



Solar Power ROI: Keys to an Affordable Commercial Solar Energy Program

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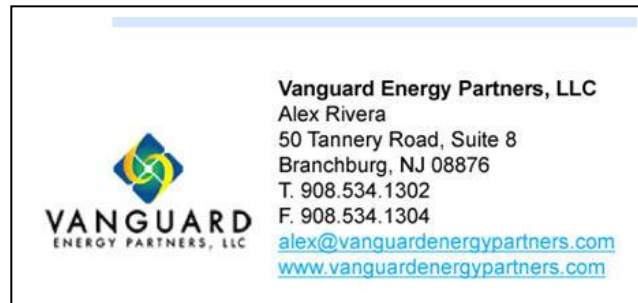
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Introduction

Solar Power ROI: Keys to an Affordable Commercial Solar Energy Program was a webinar offered by CrunchEnergy in June 2010. Based on feedback, CrunchEnergy produced this whitepaper based on the program.

Alex Rivera of Vanguard Energy Partners led the discussion. Vanguard Energy Partners designs and integrates large-scale solar electric systems for businesses, municipalities and utilities. With operating offices in New Jersey, New York and Florida, Vanguard excels at providing turnkey solar electric solutions for the private and public sectors. With extensive experience in construction, commercial roofing and electrical systems management, Vanguard has completed over 120 solar installations with 10 MW of DC rated capacity.



If you have any questions or would like additional information on this topic, please contact Robert Bailey, CrunchEnergy Business Development Director at 973.348.9162 or rbailey@crunchenergy.com.

SOLAR POWER ROI: Keys to an Affordable Commercial Solar Energy Program

Why Solar Energy?

This report will cover a number of aspects of solar power. However, first we should take a step back to understand why renewable energy is becoming so popular. Solar power dates back 53 years to right here, in New Jersey with the space program. You can give Bell Labs of New Jersey full credit for development of the first Solar Panels. The technology today is not very different from the technology over a half a century ago.

Energy savings from renewable energy benefit the environment, economic growth, and national security. These are four solid reasons for implementing a clean energy program and supporting policies through all the states.

Energy savings, benefit to the environment, economic growth, and national security are four very clear positive results of implementing clean energy.

Whether we're talking about Florida, New Jersey or Pennsylvania, each will have different programs. The net result depends on which program the state decides to implement, in order to enable you to have the right incentive for the renewable energy. It is compelling. Once you're able to have a system operational on your site, energy savings is nothing more than the result of you producing the electricity that, otherwise, you would pay for to a utility company. The environmental benefits are clear.

Economic growth is something we're are experiencing on a daily basis. All you need to do is go to the Pennsylvania Clean Energy Program website, and you'll see a number of integrators joining every single day. This means jobs are being created and the opportunity is real. Solar is a preferred technology, in most states, due to the lack of maintenance and ease of operation.

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Keys to a Successful Solar Program

Everything begins with a green mandate, which is a decision from your state to require that all the generators and distributors of electricity derive a small percentage of electricity from a renewable source. This green commitment by your state is called a Renewable Portfolio Standard or an Alternative Energy Portfolio Standard.

For the sake of simplicity, let's simply refer to it as a green mandate. A green mandate must have legislative support to invoke a penalty.

Unless it is a compliance-driven program, the providers of electricity will, most likely, continue to exclusively use conventional power sources. As we all know, these are damaging to the environment. I'm talking about natural gas, coal, and the typical sources that we see throughout the states.

*Everything
begins with a
green mandate!*

A solar alternative compliance payment is the fine required by your local legislature that the utility companies have to pay. It's the penalty that forces the power providers to ensure that part of the electricity you enjoy is actually coming from a renewable source.

For the utility companies to avoid such a penalty, and be able to meet their compliance for the green mandates, there is something called a "green credit" or a "solar renewable energy certificate." In Pennsylvania, this is called the "alternative energy credit." This tool actually enables the utility to meet its quota and avoid the compliance payment.

The way it works is that at the end of every single year, for the next 15 years, your utility company must express to your local public board, how much of green credit they need to present to meet compliance. The actual penalty is priced higher than such green credits. This enables the utilities to forego the penalty, and simply reach out to

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you, the operator of a solar panel array, to buy your green credits. This is always exercised through a distributed generation program.

