

Planning and Development Department  
Office of Energy and  
Sustainable Development

## **Berkeley FIRST Initial Evaluation**

### Introduction

Berkeley's Financing Initiative for Solar and Renewable Technology (FIRST) pilot program is a just completed solar and renewable energy financing initiative that assists Berkeley residents in tackling the financial hurdles of installing solar panels by using a pioneering financing mechanism. The pilot, using Berkeley's powers as a charter city, provided property owners an opportunity to borrow money from the City's Sustainable Energy Financing District to install solar photovoltaic electric systems and repay the financing through their own property tax bills over 20 years. This program is intended to solve many of the financial hurdles facing property owners who might be put off by the initial cost of incorporating solar on homes to become more energy efficient.

Although many enrollees withdrew when they found they were able to find other sources of funding to pay for installation (primarily home equity loans), the pilot motivated them, as detailed below, to seek to do so in the first place. The short timeframe of the pilot prevented their replacement. The thirteen owners who did use the financing demonstrate that the program can fill a gap in providing the upfront costs of installation for those who do not have access to other sources of capital.

In the meantime, numerous other jurisdictions have used the concept of property tax based financing as developed for the pilot and launched their own successful programs. Often, states first passed legislation enabling the use of such financing. The now wide-spread acceptance of the mechanism was reflected in the Vice-President's endorsement of it as a major tool for the federal energy retrofit program.

The initial evaluation of Berkeley FIRST consists of an Executive summary of responses to questions of participants presented in Section I; lessons learned from the surveys and the experience of staff, including the contract administrator Renewable Funding, in carrying out the program in Section II; a chart of metrics for the funded projects in Section III, and a description of the surveys and key results in Section IV. The appendix provides verbatim comments from the respondents. Responses are from those who voluntarily chose to respond rather than a scientific sample.

A final evaluation will be done in late spring 2010, building on this evaluation to include analysis of electricity usage data from PG&E, a comparison of participants to others who installed systems without applying to the program and further feedback from the installation contractors. The evaluation will also analyze the administrative and startup costs.

### Acknowledgements

Although the conclusions and content of the evaluation are those of the City of Berkeley Office of Energy and Sustainable Development, U.C.'s Berkeley's Renewable and Appropriate Energy Laboratory's Gogi Kalka, under the leadership of its Director Dan Kammen, contributed substantially to its research, development and analysis. We would also like to acknowledge the important contribution of Renewable Funding, the contract administrator, for providing important insights that they gained from helping develop and implement the pilot on a day-to day basis. Finally, we wish to acknowledge the funding and support of the U.S. Environmental Protection Agency and the Bay Area Air Quality Management District that made the pilot and this evaluation possible.

## **I. Executive Summary of Survey Results**

- The Berkeley FIRST (B1) pilot program succeeded in giving Berkeley residents access to installing residential solar installation who would have not done so otherwise: Over 50% of the participants would have not installed solar without B1 financing, and none of the applicants would have installed solar without prior exposure to the B1 program.
- The high interest rate of B1 financing (with 6.75% plus 1% for administration almost twice as high as common home equity loans) was the most important reason for application withdrawals.
- However, B1 motivated more Berkeley residents to install solar than is obvious from the number of participants: 85% of the enrollees who withdrew (and some applicants from the waiting list) installed, or plan to do so soon, PV using other financial means (mostly home equity loans) after being inspired to do so by exposure to B1.
- Applicants were motivated to install PV primarily for environmental and energy conservation reasons rather than to save money.
- Main reasons that motivated participants to choose B1 over other financing options for solar installation were: Ease of obtaining financing, attraction of participating in a pilot program, reasonable interest rate, benefits of transferability of loan to new owner of house & simple application process
- Most participating households earned an annual income of \$100-150,000 (Withdrawals: 50% of households earned between \$60,000-150,000/y)
- ALL participants have an outstanding mortgage on their home, (60% with over 20y of repayment left). 80% of all participants have an additional home equity loan. (In contrast, only 86% of all withdrawals have an outstanding mortgage, 64% with an additional home equity loan).

## **II. Important Lessons Learned:**

- Property tax based financing is an important tool in expanding the access to clean energy to residents who would not have had access to other funding or otherwise would not have installed solar voltaic systems.
- An extensive outreach education program, prior to and as part of the pilot, can leverage the impact of public funds through motivating owners who can do so to install using private financing.
- Acceptance by a wider range of financial institutions (than at the time of the establishment of this pioneering property tax based financing pilot) is needed to allow jurisdictions greater flexibility in designing programs.
  - While the City contacted numerous banks, only a single entity was interested in lending and only for a limited amount of funding and for a limited amount of time.
- The interest rate should be set, not so high as to deter installation by those who do not have access to other affordable financing, but priced fairly given the relative ease to qualify.
  - At nearly twice the rate for a home equity loan, the interest rate for the pilot (including 1 point for financed administrative costs) steered many applicants to other sources of money but deterred some from proceeding with installation.
  - The relatively small amount of total funds available for the pilot, the newness of property assessed financing, and the condition of the financial system in the fall of 2008 when the funding was obtained pushed up the interest rate for the pilot.
- In addition to the right interest rate, programs of short durations, in particular, need to be structured to limit issues that can lead to withdrawals and, if possible, to allow for replacement reservations.
  - The limited length of the pilot and of the availability of funds for the mini-bonds prevented replacing those who withdrew their reservations with other applicants, keeping the number of participants artificially low.
  - The low application fee (\$25) with no additional fee for receiving a reservation for funding may have undervalued reservations and, while possibly increasing applications, also likely contributed to the withdrawal rate.

- Issues not adequately identified before reservation were made provided owners with some unanticipated challenges and or reasons to withdraw (i.e., possible need for roof reinforcement or other work than installation; not enough emphasis on financial terms of program with computation and disclosure of actual payment; and no notice that home equity loans might be more competitive if available to applicant.)
- More consultation in program development with installation contractors may have developed mechanisms to address concerns about project payment.
  - Some contractors believed payment should have gone directly to them.
  - Other contractors had concerns with the amount of time that passed while waiting for customer payments.
  - Direct deposit or wire transfer of funds to property owners instead of checks may have minimized delays and ensured that contractors were being paid in a timely manner.
- The use of a lottery system rather than a race to award reservations would give more equal access.
  - Using a computer based application and first-come-first-served as the basis for awarding reservations created so much interest that all spots were reserved within minutes but shut out others with less access to technology.

