and is also directed to assist PSC in setting compliance payment levels.

How these tasks will be completed is a significant policy consideration and will reflect the priorities of PSC. Deciding what terms to include within solar purchase agreements, how aggressive of an approach to take with respect to solar alternative compliance payment levels, and the desired type of incentive program are decisions that will affect the ongoing activities of these agencies, as well as the success or failure of the policy itself.

The program design is guided by three priorities: (i) support strong demand for solar, (ii) take a long-term perspective in light of the need to sustain an entirely new program over more than a decade, and (iii) be economically, politically, and administratively feasible.

FIGURE 8: Four pillars of program implementation

Templates for Purchase Agreements

The Public Service Commission must provide a template SREC purchase plan for utilities' use, as well as establish the terms and conditions that will apply to these agreements, which must last a minimum of 15 years. A tariff for small retail distributed solar must be one of these terms. The Public Service Commission is directed by the bill to consult with NYSERDA in setting this tariff, which can be adjusted in the future as necessary to reflect changes in New York's solar market.

The policy intent of this requirement was to provide a clear and transparent understanding of SREC purchase agreements, and what they would entail, to both electric suppliers as well as solar PV generators. However, PSC has a variety of options in implementing this task, which in fact represents another significant opportunity for the agency to shape the way the Act plays out in the solar market. One option is to make these templates mandatory, requiring buyers and sellers to use the terms established by PSC. This will greatly ease oversight and ensure that purchase agreements are equitable. However, this could decrease flexibility and may not accommodate the optimal conditions desired by suppliers and generators. A second (non-exclusive option) is to provide multiple, detailed terms- for example- outlining the responsibilities and limitations of each party, the conditions that may invalidate the agreement, and requiring that solar PV panels and technology are recycled responsibly when decommissioned. Again, this would provide greater control and clarity but would reduce flexibility for regulated parties. In contrast, a third option available to PSC would be to establish very limited terms within these purchase agreements to allow for maximum flexibility and diversity within the market. This is significantly simpler from an administrative perspective at the outset for creating this template, but would create ongoing complexities in regulation since each agreement would be different.

Based on this analysis, we recommend the integration of the above options: mandating the use of the template provided to ease oversight and provide uniformity, but only include limited required terms. In addition, we recommend stipulating the basic requirements and sections that these agreements must include, but PSC will allow each party to decide on their own terms therein.

Compliance Payments

The Public Service Commission must set and make public the amount and schedule for solar alternative compliance payments, which are the fines that electricity suppliers will be required to pay if they do not buy the requisite level of SRECs for a particular year. The money collected from these payments will be directed to NYSERDA, which will use them for solar industry research and development in New York State. Deciding how high to set these payment levels is a primary policy concern. The Act prohibits the level from being lowered after it is set, but allows it to be increased by PSC on an annual review basis. For this reason, it will be extremely important for PSC to determine how much SRECs are expected to cost electric suppliers, so that this level can be set above that cost. In deciding how much more these payments should cost, one approach is to take an aggressive stance, setting penalty payments 50% or higher than the cost of solar to send a clear and strong signal to the electricity market. However, if the cost of these payments is too high and there is insufficient solar power

generation, the payment will present an undue burden to electric suppliers and opposition could be unnecessarily created. The other option is for PSC to set initial payment levels only marginally above the cost of SRECs. This will reduce the possibility of opposition, and it is a cautious approach to enforcement at the outset of the program. The risk is that if compliance payments are not high enough, the Act will fail at its primary purpose, which is to stimulate the demand for solar.

Taking into account these considerations, we recommend the adoption of a cautious payment level, moderately above the cost of SRECs, bearing in mind that PSC reserves the right to increase this level throughout the duration of the program.

Incentive Program for Electric Suppliers

The Public Service Commission is directed by the Act to establish an incentive program to reward electric suppliers that achieve and exceed SREC purchase obligations in a cost effective way that increases grid reliability and minimizes peak load. PSC is given a great deal of discretion by the Act in establishing whatever form of program it deems most effective in realizing the objectives of the Act.

One option PSC could consider is a program that gave additional weight to credits purchased above the requirement- each could count as 1.5 credits- and to specific other targeted benefits like locally purchased credits. This would incentivize the continued purchase of SRECs, and would allow PSC to increase other desired benefits as well. However, this type of program may prove relatively difficult to administrate and might reduce the availability of SRECs for other electric suppliers. A second type of incentive program could be a marketing and benefits campaign that leverages public branding- a "New York Solar Champion" designation - that would provide outstanding suppliers with free recognition as efficient and environmentally responsible companies. This would be an opportunity to increase awareness about the program and reinforce the market stimulation effect. However, it would require significant administrative investment in order to be effective. A third incentive program option would be the provision of a state allowance or refund to suppliers that exceed their SREC requirement. This option might be the simplest to administer, and necessitate the least preparatory work by PSC, but it would require significant, immediate, and undetermined funding.

After considering the various opportunities and risks associated with these options, we recommend the creation of a recognition program, which contains the option of "solar champions" receiving preference for the allocation of NYSERDA solar research and development funding assistance if they would like to pursue such initiatives.

Additional Administrative Requirements

The Act directs PSC to review and approve solar solicitation plans submitted by electric suppliers. These solicitation plans include suppliers' timetable and methodology for soliciting SRECs. Subsequently, PSC will also review and approve electric suppliers' procurement plans (which are based on approved solicitation plans) that it finds a) are the result of a fair open process; b) will result in the acquisition of SRECs to meet obligations at the lowest reasonable cost; and c) are consistent with other criteria found in the solicitation plans.

The Act also requires that NYSERDA accomplish the following:

- By January 1, 2012, establish an automated SREC tracking system.
- Direct the money from compliance payments to solar industry development and research.

