Residential Solar Energy in Flagstaff, Arizona: Practicality, Progression, and Barriers

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ACKNOWLEDGEMENTS

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ABSTRACT

Solar is a renewable energy source that allows homeowners to generate electricity through absorption of the sun's rays. This industry has recently been experiencing significant media exposure, policy changes, and technological advancements. Residential Flagstaff is no exception to this forward thinking movement, with installations occurring at an all time high.

The purpose of this practicum is to bring awareness to and educate the Flagstaff community on current solar practices. The primary goals are to view solar processes, acknowledge solar barriers, and address financial implications in residential Flagstaff. Understanding these elements can help homeowners get the facts about solar happenings in their area and what to expect if they are interested in converting.

Before coming to a conclusion on the solar education needs of Flagstaff community members, a number of steps were taken to analyze and understand the process of solar and the community outlook. Conducting extensive research in federal, state, and local solar applications provided a more in-depth understanding of solar. Surveys from solar stakeholders around the community of Flagstaff were done to identify roles, barriers, and opinions. The results of the survey indicate that the largest barrier for solar in Flagstaff is lack of updated educational information and financial commitment. Secondary findings indicate that negative publicity and "slow" processes contributed to Flagstaff's barriers. A course of action guide was created based on the need for public solar education and a model for what customers should expect. This guide is available to the public at City Hall and Rooftop Solar.

LETTERS OF SIGNIFICANT CONTRIBUTION

Waiting on letter from the city

INTRODUCTION

Solar PV (photovoltaic) was discovered in 1839 by French scientist Edmond Becquerel (ENow Blog 2012). Contributions were made to the technology in years following such as the invention of silicon PVs and commercial licensing. It wasn't until 1958 that a major milestone was reached; a weather space satellite was launched into the atmosphere powered by silicon PVs. The next fifty years were a steady advancement in the production, cost, and efficiency of solar systems. More recently, advanced technologies, increased energy demands, decline in fossil fuel availability, and government support for the solar industry has greatly grown this industry and attracted attention to its cause.

Solar energy is energy source which is considered renewable and sustainable because little or no harm is done to the environment and sunlight is unlimited source. Solar energy relies on actual sunlight not temperature; this makes it appealing to most of the world. Germany and Sweden are excellent supporting examples of colder climates with extreme winters and plenty of snow that are leading the world in solar production and installation.

How solar works is fairly simple, photovoltaic panels absorb the sunlight and convert it to energy. This energy is then hooked up to the electrical portion of the home and the product results in energy (Figure 1). Depending on the azimuth, or direction your roof is facing to the sun, determines the expected sunlight exposure. South facing, or as close to the 180-degree azimuth as possible is preferred and provides the greatest potential of solar energy production because of constant exposure to sun (Figure 2). The pitch of the roof also plays a large role in energy production (Figure 3). A pitched roof with a tilt of approximately 30 degrees is optimal for a south facing roof. The combination of the

tilt and pitch will determine how many panels, and ultimately the cost, to make a home solar sustainable. Homebuilders are now recognizing this demand and building new homes accordingly.

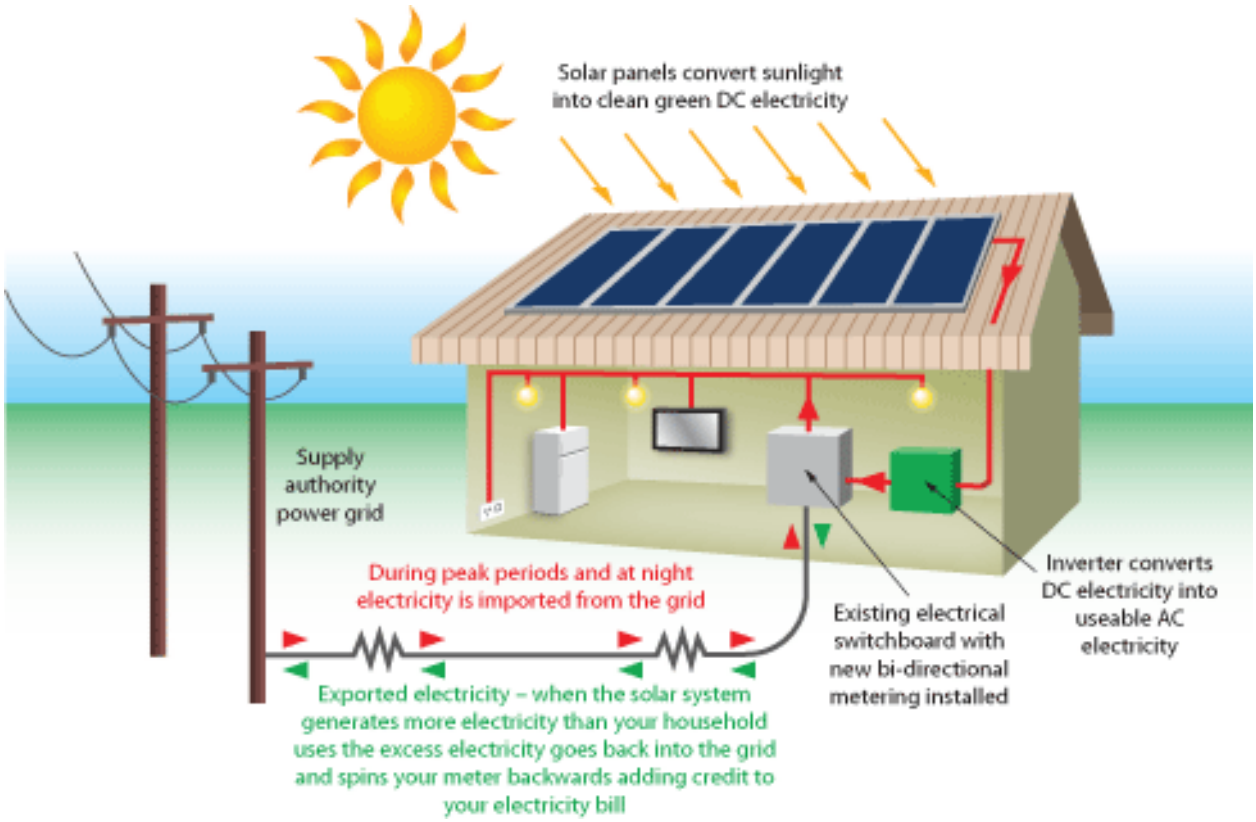


Figure 1. How Does Solar Work. *Energy Farm*, Source: Energy Farm Australia (2013).

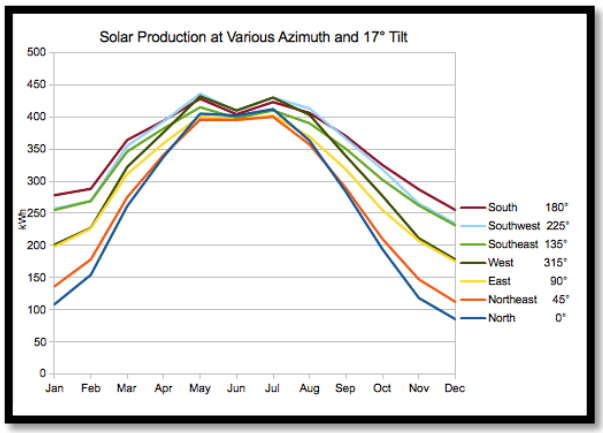


Figure 2. Various Azimuth's on Solar Production. *Pierrosolar,* Source: Pierro (2012)

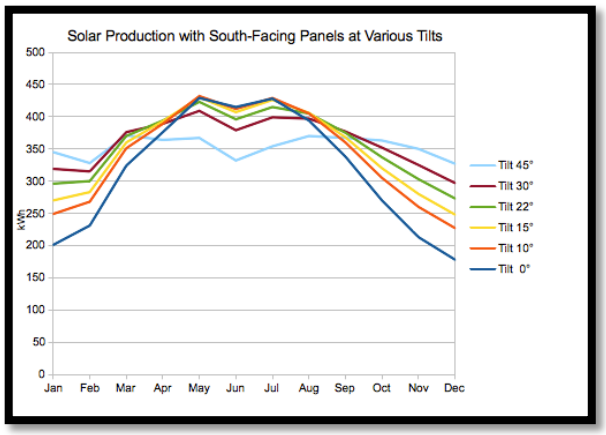


Figure 3. South Facing Panels & Solar. *Pierrosolar,* Source: Pierro (2012)

Arizona is ranked number two in the nation for solar energy use. The average household in Arizona spends $116.07 dollars per month in electricity costs (myenergy 2014) which is around 5,000 kilowatt-hours per year (The Solar Company 2014). In order to offset this cost completely a home would need to install a 4-kilowatt AC size system. These numbers are based on state averages. Solar systems are designed to meet personal needs and are unique in price, size and demand. One percent of Flagstaff energy is now solar energy.

This is well under what it could potentially be. California has driven the solar market from the beginning, experts believe their high cost of utilities and large dense populations are prime for solar installation (Sunnucks 2014). California can be used as a model for what is to come in the future as utility costs rise and natural resources are depleted.

Flagstaff, Arizona city limits were the study site for this practicum. Flagstaff's unique 7,000-elevation climate is very different from the desert surroundings of most of the state (Figure 4). Flagstaff is home to a large ponderosa pine population along with

other tree species. Shade and covered areas contribute to the list of solar barriers in Flagstaff. Another effect the trees have on the solar panels is leaf and snow covering. As Flagstaff is a four-season climate, trees can drop snow on roof panels or cover panels with leaf sheddings (Figure 5). This barrier is often reduced by cleaning of the panels, but it remains a barrier that takes away from production.

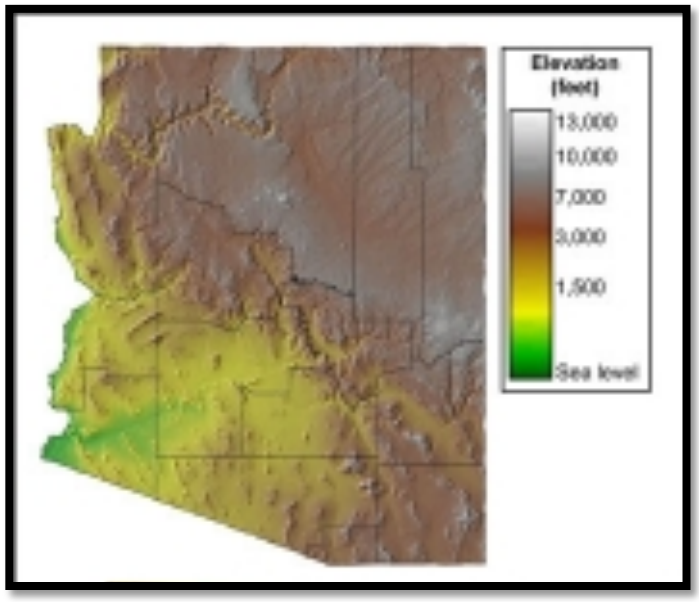


Figure 4. Arizona Elevation. *Climate of the Southwest,* Source: Lenart (2008)

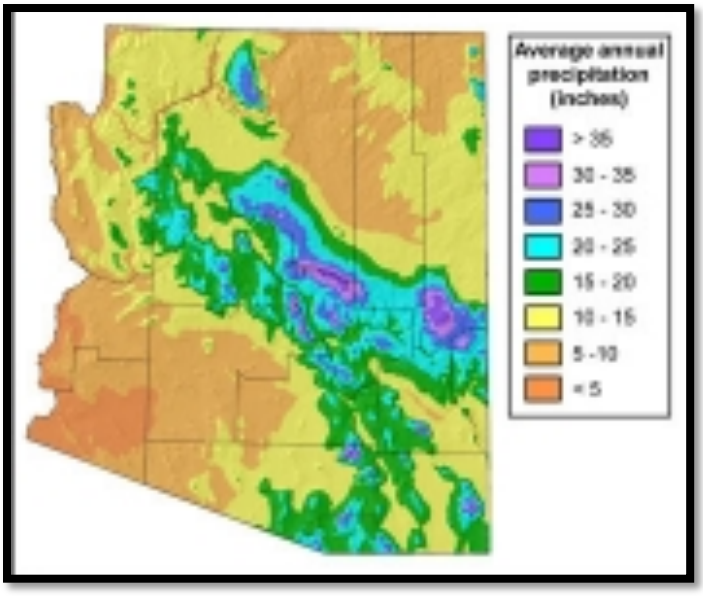


Figure 4. Arizona Average Annual Precipitation. *Climate of the Southwest,* Source: Lenart (2008)

PURPOSE AND OBJECTIVES

The purpose of this practicum is to understand the solar "landscape" of Flagstaff, Arizona, and provid information to the public about solar in Flagstaff. Rumors and opinions are heard around the community about how solar works but someone's experience two years ago will be different than today's. This practicum provides a free reference for the public who are interested in the Flagstaff solar process and wish to educate themselves about how solar in their city is currently installed and whether it's cost effective. The objectives of this practicum are the following:

- **Provide a baseline view of solar in Flagstaff**

  Understanding and evaluating the many components of solar installation, city permits, and Flagstaff's current process is included. This information can then be used to clarify and define the process to the community.

- **Review climate and cover barriers to solar energy in Flagstaff**

  Recognizing Flagstaff's tree density and climate helps evaluate if solar is optimal in this area. Understanding installation protocol will contribute to the knowledge of how barriers are reduced.

- **Review current solar financial commitments and potential upcoming changes**

  The financial commitment to solar is constantly changing. Bookmarking financing options, rebates, incentives and material costs to the public will provide guidance and also be the starting point to measure progress in years to come.

