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1 **TO:** The Arizona Corporation Commission  
 2  
 3 **FROM:** Arizona Solar Power Society  
 4  
 5 **DATE:** April 28, 2010  
 6  
 7 **DOCKET NO.:** E-00000J-09-0505  
 8  
 9 **REGARDING:** Arizona Solar Feed-in Tariff

10  
11 Dear Madam Chairman and Commissioners:

12  
13 This response contains specific information that we think the Commission will find useful in  
14 researching and drafting a feed-in tariff that is based on the cost to generate renewable energy,  
15 provide a fair return on investment for investors and offset the cost of producing clean energy  
16 for every rooftop owner in Arizona.

17  
18 These comments include important research facts that demonstrate how utility companies can  
19 effectively save their ratepayers hundreds of millions of dollars by investing in renewable  
20 energy resources that will generate power with no fuel cost and save a tremendous amount of  
21 money on utility grid upgrades and expansions.

22  
23 After careful consideration and formal and informal discussions with our more than 800  
24 members who are actively involved in the solar power, solar thermal and energy efficiency  
25 industry, we submit our public comments for your consideration.

26  
27 Please contact us with questions or comments.

28  
29 Respectfully submitted on this 28<sup>th</sup> day of April 2010.

30  
31 Robert Hoskins

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33  
34 By \_\_\_\_\_

35  
36 Robert Hoskins  
37 Executive Director  
38 Arizona Solar Power Society  
39 Phone: (602) 326-0940

Arizona Corporation Commission  
**DOCKETED**

APR 30 2010

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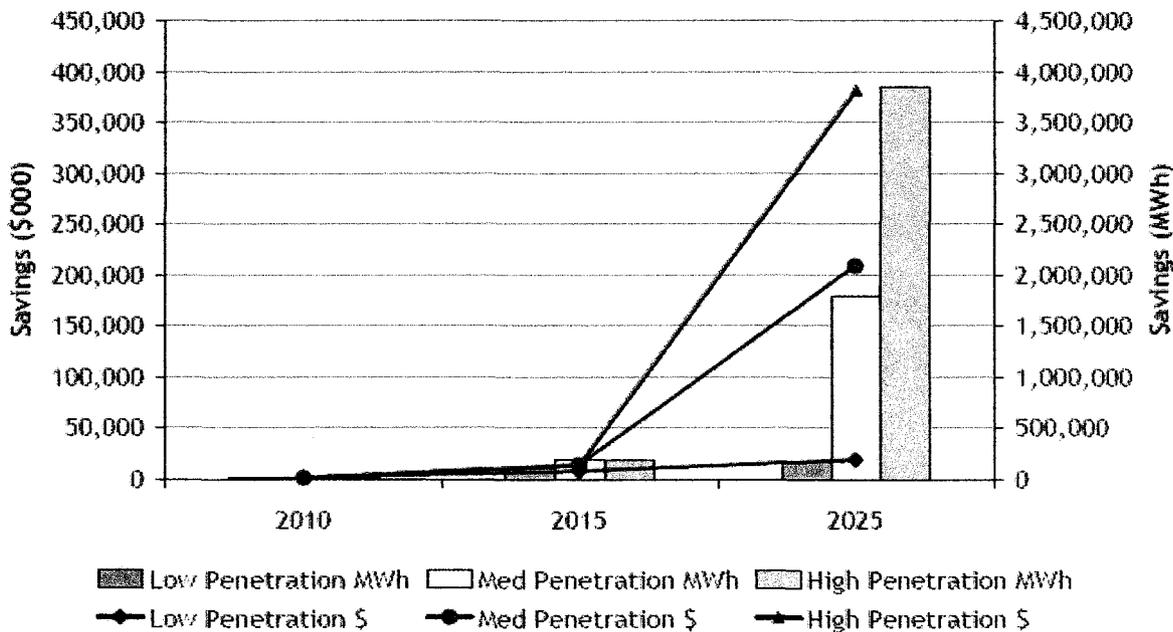
## Arizona Solar Feed-in Tariff Response #2

### Successful Solar Penetration Requirements

Per the RW Beck report sponsored by APS, “Solar distributed generation” (DG) deployment represents the opportunity to accrue real value to ratepayers and a broad range of stakeholders in Arizona. The winning business case for solar DG in Arizona is a combination of hard, quantitative economic facts, such as the reduction of line losses, energy savings for customers, and reduced or deferred capital expenditures. But it also includes softer, qualitative benefits such as increased job opportunities for installers, a more sustainable environment, and benefits that will likely become economic in the future, such as the value of carbon. Even broader economic benefits would include improved worker productivity and a more robust solar DG manufacturing industry.

To capture the benefits of a winning business case it will be important to regularly monitor and report on the progress being made, and to look for opportunities to remove barriers to the successful expansion of solar in the state. It is the removal of those barriers and the movement toward the tipping point – where solar is the norm – that will prove that solar programs have become main stream and are part of a new energy future. The value potential is shown below and it is the range of value potential that is noteworthy. The state of Arizona can influence the value potential and has great opportunity to play an important role in the future of solar energy.”

**Value Summary of Cost and Energy Savings of Solar Distributed Generation**



(Source: RW Beck report sponsored by APS)



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### **Advantages Feed-in Tariff vs. Disadvantages Performance Based Incentive (PBI) RFP**

RFP programs associated with PBI program have proven to be inadequate when measured by their ability to achieve solar installations. The following is a summary of the arguments, pro and con, including many points that were reiterated over and over during the Commission's Feed-in Tariff workshop.