Solar pavilion

Solar farm

PART II:
IMPLEMENTATION PLAN

Organizational, Contracting and Staffing Plan

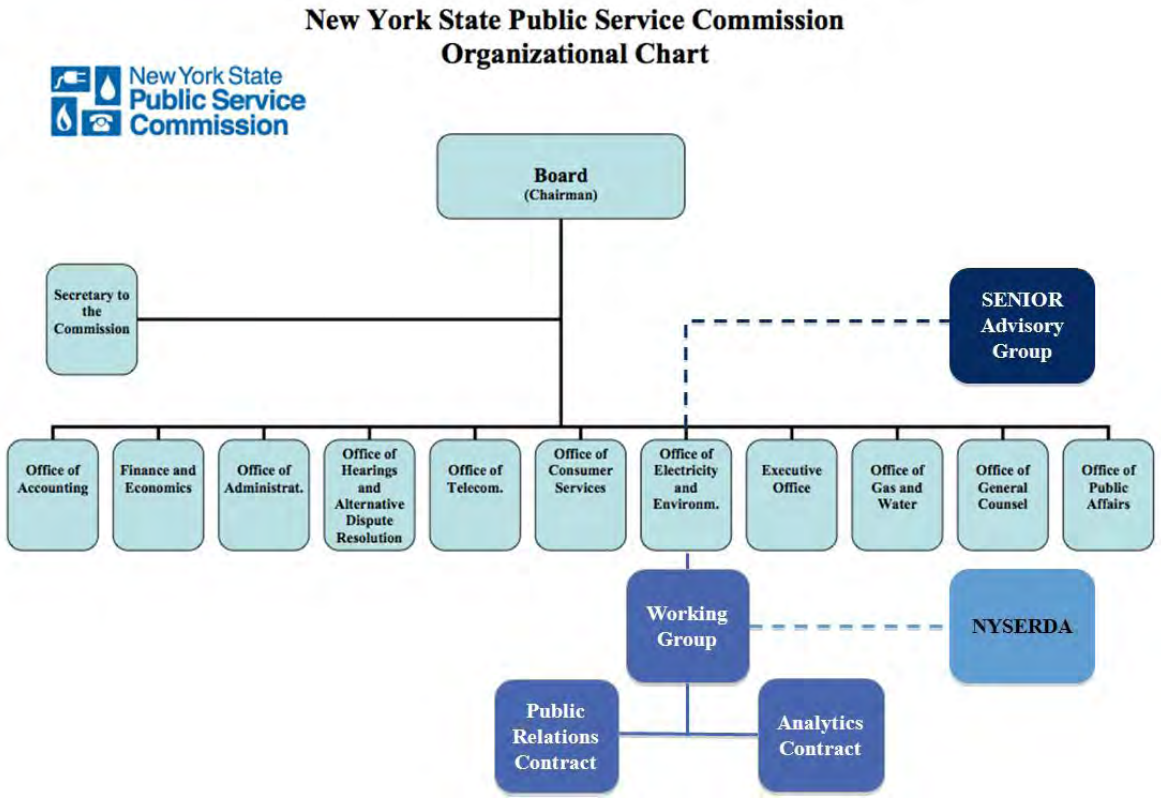
The Public Service Commission is the main implementer of the program. To be able to implement the program effectively, PSC will need to undergo some staffing changes. A new department unit – the Solar Renewable Energy Working Group – consisting of four new full-time equivalent (FTE) positions will be established within PSC's Office of Electricity and Environment to act as the operational home responsible for facilitating the creation and smooth operation of the program. In the first year of implementation, the Solar Renewable Energy Working Group will oversee two contracts – economic analysis and public relations - that support its work to get the program off the ground. The organizational design will also include the creation of a Senior Advisory Group to act as an information sharing entity concerning the progress of the program.

Existing Organizational Structure

The Public Service Commission has a staff of approximately 460 employees.[28] The Public Service Commission includes eleven offices that together provide comprehensive support of the management of utilities in New York State. They oversee facets of utility regulation ranging from consumer services and dispute resolution to finance and economics and electricity and the environment. More specifically, PSC is empowered to set rates, approve financing and set standards for utilities in New York State.

Organizational Plan

The integration of the Senior Advisory Group will help disseminate information about this solar program across PSC. The proposed vertical integration of the Solar Renewable Energy Working Group within the Office of Electricity and Environment



allows the working group to leverage the Office's key expertise and knowledge in electricity pricing as well as administrative support. Ultimately the Solar Renewable Energy Working Group will serve as the Commission's central unit for the implementation of this bill.

Staffing Plan

Senior Advisory Group

The Senior Advisory Group, consisting of office directors within PSC, will meet frequently and regularly for the first 90 days of implementation to help create an environment of information sharing. Following the 90-day period, the Senior Advisory Group will meet monthly to be updated on the program's progress. The Senior Advisory Group will also have a senior staff representative from NYSERDA, which will help to coordinate the necessary relationship between PSC and NYSERDA as outlined in the bill. It is important to integrate NYSERDA within the Senior Advisory Group because of their expertise in areas relevant to the legislation.

Solar Renewable Energy Working Group

The new permanent staff at the Solar Renewable Energy Working Group is responsible for getting the program off the ground while overseeing daily operations and administration. With the exception of the Director of the Working Group who will be appointed internally, the other three full-time staff – Program Coordinator, Technical Manager, and Legal Advisor – of the group will be hired externally. As external hiring will take about three months, the working group must first borrow staff from existing offices within PSC. First, this will alleviate any barrier to immediately beginning implementation of the program as we hire external staff to fill the aforementioned three new positions included in this working group. Additionally, use of existing staff during the hiring period allows us to tap their pre-existing knowledge to jumpstart the implementation process. Once the Solar Renewable Energy Working Group has hired its new staff, the individuals used to staff the office will resume their original functions within their respective PSC offices.

Director	• Oversee the entire operation of the SREWG • Be directly accountable to the Commissioner on the implementation of the Act
Program Coordinator	• Oversee the design of an incentive program, which will encourage electric suppliers to purchase above the required percentage of solar credits • Oversee setting the level of compliance payments, processing of payments that come in, as well as manage the program budget • Oversee daily administration of inquiries, phone calls, filing and quelling concerns from consumers regarding the use and distribution of solar renewable energy • Oversee both public relations and analytic contracted staff
Technical Manager	• Oversee the analysis of new solar technologies • Implement the use of these new solar technologies
Legal Advisor	• Oversee the creation of the template for the purchase agreements between the suppliers and solar generators and mollify opposition from utilities

TABLE 1: Responsibilities of new positions in the Solar Renewable Energy Working Group

The Solar Renewable Energy Working Group will place emphasis on fostering the transition of the industry to a competitive and diverse solar renewable market. It will perform traditional rate-related functions, which apply mainly to the distribution system. Handling of programs, rates, tariffs, and competitive services will also be a function of the Solar Renewable Energy Working Group in addition to oversight of the solar renewable master plan, strategies, emerging technology, and renewable resources.

Office of Electricity and Environment

The Office of Electricity and Environment is a key existing group that the Solar Renewable Energy Working Group will turn to for qualified expertise. This office is the natural receptacle for the working group because it is most familiar with electricity use and tariffs within the state and would have direct contact with the utilities. "This office develops and pursues the energy efficiency initiatives and ongoing renewable energy initiatives. It is able to review critical design options for the both short and long term including cost effectiveness, the role for NYSERDA-based models, and whether certain types of efficiency programs are best administered centrally while others are more suited to delivery by utilities and competitive load-serving entities[29]."

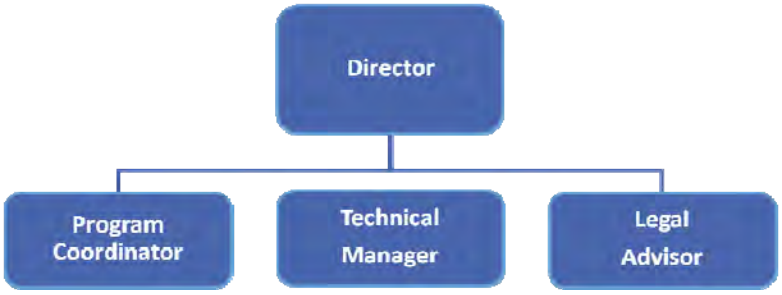


FIGURE 9: Organizational structure of Solar Renewable Energy Working Group

Contracts

The Public Service Commission neither has the requisite expertise or manpower to predict the solar market and set the compliance payment level, or design the solar champion incentive program. Due to these limitations, the SREWG will oversee two contracts that enlist the assistance from external consultants for the first year of implementation. The first contract relates to economic analysis – whereby the consultants will analyze future solar market supply and demand and consequently propose the compliance payment levels. The second contract relates to public relations – whereby the consultants will generate communications and promotional material pertaining to the entire program, publicize the solar champion award, and propose designs for the solar champion incentive program.