- **Consolidate information into a course of action guide that can be used in solar implantation as well as to advertise possibilities.**

  The course of action deliverable will be a visual display of the solar process in Flagstaff. It will stand as a model for the community, potential solar customers, and even officials in the industry.

PRACTICUM TIMELINE

Fall 2011-	Began working at the City of Flagstaff, Sustainability &
	Community Development Departments
Spring 2012-	Researched practicum topics
Fall 2012-	Began solar research for Practicum Proposal
Spring 2013-	Researched for literature review
Summer 2013-	Wrote Practicum Proposal
Fall 2013-	Started working at Rooftop Solar
	Formed committee and had first committee meeting
Winter 2013-	IRB approval
	Solar survey interviews began
Spring 2014-	Completed solar survey interviews
	Finished Practicum
	Course of Action Brochure
	Practicum Defense and graduation

LITERATURE REVIEW

Understanding the climate, financing, incentives and future of solar is important when deciding whether to switch to solar as an alternative energy source. The following information includes research and examples of solar power in areas that are facing the same challenges as Flagstaff, and those that have been successful.

Understanding of climate barriers

Northern Arizona's four-season climate is unique to the rest of the state. Unlike the central and southern parts of Arizona, Flagstaff experiences snowfall about 34 days a year accumulating approximately 104 inches of snow (Current Results 2014). While it may seem that Flagstaff is not solar practical, the city experiences an average of 264 days of sun exposure (Current Results 2014). Flagstaff is in an environment that includes tree cover that can be a shading barrier to a sun based energy system. While cold weather and plant life seem to be major climate obstacles to Flagstaff, experts from around the world have created ways to maximize sun potential in mountain climates.

Professionals in the solar industry have minimized climate variables by structurally altering a system to personalize and maximize sun intake for every home. Most installers conduct a shade report to optimize residents' solar systems. A critical part of this report is calculating the azimuth angle. This process determines the sun's directional relationship to the roof. Another step in the shade report is to find the optimal angle for the panel mounting. The information in shade reports contributes to the design, location, and amount of panels.

Outdoor technology is a constantly changing element that works differently in every climate. Like electric car batteries and wind turbine blades, cold weather is often an obstacle for developers to overcome when creating alternative energy for far Northern or far Southern hemisphere climates. While solar energy's ideal climate would be in sunshine year round with mild weather, Canada has taken a positive view on solar energy and provides an example of how extreme weather doesn't affect a willingness to install solar systems. Ontario, Canada has over 25,000 solar projects completed, reinforcing this theory. "According to the researchers, and to my surprise, nearly three-quarters of all solar PV panels installed globally in 2009 were in countries that experience some snowfall. This reflects solar subsidy programs in places such as Germany, Japan, the Czech Republic and Ontario. If cold climates keep resorting to solar it must be worth the investment" (Hamilton 2011: 2).

Hamilton goes on to explain the albedo effect of the panels on snow and ice. "Albedo is the reflective power or a surface" (2011: 2). When snow reflects light from the sun, dark surfaces absorb this light. "While snow on the panels reduced their power output, snow on the ground increased albedo, and thus increased solar irradiation onto the panels" (Hamilton 2011). Having snow surrounding the panels, but not covering, ensures the panel is hit will more light, therefore, producing more electricity. Hamilton ends his article with suggesting other possible methods that could increase energy in cold climate solar projects. Some of these methods are applying slippery coatings to panels, optimal panel placement, and snow removal methods. (Hamilton 2011: 2).

Germany is also another country making strides in PV solar installations despite snowfall and long winters. "Twenty-two percent of Germany's power is generated with renewables. Solar provides close to a quarter of that. The southern German state of Bavaria, population 12.5 million, has three photovoltaic panels per resident, which adds up to more installed solar capacity than in the entire United States" (Curry 2013:1).

Experts are spreading the word that PV solar panels operate on sun exposure, not temperature. In fact panels installed in areas of extreme heat experience a shorter life expectancy than those in milder climates. The climate where you live no longer is a deterrent in solar PV installation in most cases. Engineers and manufacturers have worked with technology to create a product and process that allows for practical solar energy almost anywhere despite climate.

Realities of financing

Purchasing options (cash & lease)

Despite the decreasing cost of materials, solar systems are still expensive investments for many homeowners. The average residential system in Arizona is about 6 kwh and costs approximately $20,000 in early 2014. This money is usually paid in increments throughout the installation period but customers are expected to pay the balance in full by the end of installation, about two months. The financial burden of solar is a major barrier for many people, but other financing options are becoming more common.

Solar leasing is an alternative payment option that is becoming popular. Leases can be offered from the installer or a third party company. Investors front a sum of money to purchase materials for the install the system. Once the system is installed, the homeowner

pays a monthly fee to the leasing company for a negotiated amount of time. Twenty-five years is a common duration. Once this time passes, the homeowner owns the system on the house.

Leasing is beneficial to investors because they receive money from tax incentives, rebates, and monthly payments. The homeowner receives a guaranteed production rate, reduced utility bills, and payment and ownership of a solar system over an extended amount of time.

Current incentives

Current solar incentives, credits, deductions, rebates, and programs are difficult to pin point because there are many offered, a variety of hosts, and they are constantly changing. The system type, size, and location are most commonly used to decide what type of cost reductions can be received. Federal incentives, local rebates, and tax credits are usually the big players for incentives in today's market. Although, there are many smaller rebates and incentives, this is a review of the top several that are available to the widest range of projects in Arizona as of March 2014. These top incentives are said to motivate the solar market and encourage investment in the sun.

The federal tax credit or Residential Renewable Energy Tax Credit for solar was a program created as part of the national financial bail out bill. This credit was implemented to create jobs as well as to create a billion dollar market for solar power, which could potentially generate over 20 gigawatts of clean energy. This specific incentive is for residential renewable technologies, including photovoltaics (PV), solar water heaters, wind, etc… The owner of the system is to receive a 30% personal tax credit from the installation of any clean power system. This system does not have to be the taxpayer's

principal residence and there is no maximum credit for systems installed after 2008. This incentive was first enacted in 2006 and is on track to expire December 31, 2016. The Residential Renewable Energy Tax Credit is known as a huge motivator to those homeowners on the fence about making the switch to solar. Many professionals in the solar industry wonder how the solar industry will fare after this large federal incentive ends (Cinnamon, 2013).

Local rebates and incentives have also been a contributor to solar's success. Arizona Public Service (APS) is a major utility provider in Arizona and until recently has offered a percentage based incentive for all solar projects from funds received from the Federal Department of Energy (DOE). Funding levels are set annually with the Arizona Corporation Commission (ACC). This up front incentive (UFI) topped out at $75,000 or 40% of the total system. In mid October 2013, installation companies across Arizona were told that the APS incentive fund had dried up, and new projects would not be eligible for the Interconnection Incentive. This incentive was last recorded in 2013 at $0.10/watt for grid-tied projects that were residential or commercial.

Additional information is available online, at the Database of State Incentives for Renewables and Efficiency (DSIRE) is a website that provides updated financial information by state for renewables. This website is a great source for customers to research personal incentives for their specific needs and stay updated and educated on changes and regulations.

updated 10/18/2013

beginning budget			funds requested (installed + reserved)		remaining budget	
$2,650,000			$3,688,853		$0	
percentage of total budget requested					139%	
applications reserved	capacity reserved (mw)	systems installed	capacity installed (mw)	funds installed	funds reserved	funds requested
2,340	18.39	2,507	18.58	$1,848,792	$1,840,061	$3,688,853

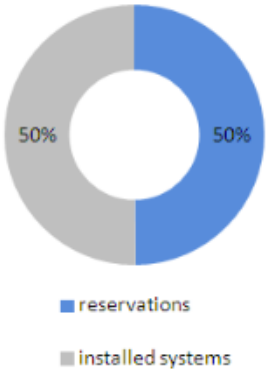


Figure 6. APS Rebate Information. *APS Renewables,* Source: APS (2013).

Net metering in Arizona

Net metering is a special billing arrangement made between the utility provider and the homeowner. The homeowner is connected to the utility grid and has access to standard energy if their PV system does not create enough energy to sustain them, for example multiple cloudy winter days. If the homeowner's panels create more energy than needed, common in summer months, their utility account would be credited. An optimal solar system would create enough energy in the summer months to offset winter electricity, giving the homeowner a zero balance.

This zero balance has now become a myth because depending on the system's location and size, monthly taxes are added. Over the years these tax rates have varied. A few of the larger ones are city, state and environmental taxes. With today's tax rates, an average size home with typical energy use in Flagstaff would pay about twenty to thirty dollars per month in solar specific energy taxes if not completely off grid.

In the United States there are five tiers of net metering. Net metering tiers are determined by the states' involvement in the program and what their specific program

guidelines are. Highly effective programs that generate loads of solar energy and which are highly beneficial to solar customers are chosen as top tier programs. Arizona is currently ranked in the highest tier along with Hawaii, Colorado, and Nevada as one of the best net metering programs. This could all be drastically changing within the upcoming year because of APS's potential changes (SEIA, 2014).

Possible evaluation of future solar practices

Many myths and rumors fly about what will become of solar technology in the future. Some experts believe the industry will shrink into insignificance after government incentives are abandoned. Others say that solar is the way of the future and is a sustainable and plausible way to produce energy. We are approaching a time when government support is slowly declining and the industry is rising, but resistance from political parties and utility companies aren't making the transition an easy one.

Material technology and progression are at an all time high. The most efficient panels are being installed at the most reasonable cost (PARC 2013). The solar module industry has uniform panel creation and has specific and limited required materials. Racking, panels, inverters, and meters are the only materials that are needed to switch to solar energy. The materials industry has standardized production thereby and minimizing confusion for installers.

Installers are concerned with consistent installation demand and keeping expenses and time allocation to minimum. It is not unreasonable to assume that an installation crew can fully install a system in one day. This quickness and efficiency supports solar installation and will improve as time goes on.

Elimination of subsidies and/or net metering

In Arizona, APS has now created a use deadline on net metering solar energy. This means that customers are not able to transfer "energy credits" from year to year. Net metering is limited to the calendar year, which means credits that are left over on customer's account at the end of December will be bought back by APS at their chosen rate. Currently the rate is set at 3 cents per watt.

In September 2013, APS publically notified customers and installers that they are proposing to amend their solar terms. APS believes that solar customers are using the grid for free while traditional energy customers are picking up the financial slack. APS's new terms would almost double solar homes' energy bills, with new costs they claim are user fees for using the grid. They are also proposing to eliminate the net metering program along with other changes. A net metering deadline was set for mid October 2013, by which only solar applicants could apply for consideration for net metering benefits. These customers and current solar customers are forever guaranteed net metering standards. But although APS set this deadline, the ACC still must deliberate and vote on policy changes (Randazzo, 2013).

This potential change has sparked great controversy across the state. Campaigns such as 60 Plus and Prosper are promotions financially backed by APS with conservative lobbyist influence. These advertisements make accusations such as "giving our tax dollars to their wealthy customers" and "solar customers get paid over five times market rate." Larger installers like SolarCity and TASC have responded to these allegations by creating ads claiming, "utility companies are monopolies that don't want to take profit hit" (SolarCity 2013). So why is this controversy surfacing now? Experts say that the high

number of solar installations this past year and the projected amounts for upcoming years is bringing solar energy into the spot light. APS is concerned with the projected solar numbers because there is a potential for homeowners to no longer need regular electricity and/or the grid. This will greatly affect their utility market and profit margins. Change is amongst us, and Arizona's response to this net metering threat will stand as an example for all of net metering states decisions to participate. (Trabish 2013).

On November 14, 2013 the ACC announced their decision on net-metering in Arizona. Starting January 1, 2014 solar customers will pay an additional fee, based on the system size of the home. Most residential customers will experience an additional 5-10 dollar monthly bill increase. Solar advocates considered this a victory over APS's proposed 50-100 dollar increase. The ACC is saying this is a trial year and the policy may need to be altered in upcoming years. APS recently released positive and supporting information about solar and their role in the upcoming technology. A list of "myths and facts" is available online (APS 2014).

Reflection on past technology transitions (home phones)

Experts are comparing this utility backlash to solar as similar to one that happened with main line phone companies and cell phones. Phones operate through telephone lines. Similarly solar uses an electric grid. These physical structures need maintenance that is paid for by the users. When these structures are no longer in such high demand, we shouldn't still be obligated to pay for them. Society should be able to gradually move forward with technology.

Another similarity between solar and landline phones is the monopoly utility companies and telecommunication services had on that specific market. AT&T was a

company that was forward thinking and recognized that changes were inevitable. It built a wireless phone business before the landline market depleted. Some utility companies in California are recognizing this and investing resources in building a solar department so their customer base may switch but they won't lose customers.

"…Some argue the government should step aside and allow the marketplace to keep moving toward digital standards (France-Presse 2013). This statement comes from an article talking about landlines being disconnected because new technology has made them no longer relevant. "Almost everyone will be off this network in the next four years. It is a dead model walking." (France-Presse 2013). These comments about landlines could be the precursor for what type of energy is used in the future.

METHODOLOY

Background Research

The Flagstaff community did not have a single information source that would explain the solar development steps, results, and progression in the local area prior to this practicum. Although there are many resources, Flagstaff has yet to release information on where to go and how to have a solar system installed locally.