#### **Advantages of an Arizona Solar Feed-in Tariff:**

1. Simplifies the bidding process on all projects regardless of size
2. Reduces the Commission's work load to manage numerous renewable energy tariffs
3. Opens customer base to all roof top owners regardless of tax status
4. Opens solar projects to every solar installation company regardless of size
5. Lets the FIT set the price and the market to determine the quantity
6. Provides a guaranteed rate-of-return for a known period of 20+ years
7. Allows a wide range of investors to see a quicker return on investment
8. Will attract an unprecedented flow of investment capital to Arizona
9. Will facilitate the wide-spread deployment of solar in short time frame
10. Will fund a multi-billion solar industry in Arizona
11. Will create tens of thousands of jobs benefiting all ratepayers
12. Will provide sufficient supply of RECs to be purchased by all Arizona utility companies
13. Will allow every Arizona utility company to meet their RES requirements
14. Will eradicate the problem of radically changing up-front incentive programs without warning or professional notice
15. Will solve the problem of utility companies refusing to pay approved solar rebates in a timely manner

#### **Disadvantages of Arizona's PBI Programs:**

1. Limits customer participation due to tax status or lack thereof
2. Allows utility companies to maintain complete control of the industry, which should not be allowed for obvious reasons
3. Overwhelming failure to put steel in the ground for solar installations
4. A 90-93% failure rate to finance projects due to poorly written RFPs
5. Parasitic costs associated with drafting RFPs by all but the largest solar installation companies
6. Propensity for cutthroat vendors to underbid RFPs in order to win
7. Sealed bids that allow a secretive RFP process that allows utility companies to select RFPs based on something other than the best return-on-investment for rate payers, i.e. Sulphur Springs Valley Electric selecting an RFP for 41 schools at a cost of \$11.77 per installed watt, which completely exhausted their Sunwatts incentive program
8. Intentional or not, the RFP process serves as an effective roadblock to widespread solar installations when considering the length of the typical RFP process, failure of winning RFPs to fund and the additional time requirements needed for subsequent rounds of RFPs to be processed



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9. The lack of checks and balances of an open bidding system to verify that RFPs selected by utility companies are indeed awarded based on the best return on investment for rate payers
10. The unwillingness of financial investors and banks to commit financial resources to renewable energy projects during the extensive length of time required to evaluate RFPs
11. The unwillingness of financial investors and banks to finance projects due to the extreme uncertainty that a project will actually come to fruition

### **Avoided/Value Costs**

Research shows that utility companies such as APS will be required to invest a minimum of 0.1411 cents per kilowatt hour (kWh) to meet future electrical grid expansions and customer demands.

A FIT will generate significant amounts of clean power that can be used to supplement carbon-based fuel during most of the on-peak demand periods, especially on commercial rooftops.

Although the RFP process has failed for most utility companies, the Performance Based Incentive (PBI) programs provide a good snapshot of what utility companies think the cost of solar installation should be.

A well written FIT will provide a short cut around the inadequate RFP process and lead to rapid installations of renewable energy. It will provide a similar cost structure to the existing PBI for solar installations, but it will streamline the solar installation process make it very easy for both rooftop owners to finance rooftop projects as well as remove all barriers of entry for solar installation companies.

### **Utility Avoided Costs**

The avoided costs outlined in the RW Beck report amount to 0.1411 cents per kilowatt hour for a high penetration level.

### **Current Solar Performance Based Incentives (PBIs)**

Current PBIs rates range from 0.14 cents/kWh to 0.18 cents/kWh. A good FIT baseline price to consider would be the statewide average of PBIs, which is 0.16 cents/kWh.

### **Cost of Renewable Energy Generation**

A recent NREL report states that the **only FIT programs that have been successful** are the FITs that are **based on the cost for renewable energy generation and NOT “avoided costs”** or “**fixed price incentives.**”



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### **Fair Return on Investment for Investors**

Investors should be awarded a fair profit that provides an attractive return-on-investment for their financial capital investments. A fair return should be in the range of 10% based on the 0.16 cents/kWh PBI price, which amounts to 0.016 cents/kWh.

Together, an average PBI of 0.16 cents/kWh added to a fair ROI of 0.016 cents/kWh adds up to 0.176 cents/kWh.

The Commission might consider using this figure to set a statewide FIT baseline rate, and then factor in costs needed to offset ratepayers' energy consumption on a utility-by-utility basis.

### **Rooftop Owners**

In order to fairly compensate the rooftop owner for utilizing their roof space to host solar power arrays, the customer should be allowed to offset the price for the price they pay for electricity.

For example, right now APS is charging 0.123 cents/kWh for residential electricity and 0.064 cents/kWh for commercial electricity. The FIT should include a payment to rooftop owners in order to offset whatever costs they are being billed for their monthly electricity bills to produce clean, carbon-free electricity.

The resulting FIT tariff for APS customers would be 0.299 cents/kWh for residential customers and 0.24 cents/kWh for commercial customers.

These rates are slightly lower than the FIT set in Gainesville, Florida, which would seem appropriate due to Arizona's lower than average electricity prices.

But FITs usually are not created to offset electricity rates. In Germany, the FIT is the same for every project, but rewards producers for the amount of renewable energy being produced by each distributed energy generation station. Arizona should consider following a similar strategy.

For example, an Arizona FIT should pay a higher rate for the first 20 kWh produced, such as 0.299 cents/kWh (0.16 cents/kWh for production, 0.016 cents/kWh for investors and 0.123 to offset retail electric rates).

Because larger projects benefit from better economies of scale, all energy produced that exceeds 20 kWh of production should be stepped down to FIT of 0.24 cents/kWh (0.16 cents/kWh for production, 0.016 cents/kWh for investors and 0.064 cents to offset commercial electric rates)

Designing a FIT based on actual power production levels and the cost by renewable energy generation type is a very simple way to keep the Arizona's FIT accounting system simple and easy to administrate.



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**Out of State Companies**

It would be nice for the Commission to find a way to provide a bonus to utilities that do business with solar installation companies and solar panel manufacturing that are headquartered in Arizona and/or employ Arizona residents.