Mandated Task	Responsible Entity
Solar Purchase System	New York State Public Service Commission (PSC)
Penalty Payments	Economic Analysis Contract managed by PSC
Solar Champion Incentive Program	Public Relations Contract managed by PSC
Tracking System	New York State Energy Research and Development Authority (NYSERDA)

FIGURE 10: Mandated tasks and responsible entities

The focus of the projected organizational structure will be the transition towards a competitive and highly diverse solar market

First-year Budget

Implementing the bill entails substantial financial cost. Staffing plans and contracts require funding from state resources. Based on the recommended program design, the first-year budget for implementing the New York Solar Industry Development and Jobs Act of 2011 will be $6.39 million. This budget would enable the two main implementing bodies of the bill, the Solar Renewable Energy Working Group within PSC and NYSERDA, to complete tasks that are mandated by the bill, with completion deadlines in 2012.

As shown in Figure 13, the budget plan reflects a strong task-oriented approach to the program design; slightly more than 90% of the budget is allocated to the two main contracts of the program, namely the public relations contract and analytics contract, and establishment and maintenance of the Solar Renewable Energy Credits (SRECs) tracking system by NYSERDA. Only 9% of the budget is allocated to the staff and administration of the SREWG.

The program does not generate any revenue for PSC. Penalty payments collected, as mandated by the Act, will be directed to NYSERDA to fund its solar-related research and development initiates.

The budget was determined via a bottom-up process – i.e. the cost of the contracts were determined based on external quotes and estimates of work hours required; the cost of establishing the SREC tracking system was based on the funding allocated by the New Jersey Board of Utilities to establish a similar tracking system and finally, staff salaries were determined based on New York State Department of Civil Service's salary codes and scales.

The projected first-year budget has a strong operational focus as more than 90% of the resources would be allocated for program activities such as economic analysis, "Solar Champion Award" incentive program and the monitoring system

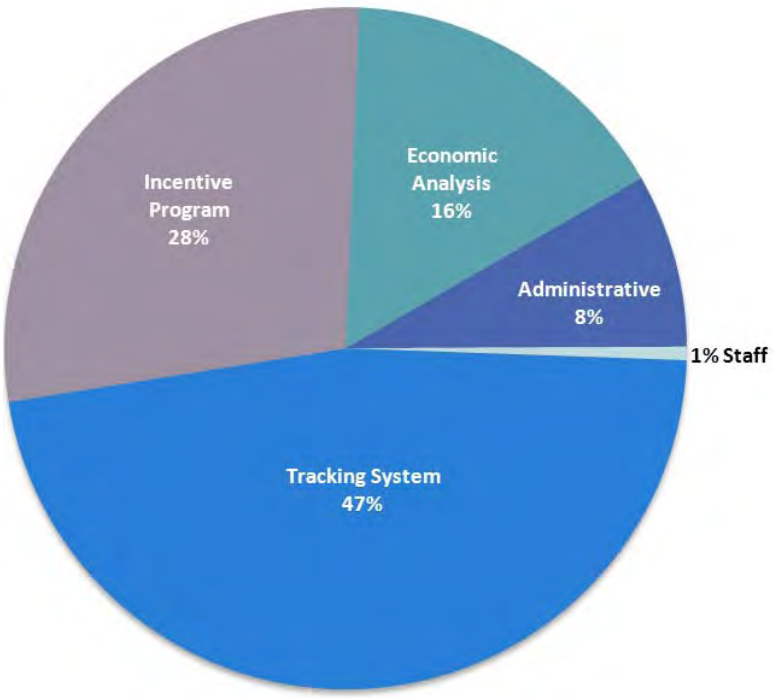


FIGURE 11: First-year budget

Master Calendar

The master calendar presents the final operational plan for the first year taking into account the resource estimates and organizational design described in the preceding sections. Assuming that the bill is passed just before the summer recess, all the deadlines found in the bill A5713B (February 25, 2011) are pushed back five months. This means that a January 1, 2012 deadline found in the bill was moved to June 1, 2012. This move will allow PSC, as intended by the bill, to realistically achieve all of its mandated tasks in the first implementation year.

Key Tasks	Deadline
Set compliance payment level	January 1, 2012
Design Template for solar credit purchase agreements	January 1, 2012
Create an incentive program for electricity suppliers that exceed obligations	July 1, 2012

TABLE 2: Milestones defined in the master calendar

Work tasks in the first year can be divided into two subgroups. The first are tasks entirely internalized by PSC. This includes the hiring process and the review and approval of solicitation and procurement plans submitted by utility companies. The hiring process will conclude in the early part of the second quarter of 2012. The second subgroup of tasks is that performed through the contracts and by NYSERDA. The program design is set up in a manner such that PSC will act as a general contractor on establishing the incentive program, and setting the alternative compliance payment level. To initiate each of these contracts, the legal department will draft and put out a request for proposals (note: because the SREC tracking system has to be done by NYSERDA, no request for proposal process will be needed for this task). Each of the two contracts will be divided into multiple deliverables. The contracted firm will have 14 working days to complete each deliverable and submit the interim product to the technical manager. The technical manager will in turn review the work and submit it to the director who will then review and approve it. This iterative approval process will repeat until each milestone is completed.

FIGURE 12

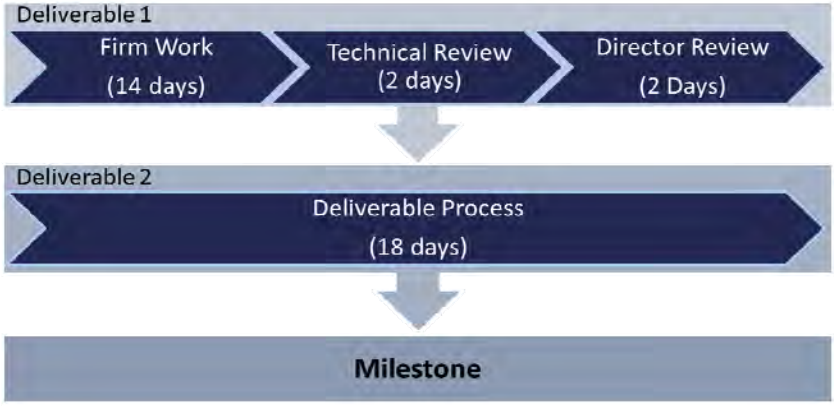


Figure 12 shows the cycle define for the completion of the different deliverables defined in the master calendar

Performance Management

The Public Service Commission will also establish and maintain a comprehensive performance management system to monitor the achievement of the bill's goals throughout the life of the program. This system will guide PSC, so that policy and program improvements in the bill and in the program design are carried out. Based on the requirements established by the New York Solar Industry Development and Jobs Act of 2011, we have identified three main goals, namely: - (i) solar market development; (ii) jobs creation in the solar energy market; and (iii) emission reduction.