The project first began with research at the federal, state and local levels. This was done to set parameters of where we are as a nation, a state, and locally in terms of mindset financial resources, and technology. This research was also done to find out what is offered at different levels and compare progression standards. Next, understanding solar incentives and local knowledge was important for laying a basis for this project. In order to effectively address and advertise opportunities, there must be an understanding of what's available, what the application process is, and what are the success rates. Stakeholders were then surveyed for a range of understanding, participation, personal barriers, changes witnessed, and overall effectiveness of the current solar process. After analyzing the facts at all levels, surveying local people who are involved helped gauge where Flagstaff is in relationship to the rest of the state and nation.

After the initial research was completed, information was analyzed. The results of the research indicated an area of educational need solar implantation, process and financial commitment. This educational need is supported by a practicum deliverable, a local distribution of solar course of action brochures, made available at the City of Flagstaff. This deliverable provides education on process for those interested in solar.

Stakeholders

The stakeholders identified for this research project are the groups of people who contribute to the installation, process, cost of solar, and use and provision. These groups are the following:

APS- Arizona's utility provider and more specifically their "Renewables" department that deals with all solar projects from installation to monitoring. Their role is monitored by the ACC, and possibly the most powerful because they dictate how energy will be delivered if needed and pricing for buy back.

Installers- Solar installers have processes of installation that are constantly becoming more efficient and reliable. The installers may also deal with financing and incentives/rebate applications. Their role is adjusting and researching new products and procedures to better suit their customers and installing and marketing the product.

Manufacturers- The manufacturers of the materials are in involved in new technology and production of enhanced materials. Their advancements and pricing influence the market prices and production. New manufacturing companies are becoming more common which also increases variety and drives down costs.

Past/Potential Customers- The public also influences the solar market because of their influence on the ACC and willingness to support solar in the community. Many customers expressed their views on the net metering policy in 2013.

City of Flagstaff- The City of Flagstaff's permit application and approval process regulates the type, size, and number of systems installed throughout the city. They

also have a voice throughout the community, making their opinion of solar a strong influence on the public and policies.

Solar Survey

The solar survey was done to get the stakeholders' experiences and opinion of solar is Flagstaff. This information was valuable to the research to test the knowledge, process, and opinions of those who affect or were affected. One of the most significant things taken away from this survey is how we can improve solar in flagstaff.

Questions on the survey were designed to be open ended so participants could responsed and expand on questions. The IRB process was completed before interviews to ensure questions were appropriate and confidential. Each participant was given a consent sheet and the option to be interviewed on the phone or in person.

The solar questions were created based on professional working experience, typical questions asked in initial stages, and topics in the media that are controversial, such as financial commitment. These questions were carefully worded to ensure fair and nonbiased responses. They were also developed to ask each stakeholder his/her opinion and their role as well as that of. This allowed for and analyzing other the communication and relationships.

Four groups of stakeholders were surveyed with three participants from each group, for a total of twelve people. Multiple positions and project situations were covered to give a broad conclusion. Three of the four stakeholder groups were surveyed through an in person or a phone interview. The fourth stakeholder (APS) could not be reached for comment so secondary sources were used to represent its views. Solar customers from different installation times, city current planners and building inspectors, as well as

architects and construction managers from an installer were interviewed. A few questions allowed for nominal or ordinal comparisons. Every participants' name and occupation is kept confidential as part of the IRB's request. The following are the questions for each stakeholder type from the surveys:

APS SURVEY

Question	Why it was asked
Q1-How does APS participate in solar installations and what is your business process?	Understanding of utility role and inside process and reasoning
Q2-What do you require from installers, customers and City to switch?	Understand what information they are interested in and who they are in contact with
Q3-What financial options do you provide or advertise for patrons (incentives/or types of payment)?	See how company is promoting or advertising financial options
Q4-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	A perspective of working in the industry and acknowledging challenges
Q5-What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?	Ability to measure progress and different sectors and an educated guess to where trends are going now
Q6-Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Understanding of where individual sees problems or where advancements could be made.

CITY SURVEY

Question	Why it was asked
Q1- What is your role in solar installations?	Understanding of where in the process that person works and what they do to contribute
Q2- What financial options do you provide or advertise for patrons (incentives/or types of payment)?	See how individual is promoting or advertising financial options
Q3- What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	A perspective of working in the industry and acknowledging challenges
Q4- What changes (positive or negative) have you seen in solar the past 10 years? And where do you see solar going in the future?	In the government sector, what changes have been made and are changes expected to be made in the future
Q5- Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Understanding of where individual sees problems or where advancements could be made.

CUSTOMER SURVEY

Question	Why it was Asked
Q1-When was your system installed?	How current installation was to understand and compare advancements made in processes.
Q2-How did you participate in your solar installations and what was that process with APS, the City, and installer?	Understanding of the "Workload" or knowledge needed to install a solar system
Q3-Where did you find out about solar and what convinced you to install?	Note advertisement opportunities out there and which ones appeal to the customer
Q4-How many different businesses/parties did you contact to get your system installed?	What length was the customer required to go to, to get system installed
Q5-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	After going through the process what did they struggle with or find as the biggest barrier.
Q6-What source of financial incentives did you benefit from (federal, state, local, etc.)?	See if/what financial incentives the customer knew about of was eligible for.
Q7- How important was financial assistance in your decision to go solar?	Find out if personal system made financial sense or something they financially benefitted from
Q8-Why did you choose to install, and why did you choose that time period?	Understand why that time period specifically impacted their switch
Q9-On a scale from 1-5 how would you rate your solar experience? (1- terrible 5-perfect) and are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Overall understanding of process satisfaction and where could there be improvement

INSTALLER SURVEY

Question	Why it was asked
Q1-How do you participate in solar installations and what is your businesses process?	Understanding of where in the process that person works and what they do to contribute
Q2-What do you require from APS, customers and City to install solar?	Understand what information they are interested in and who they are in contact with
Q3-What financial options do you provide or advertise for patrons (incentives/or types of payment)?	See how individual is promoting or advertising financial options
. Q4-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	A perspective of working in the industry and acknowledging challenges
. Q5-What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?	Ability to measure progress and different sectors and an educated guess to where trends are going now
. Q6-Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Understanding of where individual sees problems or where advancements could be made.

Question 1 was asked to all stakeholders except the customer to understand what position the response was coming from. Those three stakeholder groups were all asked questions two, three, four, five, and six so an equal comparison and analysis could be done.

Questions that were different from other surveys, were questions two, three, four, six, seven, eight, and nine from the customer survey. These questions were more about the experience as apposed to the working process. All surveys asked the opinion of barriers from personal perspective.

A simple analysis was done to the survey results. This process was chosen to determine what factors have lead to a specific response and compare those similar and different responses.

RESULTS, SURVEY & ANALYSIS

Solar Process

The solar process (Figure 7) in Flagstaff was found through working experience, local, state, national, and international research, and multiple interviews with local stakeholders. This process represents cash purchased. If the project is a leased system, the timeline is longer and includes another 3rd party and some additional paperwork as leasing companies usually request pre/post installation photos, additional paper work, utility correspondence, etc…

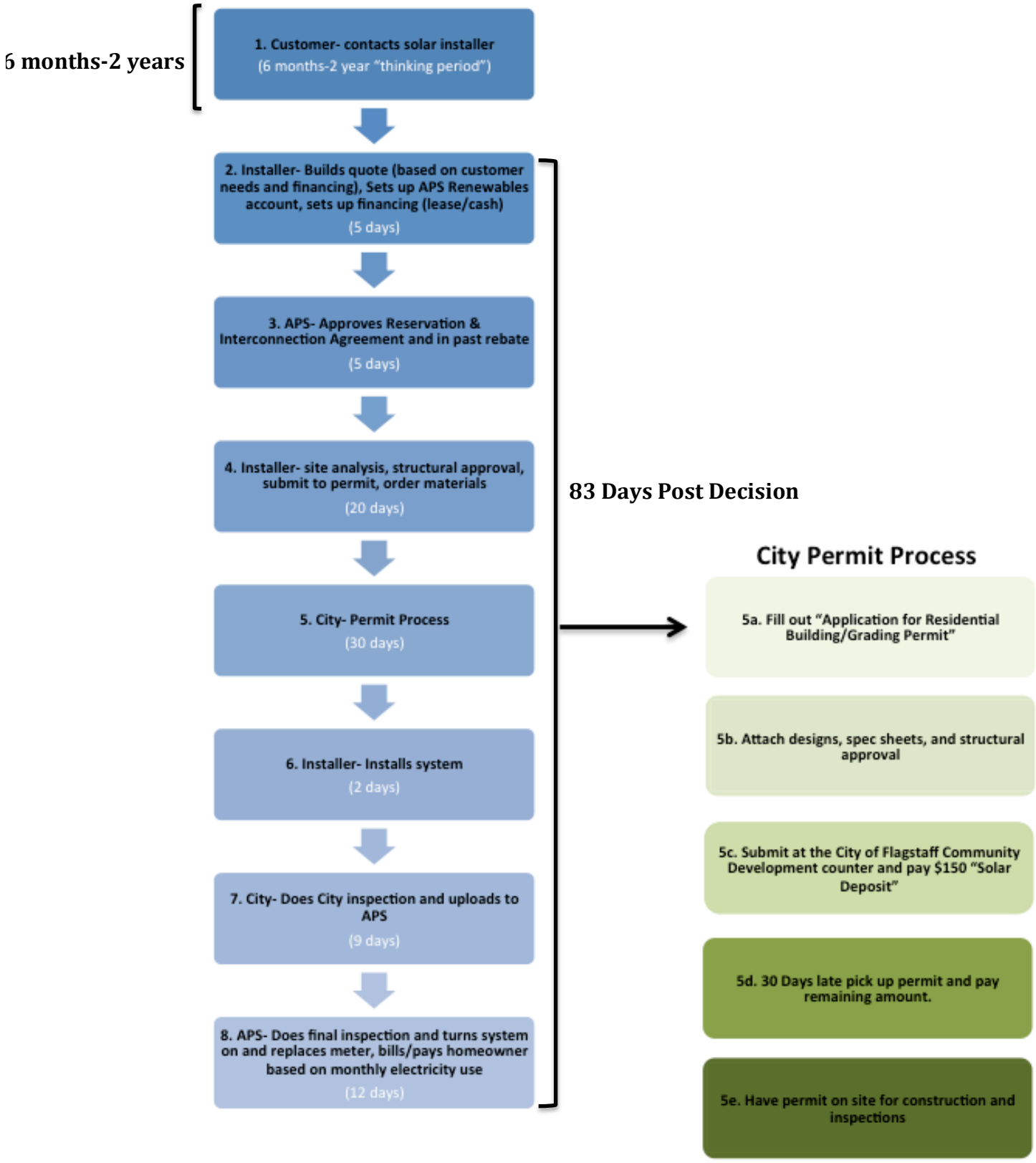


Figure 7. Solar Installation Process

Process Explained (Figure 7)

Customer- contacts solar installer (6months-2 year "thinking period")

These come from, but are not limited to, referrals and marketing events like home shows.

Installer- Builds quote (based on customer needs and financing), Sets up APS Renewables account, sets up financing (lease/cash) (5 days)

An individual quote is based off an annual electricity bill from APS. The homeowner has the option to increase the size if they estimate electricity needs will increase (having an electric car, another person in the house, hot tub, etc…) The homeowner is then offered the cash and lease purchasing quotes. Once the contract is signed, the installer creates a Renewables account for the project by filling out online application about the home and system.

APS- Approves Reservation & Interconnection Agreement and in past rebate (5 days)

An executed contract, APS Disclaimer, and W9 (if eligible for rebate) form are signed by the homeowner and uploaded for the reservation to be approved, the installer is given a rebate number. The Interconnection Agreement is approved once a site plane and 3-line diagram are uploaded and fit the needs of APS. (See Appendix G)

Installer- site analysis, structural approval, submit to permit, order materials (20 days)

A site analysis is done to confirm initial system sizing, system placement, surrounding environment (trees), azimuth, tilt, shading report, and structural analysis. A full set of designs (seven pages) is then designed based on these notes.

Once the designs are complete a building permit is filled out and taken to the City for permit submittal. (See appendix D and E)

City- Approves permit (30 days)

The City reviews the plans and spec sheets. Notes are made if the project does not meet code or is approved and sent back with permit. (See appendix H)

Installer- Installs system (2 days)

Materials are ordered and once they arrive construction begins. Reroofing is done first if needed, otherwise racking and inverters are installed. The panels are then connected to the racking. Lastly, electrical and meters are wired.

City- Does City inspection and uploads to APS (9 days)

Calling the city and making an appointment with a building inspector will trigger the City inspection. This person compares the system to the permit and tapes a card of approval to the meter. The City then uploaded their approval to the APS renewable portal.

APS- Does final inspection and turns system on and replaces meter, bills/pays homeowner based on monthly electricity use (12 days)

APS is triggered to schedule an inspection once they see the City has approved it. At the inspection the APS employee checks the system for safety and replaces the old meter with an APS "solar meter." The switch is then flipped and the customer is producing solar power.

TOTAL AVERAGE TIME IN 2013 (83 days post customer installation decision)

Results

The survey was created to gain information and knowledge and solar procedures and opinions of stakeholders in the community. The survey results met the baseline view objective as well as acknowledgment of solar barriers objective. The results from this survey will be consolidated into a course of action guides, which also meets a practicum objective.

APS did not respond, therefore secondary resources were used to voice the utility companies views.