For example, in Washington State, has a baseline FIT cents/kWh. The base price can be modified according to two multipliers:

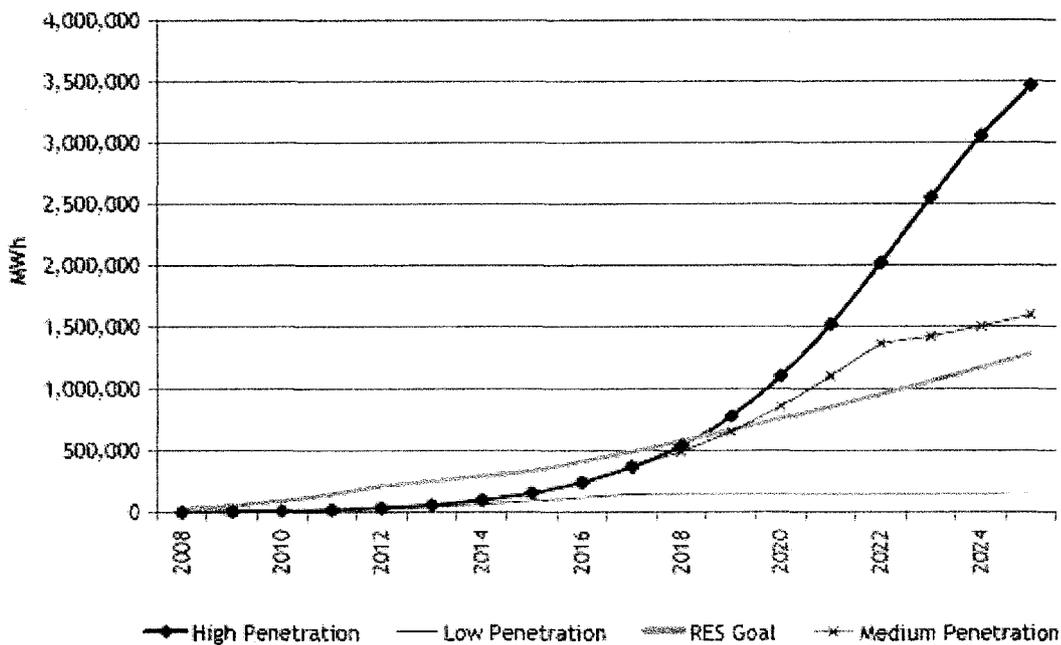
- 1) If the inverter is purchased from in-state manufacturers, a 1.2 multiplier is factored in;
- 2) if the solar panels are purchased from in-state manufacturers, a multiplier of 2.4 is factored in. (See NREL SCEPA report for details)

The only problem with problem with adding multipliers is the billing process itself. The Commission would need to evaluate whether or not adding this type of complexity to a FIT would make sense. It has been stated over and over in research reports to keep a FIT as simple as possible.

**Solar Feed-in Tariff Cap**

In theory, no overall volume cap should be set. The RW Beck states that APS will only benefit from a FIT that achieves moderate or high penetration levels of solar distributed generation. According to the graph below, more than 1.3 million mWh will be needed to achieve APS' RES goal by 2025. Perhaps a Cap for every utility should be set using the same matrix.

**Combined Penetration of Commercial and Residential Solar Distributed Energy**



(Source: RW Beck Report Sponsored by APS)



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The most common method on initiating a FIT is to offer a very attractive FIT price the first year and then degress prices 5% every year thereafter.

An alternative strategy, however, might be to start low and increase rates until a good volume is achieved. The problem is that setting the FIT too low will hurt the solar industry for the duration of the first evaluation time period, but doing so would protect Arizona ratepayers against a rapid Arizona FIT oversubscription problem.

It might be wise to establish a predicted sweet spot price and then offer a FIT 0.01 cents/kWh below the sweet spot and step it up on a yearly basis until the FIT price achieves the Commission's desired solar penetration levels on a yearly basis. This will allow the Commission to directly control the volume of solar penetrations by adjusting the FIT price up or down.

With that said, creating heavy volume with a higher FIT in the beginning would drive solar prices down and jumpstart Arizona's sagging economy. Per the RW Beck report, a high penetration level is the only way that utility companies will experience many types of avoided costs ranging from fuel costs to reduction in capital needed for grid upgrades for future projected demand growth.

Project caps might be set at 500kW per business and 20kW for residents for the 1<sup>st</sup> year and then be allowed to add more solar in subsequent years. This strategy will prevent a few large companies from oversubscribing the FIT program and allow smaller companies to participate in a larger number and wider variety of solar projects.

Creating a larger number of smaller projects will create more jobs and have a more positive effect on economic development. Injecting money back into the economy is the correct way to show a FIT's real value to ratepayers because the entire state will benefit and higher paying jobs will be created and allow money to begin flowing freely due to a healthy economy.

Another consideration is how much solar can be tolerated effectively by the grid itself. The RW Beck report suggests that there is a point of diminishing returns for utility feeders and substations on the amount of solar that can be installed, which should not exceed 10% of the emergency spinning reserves needed to meet on-peak load demand should cloud cover suddenly impact the grid's need to meet on-peak demand with carbon-based electricity.

The value for the distribution system can be derived when sufficient solar is deployed on a specific feeder. Such deployment can potentially defer distribution upgrade investments, but these solar installations must be located on a specific feeder to reduce a specific overloaded condition.

The RW Beck report suggests that solar should be capped at 15 percent of a feeder's on-peak power requirements. APS currently designs its substations for approximately 60 MW of load, and about 12 MW of load per feeder. The report states the desired load to be supplemented by



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solar DG should be 15 percent of the load, which in this case would be approximately 1.8 MW for feeders and 9 MW for substations.

Understanding the real need to stay within the 10% tolerance level, utility green zones should be mapped out and published on utility company's websites in order to educate solar installation companies on where to focus their marketing dollars for solar expansion. Perhaps a premium multiplier should be added to the FIT to encourage building in projected energy consumption growth areas.

### **Contract Terms**

Contracts should be a minimum of 20 years.

### **Rate Payer Advantages**

In the same way that home owners can install solar to hedge against future electricity rates hikes, utility companies will be able to hedge against grid expansion capital improvement and future fuel/power purchase costs by installing large quantities of solar.