<u>Goal 1</u>: Solar market development

The solar energy market in New York State is in a nascent position with less than 0.1% of total New York State electricity generation deriving from solar power. This minimal percentage is primarily due to investment costs. The current features of this small solar energy market are defined by a limited number of participants, both generators and suppliers. Therefore, the program's success in developing the solar energy market will be measured through the 5 indicators included in Table 3.

<u>Goal 2</u>: Jobs creation in the solar energy market

The social component of the program is geared towards the creation of new jobs in the sector that provide fair wages. These jobs will contribute to the development of a solar energy market while creating employment opportunities for New York State's residents. We have defined the indicators included in Table 4 to track the number of jobs created.

Indicator	Source	Responsible Entity	Reporting Frequency
1. MWh of solar energy traded (# of MWh)	Signed agreements	NYS PSC	Monthly
	Tracking System	NYSERDA	
2. Average price per MWh of solar energy (US$ per MWh)	Signed agreements	NYS PSC	Monthly
	Tracking System	NYSERDA	
3. Composition of generators and suppliers in the market (# of companies per category)	Signed agreements	NYS PSC	Monthly
	Tracking System	NYSERDA	
4. Research and development projects implemented (# of projects, US$ expended)	R&D program report	NYSERDA	Annually
5. Suppliers that bought additional SREC to the required (# of companies, US$ value of additional SRECs)	Tracking System	NYSERDA	Annually

TABLE 3: Performance indicators for the development of the solar market

Indicator	Source	Responsible Entity	Reporting Frequency
1. Jobs per industry per year (# of jobs)	Employment Statistics of NYS	NYS Department of Labor	Annually
2. Average wage per industry per year (US$ per year)	Employment Statistics of NYS	NYS Department of Labor	Annually
3. Parameters per companies size (# of employees per company)	Direct interviews	NYSERDA	Annually

TABLE 4: Performance indicators for employment generation

Indicator	Source	Responsible Entity	Reporting Frequency
1. Emissions reduction per MWh (# Tons of emissions/ MWh)	National Inventory Emissions	EPA	Annually
2. MWh of solar energy traded (# of MWh)	Signed agreements	NYS PSC	Annually
	Tracking System	NYSERDA	

TABLE 5: Performance indicators for emissions reduction

<u>Goal 3</u>: Emissions reduction

The environmental objective of the program is to reduce air pollutants and greenhouse gas emissions by lowering the percentage of electricity generated from fossil fuels. In this regard, NYSERDA will

provide an annual report detailing the estimates of emissions avoided by the increased use of solar energy. This figure will be extrapolated from the amount of solar energy in MWh traded in the market, as well as the emission factors provided by the United States Environmental Protection Agency.

We have defined the indicators in Table 5 for measuring emission reduction. The overall program evaluation process, including the feedback and improvement processes are performed annually based on the analysis of the annual indicators presented in the reports prepared by the SREWG for PSC and NYSERDA.

The SREWG, through its Director, will submit proposed upgrades and improvements for the program to the Senior Advisory Group for its approval.

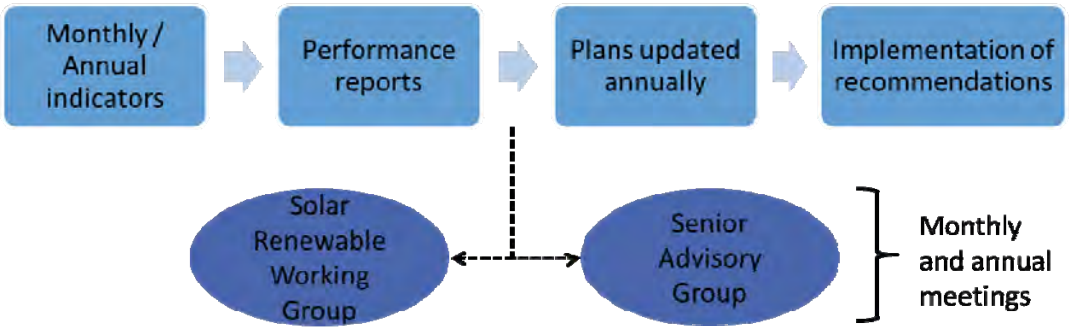


FIGURE 13: Program Feedback Process

CONCLUSION

The Act presents a triple-win opportunity for New York State, in terms of economic, environmental and social benefits. Generating 3% of electricity from solar power by 2025 is expected to yield a number of substantive outcomes: -

- New investments for 5000MW of solar PV installed capacity;
- Reduction of 4.9 million tons of carbon dioxide emissions (equivalent to taking 840,000 cars off the streets of New York State);
- Creation of 22,000 direct and induced jobs throughout the program duration (slightly more than half of the jobs created in the private sector in New York City between September 2010 and September 2011).

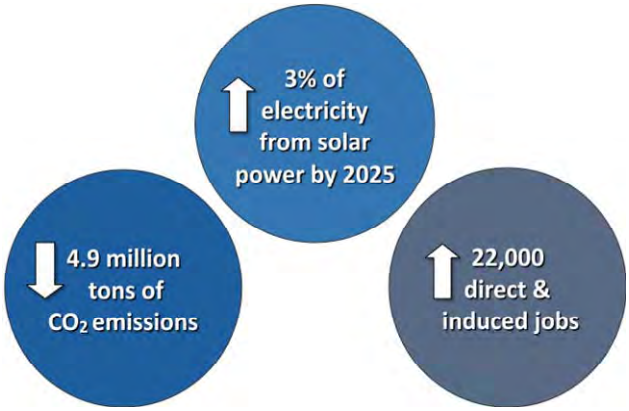


FIGURE 14: Long-term vision of program success

Overall, this Act represents a small but solid step to steer the state's energy consumption patterns towards a more sustainable direction. Indeed, converting 3% of the electricity generated in New York State to solar will not comprehensively solve the environmental problems associated with fossil fuel extraction and consumption. The transition process must, however, start somewhere. A modest step like this one can allow for midcourse corrections and fine tuning before we move towards wider implementation. This Act contributes to addressing today's environmental problems with a market-based approach that promises a catalytic effect on the State's solar energy investments in the future.

Appendix A: Detailed Summary of the Act

AO5713B: New York Solar Industry Development and Jobs Act of 2011

- **Bill Overview**

The New York Solar Industry Development and Jobs Act of 2011 will stimulate the growth of the solar industry in New York State. The legislation requires retail electric suppliers, the Power Authority of the State of New York and the Long Island Power Authority to purchase Solar Renewable Energy Credits (SRECs). A SREC equates to the green benefits that come from producing and using one megawatt-hour of solar powered electricity instead of one megawatt-hour of energy produced through fossil fuel combustion (AO5713B, 2011). The SRECs purchased will account for a determined percentage of total electric sales. The percentage of SRECs purchased would increase annually from 2013 until 2025 at which point New York State would be fulfilling 3% of its total electricity usage with solar energy (Bull, 2011).