### **III. Installation Metrics**

The table on the following two pages provides details on the cost and projected performance of each of the systems.

Berkeley FIRST Pilot Installations by Mini-Bond

Bond Series	Contractor	Construction Date	System	Inverter	CEC-AC rating (kW)	Design Factor	CSI System Size	EPBB/PBI Incentive Rate	CSI Rebate	Total Price	Net Price	Bond Amount	Est Output (kwh)	Metric tons	Est Savings (\$)
1	Sungevity	1/25/2009	32-Sharp 175W NT modules	2-Kaco 290 1xi grid tied	4,644	88.553%	4,112	EPBB @ \$1.55 per W	6,374	41,599	35,225	37,447	7,463	3.72	\$ 970
2	Borrego Solar	2/6/2009	11-Sharp Solar NT-175U1	1-Xantrex GT2.8-NA-240/208	1,596	94.663%	1,511	EPBB @ \$1.55 per W	2,384	20,204	17,820	18,284	2,565	1.28	\$ 333
3	Sun Light & Power	2/23/2009	14-Mitsubishi PV-UD185MFS	1-SunnyBoy SB3000US (240v)	2,202	96.733%	2,130	EPBB @ \$1.55 per W	3,302	23,302	20,000	20,524	3,539	1.77	\$ 460
4	Sungevity	4/13/2009	32-Sharp 175W NT modules	2-Kaco 290 1xi grid tied	4,644	90.392%	4,198	EPBB @ \$1.90 per W	7,976	42,264	34,288	35,886	7,463	3.72	\$ 970
5	Sun Light & Power	5/20/2009	20-Sunpower 225W Single Crystal Module	1-Sunpower SPR-5000m, 5KW, 240 Vac, Utility Interactive Inverter	3,956	90.000%	3,560	EPBB @ \$1.55 per W	4,872	41,374	36,502	37,436	6,357	3.17	\$ 826
6	Occidental Power	5/22/2009	18-Sunpower SPR-230-WHT-U (240v)	1-Sunpower SPR-4000X (240v)	3,670	96.854%	3,555	EPBB @ \$1.55 per W	5,510	36,150	30,640	31,424	5,898	2.94	\$ 767
7	REC Solar	5/20/2009	14-REC Solar 225 Watt	Fronius IG 3000 240v	2,637	96.28%	2,539	EPBB @ \$1.55 per W	3,956	23,403	19,447	19,945	4,238	2.11	\$ 551
8	Regrnd Power	5/22/2009	11-Sharp Solar NT-175U1	Enphase M175-24-240-5	2,335	89.56%	2,091	EPBB @ \$1.55 per W	3,241	21,507	18,266	18,734	3,752	1.87	\$ 488

Berkeley FIRST Pilot Installations by Mini-Bond

9	Sun Light & Power	9/23/2009	20-SPR-225- BLK-U	SPR-400m (240v)	3.976	80.04%	3.183	EPBB @ \$1.55 per W	4,932	36,757	31,825	32,640	6,389	3.19	\$	831
10	Sungevity	10/5/2009	7-BP 175 Watt poly solar modules	Kaco 150xl grid tied 2700w Grid Fronius The- PIFRIG3000	1.161	97.355%	1.130	EPBB @ \$1.55 per W	1,558	11,957	10,399	10,665	1,866	0.93	\$	243
11	Advanced Home E	9/24/2009	16-Evergreen 205W ST C	SMA SB3000US	2.788	94.418%	2.644	EPBB @ \$1.10 per W	2,908	24,960	22,052	22,616	4,480	2.24	\$	582
12	Al Sun, Inc.	9/18/2009	20-Andalay ST- 170-1	(240v)	2.771	89.19%	2.471	EPBB @ \$1.55 per W	3,830	25,990	22,160	22,727	4,453	2.22	\$	579
13	grosolar	11/20/2009	16-Sanyo HIP- 210KHAS Solar Module	16-Epphase 210 micro- inverters	2.978	84.92%	2.529	EPBB @ \$1.10 per W	2,782	30,300	27,518	28,222	4,786	2.39	\$	622
	<b>Total</b>								<b>\$53,625</b>	<b>\$ 379,767</b>	<b>\$ 326,142</b>	<b>\$ 336,660</b>	<b>63,248</b>	<b>31.96</b>	<b>\$</b>	<b>8,222</b>

#### **IV. Berkeley FIRST Surveys**

For the evaluation of the Berkeley FIRST (B1) pilot program, we conducted a broadcast survey, rather than a scientific sample, of all members off the following groups:

- **Participants** (P) who installed photovoltaic (PV) panels through the Berkeley FIRST (B1) financing scheme
- **Withdrawals** (W) who applied for B1, got accepted, then withdrew their application, and
- **Applicants** (A) who applied to B1 but did not get a chance to participate.

The following fraction of applicants responded to the survey:

P: 10 out of 13 (77 %)

A: 6 out of 26 (23 %)

W: 14 out of 27 (52 %)

All results are based on those who responded.

All 40 reservations available for the Berkeley First pilot were filled within the first 15 minutes of the online application opening. Yet, due to the constraints of the limited time frame in which B1 funding was available and the length of time to contract for and complete installation of a photovoltaic system, the pilot was not able to replace applicants who withdrew. At the end of the program, 13 participants had used the B1 funding to install systems.

However, as shown in the summary of survey results beginning on the following page, most withdrawals (and some applicants from the waiting list) actually installed solar without the B1 financing after being inspired to do so by the program using other financing options available to them (such as home equity loans) that were less costly. Thus, the program had a much broader impact on solar installation than is obvious from the participant numbers. It seems evident that, without the short time limit to complete the projects, the educational impact of the program would have resulted in even more than the forty installations for which public funds were available.