Right now utility rates are rising at a rate of 6-8% per year. And with the introduction of smart grid technology and a possible federal "cap and trade" program, average utility companies might have increase electricity rates 10-15% a year. It would be wise for the Commission to ask utility companies to provide projections of low, medium and high costs of implementing these types of program and showing the benefits of off-setting these risks with renewable energy generation, which would be a very good way to hedge against these risks and protect Arizona citizens from future rate hikes.

Locking in solar electricity prices at today's rates will provide cheap and clean electricity for the next 20-30 years. The more solar electricity that is installed today, the more cheap clean electricity will be available for the utilities to utilize in 2030.

As electric rates increase and technology costs decrease, the payback period will shorten and deployment will accelerate.

### **Job Growth**

The current residential solar penetration level is approximately at .003 or less than 1/3 of 1%, or close to 6,000 installations.

If a FIT program was implemented and it generated a 5% penetration level of 5-kW residential solar installations, the program would generate more than 83,000 solar installations requiring more than 2 million solar panels. At a cost of \$4 per installed watt, this would generate approximately \$1.6 billion of solar installation revenue. (See Exhibit A)

It would require more than 1,400 solar installation companies employing a minimum of 10 employees each to install 83,000 5-kW systems, which would create approximately 14,000 jobs.



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If the average salary of these employees was \$25,000, it would generate \$350 million worth of badly needed salaries. Increase salaries to \$35,000 and the figure grows to \$489 million.

Developing the demand for 2 million solar panels in Arizona also will capture the attention of most solar manufacturing companies and encourage them to open manufacturing plants in Arizona creating even more jobs.

If the top 50 Arizona cities each implemented a \$300 solar permit fee, it would generate more than \$25 million in revenue that could be used to help inject money back into municipal budgets.

A 5% penetration level would generate approximately 420 megawatts of clean energy for the State of Arizona and prevent the burning of 12 trillion pounds of coal as well as the significant reduction of carbon-based pollution such as CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub> and Mercury.

### **Exponential Growth**

More than likely, a well written FIT will generate the same type of economic development that was recorded in Germany over the last 10 years.

If an Arizona Solar FIT was able to achieve a 25% penetration level for all residential rooftops, with an average of 5-kW residential solar installations, the program would generate more than 491,701 solar installations requiring more than 10 million solar panels.

At a cost of \$4 per installed watt, this would generate approximately \$8.4 billion of solar installation revenue. (See Exhibit B)

It would require more than 7,000 solar installation companies employing a minimum of 10 employees, which would create approximately 70,000 jobs.

If the average salary of these employees was \$35,000, it would generate \$2.4 billion worth of new salaries.

Most industry experts would agree that generating \$8.4 billion of new solar installation revenue that would provide more than \$2.4 billion of new solar salaries would provide sufficient job opportunities for anyone, even people on fixed incomes, to make an extra income by helping Arizona build the world's largest solar-based economy.

## Exhibit A

Exhibit A details three solar penetration levels for 5 kilowatt (kW) systems using 200-watt solar panels at an installed cost of \$4 per watt for the top 50 cities/towns in Arizona.

One 5-kW system would require the installation of twenty five 200-watt solar panels.

A small solar installation company with 10 employees can install about five 5-kW systems per month, or 60 solar systems per year.

Utility rebates were computed using a rebate of \$2.15 per watt.

We included a fictional statewide solar permit fee to show how much revenue cities/towns could generate by aggressively marketing solar to their residents and collecting a \$300 solar permit fee for each installation.

We used an average salary of \$25,000 per year for employees of solar installation companies. It is important to note that a solar installation company employs engineers, accountants, marketing, sales, etc. positions, which typically pay higher salaries.

We provided the numbers for penetration levels of 1 percent, 5 percent and 25 percent.

Penetration	1%
City Permit Fee	\$300
Solar Array Waiver	5,000
Panel Wattage	200
Panels Per Job	25
Install Cost/Watt	\$4
Install Revenue	\$20,000
Fed Tax	-\$6,000
State Permit Fee	\$0
Utility Rebate	-\$10,750
Customer Cost	\$3,250

Panels/Year	419,701
Panels/Job	25
Installs Needed	16,788

Co. Installs/Yr.	60
Co.'s Needed	280
Company Size	10
Jobs Created	2,798
Average Salary	\$25,000
Salaries Created	\$69,950,101

City	Population	Homes	Penetration	Solar Installs	City Permits	Installed Revenue	Kilowatts
Phoenix	1,567,924	495,793	1%	4,958	\$1,487,379	\$99,158,600	24,789,650
Tucson	541,811	209,792	1%	2,098	\$629,376	\$41,958,400	10,489,600
Mesa	463,552	175,717	1%	1,757	\$527,151	\$35,143,400	8,785,850
Scottsdale	235,371	104,949	1%	1,049	\$314,847	\$20,989,800	5,247,450
Glendale	251,522	79,645	1%	796	\$238,935	\$15,929,000	3,982,250
Tempe	175,523	67,008	1%	670	\$201,024	\$13,401,600	3,350,400
Chandler	247,140	66,634	1%	666	\$199,902	\$13,326,800	3,331,700
Peoria	157,960	42,669	1%	427	\$128,007	\$8,533,800	2,133,450
Alhambra	136,197	38,913	1%	389	\$116,740	\$7,782,686	1,945,671
Gilbert	216,449	37,052	1%	371	\$111,156	\$7,410,400	1,852,600
Yuma	90,041	35,046	1%	350	\$105,138	\$7,009,200	1,752,300
Sun City	38,112	27,584	1%	276	\$82,752	\$5,516,800	1,379,200
Lake Havasu City	56,553	22,991	1%	230	\$68,973	\$4,598,200	1,149,550
Apache Junction	32,776	22,781	1%	228	\$68,343	\$4,556,200	1,139,050
Flagstaff	60,222	21,430	1%	214	\$64,290	\$4,286,000	1,071,500
Bullhead City	40,868	18,410	1%	184	\$55,230	\$3,682,000	920,500
Prescott	42,697	17,431	1%	174	\$52,293	\$3,486,200	871,550
Sun City West	26,222	17,267	1%	173	\$51,801	\$3,453,400	863,350
Surprise	92,897	16,307	1%	163	\$48,921	\$3,261,400	815,350
Sierra Vista	43,320	15,621	1%	156	\$46,863	\$3,124,200	781,050
Green Valley	16,171	13,241	1%	132	\$39,723	\$2,648,200	662,050