- **Section-by-Section Summary of A05713B**

S.1 Legislative Intent and Purpose:

The New York Solar Industry Development and Jobs Act of 2011 aims to boost solar energy industry and market development in New York State. The act intends to increase the demand for and generation of sustainable energy, create jobs, reduce the long-term costs of generating electricity, and make the existing electricity delivering grid more reliable. Within this framework, New York State will be among the world's top producers of clean energy, drawing positive attention from the global community and significant investment.

S.2 Short Title:

New York Solar Industry Development and Jobs Act of 2011

S.3:

This proposed legislation introduces a relationship between solar energy generators and retail electric suppliers. A solar energy generator is any individual or business that owns and operates a photovoltaic device, which convert solar radiation directly into electricity and is one of the world's fastest growing solar electricity generation technologies (J. Nyangon, personal communication, June 8, 2011). A retail electric supplier refers to an entity that sells electricity to consumers; a supplier can also be a distributor of solar energy.

The New York Solar Industry Development and Jobs Act would require that retail electric suppliers, starting in 2013, purchase SRECs amounting to 0.15% of its total electric sales; this percentage will increase annually to 3.00% in 2025 except when a supplier's annual expenditures on SRECs exceed 1.5% of its annual retail electricity revenues. If this is the case, its annual requirement for SRECs will stay at 1.5% of its total annual expenditures for subsequent compliance years until the supplier's spending on SRECs falls under 1.5% once again. The legislation allows complying suppliers to bill their customers a flat rate of $0.39 per month to compensate for the supplier's SREC expenses (Stuart, 2010).

If a retail electric supplier fails to meet their SREC obligation, they will make Solar Alternative Compliance Payments. These compliance payments are priced higher than SRECs to encourage retailers to purchase solar credits instead of making the alternative payment. All revenue from the compliance payments will be invested in the solar industry to increase the future supply of SRECs.

The bill directs suppliers to acquire SRECs from different size generators. At least 20% of suppliers' SRECs will be procured from small solar power generators (i.e., individuals who have installed photovoltaic cells on the roof of their house) and 30% from any sized solar generators (i.e., farms that installed photovoltaic cells on different structures) to stimulate demand for solar at these scales and ensure broad investment and participation in the state's solar industry. The bill also stipulates that suppliers produce separate plans for purchasing SRECs from different size generators. The solar purchasing agreements between suppliers and solar power generators will last fifteen years, and electricity distributors will pay a tariff to small solar generators. The rate of the tariff will consider solar industry expenditure differences between varying market segments (personal, small business, not-for-profit), the cost of solar equipment and existing federal incentives that favor small solar

electricity generators. The bill also requires that all employees contracted through these solar purchase agreements to install solar equipment be paid a fair and standard industry wage.

Beginning in 2014, each retail electric supplier will submit an annual report of its progress to the legislation's success. This report will include:

1. The number of megawatt hours of solar energy sold to New York State energy consumers
2. The number of SRECs associated with the aforementioned energy
3. The number of Solar Alternative Compliance Payments made
4. The annual electricity sales revenue and the amount of money spent on SRECs
5. The number of SRECs purchased from small, medium and large solar power generators
6. The number of SRECs acquired through the devised solar purchase agreements
7. The monetary amount of tariffs paid to small solar energy generators

S.4:

The New York State Solar Industry Development and Jobs Act also establishes a relationship between solar energy generators and the Power Authority of the State of New York, a public corporation acting as an electricity provider (New York Power Authority, 2011). This public authority will be subject to similar obligations under this legislation as its retail electric supplier counterparts. A key difference, however, is that the Power Authority of the State of New York's annual SREC purchasing obligation will be initially set at 0.33% of its total annual electricity sales and increase annually to 3.5% in 2025. Additionally, this public authority is not allowed to meet its annual percentage obligations by making Solar Alternative Compliance Payments.

The Power Authority of the State of New York will release solicitation plans and solar purchase agreements similar to the ones devised by retail electric suppliers. These plans will be submitted to the Comptroller, Governor, Speaker of the Assembly, temporary President of the Senate, and Chairs of the Senate and Assembly Energy Committees for review. Beginning in July 2014, the Power Authority of the State of New York will also submit annual reports to the aforementioned parties. This report will detail the public authority's progress in procuring SRECs by including the following:

1. The number of SRECs purchased to meet annual obligations
2. The number of SRECs purchased from small, medium and large solar power generators
3. The number of SRECs acquired through the devised solar purchase agreement

S.5:

The New York State Solar Industry Development and Jobs Act also establishes a relationship between solar energy generators and the Long Island Power Authority. The Long Island Power Authority is a not-for-profit electricity provider (Long Island Power Authority, 2011). Under the New York State Solar Industry Development and Jobs Act, the Long Island Power Authority is subject to the same regulations as the Power Authority of the State of New York mentioned above.

S.6:

If any portion of this legislation is found to be unconstitutional by a court, it can be removed from the bill without affecting the legitimacy of the remaining stipulations.

S.7:

The stipulations in this legislation will be enforced immediately. If a comparable federally sponsored solar electricity program is implemented, this bill can be repealed.

Appendix B: - Program and Line Item Budget

New York Solar Industry Development and Jobs Act of 2011
First-Year Budget

Program Budget

Program Administration			
Personnel Services			
Director	(100% of time)		123,500
Program Coordinator	(75% of time)		75,383
Legal Advisor	(75% of time)		75,383
Technical Manager	(75% of time)		75,383
		Base Salaries	349,648
		Fringe Benefits	178,320
		Total Personnel Services	$527,968
Other Than Personnel Services			
Supplies and materials			5,000
Travel			13,536
Equipment			11,790
Meetings and Occasions			10,000
		Total OTPS	40,326
		Total Program Administration	**$568,294**
Public Relations			
Personnel Services			
			-
		Base Salaries	-
		Fringe Benefits	-
		Total Personnel Services	-
Other Than Personnel Services			
Contract (90 hours per week, 100% time)			1,800,000
		Total OTPS	1,800,000
		Total Public Relation	**$1,800,000**
Research & Analysis			
Personnel Services			
			-

	Base Salaries	-
	Fringe Benefits	-
	Total Personnel Services	-
Other Than Personnel Services		
Contract (160 hours per week for the first 4 months)		1,024,000
	Total OTPS	1,024,000
	Total Research & Analysis	**$1,024,000**
NYSERDA		
Personnel Services		-
	Base Salaries	-
	Fringe Benefits	-
	Total Personnel Services	-
Other Than Personnel Services		
Program Operations		3,000,000
	Total OTPS	3,000,000
	Total NYSERDA	**$3,000,000**
	Total Operation Cost	**$6,392,294**
	Total Project Budget	**$6,392,294**

Line- item Budget

Personnel Services		
Salaries		349,648
Fringe Benefits		178,320
	Total Personnel Services	**$527,968**
Other Than Personnel Services		
Contractual services		2,824,000
Supplies and materials		5,000

Travel		13,536
Equipment		11,790
Meetings and Occasions		10,000
Program Operations (NYSERDA)		3,000,000
	Total OTPS	**$5,864,326**
	Total Operation Cost	**$6,392,294**
Revenue		**$0**
	Total Project Budget	**$6,392,294**