APS RESULTS
(Information based on secondary resources)

Question 1	News and Press Released Information
Q1-How does APS participate in solar installations and what is your business process?	"APS has helped make Arizona a national leader in solar development. Our company is spending nearly $1 billion on solar projects throughout the state, while providing a stable electric grid. In 2012, APS added a record-breaking 148 megawatts of clean solar energy, which is enough electricity to serve more than 35,000 customers. We expect to more than double that number in 2013." (APS 2013).
Q2-What do you require from installers, customers and City to switch?	Customer online utility account, executed contract, disclaimer form, lessor acknowledgment (if leased), City/County approval.
Q3-What financial options do you provide or advertise for patrons (incentives/or types of payment)?	APS also is supporting an increase in the up-front cash incentive that makes rooftop solar a more affordable option for customers who want to "go solar." "We support an incentive program for rooftop solar that is transparent, reviewed frequently by the ACC, and shared fairly among customers," said Mark Schiavoni, APS executive vice president of Operations (APS 2013).
Q4-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	"As we get more rooftop solar customers … what we want is a system that's fair for all of our customers." (O'Donnell, 2013)
Q5-What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?	Paperwork, requirements, process, taxes and rates.
Q6-Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	"Of course, having determined that a problem exists (net metering cost shift), we would have preferred for the ACC to fix it. The proposal adopted by the ACC, and surprisingly championed by the state's consumer advocate RUCO, falls well short of protecting the interests of the one million residential customers who do not have solar panels. We will continue to advocate forcefully for the best interests of our customers and for a sustainable solar policy for Arizona." Dan Brandt (APS 2013).

- **Type of stakeholder-**APS is a utility stakeholder, making them a powerful voice in the survey.
- **Why the question was asked-**The first questions was asked to understand at what level we are getting a representation from. The second question was to analyze the communication between the stakeholders and their understand of roles in the

process. Next, financial options are important to advertise correctly and see how if/how they contribute on that level. Question four was understand what barriers APS faces and what feedback they get from customers. The fifth question was asked to gage how long the person had been in the position and to measure the successes/drawbacks of solar. The last question allowed the person to voice opinions about inefficiencies in their positions or overall things that could be made better.

CITY RESULTS

Question #	**Responses/Agreements**	**Other Secondary Responses**
Q1- What is your role in solar installations?	Building inspector, current planner	NA
Q2- What financial options do you provide or advertise for patrons (incentives/or types of payment)?	None	Flat rate permitting fee
Q3- What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	Financing	Education
Q4- What changes (positive or negative) have you seen in solar the past 10 years? And where do you see solar going in the future?	Price decrease, faster	More common
Q5- Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Inefficiencies- practicality, cost Future- faster, cheaper	Inefficiencies- Policy fluctuation Future- more common

- **Type of stakeholder-**the City of Flagstaff is a public stakeholder. They are involved in the key role of permitting and approval, but also stand for a neutral figure and voice for the community.
- **Why the question was asked-**The first questions was asked to understand at what level we are getting a representation from. Next, financial options is important to advertise correctly and see how if/how they contribute on that level. Question three was understand what barriers the city faces and what feedback they get from customers. The fourth question was asked to gage how long the person had been in the position and to measure the successes/drawbacks of solar. They are also able to comment on trends that may lead progress. The last question allowed the person to voice opinions about inefficiencies in their positions or overall things that could be made.

CUSTOMER RESULTS

Question #	Responses/Agreements	Other Secondary Responses
Q1-When was your system installed?	Within the past 2 years	NA
Q2-How did you participate in your solar installations and what was that process with APS, the City, and installer?	Contacted Installation Company	After installation had correspondence with APS
Q3-Where did you find out about solar and what convinced you to install?	Informed- Media Why- Personal obligation	Informed- Home show Why- Overall financial saving, uncertainty of fuels in the future, keeping energy money in USA
Q4-How many different businesses/parties did you contact to get your system installed?	2- Installer, APS	Leasing company, ACC
Q5-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	Financing, lack of education	Media/publicity, peer support
Q6-What source of financial incentives did you benefit from (federal, state, local, etc.)?	APS rebate, state and federal tax rebate	Leasing incentive, installer promotion
Q7- How important was financial assistance in your decision to go solar?	Top priority	Significant
Q8-Why did you choose to install, and why did you choose that time period?	Right time in life financially, home, electricity usage, personally.	ACC net metering deadline
Q9-On a scale from 1-5 how would you rate your solar experience? (1- terrible 5- perfect) and are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Rate- 4 Improvements- pace, truth, unity, stability	Improvements- consistency, process outline, uniformed payments system

- **Type of stakeholder-**The customer is a personal stakeholder that represents the public and poses as standard for installation and process.
- **Why the question was asked-**The first question was to date how old their system was and identify under what process they installed under. Then, asking how the homeowner was involved was asked to see how much time and effort was expected of that person. The third question was to understand where the community is going to get solar information. Question four was asked to see what the process was like finding an installer in the Flagstaff area and if they knew of or was in communication with any of the other stakeholders. Question five was seeing what barriers the homeowner experienced or what they thought were drawbacks. The sixth question was seeing if the homeowner knew of incentives and if so which applied to their project. Question seven confronts the homeowner on their financial commitment and to find their motive for installation. Understanding when and why the homeowner installed was addressed in question eight. This is important to see motivators and target audiences. Lastly, rating the experience on a scale give satisfaction numbers that are measurable.

INSTALLER RESULTS

Question #	Responses/Agreements	Other Secondary Responses
Q1-How do you participate in solar installations and what is your businesses process?	Construction	Site analysis, design
Q2-What do you require from APS, customers and City to install solar?	APS- IA, inspection, rebate, reservation City- Permit, inspection Customer- contract, funds, utility bill	Structural engineering approval, leasing paperwork
Q3-What financial options do you provide or advertise for patrons (incentives/or types of payment)?	Cash, lease, tax incentive, APS rebate	In house promotions, manufacturer promotions, leasing incentives
Q4-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	APS- negative advertisement, inconsistent procedures	Education, financing, cost of traditional energy costs aren't very high in Flagstaff
Q5-What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?	Cost decrease, consistency, incentive decrease, new technology	Acceptance of solar, less materials needed, industry responses to problems, more jobs
Q6-Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Inefficiencies- Pace, consistency in parties/materials/cost Future- Solar becomes more common, grid defection	Inefficiencies- national uniformity, lack of experience, renewable have "bad" image Future- battery storage improvements

- **Type of stakeholder-** The Installer is a stakeholder that represents the construction aspect of solar projects. In this case the installer was also a local installer, so local jobs were also represented.
- **Why the question was asked-** The first questions was asked to understand at what level we are getting a representation from. The second question was to analyze the communication between the stakeholders and their understand of roles in the process. Next, financial options is important to advertise correctly and see how if/how they contribute on that level. Question four was understand what barriers

APS faces and what feedback they get from customers. The fifth question was asked to gage how long the person had been in the position and to measure the successes/drawbacks of solar. The last question allowed the person to voice opinions about inefficiencies in their positions or overall things that could be made better.

Summary of Results

The APS surveys, based on secondary sources, indicated that APS is a utility has provided that supports solar installation across the state and will continue to grow it's involvement. Learning that while rebates are no longer available through APS, they still honor the net-metering policy. They acknowledged that while paperwork and processes have changed over the years, they see solar growing in Arizona. Cost shifts in still remain as an improvement for APS but they expect the ACC will correct this eventually.

City surveys showed their permit and inspection roles in the solar process. In the future they believe solar will become more popular, efficient and less expensive. Inefficiencies that they acknowledged were policy regulation and practicality. Code compliance and city process was not seen as a barrier by any of the participants.

Customers surveyed had systems installed in the past two years. These homeowners made contact with two of the other stakeholder groups and learned about solar through media. Their personal obligation and financial situations made the decision to install solar. They believed the biggest barrier for Flagstaff solar was the lack of education and negative press. APS, state, and federal incentives were accepted on behalf of these people because they all identified the financial commitment as significant decision. An average of four rating was given to the overall process and they believed improvement in timeline consistency, unity, and stability would benefit the future of solar.

The installers' survey indicated that they had correspondence with all stakeholder groups. They provide alternative financing and tax incentive/APS rebate assistance. As a group they believe inconsistencies, education, and negative media all contribute to barriers of Flagstaff. Technology advances, increase of jobs, and total cost decreases have all be changes they've witnessed in the last ten years. Installers believe inefficiencies consist of consistency and lack of experience.

Based on local research and interview surveys, Flagstaff shows a need for easy and accessible information what solar is, practicality of energy in Flagstaff, pros vs. cons, where the industry stands, financing options, and how to get started. Stakeholders like APS, the City of Flagstaff, and local installers could also benefit from this information because of the advertising benefits as well as public feedback.

RECOMMENDATIONS

Based on the defined process, interviews, and professional experience working as a solar project manager I recommend Flagstaff update solar incentives and financing information annually to inform the public of new and expired options. Also maintaining and increasing alternative energy education in the community would be beneficial. One way they could incorporate this goal is by holding annual or bi annual stakeholder education opportunities. A short workshop where the community could come and be informed of city and installer processes would keep communication and ease installation in the future. I also recommend the publication of the solar process and who to contact for complete details. Bringing this awareness will create unity throughout the community and potentially convert more homes solar. The ultimate goal is to increase Flagstaff's

sustainability, support local business by creating more jobs, and creating an educated community.

LIST OF APPENDICES
Appendix A

Institutional Review Board for the Protection of Human Subjects in Research

Northern Arizona University
PO Box 4087
Flagstaff, AZ 86011-4087

928-523-4340
928-523-1075 fax
www.research.nau.edu/vpr/IRB

To:	Anna Highley
From:	Donna Goldberg
Approval Date:	January 31, 2014
Project:	Solar Practicum
Project Number:	558042-1
Review Category/ies:	2) Survey procedures

Your research protocol has been approved by the Human Subjects Committee/Institutional Review Board (IRB) at NAU under the category of EXEMPT. This category means that your IRB approval for this project does not have an expiration date, so periodic renewal of approval is not necessary unless there are changes in your project that affect the status.

If your project **changes** in any way, you must file a Research Amendment form available at https://www.research.nau.edu/compliance/irb/forms.aspx PRIOR TO implementing any changes. You may not implement the changes until you have written approval for the change from the IRB, unless the change is necessary to eliminate immediate hazards to participants. Failure to do so will result in noncompliance and possible suspension or termination of your research project.

Any unanticipated problems or unexpected **adverse events** must be reported to the IRB within 5 business days (within 24 hours for serious adverse events) of your becoming aware of the event by filling out an Adverse Reaction or Event Reporting form (also available at website above).

As you conduct your research, please remember that:
1. Participants are volunteers or are involved in regular educational programs; they are free to withdraw from the research at any time without penalty.

2. Unless you are using existing data, Participants must be informed of the research project through written or oral explanation and must sign or approve electronically or verbally an informed consent form (for minors and children the parent or guardian must sign).

3. Unless the participants agreed to an alternative arrangement, the participants' anonymity and confidentiality must be protected. They should not be able to be identified through the responses. The presentation of the data should not put them at risk of any negative consequences. Access to the data is specified and restricted by the researcher and the department.

Additional IRB information may be found at https://www.research.nau.edu/compliance/irb/index.aspx.

Appendix A- IRB

Appendix B

NORTHERN ARIZONA UNIVERSITY

NAU Human Subject Informed Consent

Department of Geography, Planning and Recreation
Northern Arizona University, Flagstaff, Arizona 86011-5016, USA
Tel: +1 208 724 1759 (in USA)

Project Title: Solar Energy in Flagstaff, Arizona- Practicality, Progression and Barriers

Dear Participant,

You are being asked to participate in a project conducted through the Department of Geography, Planning and Recreation at Northern Arizona University by Anna Alisse Highley that involves research. The researcher is required to receive your informed consent before you participate in this project.

Anna Highley will explain to you in detail: (1) the purpose of the project; (2) what you will be asked to do and how long your participation will last; (3) how your personal information, if collected, will be kept confidential; (4) if you will receive any compensation; (5) the possible risks; and (6) potential benefits of participation.

Your participation in research is voluntary. If you refuse to participate, there are no penalties or loss of benefits or services that you are otherwise entitled. If you decide to participate and then withdraw or skip a question there are also no penalties or loss of benefits or services. Whether or not you choose to participate in this project will have no effect on your relationship with NAU now or in the future.

A basic explanation of the project is written below. Please read this explanation and discuss it with the Anna Highley. Feel free to ask questions to help you understand the project.

After any questions you may have are answered and you decide to participate in the research, please sign on the last page of this form in the presence of the person who explained the project to you. A copy of this form will be given to you to keep.

1. PROJECT PURPOSE:
To identify what the solar processes are in Flagstaff, how they relate to each other, and gage current understanding.

2. EXPLANATION OF PROCEDURES:
There will be several questions for you to answer in an open discussion format. Interviews can be done over the phone or done in-person. The approximate time to complete this interview is one hour.

Appendix B- IRB

3. CONFIDENTIALITY:
Your name will not be associated with your responses and you will not be identified as a participant.

4. COMPENSATION:
You will not receive any compensation by participating in this interview.

5. BENEFITS:
This interview will help us to better understand the role and understanding of PV solar in the Flagstaff community.

6. RISKS:
There are no known risks to you in participating in this interview. You may refuse to answer any questions and you can stop the interview at any time.

7. CONSENT:
I have read the above information about **Solar Energy in Flagstaff** and have been given an opportunity to ask questions. I agree to participate in this project, and I have been given a copy of this consent document.