Avondale	81,299	11,412	1%	114	\$34,236	\$2,282,400	570,600
Casa Grande	41,152	10,936	1%	109	\$32,808	\$2,187,200	546,800
Fountain Hills	25,227	10,498	1%	105	\$31,494	\$2,099,600	524,900
Golden Valley	4,587	2,220	1%	22	\$6,660	\$444,000	111,000
Cave Creek	5,428	1,779	1%	18	\$5,337	\$355,800	88,950
Youngtown	4,896	1,769	1%	18	\$5,307	\$353,800	88,450
Litchfield Park	5,126	1,631	1%	16	\$4,893	\$326,200	81,550
Tolleson	7,199	1,482	1%	15	\$4,446	\$296,400	74,100
Cornville	3,572	1,467	1%	15	\$4,401	\$293,400	73,350
Queen Creek	3,551	1,306	1%	13	\$3,918	\$261,200	65,300
Sahuarita	2,412	1,242	1%	12	\$3,726	\$248,400	62,100
Huachuca City	1,963	852	1%	9	\$2,556	\$170,400	42,600
Vail	2,164	847	1%	8	\$2,541	\$169,400	42,350
Maricopa	1,080	286	1%	3	\$858	\$57,200	14,300
	5,038,556	1,678,802		16,788	\$5,036,407	\$335,760,486	83,940,121

Penetration	5%
City Permit Fee	\$300
Solar Array Watts	5,000
Panel Wattage	200
Panels Per Job	25
Install Cost/Watt	\$4
Install Revenue	\$20,000
Fed Tax	-\$6,000
State Permit Fee	\$0
Utility Rebate	-\$10,750
Customer Cost:	\$3,250

Panels/Year	2,098,503
Panels/Job	25
Installs Needed	83,940

Co. Installs/Yr.	60
Co.'s Needed	1,399
Company Size	10
Jobs Created	13,990
Average Salary	\$25,000
Salaries Created	\$349,750,506

City	Population	Homes	Penetration	Solar Installs	City Permits	Installed Revenue	Kilowatts
Phoenix	1,567,924	495,793	5%	24,790	\$7,436,895	\$495,793,000	123,948,250
Tucson	541,811	209,792	5%	10,490	\$3,146,880	\$209,792,000	52,448,000
Mesa	463,552	175,717	5%	8,786	\$2,635,755	\$175,717,000	43,929,250
Scottsdale	235,371	104,949	5%	5,247	\$1,574,235	\$104,949,000	26,237,250
Glendale	251,522	79,645	5%	3,982	\$1,194,675	\$79,645,000	19,911,250
Tempe	175,523	67,008	5%	3,350	\$1,005,120	\$67,008,000	16,752,000
Chandler	247,140	66,634	5%	3,332	\$999,510	\$66,634,000	16,658,500
Peoria	157,960	42,669	5%	2,133	\$640,035	\$42,669,000	10,667,250
Alhambra	136,197	38,913	5%	1,946	\$583,701	\$38,913,429	9,728,357
Gilbert	216,449	37,052	5%	1,853	\$555,780	\$37,052,000	9,263,000
Yuma	90,041	35,046	5%	1,752	\$525,690	\$35,046,000	8,761,500
Sun City	38,112	27,584	5%	1,379	\$413,760	\$27,584,000	6,896,000
Lake Havasu City	56,553	22,991	5%	1,150	\$344,865	\$22,991,000	5,747,750
Apache Junction	32,776	22,781	5%	1,139	\$341,715	\$22,781,000	5,695,250
Flagstaff	60,222	21,430	5%	1,072	\$321,450	\$21,430,000	5,357,500
Bullhead City	40,868	18,410	5%	921	\$276,150	\$18,410,000	4,602,500
Prescott	42,697	17,431	5%	872	\$261,465	\$17,431,000	4,357,750
Sun City West	26,222	17,267	5%	863	\$259,005	\$17,267,000	4,316,750
Surprise	92,897	16,307	5%	815	\$244,605	\$16,307,000	4,076,750
Sierra Vista	43,320	15,621	5%	781	\$234,315	\$15,621,000	3,905,250
Green Valley	16,171	13,241	5%	662	\$198,615	\$13,241,000	3,310,250

Avondale	81,299	11,412	5%	571	\$171,180	\$11,412,000	2,853,000
Casa Grande	41,152	10,936	5%	547	\$164,040	\$10,936,000	2,734,000
Fountain Hills	25,227	10,498	5%	525	\$157,470	\$10,498,000	2,624,500
Golden Valley	4,587	2,220	5%	111	\$33,300	\$2,220,000	555,000
Cave Creek	5,428	1,779	5%	89	\$26,685	\$1,779,000	444,750
Youngtown	4,896	1,769	5%	88	\$26,535	\$1,769,000	442,250
Litchfield Park	5,126	1,631	5%	82	\$24,465	\$1,631,000	407,750
Tolleson	7,199	1,482	5%	74	\$22,230	\$1,482,000	370,500
Cornville	3,572	1,467	5%	73	\$22,005	\$1,467,000	366,750
Queen Creek	3,551	1,306	5%	65	\$19,590	\$1,306,000	326,500
Sahuarita	2,412	1,242	5%	62	\$18,630	\$1,242,000	310,500
Huachuca City	1,963	852	5%	43	\$12,780	\$852,000	213,000
Vail	2,164	847	5%	42	\$12,705	\$847,000	211,750
Maricopa	1,080	286	5%	14	\$4,290	\$286,000	71,500
	5,038,556	1,678,802		83,940	\$25,182,036	\$1,678,802,429	419,700,607