Appendix C - Master Calendar

Task Name	Duration	Start	Finish	Resource Names	Deadline
START	1 day	Sun 1/1/12	Sun 1/1/12		NA
SREC Procurment Plan	**56 days**	**Tue 1/3/12**	**Fri 3/23/12**		**NA**
Receive Plans	1 day	Tue 1/3/12	Tue 1/3/12	Admin	Sat 12/1/12
Legal Review	30 days	Wed 1/4/12	Thu 2/16/12	Legal	NA
Technical Review	15 days	Fri 2/17/12	Fri 3/9/12	Tech Manager	NA
Director Review	10 days	Mon 3/12/12	Fri 3/23/12	Head of OE&E	NA
Solar Solicitation Plans	**56 days**	**Tue 1/3/12**	**Fri 3/23/12**		**NA**
Receive Plans	1 day	Tue 1/3/12	Tue 1/3/12	Admin	Sat 12/1/12
Legal Review	30 days	Wed 1/4/12	Thu 2/16/12	Legal	NA
Technical Review	15 days	Fri 2/17/12	Fri 3/9/12	Tech Manager	NA
Director Review	10 days	Mon 3/12/12	Fri 3/23/12	Head of OE&E	NA
Hire WG Director	**40 days**	**Tue 1/3/12**	**Thu 3/1/12**		**NA**
Compose Job Description	3 days	Tue 1/3/12	Thu 1/5/12	HR	NA
Post Job Opening	15 days	Fri 1/6/12	Fri 1/27/12	HR	NA
Review Apps	7 days	Mon 1/30/12	Tue 2/7/12	HR	NA
Interviews	10 days	Wed 2/8/12	Thu 2/23/12	HR	NA
Make Offer	5 days	Fri 2/24/12	Thu 3/1/12	HR	NA
Hire Legal Advisor	**65 days**	**Tue 1/3/12**	**Thu 4/5/12**		**NA**
Compose Job Description	3 days	Tue 1/3/12	Thu 1/5/12	HR,Legal	NA
Post Job Opening	40 days	Fri 1/6/12	Tue 3/6/12	HR	NA
Review Apps	7 days	Wed 3/7/12	Thu 3/15/12	HR,Legal	NA
Interviews	10 days	Fri 3/16/12	Thu 3/29/12	HR,Legal	NA
Make Offer	5 days	Fri 3/30/12	Thu 4/5/12	Legal	Sun 4/1/12
Send out notice of legal requirements	20 days	Fri 4/6/12	Thu 5/3/12	Legal	NA
Hire Program Coordinator	**76 days**	**Tue 1/3/12**	**Fri 4/20/12**		**NA**
Compose Job Description	3 days	Tue 1/3/12	Thu 1/5/12	HR	NA
Post Job Opening	45 days	Fri 1/6/12	Tue 3/13/12	HR	NA
Review Apps	7 days	Wed 3/14/12	Thu 3/22/12	HR	NA
Interviews	14 days	Fri 3/23/12	Wed 4/11/12	Director	NA
Make Offer	7 days	Thu 4/12/12	Fri 4/20/12	Director	Sun 4/1/12
Hire Tech Manager	**76 days**	**Tue 1/3/12**	**Fri 4/20/12**		**NA**
Compose Job Description	3 days	Tue 1/3/12	Thu 1/5/12	HR	NA
Post Job Opening	45 days	Fri 1/6/12	Tue 3/13/12	HR	NA
Review Apps	7 days	Wed 3/14/12	Thu 3/22/12	HR	NA

Interviews	14 days	Fri 3/23/12	Wed 4/11/12	Director	NA
Make Offer	7 days	Thu 4/12/12	Fri 4/20/12	Director	Sun 4/1/12
Template	**27 days**	**Mon 4/23/12**	**Wed 5/30/12**		**Fri 6/1/12**
1st Draft	**15 days**	**Mon 4/23/12**	**Fri 5/11/12**		**NA**
Legal Review	5 days	Mon 4/23/12	Fri 4/27/12	Legal	NA
Technical Review	5 days	Mon 4/30/12	Fri 5/4/12	Tech Manager	NA
Director Review	5 days	Mon 5/7/12	Fri 5/11/12	Director	NA
Design Template	**12 days**	**Mon 5/14/12**	**Wed 5/30/12**		**NA**
Legal Review	4 days	Mon 5/14/12	Thu 5/17/12	Legal	NA
Technical Review	4 days	Fri 5/18/12	Wed 5/23/12	Tech Manager	NA
Director Review	4 days	Thu 5/24/12	Wed 5/30/12	Director	NA
Analytics CONTRACT (Compliance Level)	**100 days**	**Tue 1/3/12**	**Thu 5/24/12**		**Fri 6/1/12**
Contract Prep	**43 days**	**Tue 1/3/12**	**Tue 3/6/12**		**NA**
Analytics - Contract Draft	7 days	Tue 1/3/12	Wed 1/11/12	Legal	NA
Analytics - Contract RFP	25 days	Thu 1/12/12	Fri 2/17/12	Director	NA
Analytics - Receive Pitches	5 days	Tue 2/21/12	Mon 2/27/12	Director	NA
Analytics - Decision Making Process	3 days	Tue 2/28/12	Thu 3/1/12	Director	NA
Analytics- Award Contract	3 days	Fri 3/2/12	Tue 3/6/12	Director	NA
Analytics - First Meeting	0 days	Tue 3/6/12	Tue 3/6/12	Director	NA
Analytics- Estimation of Current Market	**19 days**	**Wed 3/7/12**	**Mon 4/2/12**	**Legal**	**NA**
Firm Work	14 days	Wed 3/7/12	Mon 3/26/12	Analytics Firm	NA
Tech Review	2 days	Tue 3/27/12	Wed 3/28/12	Tech Manager	NA
Dir Review	2 days	Thu 3/29/12	Fri 3/30/12	Director	NA
Approval	1 day	Mon 4/2/12	Mon 4/2/12	Director	NA
Analytics - Projected Market	**19 days**	**Tue 4/3/12**	**Fri 4/27/12**		**NA**
Firm Work	14 days	Tue 4/3/12	Fri 4/20/12	Analytics Firm	NA
Tech Review	2 days	Mon 4/23/12	Tue 4/24/12	Tech Manager	NA
Dir Review	2 days	Wed 4/25/12	Thu 4/26/12	Director	NA
Approval	1 day	Fri 4/27/12	Fri 4/27/12	Director	NA
Analytics - Milestone: Compliance Level Set	**19 days**	**Mon 4/30/12**	**Thu 5/24/12**		**NA**
Firm Work	14 days	Mon 4/30/12	Thu 5/17/12	Analytics Firm	NA
Tech Review	2 days	Fri 5/18/12	Mon 5/21/12	Tech Manager	NA