#### **Applicant motivation to install PV panels**

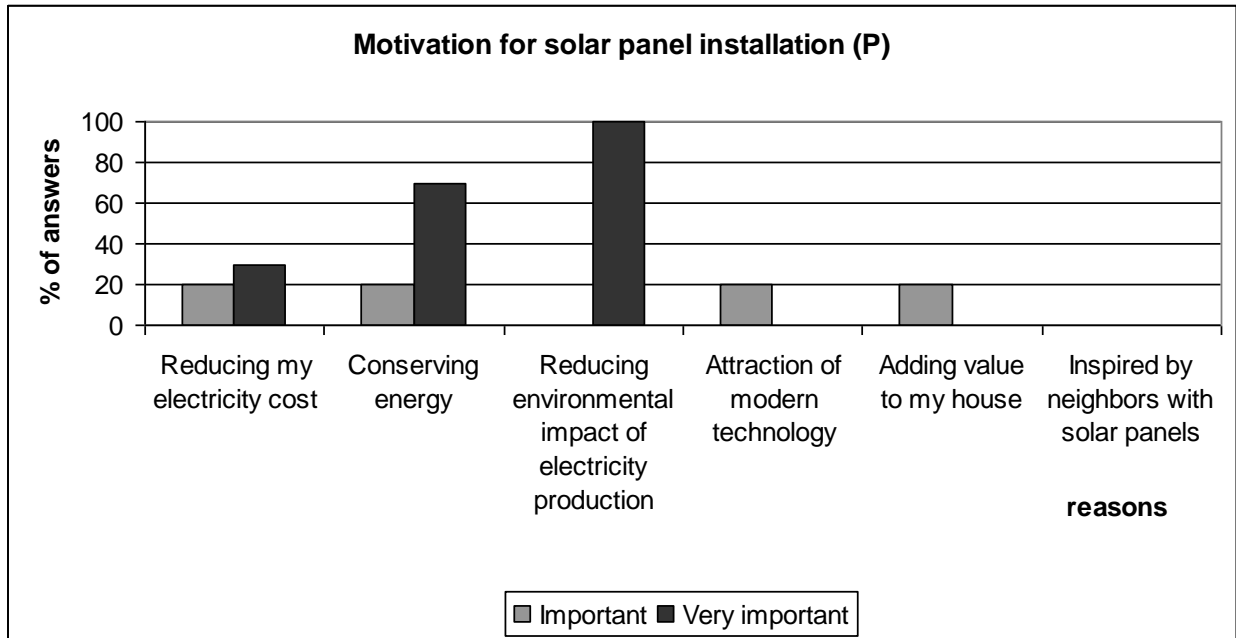
##### *Participants*

Solar installation by participants was mostly motivated by environmental and energy conservation rather than economic reasons.

##### *Withdrawals and applicants:*

Environmental reasons were also most important for Withdrawals and Applicants, but economic considerations were also stated as very

important.

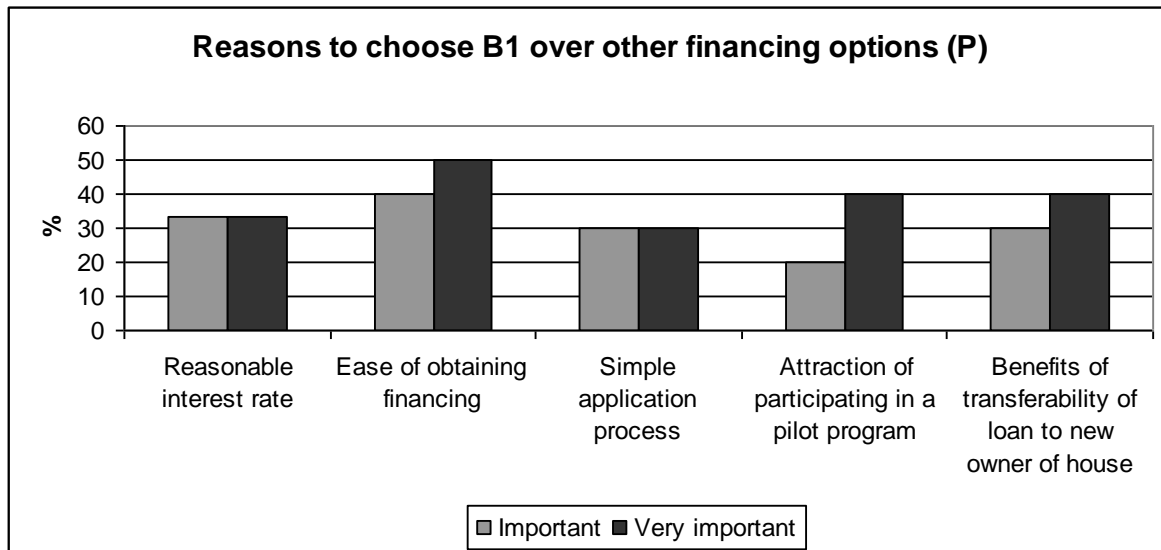


**Reasons for choosing Berkeley FIRST over other financing options for PV installation:**

*Participants:*

As most important reasons for choosing B1 financing over other options were stated:

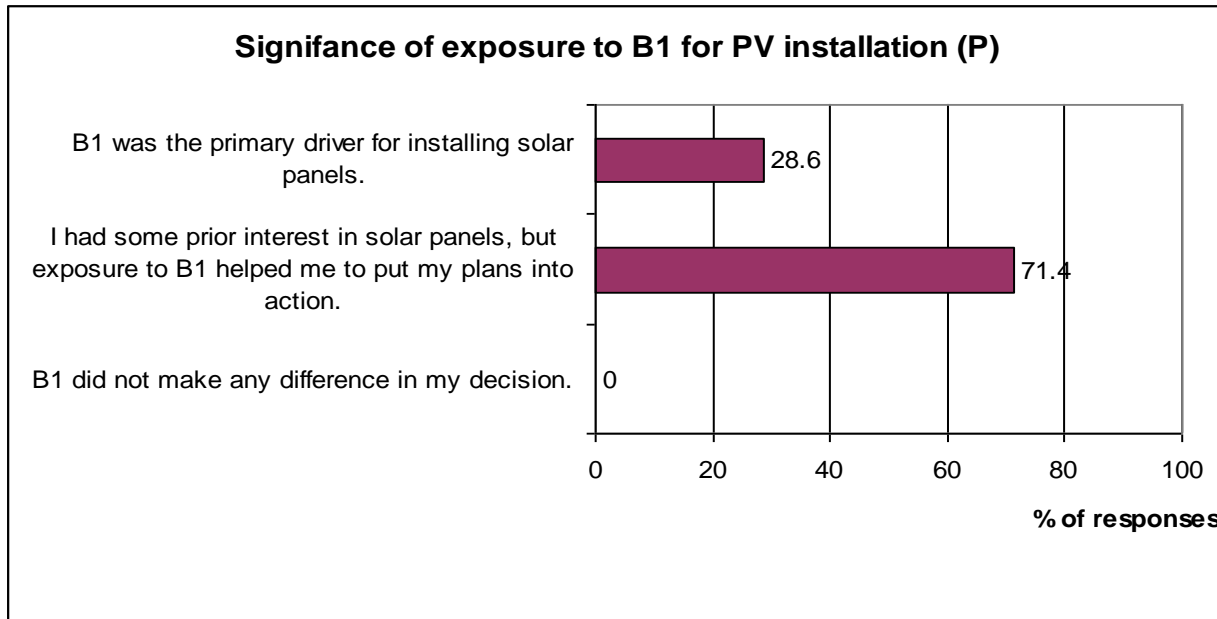
- 1) Ease of application process (50% ranked as VERY IMPORTANT (VI))
- 2) Simple application process & Attraction of participating in a pilot program (40% VI each)
- 3) Reasonable interest rate & Benefits of transferability of loan to new owner of house (30% VI)



**Berkeley FIRST’s significance for interest in PV installation**

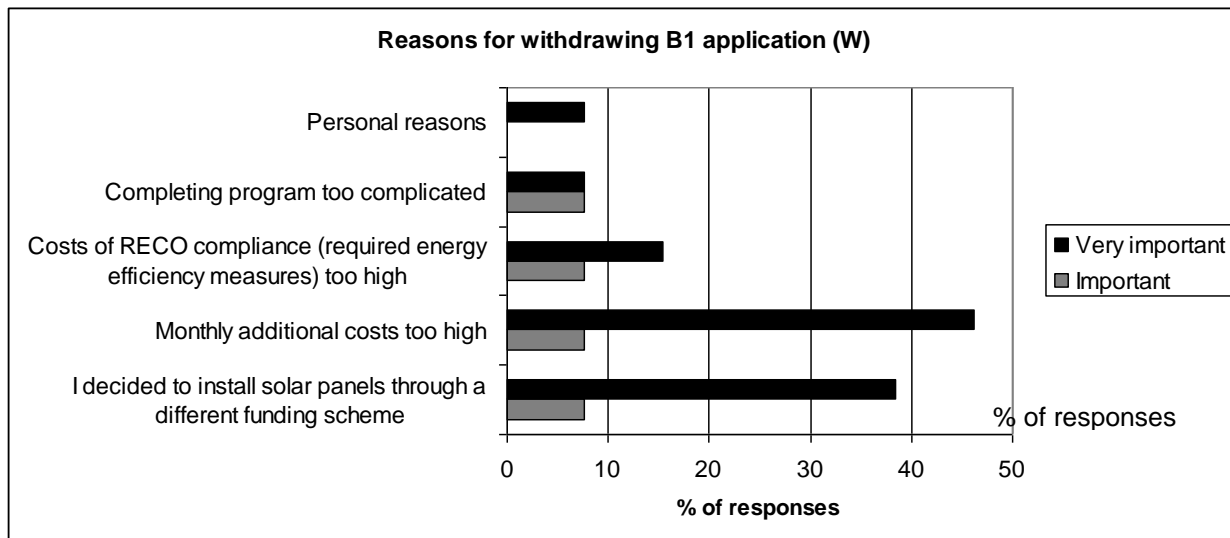
ALL (100 %) of respondents of all three survey groups (participants, withdrawals and applicants) stated that Berkeley FIRST had a significant influence in their decision to install PV panels. Thus, Berkeley FIRST can be seen as successful in enhancing PV deployment beyond the relatively limited participant group.

None of the survey respondents (P, W & A) would have installed solar *without* exposure to Berkeley First. For 28.6 % of the participants, 25.0 % of the withdrawals, and 12.5 % of the applicants, B1 first was the *primary driver* for PV installation. All other respondents, (71.4% of participants, 75.0 % of withdrawals, and 87.5 % of the applicants) were ultimately motivated by Berkeley FIRST to install solar panels despite some previous interest in PV.



**Reasons for withdrawal of applications**

The most prevalent reason that caused applicants to withdraw their application was the relatively *high interest rate*.



***However, the majority of people (67%) who withdrew their application went ahead and installed PV panels without Berkeley First. (All of these stated that they were ultimately motivated by B1 to do so).***

An additional 17.5 % are considering installing PV panels within the next 2-5 years.

In summary, about **85%** of people who withdrew their application have installed or are going to install solar even without Berkeley FIRST.

### **Alternative financing of PV panels: Home equity loans**

#### *Withdrawals:*

Most PV panels (50 %) installed by withdrawals by alternative funding schemes were financed by home equity loans. A smaller fraction was paid in cash.

#### *Applicants:*

Like the withdrawals, the majority (67%) of the applicants who did not get a chance to participate in B1 (and who responded to our survey), already did install solar with other financing measures, or plan to do so in the future.

Home equity loans (50%) as well as personal finances (25%) were used for solar installation.

### **Expected impact of PV panel installation with Berkeley FIRST on house resale value:**

**None** of the respondents (p/w/a) expected their overall house resale value to drop after PV installation, despite the increased property tax.

#### *Participants:*

50% of the responding participants expected the resale value of their house to increase after PV panel installation. Ten percent expected no change.