Penetration	25%
City Permit Fee	\$300
Solar Array Watts	5,000
Panel Wattage	200
Panels Per Job	25
Install Cost/Watt	\$4
Install Revenue	\$20,000
Fed Tax	-\$6,000
State Permit Fee	\$0
Utility Rebate	-\$10,750
Customer Cost.	\$3,250

Panels/Year	10,492,515
Panels/Job	25
Installs Needed	419,701

Co. Installs/Yr.	60
Co.'s Needed	6,995
Company Size	10
Jobs Created	69,950
Average Salary	\$25,000
Salaries Created	\$1,748,752,530

City	Population	Homes	Penetration	Solar Installs	City Permits	Installed Revenue	Kilowatts
Phoenix	1,567,924	495,793	25%	123,948	\$37,184,475	\$2,478,965,000	619,741,250
Tucson	541,811	209,792	25%	52,448	\$15,734,400	\$1,048,960,000	262,240,000
Mesa	463,552	175,717	25%	43,929	\$13,178,775	\$878,585,000	219,646,250
Scottsdale	235,371	104,949	25%	26,237	\$7,871,175	\$524,745,000	131,186,250
Glendale	251,522	79,645	25%	19,911	\$5,973,375	\$398,225,000	99,556,250
Tempe	175,523	67,008	25%	16,752	\$5,025,600	\$335,040,000	83,760,000
Chandler	247,140	66,634	25%	16,659	\$4,997,550	\$333,170,000	83,292,500
Peoria	157,960	42,669	25%	10,667	\$3,200,175	\$213,345,000	53,336,250
Alhambra	136,197	38,913	25%	9,728	\$2,918,507	\$194,567,143	48,641,786
Gilbert	216,449	37,052	25%	9,263	\$2,778,900	\$185,260,000	46,315,000
Yuma	90,041	35,046	25%	8,762	\$2,628,450	\$175,230,000	43,807,500
Sun City	38,112	27,584	25%	6,896	\$2,068,800	\$137,920,000	34,480,000
Lake Havasu City	56,553	22,991	25%	5,748	\$1,724,325	\$114,955,000	28,738,750
Apache Junction	32,776	22,781	25%	5,695	\$1,708,575	\$113,905,000	28,476,250
Flagstaff	60,222	21,430	25%	5,358	\$1,607,250	\$107,150,000	26,787,500
Bullhead City	40,868	18,410	25%	4,603	\$1,380,750	\$92,050,000	23,012,500
Prescott	42,697	17,431	25%	4,358	\$1,307,325	\$87,155,000	21,788,750
Sun City West	26,222	17,267	25%	4,317	\$1,295,025	\$86,335,000	21,583,750
Surprise	92,897	16,307	25%	4,077	\$1,223,025	\$81,535,000	20,383,750
Sierra Vista	43,320	15,621	25%	3,905	\$1,171,575	\$78,105,000	19,526,250
Green Valley	16,171	13,241	25%	3,310	\$993,075	\$66,205,000	16,551,250

Avondale	81,299	11,412	25%	2,853	\$855,900	\$57,060,000	14,265,000
Casa Grande	41,152	10,936	25%	2,734	\$820,200	\$54,680,000	13,670,000
Fountain Hills	25,227	10,498	25%	2,625	\$787,350	\$52,490,000	13,122,500
Golden Valley	4,587	2,220	25%	555	\$166,500	\$11,100,000	2,775,000
Cave Creek	5,428	1,779	25%	445	\$133,425	\$8,895,000	2,223,750
Youngtown	4,896	1,769	25%	442	\$132,675	\$8,845,000	2,211,250
Litchfield Park	5,126	1,631	25%	408	\$122,325	\$8,155,000	2,038,750
Tolleson	7,199	1,482	25%	371	\$111,150	\$7,410,000	1,852,500
Cornville	3,572	1,467	25%	367	\$110,025	\$7,335,000	1,833,750
Queen Creek	3,551	1,306	25%	327	\$97,950	\$6,530,000	1,632,500
Sahuarita	2,412	1,242	25%	311	\$93,150	\$6,210,000	1,552,500
Huachuca City	1,963	852	25%	213	\$63,900	\$4,260,000	1,065,000
Vail	2,164	847	25%	212	\$63,525	\$4,235,000	1,058,750
Maricopa	1,080	286	25%	72	\$21,450	\$1,430,000	357,500
	5,038,556	1,678,802		419,701	\$125,910,182	\$8,394,012,143	2,098,503,036

## Exhibit B

Exhibit A details three solar penetration levels for 5 kilowatt (kW) systems using 200-watt solar panels at an installed cost of \$4 per watt for the top 50 cities/towns in Arizona.

One 5-kW system would require the installation of twenty five 200-watt solar panels.

A small solar installation company with 10 employees can install about five 5-kW systems per month, or 60 solar systems per year.

Utility rebates were computed using a rebate of \$2.15 per watt.

We included a fictional statewide solar permit fee to show how much revenue cities/towns could generate by aggressively marketing solar to their residents and collecting a \$300 solar permit fee for each installation.

We used an average salary of \$35,000 per year for employees of solar installation companies. It is important to note that a solar installation company employs engineers, accountants, marketing, sales, etc. positions, which typically pay higher salaries.

We provided the numbers for penetration levels of 1 percent, 5 percent and 25 percent.