Dir Review	2 days	Tue 5/22/12	Wed 5/23/12	Director	NA
Approval	1 day	Thu 5/24/12	Thu 5/24/12	Director	NA
NYSERDA CONTRACT (SREC TRACKING SYTEM)	**125 days**	**Fri 6/1/12**	**Thu 11/29/12**		**Sat 12/1/12**
NYSERDA - Contract Draft	10 days	Fri 6/1/12	Fri 6/15/12	Legal	NA
NYSERDA - First Meeting	5 days	Mon 6/18/12	Fri 6/22/12	Director	NA
NYSERDA - Contract ReNegotation	15 days	Mon 6/25/12	Fri 7/13/12	Legal	NA
NYSERDA - Database Set Up	**19 days**	**Mon 7/16/12**	**Thu 8/9/12**		**NA**
Firm Work	14 days	Mon 7/16/12	Thu 8/2/12	NYSERDA	NA
Tech Review	2 days	Fri 8/3/12	Mon 8/6/12	Tech Manager	NA
Dir Review	2 days	Tue 8/7/12	Wed 8/8/12	Director	NA
Approval	1 day	Thu 8/9/12	Thu 8/9/12	Director	NA
NYSERDA - Complete Graphic User Interface	**19 days**	**Fri 8/10/12**	**Thu 9/6/12**		**NA**
Firm Work	14 days	Fri 8/10/12	Wed 8/29/12	NYSERDA	NA
Tech Review	2 days	Thu 8/30/12	Fri 8/31/12	Tech Manager	NA
Dir Review	2 days	Tue 9/4/12	Wed 9/5/12	Director	NA
Approval	1 day	Thu 9/6/12	Thu 9/6/12	Director	NA
NYSERDA - SREC Tracking System Working Prototype	**19 days**	**Fri 9/7/12**	**Wed 10/3/12**		**NA**
Firm Work	14 days	Fri 9/7/12	Wed 9/26/12	NYSERDA	NA
Tech Review	2 days	Thu 9/27/12	Fri 9/28/12	Tech Manager	NA
Dir Review	2 days	Mon 10/1/12	Tue 10/2/12	Director	NA
Approval	1 day	Wed 10/3/12	Wed 10/3/12	Director	NA
NYSERDA - Prototype II	**19 days**	**Thu 10/4/12**	**Wed 10/31/12**		**NA**
Firm Work	14 days	Thu 10/4/12	Wed 10/24/12	NYSERDA	NA
Tech Review	2 days	Thu 10/25/12	Fri 10/26/12	Tech Manager	NA
Dir Review	2 days	Mon 10/29/12	Tue 10/30/12	Director	NA
Approval	1 day	Wed 10/31/12	Wed 10/31/12	Director	NA
NYSERDA - Milestone: SREC Tracking System	**19 days**	**Thu 11/1/12**	**Thu 11/29/12**		**Sat 12/1/12**
Firm Work	14 days	Thu 11/1/12	Wed 11/21/12	NYSERDA	NA
Tech Review	2 days	Fri 11/23/12	Mon 11/26/12	Tech Manager	NA
Dir Review	2 days	Tue 11/27/12	Wed 11/28/12	Director	NA
Approval	1 day	Thu 11/29/12	Thu 11/29/12	Director	NA

PR CONTRACT (Solar Champion)	**255 days**	**Tue 1/3/12**	**Mon 1/7/13**		**Sat 12/1/12**
PR - Contract Draft	15 days	Tue 1/3/12	Tue 1/24/12	Legal	NA
PR - Contract RFP	45 days	Wed 1/25/12	Thu 3/29/12	Director	NA
PR - Receive Pitches	15 days	Fri 3/30/12	Thu 4/19/12	Director	NA
PR - Decision Making Process	7 days	Fri 4/20/12	Mon 4/30/12	Director	NA
PR - Award Contract	0 days	Mon 4/30/12	Mon 4/30/12	Director	NA
PR - First Meeting	5 days	Tue 5/1/12	Mon 5/7/12	Director	NA
PR - Contract ReNegotation	15 days	Tue 5/8/12	Tue 5/29/12	Legal	NA
Sign Contract	0 days	Tue 5/29/12	Tue 5/29/12	Legal	NA
PR - Audit	**19 days**	**Wed 5/30/12**	**Tue 6/26/12**		**NA**
Firm Work	14 days	Wed 5/30/12	Tue 6/19/12	PR Firm	NA
Tech Review	2 days	Wed 6/20/12	Thu 6/21/12	Tech Manager	NA
Dir Review	2 days	Fri 6/22/12	Mon 6/25/12	Director	NA
Approval	1 day	Tue 6/26/12	Tue 6/26/12	Director	NA
PR - Brand Ambition	**19 days**	**Wed 6/27/12**	**Mon 7/23/12**		**NA**
Firm Work	14 days	Wed 6/27/12	Mon 7/16/12	PR Firm	NA
Tech Review	2 days	Tue 7/17/12	Wed 7/18/12	Tech Manager	NA
Dir Review	2 days	Thu 7/19/12	Fri 7/20/12	Director	NA
Approval	1 day	Mon 7/23/12	Mon 7/23/12	Director	NA
PR - Program Design	**19 days**	**Tue 7/24/12**	**Fri 8/17/12**		**NA**
Firm Work	14 days	Tue 7/24/12	Fri 8/10/12	PR Firm	NA
Tech Review	2 days	Mon 8/13/12	Tue 8/14/12	Tech Manager	NA
Dir Review	2 days	Wed 8/15/12	Thu 8/16/12	Director	NA
Approval	1 day	Fri 8/17/12	Fri 8/17/12	Director	NA
PR - Solar Champion Brand Pitch	**19 days**	**Mon 8/20/12**	**Fri 9/14/12**		**NA**
Firm Work	14 days	Mon 8/20/12	Fri 9/7/12	PR Firm	NA
Tech Review	2 days	Mon 9/10/12	Tue 9/11/12	Tech Manager	NA
Dir Review	2 days	Wed 9/12/12	Thu 9/13/12	Director	NA
Approval	1 day	Fri 9/14/12	Fri 9/14/12	Director	NA
PR - Review Solar Champion Program	**19 days**	**Mon 9/17/12**	**Fri 10/12/12**		**NA**
Firm Work	14 days	Mon	Thu	PR Firm	NA

		9/17/12	10/4/12		
Tech Review	2 days	Fri 10/5/12	Tue 10/9/12	Tech Manager	NA
Dir Review	2 days	Wed 10/10/12	Thu 10/11/12	Director	NA
Approval	1 day	Fri 10/12/12	Fri 10/12/12	Director	NA
PR - Milestone: Approve SCP	**19 days**	**Mon 10/15/12**	**Thu 11/8/12**		**Sat 12/1/12**
Firm Work	14 days	Mon 10/15/12	Thu 11/1/12	PR Firm	NA
Tech Review	2 days	Fri 11/2/12	Mon 11/5/12	Tech Manager	NA
Dir Review	2 days	Tue 11/6/12	Wed 11/7/12	Director	NA
Approval	1 day	Thu 11/8/12	Thu 11/8/12	Director	NA
PR - Campaign Launch	**19 days**	**Fri 11/9/12**	**Fri 12/7/12**		**NA**
Firm Work	14 days	Fri 11/9/12	Fri 11/30/12	PR Firm	NA
Tech Review	2 days	Mon 12/3/12	Tue 12/4/12	Tech Manager	NA
Dir Review	2 days	Wed 12/5/12	Thu 12/6/12	Director	NA
Approval	1 day	Fri 12/7/12	Fri 12/7/12	Director	NA
PR - Campaign Review	**20 days**	**Mon 12/10/12**	**Mon 1/7/13**		**NA**
Firm Work	14 days	Mon 12/10/12	Fri 12/28/12	PR Firm	NA
Dir Review	5 days	Mon 12/31/12	Fri 1/4/13	Director,Legal,Tech Manager	NA
Approval	1 day	Mon 1/7/13	Mon 1/7/13	Director	NA