8. AUDIO CONSENT:
I agree to be audio recorded ____yes ____no.

The dated approval stamp in the header of this consent form indicates that this project has been reviewed and approved by the Northern Arizona University Institutional Review Board (IRB) for the Protection of Human Subjects in Research. Contact the Human Research Protections Office at 928-523-4236 if you have any questions about: (1) the conduct of the project, or (2) your rights as a research participant, or (3) a research-related injury. Any other questions about the research project should be directed to:

Investigator: Anna Alisse Highley
Department of Geography, Planning and Recreation
Northern Arizona University, Flagstaff, Arizona 86011-5016, USA
Tel: +1 208 724 1759

Appendix B- IRB (Continued)

Appendix C

SOLAR PRACTICUM QUESTIONS

APS

1. How does APS participate in solar installations and what is your businesses process?
2. What do you require from installers, customers and City to switch?
3. What financial incentives do you provide or advertise for patrons, if any?
4. What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?
5. What changes (positive or negative) have you seen in solar the past 10 years? And where do you see solar going in the future?
6. Are there any existing inefficiencies that you think exist in the current system and how could this be changed?

INSTALLERS

13. How do you participate in solar installations and what is your businesses process?
14. What do you require from APS, customers and City to switch?
15. What financial options do you provide or advertise for patrons (incentives/or types of payment)?
16. What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?
17. What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?
18. Are there any existing inefficiencies that you think exist in the current system and how could this be changed?

Appendix C- Solar Survey

CITY

8. What is your role in solar installations?
9. What financial options do you provide or advertise for patrons (incentives/or types of payment)?
10. What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?
11. What changes (positive or negative) have you seen in solar the past 10 years? And where do you see solar going in the future?
12. Are there any existing inefficiencies that you think exist in the current system and how could this be changed?

SOLAR PARTICIPANTS

1. When was your system installed?
2. How did you participate in your solar installations and what is was that process with APS, the City, and installer?
3. Where did you find out about solar and what convinced you to install?
4. How many different businesses/parties did you contact to get your system installed?
5. What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?
6. What source of financial incentives did you benefit from (federal, state, local, etc.)?
7. How important was financial assistance in your decision to go solar?
8. Why did you choose to install, and why did you choose that time period?
9. On a scale from 1-5 how would you rate your solar experience? (1- terrible 5- perfect) and are there any existing inefficiencies that you think exist in the current system and how could this be changed?

Appendix C- Solar Survey (continued

Appendix D

Sheet1

CASH SOLAR TIMELINE/CHECKLIST				
		Initiated/Sent	**Completed/Approved**	**Date**
Hand-Off A (Sales to PM)				
RS	Name			
	Contract Date			
	System Size			
	3rd pg. Contract to Books			
	Payment 1 of 3			
APS	Executed Contract			
	APS login/password			
	Rebate Reservation			
	Reservation # and $			
	W9			
Comments				
Hand-Off B (PM to SA)				
RS	Site Analysis Date/Time			
	Structural Analysis			
Hand-Off C (SA to PM)				
	Upgrades/Conditions			
Comments				
Hand-Off D (Design to PM)				
RS	Drawings in Dropbox			
	Specs in Dropbox			
	AHJ Permit			
	Parts list			
APS	Upload Site Plan			
	IA			
Comments				
Hand-Off E (PM to Construction)				
RS	Confirm Parts List			
	Parts Delivery Date			
	Scheduled/Actual Installation			
	Installation Complete			
	Put in Total Install Sheet			
	Payment 2 of 3			
Comments				

Page 1

Hand-Off F (Construction to PM)				
RS	Market Canvassing			
	Pre/Post Photos			
APS	AHJ Inspection Upload			
	APS Inspection (Flip Switch)			
Comments				
Final Completion				
RS	**Payment 3 of 3**			
	System Care Packet			
	System Tutorial			
	Homeowner Acceptance			
	Update Total Install Sheet			
APS	Upload Final Invoice Receipt			
Comments				
Project Accounting				
RS	APS Rebate Check			
	Project Projections			
	Project Closeout			
Comments				
Hand-Off G (PM to Sales)				
RS	Installation Party			
	Flowers			
Issues				
Date	**Problem**		**Resolved by**	
Weekly Updates (Track in Pipedrive)				
Date				

Appendix E

Sheet1

LEASE SOLAR TIMELINE/CHECKLIST				
		Initiated/Sent	**Completed/Approved**	**Date**
Lease Hand-Off A (Sales to PM)				
RS	Name			
	Contract Lease Date			
	System Size			
	3rd pg. Contract to Books			
APS	Executed Contract			
	APS login/password			
	Rebate Reservation			
	Reservation # and $			
	5A			
	6A			
	W9			
ORE	**MILESTONE 1**			
	Lease Counter Sign			
	W9 if Required			
	Utility Bill (2 Months)			
	Voided Check or ACH Signed			
	Proof of Income Statement			
	M1 Payment Received			
Comments				
Lease Hand-Off B (PM to SA)				
RS	Site Analysis Date/Time			
	Structural Analysis			
Lease Hand-Off C (SA to PM)				
RS	Upgrades/Conditions			
ORE	Upload Pre-Shading			
	Upload APS Rebate Application			
	Upload APS IA			
Comments				

Page 1

Lease Hand-Off D (Design to PM)				
RS	Drawings in Dropbox			
	Specs in Dropbox			
	AHJ Permit			
	Schedule Design Signing			
	Parts list			
APS	Upload Site Plan			
	IA			
ORE	Upload Initialed Final Designs			
	Receive Kitting Approval			
Comments				
Lease Hand-Off E (PM to Construction)				
RS	Confirm Parts List			
	Parts Delivery Date			
	Scheduled/Actual Installation			
	Installation Complete			
	Input into Total Install Sheet			
Comments				
Lease Hand-Off F (Construction to PM)				
RS	Market Canvassing			
ORE	**MILESTONE 2**			
	Upload QA			
	Upload Installation Photos			
	Upload Maximizer Map			
	Upload Post Shading			
	Upload HO Final Accept			
	Locate/Upload Monitoring			
	Request/Upload BOS			
	Locate/Upload Installation Cert.			
	Request/Upload Lien Waiver			
	M2 Payment Received			
Comments				

Appendix E- Rooftop Solar (Continued)

Lease Final Completion				
RS	Update Total Install Sheet			
APS	AHJ Inspection Upload			
	APS Inspection (Flip Switch)			
ORE	Receive/Upload AHJ Sign off			
	PTO			
	Request/Upload Lien Waiver			
	Upload APS Rebate Claim Stat.			
	M3 Payment Received			
Comments				
Lease Project Accounting				
RS	All Lease Payments Recieved			
	Project Projections			
	Project Closeout			
Comments				
Hand-Off G (PM to Sales)				
RS	Installation Party			
	Flowers			
Issues				
Date	**Problem**		**Resolved by**	
Weekly Updates (Track in Pipedrive)				
Date				

Appendix E- Rooftop Solar (Continued)

Appendix F

Practicum Hours

City of Flagstaff 2012
Week 1-2 (August 19- September 1)
50 TOTAL HOURS
Roger Eastman
The first week of my internship I was introduced to the basic processes of the Community Development Department. This included becoming familiar with Flagstaff's new Zoning Code and future amendments that were planned to be made. Into the second week, I started filing and organizing staff and community comments for the Zoning Code. Each comment was put into the correct chapter which it applied to; this was a tedious task that was useful in educating me on the Zoning Code and what each chapter had to offer.

Week 3-4 (September 3-16)
21.5 TOTAL HOURS
Roger Eastman
During this time frame I continued working on filing comments into the appropriate chapter, after this was done; I interrupted the comments into "Zoning Code language." This process was challenging because trying to extract the information from peoples' comments and relating it to the zoning code was very time consuming. The last days of this week were spent compiling this information and adding to a document with future Zoning Code amendments. The layout of this information was critical to follow and learning how to format the information is a useful skill.

Week 5-6 (September 16-29)
28 TOTAL HOURS
Roger Eastman
The sixth week I aided Roger in finding exceptions to signage in bus stop areas. This is usually not accepted because of pedestrians' right-of-way, but Roger wanted to make an exception to promote NAIPTA's buses. These signs would be located on/nearby bus shelters. I looked through other Arizona cities' Zoning Code to look for examples of possible exemption solutions. (6 Hours)
Kim Sharp
During week five I assisted Andrew in compiling and summarizing Regional Plan documents into a background report. I was looking for this information in chapter binders and in data file resources; I would then summarize the information and provide a hyperlink. I worked on the Circulation, Bike and Community Character Chapters this gave me an insight into these areas and what makes them successful and unsuccessful. (13 Hours)
Nicole Woodman
I began working for Nicole the sixth week, we first discussed her project and the role that I would play in helping her organize a DOE Sunshot Initiative Seminar. My job this week was

to find possible Northern Arizona attendees, find a location for the event and contact APA to find out requirements of giving credits to people who attend. I found this to be different from the past work I had done, but it taught me how to be professional to people outside of this office and how planning has many different side.
(9 Hours)

Week 6-7 (September 30- October 13)
24 TOTAL HOURS
Roger Eastman
This week I researched other cities in and outside of Arizona that made exceptions for bus stop advertising. NAIPTA is asking Roger to make exceptions for bus stop advertising so it can help fund future improvements. This was an interesting assignment because the issue with most advertising at bus stops has to do with right-of-way issues. I thought that Portland and Tucson made simple exceptions that worked well. (11 Hours)
Nicole Woodman
I have begun researching possible locations, dates, times, and food options for the seminar. Local hotels, NAU facilities, and conference centers are places that I have contacted.
(13 Hours)

Rooftop Solar 2013

ALISSE HIGHLEY			
October 29,2013	09:00:00 AM	01:59:59 PM	5
October 31,2013	09:00:00 AM	02:00:00 PM	5
November 1,2013	01:00:00 PM	04:00:00 PM	3
11/05/13	09:00:00 AM	02:29:59 PM	5.5
11/07/13	09:00:00 AM	01:59:59 PM	5
11/08/13	02:29:59 PM	05:29:59 PM	3
11/12/13	09:59:59 AM	03:00:00 PM	5
11/14/13	09:00:00 AM	01:59:59 PM	5
11/15/13	03:30:00 PM	05:29:59 PM	2
11/19/13	09:00:00 AM	01:59:59 PM	5
11/21/13	09:00:00 AM	02:29:59 PM	5.5
12/03/13	09:00:00 AM	01:59:59 PM	5
12/05/13	10:29:59 AM	03:30:00 PM	5
12/06/13	01:00:00 PM	04:00:00 PM	3
12/10/13	09:59:59 AM	03:00:00 PM	5
12/12/13	09:00:00 AM	03:00:00 PM	6
12/13/13	01:59:59 PM	06:00:00 PM	4
12/16/13	09:59:59 AM	03:30:00 PM	5.5
12/17/13	04:00:00 PM	06:30:00 PM	2.5
12/18/13	01:00:00 PM	06:00:00 PM	5
NEW YEAR			
01/14/14	09:00:00 AM	01:59:59 PM	5
01/16/14	09:00:00 AM	01:59:59 PM	5
01/17/14	01:00:00 PM	06:00:00 PM	5
01/21/14	09:00:00 AM	01:59:59 PM	5
01/23/14	09:00:00 AM	01:59:59 PM	5
01/24/14	01:30:00 PM	04:59:59 PM	3.5
01/28/14	09:00:00 AM	01:59:59 PM	5
01/30/14	09:00:00 AM	02:29:59 PM	5.5
01/31/14	11:30:00 AM	01:30:00 PM	2
02/04/14	09:00:00 AM	01:59:59 PM	5
02/06/14	09:00:00 AM	01:59:59 PM	5
02/11/14	09:00:00 AM	01:59:59 PM	5
02/13/14	09:00:00 AM	01:59:59 PM	5
02/14/14	01:00:00 PM	03:00:00 PM	2
02/18/14	09:00:00 AM	01:59:59 PM	5
02/20/14	09:00:00 AM	03:00:00 PM	6
02/21/14	12:45:00 PM	03:15:00 PM	2.5
02/25/14	09:00:00 AM	01:59:59 PM	5
02/27/14	09:00:00 AM	01:59:59 PM	5
02/28/14	01:59:59 PM	04:00:00 PM	2
03/04/14	09:00:00 AM	01:59:59 PM	5
03/06/14	09:00:00 AM	01:59:59 PM	5
03/07/14	02:29:59 PM	04:59:59 PM	2.5
03/11/14	09:00:00 AM	01:59:59 PM	5
03/13/14	09:00:00 AM	01:59:59 PM	5
03/14/14	12:45:00 PM	02:44:59 PM	2
03/25/14	09:00:00 AM	01:59:59 PM	5
03/27/14	09:00:00 AM	01:59:59 PM	5
03/28/14	11:00:00 AM	01:00:00 PM	2
04/01/14	09:00:00 AM	01:59:59 PM	5
04/03/14	09:00:00 AM	01:59:59 PM	5
04/04/14	12:00:00 PM	03:00:00 PM	3
04/08/14	09:00:00 AM	01:59:59 PM	5
04/10/14	09:00:00 AM	01:59:59 PM	5
04/11/14	09:00:00 AM	11:00:00 AM	2
04/15/14	09:00:00 AM	01:59:59 PM	5

Over the past nine months I have worked with solar customers, APS and installers to installed solar systems around Flagstaff. This experience has taught me what is required to install solar and the processes behind it. Understanding the requirements has given me an inside look at why regulations and stakeholders are in place.

Appendix G

Process Guide (Effective on March 3rd 2014)

:: residential renewable energy program guide and application process ::

Thank you for your interest in the APS Renewable Energy Program. This guide will help you navigate the process to interconnect a residential solar photovoltaic (PV) system, and to complete residential incentive applications for solar water heaters. For document requirements, please see the Document Requirements Guide (the last page of this document). Each step of the process must be completed and approved before moving to the next step.