#### *Withdrawals:*

A slightly lesser proportion of withdrawals (39%) believed house value to increase after PV installation (15% expected no change).

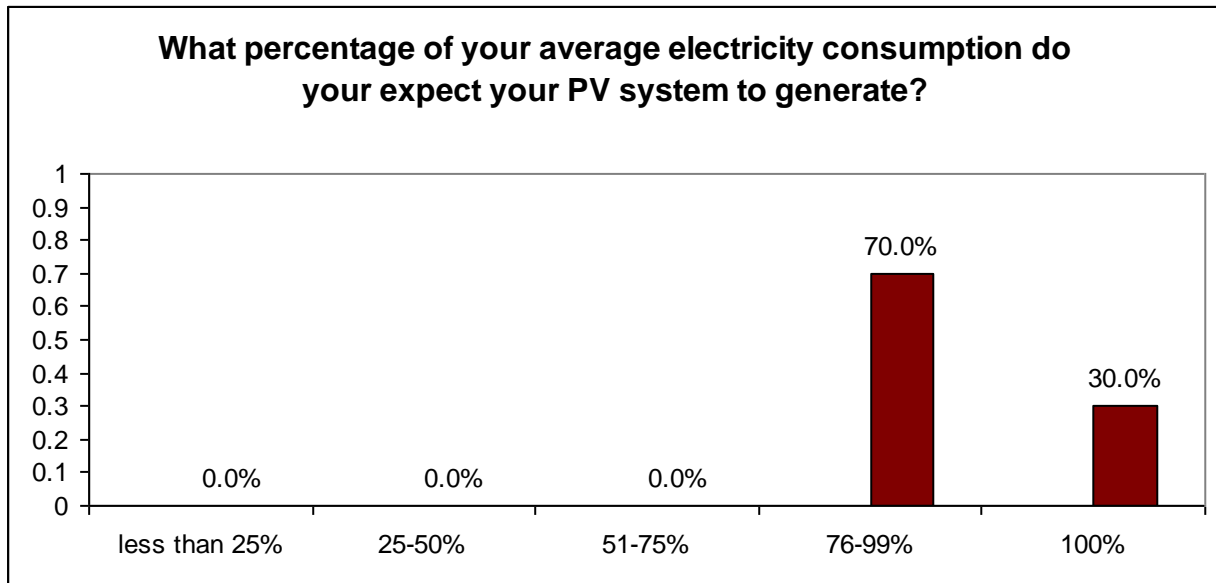
#### *Applicants:*

67% of the applicants believed that resale value would increase, while 33% believed there would be no change.

### Expected electricity load covered by the installed PV system

*Participants:*

Participants expected their PV system to cover  $\frac{3}{4}$  or more of their total electricity consumption.



### Unexpected issues that surfaced during solar installation

Sixty percent of responding participants experienced unexpected issues during solar installation.

The most common ones were:

- Roof needed reinforcement (36” minimum beam distance for PV installation), or alternative location for PV installation had to be found (e.g. garage) (3 out of 10 people).
- Electrical breaker panel had to be modified.

### Main challenges

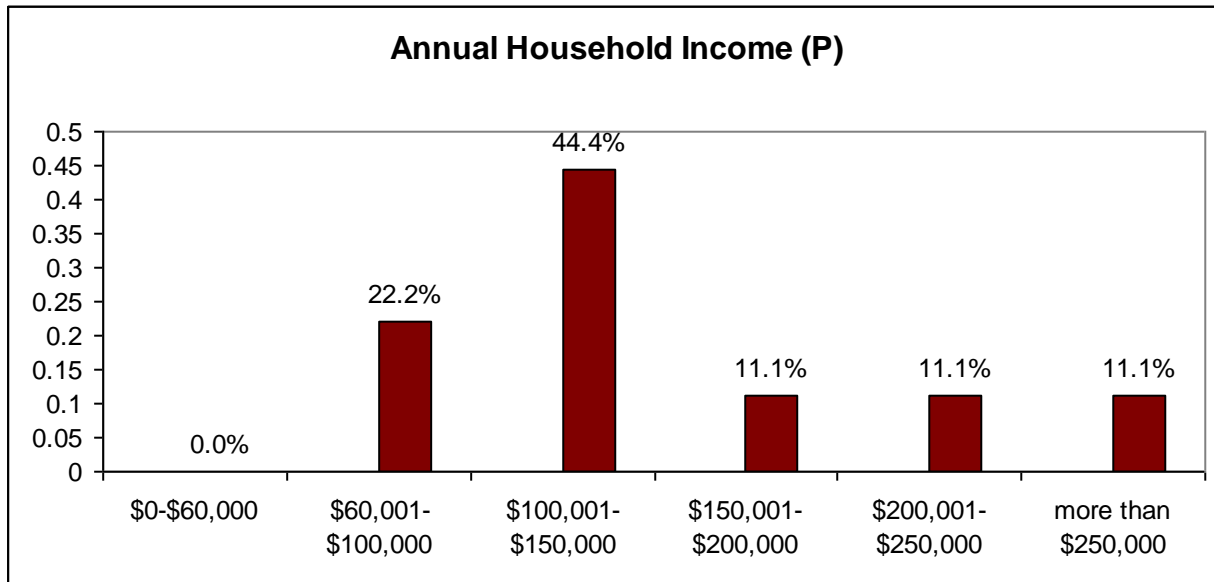
Some of the challenges B1 participants encountered were:

- System permitting process took a long time and almost made the solar installer quit
- Attic not strong enough
- Payment too slow for some contractors