Penetration	1%
City Permit Fee	\$300
Solar Array Watts	5,000
Panel Wattage	200
Panels Per Job	25
Install Cost/Wait	\$4
Install Revenue	\$20,000
Fed Tax	-\$6,000
State Permit Fee	\$0
Utility Rebate	-\$10,750
Customer Cost:	\$3,250

Panels/Year	419,701
Panels/Job	25
Installs Needed	16,788

Co. Installs/Yr.	60
Co.'s Needed	280
Company Size	10
Jobs Created	2,798
Average Salary	\$35,000
Salaries Created	\$97,930,142

City	Population	Homes	Penetration	Solar Installs	City Permits	Installed Revenue	Kilowatts
Phoenix	1,567,924	495,793	1%	4,958	\$1,487,379	\$99,158,600	24,789,650
Tucson	541,811	209,792	1%	2,098	\$629,376	\$41,958,400	10,489,600
Mesa	463,552	175,717	1%	1,757	\$527,151	\$35,143,400	8,785,850
Scottsdale	235,371	104,949	1%	1,049	\$314,847	\$20,989,800	5,247,450
Glendale	251,522	79,645	1%	796	\$238,935	\$15,929,000	3,982,250
Tempe	175,523	67,008	1%	670	\$201,024	\$13,401,600	3,350,400
Chandler	247,140	66,634	1%	666	\$199,902	\$13,326,800	3,331,700
Peoria	157,960	42,669	1%	427	\$128,007	\$8,533,800	2,133,450
Alhambra	136,197	38,913	1%	389	\$116,740	\$7,782,686	1,945,671
Gilbert	216,449	37,052	1%	371	\$111,156	\$7,410,400	1,852,600
Yuma	90,041	35,046	1%	350	\$105,138	\$7,009,200	1,752,300
Sun City	38,112	27,584	1%	276	\$82,752	\$5,516,800	1,379,200
Lake Havasu City	56,553	22,991	1%	230	\$68,973	\$4,598,200	1,149,550
Apache Junction	32,776	22,781	1%	228	\$68,343	\$4,556,200	1,139,050
Flagstaff	60,222	21,430	1%	214	\$64,290	\$4,286,000	1,071,500
Bullhead City	40,868	18,410	1%	184	\$55,230	\$3,682,000	920,500
Prescott	42,697	17,431	1%	174	\$52,293	\$3,486,200	871,550
Sun City West	26,222	17,267	1%	173	\$51,801	\$3,453,400	863,350
Surprise	92,897	16,307	1%	163	\$48,921	\$3,261,400	815,350
Sierra Vista	43,320	15,621	1%	156	\$46,863	\$3,124,200	781,050
Green Valley	16,171	13,241	1%	132	\$39,723	\$2,648,200	662,050

Avondale	81,299	11,412	1%	114	\$34,236	\$2,282,400	570,600
Casa Grande	41,152	10,936	1%	109	\$32,808	\$2,187,200	546,800
Fountain Hills	25,227	10,498	1%	105	\$31,494	\$2,099,600	524,900
Golden Valley	4,587	2,220	1%	22	\$6,660	\$444,000	111,000
Cave Creek	5,428	1,779	1%	18	\$5,337	\$355,800	88,950
Youngtown	4,896	1,769	1%	18	\$5,307	\$353,800	88,450
Litchfield Park	5,126	1,631	1%	16	\$4,893	\$326,200	81,550
Tolleson	7,199	1,482	1%	15	\$4,446	\$296,400	74,100
Cornville	3,572	1,467	1%	15	\$4,401	\$293,400	73,350
Queen Creek	3,551	1,306	1%	13	\$3,918	\$261,200	65,300
Sahuarita	2,412	1,242	1%	12	\$3,726	\$248,400	62,100
Huachuca City	1,963	852	1%	9	\$2,556	\$170,400	42,600
Vail	2,164	847	1%	8	\$2,541	\$169,400	42,350
Maricopa	1,080	286	1%	3	\$858	\$57,200	14,300
	5,038,556	1,678,802		16,788	\$5,036,407	\$335,760,486	83,940,121

Penetration	5%
City Permit Fee	\$300
Solar Array Watts	5,000
Panel Wattage	200
Panels Per Job	25
Install Cost/Watt	\$4
Install Revenue	\$20,000
Fed Tax	-\$6,000
State Permit Fee	\$0
Utility Rebate	-\$10,750
Customer Cost:	\$3,250

Panels/Year	2,098,503
Panels/Job	25
Installs Needed	83,940

Co. Installs/Yr.	60
Co.'s Needed	1,399
Company Size	10
Jobs Created	13,990
Average Salary	\$35,000
Salaries Created	\$489,650,708

City	Population	Homes	Penetration	Solar Installs	City Permits	Installed Revenue	Kilowatts
Phoenix	1,567,924	495,793	5%	24,790	\$7,436,895	\$495,793,000	123,948,250
Tucson	541,811	209,792	5%	10,490	\$3,146,880	\$209,792,000	52,448,000
Mesa	463,552	175,717	5%	8,786	\$2,635,755	\$175,717,000	43,929,250
Scottsdale	235,371	104,949	5%	5,247	\$1,574,235	\$104,949,000	26,237,250
Glendale	251,522	79,645	5%	3,982	\$1,194,675	\$79,645,000	19,911,250
Tempe	175,523	67,008	5%	3,350	\$1,005,120	\$67,008,000	16,752,000
Chandler	247,140	66,634	5%	3,332	\$999,510	\$66,634,000	16,658,500
Peoria	157,960	42,669	5%	2,133	\$640,035	\$42,669,000	10,667,250
Alhambra	136,197	38,913	5%	1,946	\$583,701	\$38,913,429	9,728,357
Gilbert	216,449	37,052	5%	1,853	\$555,780	\$37,052,000	9,263,000
Yuma	90,041	35,046	5%	1,752	\$525,690	\$35,046,000	8,761,500
Sun City	38,112	27,584	5%	1,379	\$413,760	\$27,584,000	6,896,000
Lake Havasu City	56,553	22,991	5%	1,150	\$344,865	\$22,991,000	5,747,750
Apache Junction	32,776	22,781	5%	1,139	\$341,715	\$22,781,000	5,695,250
Flagstaff	60,222	21,430	5%	1,072	\$321,450	\$21,430,000	5,357,500
Bullhead City	40,868	18,410	5%	921	\$276,150	\$18,410,000	4,602,500
Prescott	42,697	17,431	5%	872	\$261,465	\$17,431,000	4,357,750
Sun City West	26,222	17,267	5%	863	\$259,005	\$17,267,000	4,316,750
Surprise	92,897	16,307	5%	815	\$244,605	\$16,307,000	4,076,750
Sierra Vista	43,320	15,621	5%	781	\$234,315	\$15,621,000	3,905,250
Green Valley	16,171	13,241	5%	662	\$198,615	\$13,241,000	3,310,250