We don't want all these things to only benefit the utilities. We want everyone to enjoy these incentives, so the incentives for renewable energy are generated and distributed in an equal fashion. This means your home, my place of business, my neighbor's home, and so on, as opposed to a centralized site where a utility burns coal or natural gas. We want to ensure that all these incentives are aimed at a distributed program where we can all benefit from the incentives and savings.

SRECs and AECs: The Return on Solar Investment

Now let's discuss how we get our money back when we invest in solar. Regardless of which state you actually live in, most likely you're going to look for an SREC (Solar Renewable Energy Certificates) or ARC (Alternative Energy Credit). This again, is the equivalent of a green credit.

When you produce solar electricity, you are currently awarded a green credit for every 1,000 kilowatt hours of solar electricity. You are awarded these green credits, automatically, on your electronic account with your local solar program.

The idea is to incentivize the production and long-term operation of renewable energy. As you produce electricity, and you either use it or, at times, sell the excess electricity to a utility. Regardless of the end user of that electricity, you are always receiving that green credit. This is the green credit that most electric distribution companies and load-serving utilities need to show to

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prove compliance. Once again, when you invest in solar, you not only receive solar electricity, but you receive solar credits.

The Renewable Portfolio Standard (RPS)

Renewable Portfolio Standard is just a fancy name for a green mandate. As previously explained, each state develops a policy based on the relationship between your legislature and your clean energy program. You're going to better monetize your investment when your state, not only has this green mandate, but when it's actually supported by legislative action.

Any state can have a mandate, but a penalty derived from the legislature is not required. In those scenarios, what you have is a voluntary market, which doesn't yield much development at all. We know that Pennsylvania, New Jersey, and 24 other states have the mandate. However, states like NJ and PA that have the penalty is where the solar programs are really developing.

The first thing to do is call your local solar provider. You can call CrunchEnergy for information about your local incentives and the local state commitment to the green goals backed by legislature.

When you invest in solar, you'll receive solar electricity, and you'll also receive solar credits.

NJ Renewable Portfolio Standards

Before we talk about New Jersey, let's talk a little bit about where we're heading from here. Let's talk about Pennsylvania. A green commitment was started back in March of 2004 by the State of Pennsylvania. Unfortunately, the actual incentives didn't arrive in Pennsylvania until a year ago. Governor Rendell has certainly taken a pretty aggressive stand and actually called for over \$100 million to fund the incentives. All the incentives in Pennsylvania have yielded over 10 megawatts of solar power. Keep in mind that 1 megawatt translates to anywhere from 5,000 to 7,000 solar panels, and they have done 10 of these. It's quite substantial for just one year in existence.

When we look at New Jersey, it has a 30% renewable energy green mandate. Keep in mind that within that 30%, you have a mix of various renewable sources such as wind, biomass, solar, and so on. That 30%, by the year 2020, is the aggregate of all those renewable power sources.

Just to give you an idea, the green commitment, combined with the legislature's compliance-driven market, has yielded over 5,800 installations. In just nine years, this commitment has allowed the state to go from only four solar installations to now over 5,800. I think that's a very successful program. It is also enabling the residents of New Jersey to save a lot of money, support a local economy, and improve the environment - as Pennsylvania is currently doing as well.

In just nine years, New Jersey has gone from only four solar installations to over 5,800.

It is important to all of us that we understand the certainty of our investment. This can only be provided by having a very clear and consistent set of rules enabling us to achieve payback, and hopefully, a long-term relationship with the generation of renewable energy.

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Solar Alternative Compliance Payment (SCAP)

The SCAP is the penalty. Unless there is a compliance-driven market, where the utilities are subject to a penalty for each megawatt hour of electricity, you're not going to have anyone buying your green credits. We need the law, that we have in Pennsylvania and New Jersey, to require every provider of electricity to meet their green quota.

Once again, as you produce electricity from your solar array, you are producing green credits. Those are the green credits that the utilities will procure from you to avoid this penalty for SCAP. Of course, at the end of the day, what the state wants is to promote your investment in solar so they can meet their green mandate for renewable portfolio standards.

We must foster investor confidence and jump into this industry. None of us will implement solar in our place of business or home unless we feel there will be a reasonable payback for our investment. What you are looking at is a penalty mandated by the legislature to ensure such goals.

*None of us will
implement solar unless
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reasonable payback
for our investment.*

Distributor Generation

Let's talk very briefly about distributor generation. It is important that our public officials understand that we want every resident of Pennsylvania and New Jersey to have the ability, or the option, to implement renewable energy. Why else should we have all these incentives that only financially benefit the utility companies?