APPLICATION PROCESS FOR GRID-TIED SYSTEMS WHERE CUSTOMER IS NOT SEEKING AN INCENTIVE

Step 1: Customer application (Customer)

- Register for an aps.com account, if you do not currently have one
- Be sure that your installer, dealer, and lessor (if applicable) are registered with aps.com prior to starting an application
- Disable pop up blockers, then log in to your APS account
- Select "my rebates and renewables"
- Select "renewable energy applications"
- **Profile page: be sure to completely fill out this page before continuing**
- Navigate through the pre-validation page and the online application by either clicking on the page names on the top or by scrolling down and selecting "previous" or "continue" – **very important: do not use your browser's back button**
- **Submit and print out the summary of your application** – your **Interconnect Agreement** is signed in conjunction with submitting your application, so please keep a copy for your records
- When you submit your application, a hand-signed Disclaimer and signed Executed Contract must be uploaded. We will dismiss the application if we do not receive these documents and you will be asked to reapply when ready

The Disclaimer

As of December 1st, 2013, a hand-signed disclaimer must be signed by the APS customer for every application.

Step 2: Installer application (Installer)

- Prior to installation, submit the online installer application and upload any required design documents, such as the Site Plan and 3-Line Diagram
- Once APS confirms that your grid-tied system is designed in conformance with our interconnection requirements, you will receive notification and may proceed with installation

Step 3: Clearance (Installer and/or Customer) and Lessor Agreement online if applicable (Lessor)

- The City or County may send Clearance to APS, but a copy of the clearance/green tag may also be uploaded to the application by you or your installer
- For leased systems, after the lessor has issued you or your installer with their notice to proceed (NTP), the lessor must log into their aps.com portal to sign the lessor agreement for your application

Step 4: Certifications (Installer)

- Installer will upload the Installer Checklist and submit the Certifications

Step 5: Inspection / Meter Set (APS)

- Your electric billing meter will be swapped out for a bi-directional meter
- At no cost to you, your "test" production meter will also be swapped out for an APS production meter, if you are in AMI territory

Process Complete

Appendix G. APS Program Guide

APPLICATION PROCESS FOR GRID-TIED SYSTEMS WHERE CUSTOMER IS SEEKING AN INCENTIVE

Continue here for application submitted before March 3rd 2014 that did not have clearance verified or lessor acknowledgements completed by March 3rd 2014.

Step 3: Clearance (Installer and/or Customer) and Lessor Agreement online if applicable (Lessor)

- The City or County may send Clearance to APS, but a copy of the clearance/green tag may also be uploaded to the application by you or your installer
- For leased systems, after the lessor has issued you or your installer with their notice to proceed (NTP), the lessor must log into their aps.com portal to sign the lessor agreement for your application

Step 4: Certifications (Installer)

- Installer will upload the Installer Checklist and submit the Certifications

Step 5: Inspection / Meter Set (APS)

- Your electric billing meter will be swapped out for a bi-directional meter
- At no cost to you, your "test" production meter will also be swapped out for an APS production meter, if you are in AMI territory

Step 6: Payment (Installer / Dealer and / or Customer)

- A Final Paid Invoice must be uploaded.
- The IRS considers utility incentives a reportable income. Prior to payment a W-9 form must be submitted to APS. If you have purchased your system, the W-9 should be provided by you. If you are leasing a system, the lessor must provide a W-9 since they are the system owner. W-9 forms are available online at the IRS website. If you have any questions regarding the W-9 requirement, **please contact your tax advisor or contact the IRS directly at 1-800-829-1040**.
- APS can issue the incentive check only once all requirements are met and all documents are reviewed and verified.
- Incentive checks are automatically sent to the installer (in the case of customer-owned application) or the lessor (in case of a leased application) to buy down the cost of the system.

Process Complete

We're here to help!

Our processes have changed slightly for applications submitted before March 3rd 2014. We have a new process for applications submitted on or after March 3rd 2014. Please be sure to read the correct process guides to help you.

For assistance with your aps.com account or to ask general questions about your application, call 602-328-1924.

To troubleshoot the online application, email renewables@aps.com.

Appendix G. APS Program Guide (Continued)

APPLICATION PROCESS FOR SOLAR WATER HEATING SYSTEMS WHERE CUSTOMER IS SEEKING AN INCENTIVE

Please note that the entire process must be completed within 180 days of the application being reserved. Also, customers not seeking an incentive for solar water heating systems do not need to notify APS about their installation.

Step 1: Customer application (Customer)

- Register for an aps.com account, if you do not currently have one
- Be sure that your installer, dealer, and lessor (if applicable) are registered with aps.com prior to starting an application
- Disable pop up blockers, then log in to your APS account
- Select "my rebates and renewables"
- Select "renewable energy applications"
- **Profile page: be sure to completely fill out this page before continuing**
- Navigate through the pre-validation page and the online application by either clicking on the page names on the top or by scrolling down and selecting "previous" or "continue" – **very important: do not use your browser's back button**
- **Submit and print out the summary of your application** – your **APS Agreement** is signed in conjunction with submitting your application, so please keep a copy for your records
- Upload a signed Executed Contract and W9 when you submit the application. We will dismiss the application if we do not receive these documents when the application is submitted.
- The IRS considers utility incentives as reportable income. Prior to payment a W-9 form must be submitted to APS. If you have purchased your system, the W-9 should be provided by you. If you are leasing a system, the lessor must provide a W-9 since they are the system owner. W-9 forms are available online at the IRS website. If you have any questions regarding the W-9 requirement, **please contact your tax advisor or contact the IRS directly at 1-800-829-1040**.

Reminder:

The System must be tested and certified to the OG-300 by an APS-approved certifying organization and have a rating that is accompanied by the certified system design schematic. This will be verified before we reserve the application.

Step 2: Installer Application (Installer)

- Prior to installation, your installer submits the online installer application. No documents are required.

Step 3: Clearance (Installer and/or Customer) and Lessor Agreement online if applicable (Lessor)

- The City or County may send Clearance to APS, but a copy of the clearance/green tag may also be uploaded to the application by you or your installer
- For leased systems, after the lessor has issued you or your installer with their notice to proceed (NTP), the lessor must log into their aps.com portal to sign the lessor agreement for your application

Step 4: Certifications (Installer)

- Submit the certifications and upload a Final Paid Invoice.

Step 5: Inspection (Arizona Solar Center and Installer)

- APS will require an inspection for every SWH system installed seeking an incentive. The **Arizona Solar Center** will schedule the inspection, if leased we must have the leased documents before we can send to Arizona Solar Center
- If the system fails the first inspection, the installer is responsible for the cost of all re-inspections until it passes.
- **Installer must email renewables@aps.com when ready for the re-inspection stating: "application # has been paid and is ready for re-inspection"**

Step 6: Payment (Installer / Dealer and / or Customer)

- Incentive checks are automatically sent to the installer to buy down the cost of the system.
- APS only issues payment once all required documents are received.
- Process Complete

Appendix G. APS Program Guide (Continued)

:: Document Requirements Guide ::

Document:	Requirements:
Executed Contract	▪ Must be on a company letter head ▪ Customer name ▪ Site address ▪ Equipment (recommended) ▪ Total System Cost (recommended) ▪ Signatures of customer and company Click her for a sample Executed Contract
Disclaimer (Grid Tied Systems Only)	▪ Must be the most current revision ▪ Signed and dated by the APS customer Click here for the Disclaimer
Site plan, 3-line Diagram, and other Diagrams (Grid Tied Systems Only)	• Interconnection Webpage Click here for sample Site Plan and Diagrams (Line Side) Click here for sample Site Plan and Diagrams (Load Side)
Installer Checklist (Grid Tied Systems Only)	Click here for Installer Checklist for PV & Wind Interconnections
Clearance	▪ Show which City or County the Clearance is from ▪ Site address ▪ Indicate PV (Electric and Solar) or SWH (Solar Plumbing) ▪ Indicate pass / final / approved ▪ Date
W9 (Incentive Only)	Click here for forms at IRS.GOV ▪ Clearly printed customer name, address and Social Security Number ▪ Name needs to be the same as it appears on your income tax returns ▪ Customer signature and date
Final Paid Invoice (Incentive Only)	▪ Must be on a company letter head ▪ Customer name ▪ Site address ▪ Equipment • Major equipment detailed (manufacturer, model, and quantity) ▪ Total System Cost ▪ Estimated incentive amount deducted from total system cost (required for SWH) ▪ Show zero balance / paid in full ▪ Customer Signature (required for SWH)
Landlord / Tenant Rider*	Click here for Landlord / Tenant Rider form

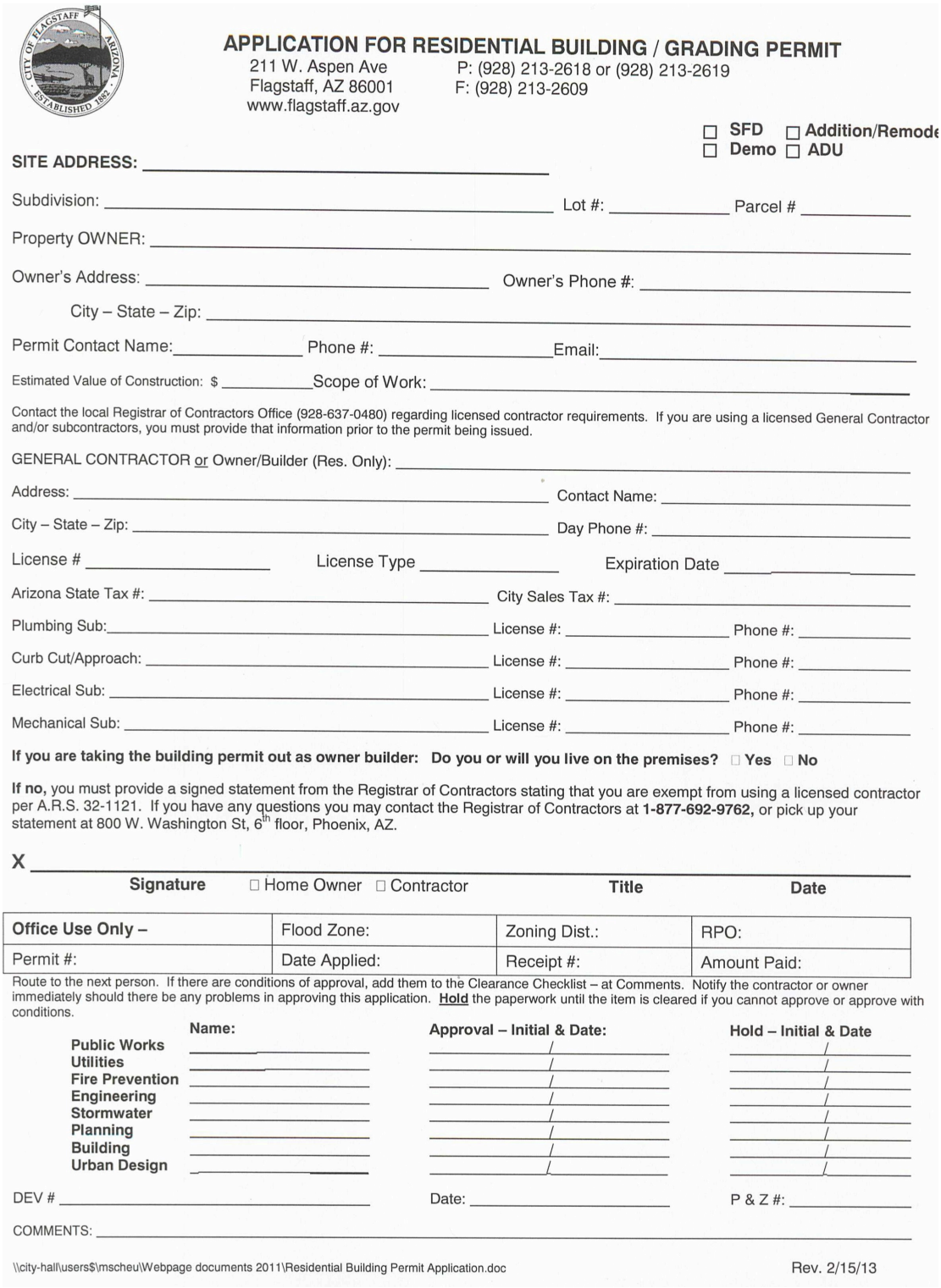
* If you are a landlord wanting to install solar on your rental property, be sure to log in with your own user name and password. If you do not currently have an active APS account, you may create one. **Do not use your tenants log in information.** If you are a tenant installing the solar on a property you rent, then fill out the application using your login and fill out the Tenant / Landlord Rider.

Please email questions about the documents to renewables@aps.com.

Duration of the application process varies. Installers are advised to inform customers that timeframes are looked at on a project to project basis.

Appendix G. APS Program Guide (Continued)

Appendix H



APPLICATION FOR RESIDENTIAL BUILDING / GRADING PERMIT

211 W. Aspen Ave
Flagstaff, AZ 86001
www.flagstaff.az.gov

P: (928) 213-2618 or (928) 213-2619
F: (928) 213-2609

☐ SFD ☐ Addition/Remode
☐ Demo ☐ ADU

SITE ADDRESS: _____

Subdivision: _____ Lot #: _____ Parcel # _____

Property OWNER: _____

Owner's Address: _____ Owner's Phone #: _____

City – State – Zip: _____

Permit Contact Name: _____ Phone #: _____ Email: _____

Estimated Value of Construction: $ _____ Scope of Work: _____

Contact the local Registrar of Contractors Office (928-637-0480) regarding licensed contractor requirements. If you are using a licensed General Contractor and/or subcontractors, you must provide that information prior to the permit being issued.