### Yearly household income

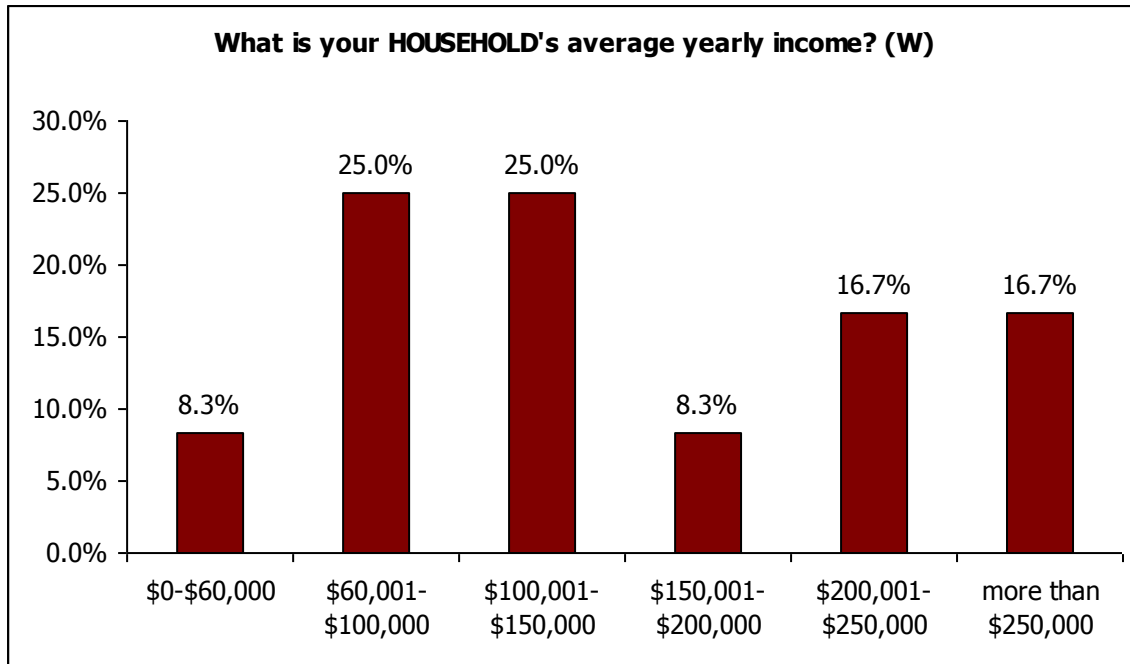
*Participants:*

Roughly 80% of participating households earn an annual income over \$100,000. Most (>44%) participating households earn \$100,000-150,000/y, about 1/5 (22%) earn between \$60,000-100,000 per year.



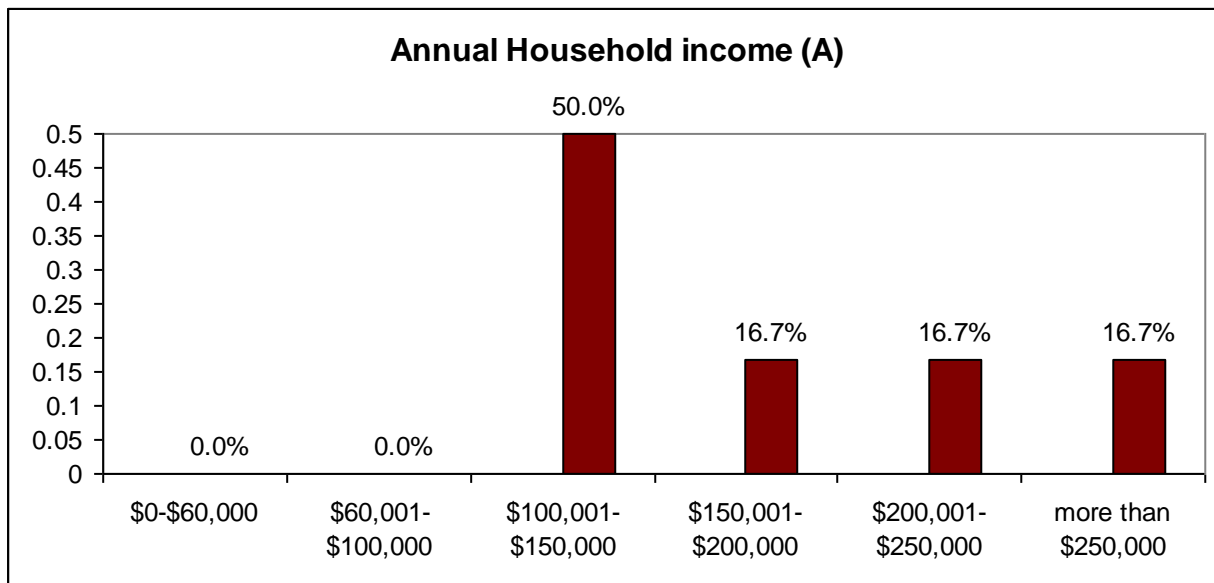
*Withdrawals:*

Roughly 67 % of all households who withdrew the application (but of which the majority went ahead and installed solar with B1) earn over 100,000\$/y.



*Applicants:*

All responding applicant households earned over \$100,000 per year. Most (50%) earn between \$100,000-150,000/y.



**Mortgage and home equity loans**

*Participants:*

ALL participants have an outstanding mortgage of at least 5 years on their house. (60% of those have over 20 years or repayment left).

In addition to a mortgage, a large majority of participant households (80%) also have to repay a home equity loan.