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It would only be fair for incentives to be spread and encouraged throughout the whole rate-payer base or the residents of both states. Keep in mind that "distribute" simply means the ability to implement solar on your rooftop and distribute the sources that add electricity to the entire grid.

When your solar arrays are producing electricity, as that electricity travels from your backyard or rooftop into your current electrical panel, very little energy is sent through a centralized site to the end user.

Onsite generation of solar electricity, aimed at onsite consumption, enables the utilities to minimize and decrease the large investment necessary to update their grid network. Think about how many grid networks are outdated. For all the utilities to get electricity to your site, it must travel through such networks. Because solar enables you to have electricity on your site, you're able to then allay and minimize such large investments.

Interconnection & Net Metering

I can't stress enough how important it is to have incentives and mandates. More importantly, it has to be feasible for your developer or solar general contractor to interconnect those panels to your local utilities. This brings me to two very important laws, which are interconnection and net metering.

When you design a solar system, some previously decided factors that must be present in your electrical design, to ensure the delivery of utility-grade electricity from your solar panels. That is what the Interconnection document allows your contractor to do.

Net metering means energy is credited at the same rate you are invoiced.

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Net metering is extremely important. This is the ability for you to export electricity that is not needed on your site to your utility, and for you to be compensated, at the very same rate, at which you are invoiced.

For example, say we're having a beautiful day today. In all likelihood, your solar array is enjoying maximum power production. If your need for electricity, at any given moment, is less than what the solar panels are producing, that surplus will travel from your site, through your breaker box, back to the utility and move your meter backward.

By moving your meter backward, you're doing no more than developing a credit. As the sunny day continues, you further build a credit. When the sun goes down that night, you're using electricity from your local utility company. You're just not paying for it because you built up credits. Throughout the night, as you exhaust that credit, then you will begin paying for that electricity from your local utility.

An important factor to understand, is that it's credited at the same rate you are invoiced. This is why net metering is a fair guidance for all of us to implement solar.

Many commercial and residential customers ask: Are the utilities going to welcome this newly interconnected set of panels? The answer is a paramount yes! Because you have a compliance payment, understand that utilities must deliver a specific increasing percentage of renewable energy credits every single year.

In New Jersey, as well as in Pennsylvania, some of our utilities are becoming very proactive in this process. They are going to the extent of actually loaning you part of the money to implement solar, and allowing you to repay that loan, not with currency, but with those very green credits that we talked previously discussed.

If you are a for-profit business or resident of PA or NJ subject to taxes, you are a prime candidate because solar investment is tax-driven

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Think about this for a moment. Utilities are basically saying, "This is great. We're going to meet our compliance, and we're going to initiate grants, loans and specific incentive programs to enable our users within our service territory to implement solar."

Solar Installation Projects

The chart on the following page is a quick summary of New Jersey solar installations accomplished as of the date displayed, and their total solar capacity. Take a close look at the number of projects. You have 500 on the commercial side and 3,303 on the residential. Then it lists schools and municipalities. For all these end users, there are specific ways to monetize solar.

Let's not forget that if you are a for-profit business, or a resident of Pennsylvania or New Jersey, subject to taxes from the federal government or the state, you are a prime candidate to implement solar as the solar investment is tax-driven.

NJ Solar Installations by Market Segment (7/31/09)

Market Segment	# Projects	Total kW	Total Rebate \$
Commercial	500	48,571.2	\$ 98,985,864
Residential	3,303	23,876.6	\$ 111,108,663
School Public K-12	57	8,479.1	\$ 26,551,298
Municipality	22	4,552.2	\$ 6,636,729
Government Facility	26	2,855.9	\$ 10,624,998
University Public	14	2,300.9	\$ 7,350,274
Farm	45	828.9	\$ 3,230,675
Non Profit	63	759.2	\$ 3,179,610
SUNLIT	43	750.2	\$ 2,528,886
School Other	11	413.6	\$ 1,652,558
University Private	3	245.0	\$ 2,194,660
Total	4,087	93,632.8	\$ 274,044,215

Some of the participants, like universities and public sites, have different routes to implement solar, but they will, most likely, not fully monetize it the same way you and I could. If you call any solar provider, they will further explain the four or five available avenues to fully monetize your solar investment.