GENERAL CONTRACTOR or Owner/Builder (Res. Only): _____

Address: _____ Contact Name: _____

City – State – Zip: _____ Day Phone #: _____

License # _____ License Type _____ Expiration Date _____

Arizona State Tax #: _____ City Sales Tax #: _____

Plumbing Sub: _____ License #: _____ Phone #: _____

Curb Cut/Approach: _____ License #: _____ Phone #: _____

Electrical Sub: _____ License #: _____ Phone #: _____

Mechanical Sub: _____ License #: _____ Phone #: _____

If you are taking the building permit out as owner builder: Do you or will you live on the premises? ☐ Yes ☐ No

If no, you must provide a signed statement from the Registrar of Contractors stating that you are exempt from using a licensed contractor per A.R.S. 32-1121. If you have any questions you may contact the Registrar of Contractors at **1-877-692-9762,** or pick up your statement at 800 W. Washington St, 6th floor, Phoenix, AZ.

X _____

Signature ☐ Home Owner ☐ Contractor **Title** **Date**

Office Use Only –	Flood Zone:	Zoning Dist.:	RPO:
Permit #:	Date Applied:	Receipt #:	Amount Paid:

Route to the next person. If there are conditions of approval, add them to the Clearance Checklist – at Comments. Notify the contractor or owner immediately should there be any problems in approving this application. **Hold** the paperwork until the item is cleared if you cannot approve or approve with conditions.

	Name:	**Approval – Initial & Date:**	**Hold – Initial & Date**
Public Works			
Utilities			
Fire Prevention			
Engineering			
Stormwater			
Planning			
Building			
Urban Design			

DEV # _____ Date: _____ P & Z #: _____

COMMENTS: _____

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Appendix H. City Permit

Impervious Surface (Square Feet)

The following square footages must also be provided on the plans

For new construction on undeveloped lots, include all impervious surfaces.
For additions and improvements on developed lots, include only additional impervious surfaces.
Use building footprints to determine impervious surfaces, not livable areas.

Buildings: _____SF

Driveway: _____SF

Parking: _____SF

Sidewalks: _____SF

Decks/Patios: _____SF

Other: _____SF

TOTAL: _____SF

Property Information: ☐ Yes ☐ No Located in an existing City of Flagstaff Historic District? (Name:_____)
☐ Yes ☐ No Existing structures are pre-World War II housing (1946)?

Grading Questionnaire

Do any of the following conditions apply to your site? Please check the appropriate response. (cut and fill inside the building foot print is not counted).

Yes	No	
☐	☐	1. Will there be fill greater than 50 cubic yards on any one lot (about 4 ½ - 10 wheeler loads)?
☐	☐	2. Will you be placing fill or creating a cut-slope near your property line (i.e. leveling lot)?
☐	☐	3. Will you be filling areas of your project outside the building footprint/foundation with imported fill material or existing material from excavations for basements, lower floors, foundations, retaining walls or other structures authorized by a valid building permit?
☐	☐	4. Will there be fill supporting a structure (must be engineered prior to commencing work)?
☐	☐	5. Will the placement of fill on your property obstruct or change the flow of an existing man-made or natural drainage course or divert runoff onto neighboring property?

A **"YES"** response to any question may require a grading permit, and must be shown on the site plans (existing contour lines and new proposed). Sections may be required. Please provide two (2) sets of the following:
- Shade the area to be cut and/or filled.
- Typical cross section for area to be cut and/or filled

Indicate quantities of cut _____ cyds.; fill _____ cyds. Estimate value of grading $ _____

Plans for any retaining walls (if retaining greater than 48" or has a surcharge from a structure or parking area, the plans must be prepared by a professional engineer and stamped). Special Inspection is required: yes / no

DEPOSIT SCHEDULE: (Balance of permit fee will be due at the time the permit is issued)

Solar Application Deposit: $150.00

Project estimated value:	$ 0 - $ 4,999 ..... $ 0.00 deposit	$ 25 - $ 49,999 ..... $ 175.00 deposit
	$ 5 - $ 9,999 ..... $ 50.00 deposit	$ 50 - $ 99,999..... $ 300.00 deposit
	$ 10 - $ 24,999 .... $ 85.00 deposit	$100 ,000 & over.... $ 450.00 deposit

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Appendix H. City Permit (Continued)

LIST OF FIGURES

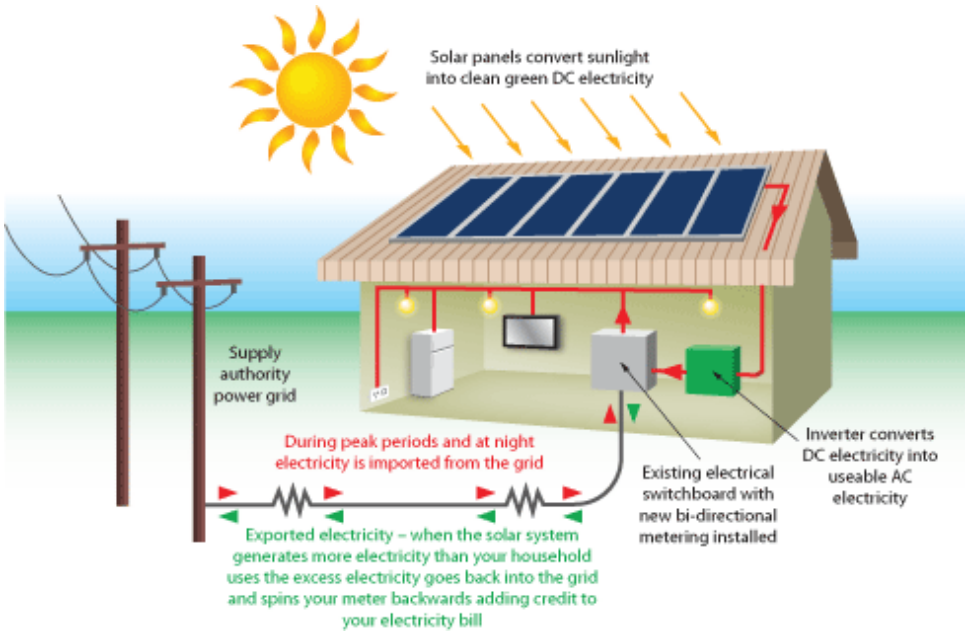

Figure 1. How Does Solar Work. *Energy Farm*, Source: Energy Farm Australia (2013).

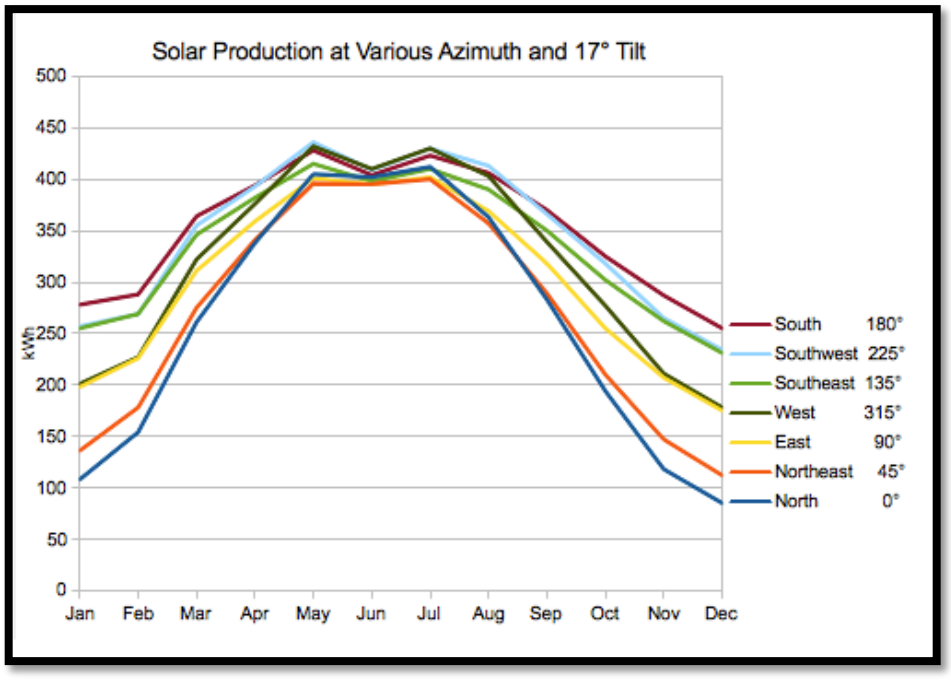

Figure 2. Various Azimuth's on Solar Production. *Pierrosolar,* Source: Pierro (2012)

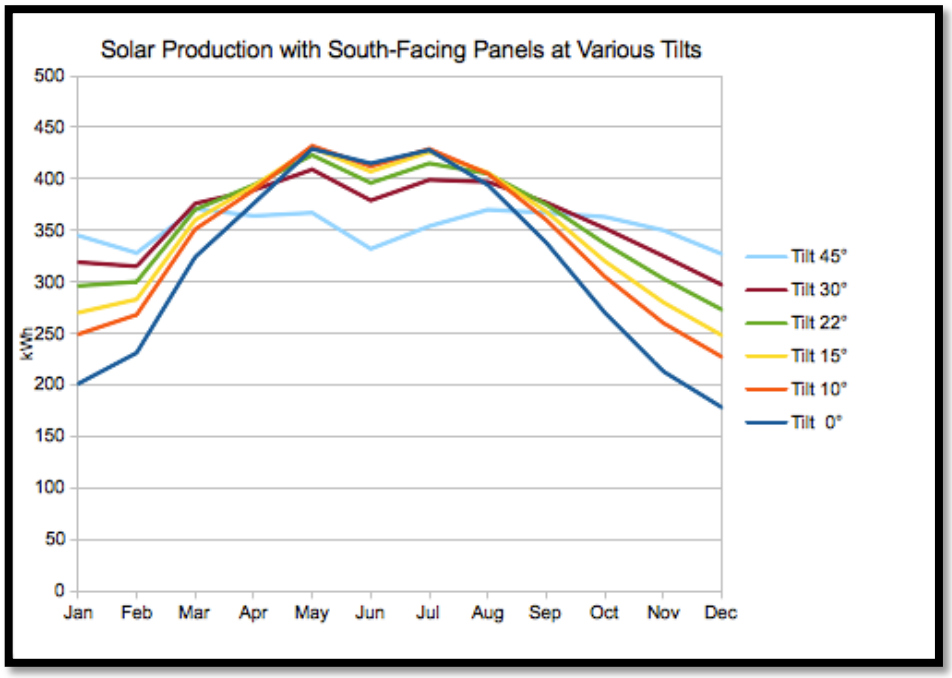

Figure 3. South Facing Panels & Solar. Production. *Pierrosolar,* Source: Pierro (2012)

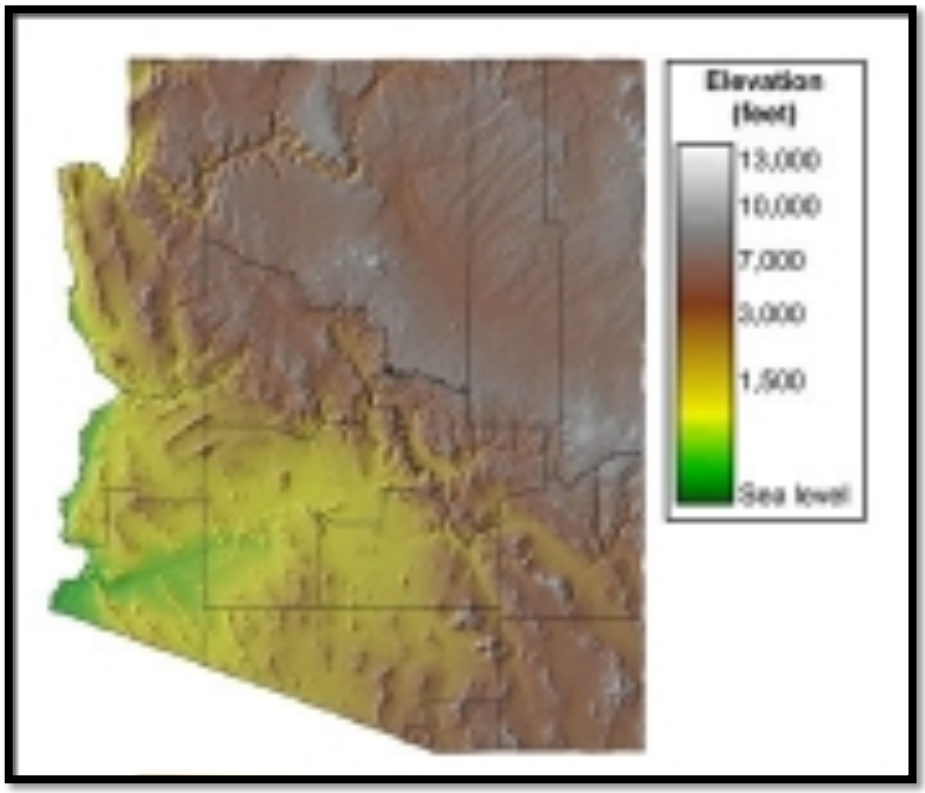

Figure 4. Arizona Elevation. *Climate of the Southwest,* Source: Lenart (2008)