Image Sources

Page 7 – Bryant Park: Photograph by Juan Felipe Rengifo-Borrero

Page 8 – Empire State Building: Photograph by Joe McNally for National Geographic (Web. 5 Dec. 2011)
http://photography.nationalgeographic.com/photography/photo-of-the-day/empire-state-building-night-new-york/

Page 10: Electricity tower: Galvanized Power (Web. 5 Dec. 2011)
www.galvanizedpower.com

Page 11 – Deepwater Horizon: i.bnet.com (Web. 5 Dec. 2011)
http://i.bnet.com/blogs/bp-photoskimmers_at_work.jpg?tag=contentMain;contentBody

Page 12 – Mountaintop removal practices in Kentucky: Indian Country Today (Web. 11 Aug. 2011)
http://indiancountrytodaymedianetwork.com/2011/01/researchers-to-study-mountaintop-minings-effect-on-watersheds/

Page 13 – Climate change threatens animals: Photo Pharmacy (Web. 11 Aug. 2011)
www.photopharmacyescrow.com

Page 13 – Greenhouse gas emissions: Harvest Power (Web. 11 Aug. 2011)
http://blog.harvestpower.com/tag/greenhouse-gas-emissions/

Page 18 – Solar panels: inhabitat (Web. 5 Dec. 2011)
http://inhabitat.com/largest-solar-plant-in-europe-set-to-open-in-italy/solar-panels-2/

Page 22 – Solar panel pavilion: Black Rock Forest Consortium (Web. 5 Dec. 2011)
http://www.blackrockforest.org/docs/about-the-forest/GreenBuildings/SolarPanels.html

Page 22 – Solar farm: Photograph by Kabl1992 (Web. 5 Dec. 2011)
http://farm2.staticflickr.com/1160/1005751421_5568e58de5_b.jpg

Page 23 – Solar panels: Clean Green Energy Zone (Web. 5 Dec. 2011)
www.cleangreenenergyzone.com

Page 32 – New York City summer sunset: Photograph by Dianemarie007 (Web. 6 Dec. 2011)
http://www.flickr.com/photos/15212763@N04/1592884556/in/photostream

Works Cited

[8] U.S. Fish and Wildlife Service. *Effects of Oil Spills on Wildlife and Habitat*. Fact sheet. Accessed November 13, 2011. Available from: http://alaska.fws.gov/media/unalaska/Oil%20Spill%20Fact%20Sheet.pdf

[9] Restore the Gulf. *Assessing the Impacts of Oil: Next Steps.* Nov 2010. Accessed 14 Aug 2011. Available from: <http://www.restorethegulf.gov/sites/default/files/documents/pdf/Preassessment_Factsheet_11_09.pdf>.

[10] The Environmental Protection Agency. *EPA's Toxicity Testing of Dispersants.* Jan 2010. Accessed 14 Aug 2011. Available from: <http://www.epa.gov/bpspill/dispersants-testing.html>.

[11] The Environmental Protection Agency. *EPA's Toxicity Testing of Dispersants.* Jan 2010. Accessed 14 Aug 2011. Available from: <http://www.epa.gov/bpspill/dispersants-testing.html>.

[12] United States House of Representatives Committee on Energy and Commerce Minority Staff. *Chemicals Used in Hydrofracking.* Apr 2011. Accessed 14 Aug 2011. Available from: <http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic%20Fracturing%20Report%204.18.11.pdf>.

[13] Eltschlager, Kenneth K. *Carbon Monoxide Poisoning at a Surface Coal Mine.* Accessed 14 Aug 2011. Available from: <http://pa.water.usgs.gov/projects/energy/stray_gas/presentations/3_800_Eltschlager.pdf>.

[14] Union of Concerned Scientists. *The Hidden Cost of Fossil Fuels.* Oct 2002. Accessed 14 Aug 2011. Available from: <http://www.ucsusa.org/clean_energy/technology_and_impacts/impacts/the-hidden-cost-of-fossil.html>.

[15] Environmental Protection Agency. *Health Effects, Mercury*. 29 Oct 2002. Accessed 14 Aug 2011. Available from: <http://www.epa.gov/hg/effects.htm>.

[16] United States Geological Survey. *USGS Fact Sheet 095-01: Mercury in U.S. Coal -- Abundance, Distribution, and Modes of Occurrence.* Aug 2011. Accessed 14 Aug 2011. Available from: <http://pubs.usgs.gov/fs/fs095-01/>.

[17] Intergovernmental Panel on Climate Change. *Summary for Policymakers in: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* . 2007. Accessed 14 Aug 2011. Available from: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>.

[18] New York State Assembly. *The New York State Solar Industry Development and Jobs Act of 2011* (AO5713B). May 2011.

[19] Vote Solar. *About the New York Solar Industry Development & Jobs Act*. Accessed 14 Aug 2011. Available from: <http://votesolar.org/wp-content/uploads/2011/04/NY2-Pager_revised_4_8.pdf>.

[20] Martin, Christopher. *Con Ed Fights Solar Rules in New York That It Profits From in New Jersey*. 15 May 2011. Bloomberg. Accessed on: 12 September 2011. Available from: <http://www.bloomberg.com/news/2011-05-25/con-ed-fights-solar-rules-in-new-york-that-it-profits-from-in-new-jersey.html>.

[21] Vote Solar Initiative. *Economic Benefit & Rate Impact Analysis of the New York Solar Industry Development and Jobs Act of 2010*. June 2010. Accessed on: 15 September 2011 Available from: <http://votesolar.org/ny-solar-jobs-act-of-2010/>.

[22] Citizen Campaign. *Memoranda in Support*. Accessed on: 15 September 2011
Available from: <http://www.citizenscampaign.org/PDFs/2011%20NY%20Solar%20Memos%20-%20Composite.pdf>

[23] Central Hudson, ConEdison, NYSEG, Orange and Rockland, RG and E., 18, June 2010. *Joint Memorandum in Opposition*.

[24] Vote Solar Initiative, June 2010.

[25] National Institute on Money in State Politics. *Cuomo, Andrew, Follow the Money*. Accessed on: 16 Sept. 2011. Available from: <http://www.followthemoney.org/database/StateGlance/candidate.phtml?c=118137>.

[26] Cuomo, Andrew. *Andrew Cuomo's Energy Proposals*. Accssed on: 14 September 2011 Available from: <http://www.andrewcuomo.com/powerNY>.

[27] New York State Assembly, May 2011.

[28] Interview October 13, 2011: New York State Public Service Commission Office of Public Affairs, Information Officer.

[29] New York State Public Service Commission. *Directory of Offices.* Accessed on: 15 September 2011. Available from: <http://www.dps.state.ny.us/directory.htm>