At the bottom of the chart, it says 93,632.8 KW. That's basically 93 megawatts. At the time of this discussion, New Jersey is up to 158 megawatts of its total capacity in the last nine

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years. Pennsylvania is also becoming a hub of renewable energy, mimicking some of the efforts in other states like New Jersey.

You'll hear public officials or others talking about the expense of solar. Let's define the myth that's out there. Solar continues to be more expensive than generating power from coal or natural gas. However, let's keep in mind that the price of implementing solar has dropped from 50% to 65% just in the last 24 months. This is a direct result of federal and state incentives, which have led to larger capacity, therefore bringing down the price.

Government Incentives have brought the cost of the projects down as well as the price of the raw material to create solar panels, which is silicon. The price for a refined kilogram of silicon necessary for the production of solar panels went from a high of \$450 to currently around \$63. That drop was a direct result of large implementation and larger capacity, fueled and incentivized by state and federal programs.

Once again, not only have we expanded the capacity of producing solar panels, but we have incentivized it, enabling you to enjoy up to a 65% savings on solar.

The Societal Benefit Charge (SBC)

Now let's talk about how the state and federal government enables the utilities to buy those green credits and pay you a cash rebate when you implement solar. There's something called a societal benefit charge. Open your utility bill and you will see a line item that's basically a tax or tariff. This is a tariff that is like decommissioning for nuclear facilities and renewable energy.

At the end of the day, it's not the state or the utilities. It's all of us. Anyone subject to a bill by any utility is actually contributing to the overall funds and that allows you to

New Jersey is the second largest solar-producing state in the U.S, and sixth in the world.

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have a reasonable payback on your solar investment. By way of example, the average family in New Jersey paid around \$15 last year in tariffs for renewable energy.

This is very ironic. You would think that Florida, and the southern states, would be leaders in implementing solar. Why are Germany, New Jersey and now Pennsylvania becoming the leaders of solar renewable energy generation? As you can tell, it's not so much the exposure of sun (although we need sun to be able to develop electricity).

New Jersey is the second largest solar-producing state in the U.S., and sixth in the world. The state of Florida is probably dead last when it comes to the distributive model. They don't have a payback model like we have in Pennsylvania and New Jersey. If you're a resident of the Sunshine State, your payback for a solar program is probably around 17 to 20 years. In Pennsylvania and New Jersey, it's anywhere from 4 to 7 years. That tells you a lot.

It really boils down to one item, which is a robust and transparent solar program. That's what we've been talking about in this document. Germany has it, New Jersey has it, and now Pennsylvania has it as well.

The Feed in Tariff (FIT)

The program in the U.S. is based on those green credits that we talked about earlier and cash rebates from the federal or state government. In 40 countries in Europe, it's based on a FIT or feed-in tariff. When you decide to put in solar, the utility company engages in a 20-year contract to buy all the renewable solar electricity from you at a large premium from your cost. That's what a fit-in tariff is. I wanted to bring that up so you see why Europe is so far ahead of the U.S.

SOLAR POWER ROI: Keys to an Affordable Commercial Solar Energy Program**International Aspects**

Internationally, certainly Germany, Spain and the U.S. are on the forefront. The European Union has a 25% goal in deriving electricity from renewable sources. Renewable energy, such as wind and solar, are going to be part of conventional power production over the next 25 years for European Utility Companies.

*The European Union
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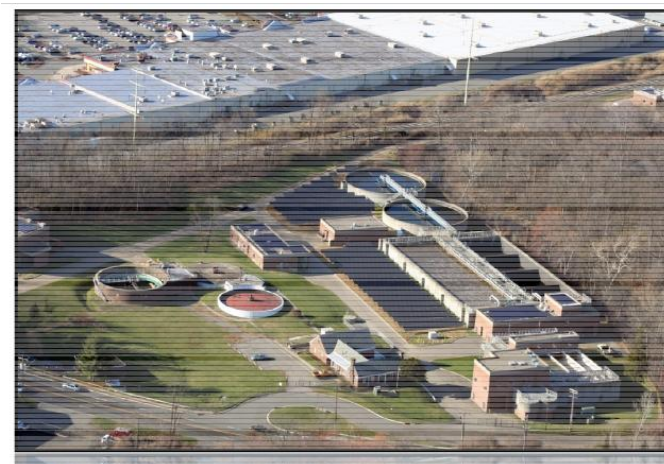
The bottom line is we must thank China, believe it or not, for being the catalyst in bringing a lot of the pricing down. Even though we had a lot of incentives and capacity, Chinese manufacturers were the ones who came to the U.S., dropping the price of solar panels. That forced many U.S. manufacturing companies to do the same. Whether we like it or not, China was a catalyst because of all the volatility and the decline on the overall price of solar projects.