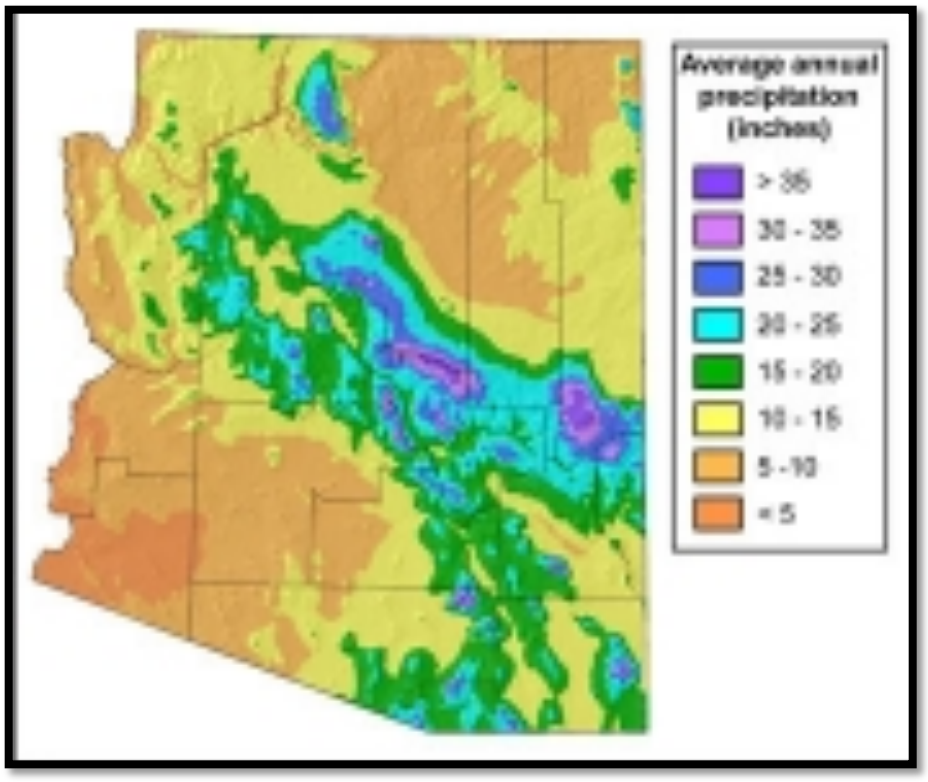

Figure 5. Arizona Average Annual Precipitation. *Climate of the Southwest,* Source: Lenart (2008)

updated 10/18/2013

beginning budget			funds requested (installed + reserved)		remaining budget	
$2,650,000			$3,688,853		$0	
percentage of total budget requested					139%	
applications reserved	capacity reserved (mw)	systems installed	capacity installed (mw)	funds installed	funds reserved	funds requested
2,340	18.39	2,507	18.58	$1,848,792	$1,840,061	$3,688,853

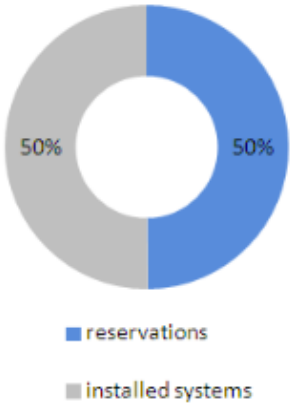

Figure 6. APS Rebate Information. *APS Renewables,* Source: APS (2013).

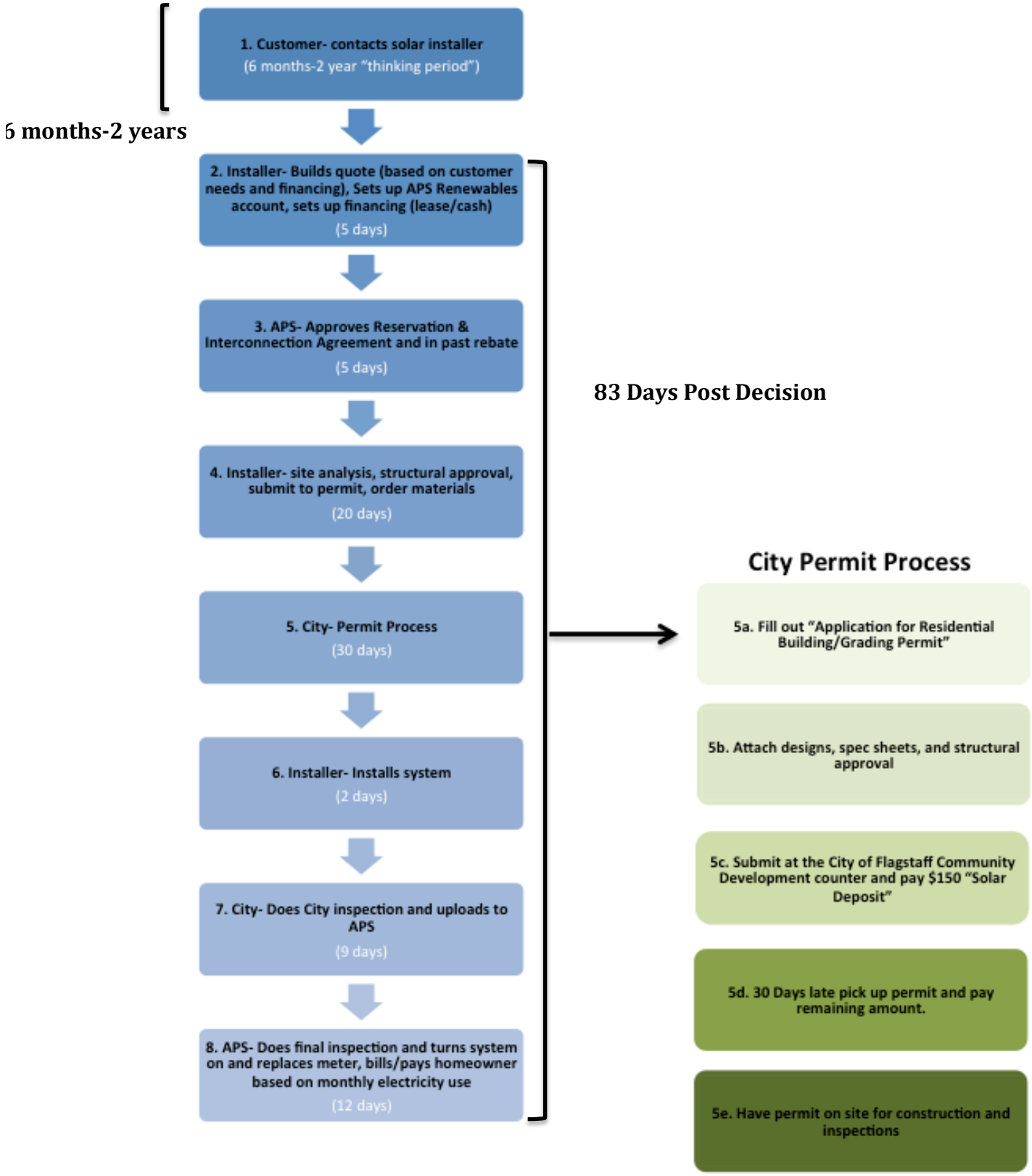

Figure 7. Solar Installation Process

LIST OF TABLES

CUSTOMER SURVEY

Question	Why it was Asked
Q1-When was your system installed?	How current installation was to understand and compare advancements made in processes.
Q2-How did you participate in your solar installations and what was that process with APS, the City, and installer?	Understanding of the "Workload" or knowledge needed to install a solar system
Q3-Where did you find out about solar and what convinced you to install?	Note advertisement opportunities out there and which ones appeal to the customer
Q4-How many different businesses/parties did you contact to get your system installed?	What length was the customer required to go to, to get system installed
Q5-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	After going through the process what did they struggle with or find as the biggest barrier.
Q6-What source of financial incentives did you benefit from (federal, state, local, etc.)?	See if/what financial incentives the customer knew about of was eligible for.
Q7- How important was financial assistance in your decision to go solar?	Find out if personal system made financial sense or something they financially benefitted from
Q8-Why did you choose to install, and why did you choose that time period?	Understand why that time period specifically impacted their switch
Q9-On a scale from 1-5 how would you rate your solar experience? (1- terrible 5-perfect) and are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Overall understanding of process satisfaction and where could there be improvement

Table 1. Customer Solar Survey

CUSTOMER RESULTS

Question #	Consensuses	Notable Findings
Q1	Within the past 2 years	NA
Q2	Contacted Installation Company	After installation had correspondence with APS
Q3	Informed- Media Why- Personal obligation	Informed- Home show Why- Overall financial saving, uncertainty of fuels in the future, keeping energy money in USA
Q4	2- Installer, APS	Leasing company, ACC
Q5	Financing, lack of education	Media/publicity, peer support
Q6	APS rebate, state and federal tax rebate	Leasing incentive, installer promotion
Q7	Top priority	Significant
Q8	Right time in life financially, home, electricity usage, personally.	ACC net metering deadline
Q9	Rate- 4 Improvements- pace, truth, unity, stability	Improvements- consistency, process outline, uniformed payments system

Table 2. Customer Results from Solar Survey

INSTALLER SURVEY

Question	Why it was asked
. Q1-How do you participate in solar installations and what is your businesses process?	Understanding of where in the process that person works and what they do to contribute
. Q2-What do you require from APS, customers and City to install solar?	Understand what information they are interested in and who they are in contact with
. Q3-What financial options do you provide or advertise for patrons (incentives/or types of payment)?	See how individual is promoting or advertising financial options
. Q4-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	A perspective of working in the industry and acknowledging challenges
. Q5-What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?	Ability to measure progress and different sectors and an educated guess to where trends are going now
. Q6-Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Understanding of where individual sees problems or where advancements could be made.

Table 3. Installer Solar Survey

INSTALLER RESULTS

Question #	Consensuses	Notable Findings
Q1	Construction	Site analysis, design
Q2	APS- IA, inspection, rebate, reservation City- Permit, inspection Customer- contract, funds, utility bill	Structural engineering approval, leasing paperwork
Q3	Cash, lease, tax incentive, APS rebate	In house promotions, manufacturer promotions, leasing incentives
Q4	APS- negative advertisement, inconsistent procedures	Education, financing, cost of traditional energy costs aren't very high in Flagstaff
Q5	Cost decrease, consistency, incentive decrease, new technology	Acceptance of solar, less materials needed, industry responses to problems, more jobs
Q6	Inefficiencies- Pace, consistency in parties/materials/cost Future- Solar becomes more common, grid defection	Inefficiencies- national uniformity, lack of experience, renewable have "bad" image Future- battery storage improvements

Table 4. Installer Results from Solar Survey

CITY SURVEY

Question	Why it was asked
. Q1- What is your role in solar installations?	Understanding of where in the process that person works and what they do to contribute
Q2- What financial options do you provide or advertise for patrons (incentives/or types of payment)?	See how individual is promoting or advertising financial options
. Q3- What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	A perspective of working in the industry and acknowledging challenges
. Q4- What changes (positive or negative) have you seen in solar the past 10 years? And where do you see solar going in the future?	In the government sector, what changes have been made and are changes expected to be made in the future
. Q5- Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Understanding of where individual sees problems or where advancements could be made.

Table 5. City Solar Survey

CITY RESULTS

Question #	Consensuses	Notable Findings
Q1	Building inspector, current planner	NA
Q2	None	Flat rate permitting fee
Q3	Financing	Education
Q4	Price decrease, faster	More common
Q5	Inefficiencies- practicality, cost Future- faster, cheaper	Inefficiencies- Policy fluctuation Future- more common

Table 6. City Results from Solar Survey

APS SURVEY

Question	Why it was asked
. Q1-How does APS participate in solar installations and what is your business process?	Understanding of utility role and inside process and reasoning
. Q2-What do you require from installers, customers and City to switch?	Understand what information they are interested in and who they are in contact with
. Q3-What financial options do you provide or advertise for patrons (incentives/or types of payment)?	See how company is promoting or advertising financial options
. Q4-What is the biggest barrier you believe solar in Flagstaff has (financial, climate, implementation, etc.)?	A perspective of working in the industry and acknowledging challenges
. Q5-What changes (positive or negative) have you seen in solar the past 10 years (ex. Lease vs. cash)? And where do you see solar going in the future?	Ability to measure progress and different sectors and an educated guess to where trends are going now
. Q6-Are there any existing inefficiencies that you think exist in the current system and how could this be changed?	Understanding of where individual sees problems or where advancements could be made.

Table 7. APS Solar Survey

APS RESULTS
(Information based on secondary resources)

Question #	News and Press Released Information
Q1	"APS has helped make Arizona a national leader in solar development. Our company is spending nearly $1 billion on solar projects throughout the state, while providing a stable electric grid. In 2012, APS added a record-breaking 148 megawatts of clean solar energy, which is enough electricity to serve more than 35,000 customers. We expect to more than double that number in 2013." (APS, 2013).
Q2	Customer online utility account, executed contract, disclaimer form, lessor acknowledgment (if leased), City/County approval.
Q3	APS also is supporting an increase in the up-front cash incentive that makes rooftop solar a more affordable option for customers who want to "go solar." "We support an incentive program for rooftop solar that is transparent, reviewed frequently by the ACC, and shared fairly among customers," said Mark Schiavoni, APS executive vice president of Operations (APS, 2013).
Q4	"As we get more rooftop solar customers … what we want is a system that's fair for all of our customers." (O'Donnell, 2013)
Q5	Paperwork, requirements, process, taxes and rates.
Q6	"Of course, having determined that a problem exists (net metering cost shift), we would have preferred for the ACC to fix it. The proposal adopted by the ACC, and surprisingly championed by the state's consumer advocate RUCO, falls well short of protecting the interests of the one million residential customers who do not have solar panels. We will continue to advocate forcefully for the best interests of our customers and for a sustainable solar policy for Arizona." Dan Brandt (APS, 2013).

Table 8. APS Results from Solar Survey

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