Avondale	81,299	11,412	5%	571	\$171,180	\$11,412,000	2,853,000
Casa Grande	41,152	10,936	5%	547	\$164,040	\$10,936,000	2,734,000
Fountain Hills	25,227	10,498	5%	525	\$157,470	\$10,498,000	2,624,500
Golden Valley	4,587	2,220	5%	111	\$33,300	\$2,220,000	555,000
Cave Creek	5,428	1,779	5%	89	\$26,685	\$1,779,000	444,750
Youngtown	4,896	1,769	5%	88	\$26,535	\$1,769,000	442,250
Litchfield Park	5,126	1,631	5%	82	\$24,465	\$1,631,000	407,750
Tolleson	7,199	1,482	5%	74	\$22,230	\$1,482,000	370,500
Cornville	3,572	1,467	5%	73	\$22,005	\$1,467,000	366,750
Queen Creek	3,551	1,306	5%	65	\$19,590	\$1,306,000	326,500
Sahuarita	2,412	1,242	5%	62	\$18,630	\$1,242,000	310,500
Huachuca City	1,963	852	5%	43	\$12,780	\$852,000	213,000
Vail	2,164	847	5%	42	\$12,705	\$847,000	211,750
Maricopa	1,080	286	5%	14	\$4,290	\$286,000	71,500
	5,038,556	1,678,802		83,940	\$25,182,036	\$1,678,802,429	419,700,607

Penetration	25%
City Permit Fee	\$300
Solar Array Watts	5,000
Panel Wattage	200
Panels Per Job	25
Install Cost/Watt	\$4
Install Revenue	\$20,000
Fed Tax	-\$6,000
State Permit Fee	\$0
Utility Rebate	-\$10,750
Customer Cost	\$3,250

Panels/Year	10,492,515
Panels/Job	25
Installs Needed	419,701

Co. Installs/Yr.	60
Co.'s Needed	6,995
Company Size	10
Jobs Created	69,950
Average Salary	\$35,000
Salaries Created	\$2,448,253,542

City	Population	Homes	Penetration	Solar Installs	City Permits	Installed Revenue	Kilowatts
Phoenix	1,567,924	495,793	25%	123,948	\$37,184,475	\$2,478,965,000	619,741,250
Tucson	541,811	209,792	25%	52,448	\$15,734,400	\$1,048,960,000	262,240,000
Mesa	463,552	175,717	25%	43,929	\$13,178,775	\$878,585,000	219,646,250
Scottsdale	235,371	104,949	25%	26,237	\$7,871,175	\$524,745,000	131,186,250
Glendale	251,522	79,645	25%	19,911	\$5,973,375	\$398,225,000	99,556,250
Tempe	175,523	67,008	25%	16,752	\$5,025,600	\$335,040,000	83,760,000
Chandler	247,140	66,634	25%	16,659	\$4,997,550	\$333,170,000	83,292,500
Peoria	157,960	42,669	25%	10,667	\$3,200,175	\$213,345,000	53,336,250
Alhambra	136,197	38,913	25%	9,728	\$2,918,507	\$194,567,143	48,641,786
Gilbert	216,449	37,052	25%	9,263	\$2,778,900	\$185,260,000	46,315,000
Yuma	90,041	35,046	25%	8,762	\$2,628,450	\$175,230,000	43,807,500
Sun City	38,112	27,584	25%	6,896	\$2,068,800	\$137,920,000	34,480,000
Lake Havasu City	56,553	22,991	25%	5,748	\$1,724,325	\$114,955,000	28,738,750
Apache Junction	32,776	22,781	25%	5,695	\$1,708,575	\$113,905,000	28,476,250
Flagstaff	60,222	21,430	25%	5,358	\$1,607,250	\$107,150,000	26,787,500
Bullhead City	40,868	18,410	25%	4,603	\$1,380,750	\$92,050,000	23,012,500
Prescott	42,697	17,431	25%	4,358	\$1,307,325	\$87,155,000	21,788,750
Sun City West	26,222	17,267	25%	4,317	\$1,295,025	\$86,335,000	21,583,750
Surprise	92,897	16,307	25%	4,077	\$1,223,025	\$81,535,000	20,383,750
Sierra Vista	43,320	15,621	25%	3,905	\$1,171,575	\$78,105,000	19,526,250
Green Valley	16,171	13,241	25%	3,310	\$993,075	\$66,205,000	16,551,250

Avondale	81,299	11,412	25%	2,853	\$855,900	\$57,060,000	14,265,000
Casa Grande	41,152	10,936	25%	2,734	\$820,200	\$54,680,000	13,670,000
Fountain Hills	25,227	10,498	25%	2,625	\$787,350	\$52,490,000	13,122,500
Golden Valley	4,587	2,220	25%	555	\$166,500	\$11,100,000	2,775,000
Cave Creek	5,428	1,779	25%	445	\$133,425	\$8,895,000	2,223,750
Youngtown	4,896	1,769	25%	442	\$132,675	\$8,845,000	2,211,250
Litchfield Park	5,126	1,631	25%	408	\$122,325	\$8,155,000	2,038,750
Tolleson	7,199	1,482	25%	371	\$111,150	\$7,410,000	1,852,500
Cornville	3,572	1,467	25%	367	\$110,025	\$7,335,000	1,833,750
Queen Creek	3,551	1,306	25%	327	\$97,950	\$6,530,000	1,632,500
Sahuarita	2,412	1,242	25%	311	\$93,150	\$6,210,000	1,552,500
Huachuca City	1,963	852	25%	213	\$63,900	\$4,260,000	1,065,000
Vail	2,164	847	25%	212	\$63,525	\$4,235,000	1,058,750
Maricopa	1,080	286	25%	72	\$21,450	\$1,430,000	357,500
	5,038,556	1,678,802		419,701	\$125,910,182	\$8,394,012,143	2,098,503,036