Case Study: Morristown, NJ Waste Water Treatment Plant

Many people talk about the feasibility of solar. The image on this page is a waste water treatment plant located in Morristown.

There are the panels. I don't know if you can tell, but the blue sections on the ground, on the roof, and over the tanks, are solar energy-producing panels. This clears a big myth that limited sites, like wastewater treatments, are not good candidates for solar.

Vanguard Energy Partners in New Jersey broke that myth and enabled the Morristown Waste Water Treatment at the Northwest



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Bergen site to implement solar. In fact, 41% of all the electricity needed at Morristown Waste Water Treatment is derived from the sun.

**Q&A**

Is the implementation of a solar array financially feasible even without a solar cash rebate from the State Sunshine Program?

Everybody gets so focused on this cash rebate. Most cash rebates are derived from state sources. In Pennsylvania, the Sunshine Solar Program offers approximately 50 cents per watt for commercial jobs and \$1 to \$2 for residential.

Keep in mind that this changes quite often because solar is becoming so popular and these cash rebates are being exhausted faster than the programs can publicize them.

The answer is yes. Indeed, the main sources of repayment of your investment are the federal tax credit, the depreciation of the asset and the cash rebate. However, it's really the green credit. It's that alternative energy credit in Pennsylvania, the solar renewable energy certificate or green credits. They are the driving force for the real payback.

*The green credits
are the top source
for repayment of
capital.*

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Most commercial jobs don't even depend on a cash payment. By the way, those cash payments are usually paid 60 to 120 days after your project is finished. I will tell you that the green credits are your top source for repayment of capital.

I'd like to also note that this 40% federal tax credit can be replaced with a cash payment. Vanguard Energy Partners has collected quite a bit of cash funds for our customers who decided to forego the tax credit from the federal government and simply receive an equal amount as a cash payment from the Department of Treasury.

What are the typical technical challenges for solar installation?

On the residential side, shading is certainly a main factor, because most residences are landscaped and are more than likely subject to obstruction of the southern exposure of the sun.

It's important for you to communicate or share your address with your solar contractor. Utilizing Google, they can pretty closely define whether your rooftop is a good candidate.

Your roof needs to be in good shape and able to withstand the weight of the panels. More importantly, it needs to have southern exposure so the panels are exposed to the sun throughout the entire day.

From the commercial sector, it's the same thing. We want to have a southern exposure. There are more flat roofs on commercial buildings, which work perfectly because they're not inclined or tilted in any specific direction. The orientation of the building on a flat roof is neutral, and it's the perfect candidate for solar.

Solar panels need a southern exposure so they can be exposed to the sun throughout the entire day.

On a commercial site, we must ensure that the solar contractor doesn't violate your solar warranty. You must make sure that both parties are in communication and that a structural engineering analysis is part of the contract.

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You must ensure your warranty is in place and that your roof will withstand the typical seven to eight pounds per square foot needed for a typical commercial solar array.

What is the total number of megawatts that the providers need to generate to avoid the penalty?

We all want to make sure that when we invest in solar, a payback will be in place. The payback is heavily dependent on the provider's obligation to buy those green credits and meet their quotas.

I can tell you that for the reporting year 2009, believe it or not, only 45% of the entire green quota was actually met by providing those green credits. Unfortunately, the utility companies had to make up the difference, approximately 55%, by paying the much higher penalty. This is terrible because the utility companies have to pay a higher penalty price that otherwise could have been met by buying the green credits.

Your next question probably is "Why was that the case?" It was because of lack of projects. There were not enough solar projects in place that were producing those green credits so the utility could buy them and forego the payment of the higher priced penalty.

We all want to make sure that when we invest in solar, a payback will be in place.

For the year 2010, the requirement is going to go to a specific gigawatt hour. I don't want to get too technical here, but I can certainly assure you by the numbers that the obligation with this green credit is way behind schedule. We are in desperate need of more solar arrays both in Pennsylvania and New Jersey so the utilities can meet their quotas.

If you have additional questions, please send them to Info@CrunchEnergy.com.