*Applicants:*

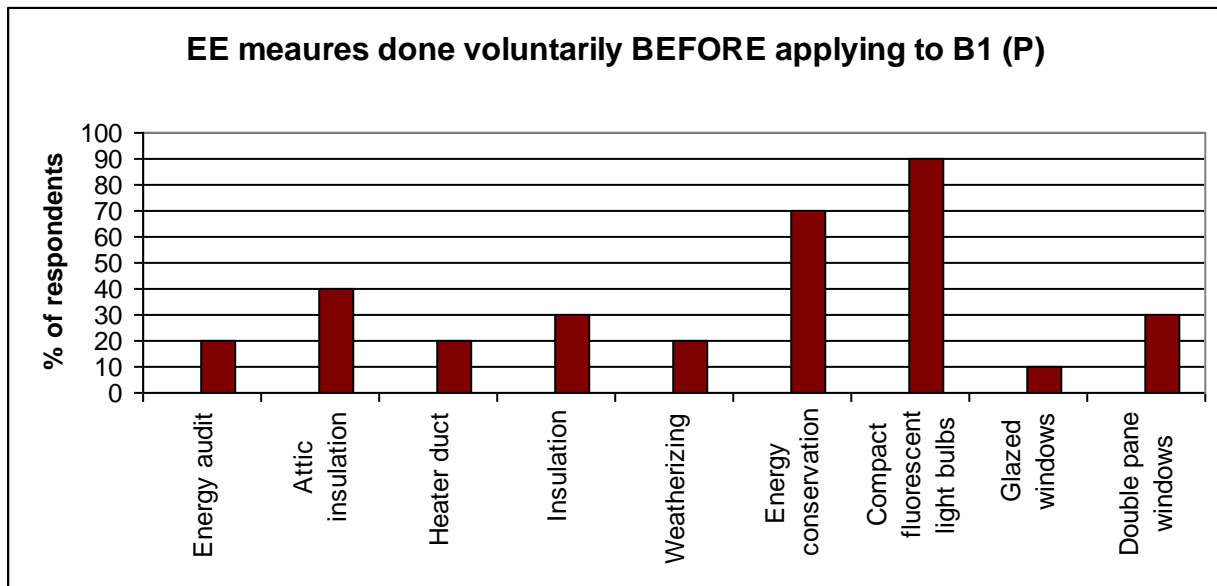
All applicants have an outstanding mortgage, and 67% have an additional home equity loan.

*Withdrawals:*

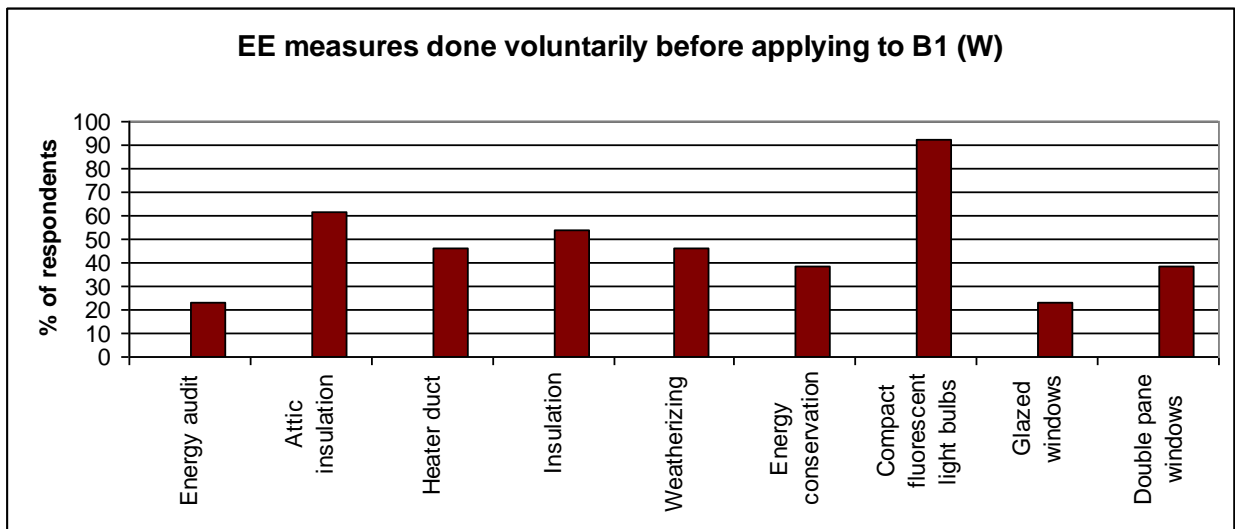
Only 86% of all withdrawals have an outstanding mortgage, and 64% have a home equity loan on their property.

**Energy efficiency measures done prior to solar**

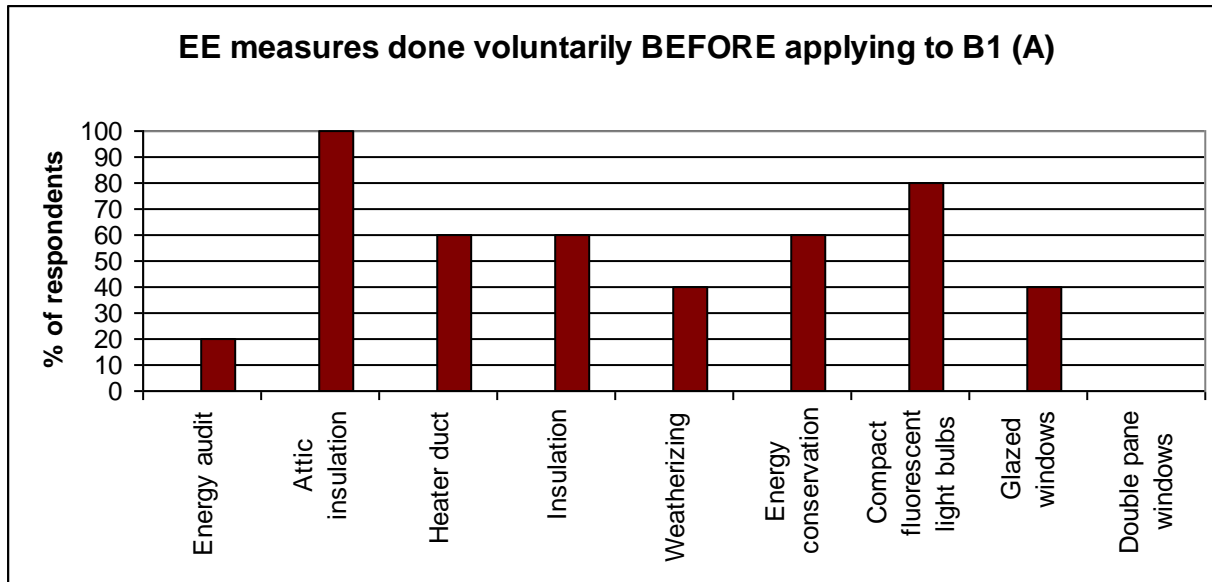
*Participants:*



*Withdrawals:*



*Applicants:*



### Program satisfaction

Most people were satisfied with program (90% of participants who responded).

### Suggested program improvements

*Participants:*

Application process was conceived as *easy* or *very easy* by 70% of the participants.

#### Application process: potential improvements

- Unfair application process: People who could not easily handle online application or had a slow (or no) internet connection were excluded from application process (this potentially represents a bias against low income residents).
- All spots were taken within first 15 min – people who did not know this did not have a chance to participate. A lottery system instead of a race would be fairer.
- It would be helpful if contractors could upload some of the required documentation (invoice, CSI letter, city permit, etc.), as a sort of document repository that could be available to both the applicant and the FIRST administrators.
- Requested RECO compliance did not appreciate some other (voluntary) energy efficiency measures taken.
- Applicants should be asked to determine whether the program is right for them *before* they apply (for instance by participating in a short survey that emphasizes the financial terms, makes clear that home equity loans are potentially a better financing alternative if available, indicates potential construction issues such as necessary roof re-enforcement etc).

#### Additional information requested on B1 website

- Full (and more obvious) disclosure of the financing terms up front
- Accurate statement of interest rates
- More info on building permits
- Up to date information on funding dates

#### Overall program improvements

- Lower interest rates!
- Make it available for everyone

### **Reasons for withdrawing the application:**

- My home equity loan is significantly less than the rate offered by the City
- It turned out that the amount of electricity that solar would replace was only about 1/2.
- high interest rate meant that we would pay double the cost of the system over term of loan
- Had not sufficient funds to complete the roofing replacement i needed to do first, let alone the rafter reinforcement I would need to do to meet current building code structural requirements. Nor could I find any way to get this money-credit is scarce, no programs could I find, no grants, to help with this part of the project. So, though I am eager to have a pv system to serve my duplex (I owner-occupy one unit), I am waiting until it is possible.
- interest rate way too high
- I felt that the interest rate, over 20 years would be WAY too expensive - completely removing and financial benefit to the program. In fact, there should have been full disclosure about the total sum that the panels would cost when the initial cost and the accrued interest are added up.
- Interest rate much too high. Does not offer any benefit.
- Berkeley first interest rate was way too high..but it did get me interested in doing solar...that's a really good thing...now have to bring interest rates down.
- Most likely we will wait until the technology improves a bit and the cost goes down
- interest rate at 7.75% was way too expensive...used home equity loan....the interest difference was too great...even though i was a big supporter of berkeley first and it got me interested in really doing solar panels. gotta find a way to make the interest rate an incentive as well
- After I was selected for Berkeley First and found out how very high the interest rate was, I decided it was far more cost effective to refinance my house to pay for the Solar panels.
- Again, financing through my home equity line of credit, at half the interest rate (or less) saved me over \$1000/year in interest

### **Unexpected issues that surfaced during solar installation**

6 out of 10 people (who responded to survey) experienced unexpected issues:

- My older house needed extra beams to be eligible and safe (house built in 1920s, beams 48" apart, needed to be 36" minimum)
- The roof on our house was not strong enough to support panels. The panels had to be installed on the garage.
- Type of system had to change.
- My electrical breaker panel turned out to be a 3-phase unit, wired single-phase in a very strange way. As a result, the solar installers had to install a separate sub-panel for their breakers.
- Inverter had to be placed on N side of house, opposite to electrical panel.
- Small mishap during installation caused phone line to be out for 2 days.
- roof rafters needed to be reinforced.

### **Main challenges:**

- In particular, due to the ridiculous prepayment penalties, I am very exposed if i attempt to sell or refinance the house, and the new lender demands that i pay off BerkeleyFirst. I am gambling on a growing acceptance of programs such as B-First, though of course, newer

programs may eliminate the prepayment penalties. 2) Extreme difficulty in getting simple answers to simple questions. The word "obfuscation" came to mind many times

- Our system took 3 tries to get through the permitting process which then made the builder threaten to quit because of the deadline the program had which he felt he had no control over the passing of inspection.
- "(Attic problem as described above).
- Contractor wanted to be paid sooner than City could handle payment,"
- timing issues that were due to my own delay

### **Suggested program improvements**

#### Application process:

##### *Participants:*

- I felt it excluded people who could not easily handle online application
- I would have liked a full disclosure of the financing terms up front.
- The pilot's application process clearly favored computer-savvy persons. This is unfair to many prospective applicants who might not have been such, let alone own a computer or have an internet connection at home.
- I was lucky enough to have had my solar company organize a breakfast application set up so that all their customers were able to apply as soon as the applications were available at 9 a.m. Had I not had that assistance, I would have probably applied on my own at some point during the day, but not necessarily at the very beginning of the process. I think people may not have realized if they didn't apply immediately, that their chances were zilch. I think Berkeley should make it very clear the next time around that the first-come first-served meant that the applicants were selected within the first 15 minutes. That was not at all clear to me. I feel lucky that my solar company was on top of it.

##### *Applicants:*

- Notification that all slots had already been taken before i even applied.
- There's not much certainty to those applicants who are > #40 on the list re: whether the program will be extended. It would be nice to know timing; i.e. if we should continue to wait for subsequent phase(s) of Berkeley FIRST financing. We're ~ 170 on the list, so if it will take another ten years for the City to get the financing, maybe we should go ahead and get it done under another program.

##### *Withdrawals:*

- RECO compliance was VERY quirky. It did not "appreciate" some energy efficiency steps I took - new efficient hot water heater, new efficient heating system, sealed pipes - & instead dinged me for petty issues.
- Although I was quick to jump on the program, it turned out it wasn't right for me. You should probably make it more widely available to people whose houses could really benefit from it.
- lottery instead of race to submit
- I had expressed interest in the program from the beginning. That interest should have gotten me at the front of the list of participants. Instead, I was #6 in my district even though I completed my application within 8 minutes of the online process being opened.
- What made it hard was the timing of the submission. We have an old computer, and by the time I submitted my application (and I'm a pretty good typist) there were already 146

applications submitted, and i was on a wait list. This seems unfair to folks who have slower computers (i.e. lower income residents).

- The city acts as if they are doing the resident a big favor when there is no favor at all. Interest rate much too high.
- Simple as possible so program encourages people to participate. solar good by itself...don't need reco also....do that separately

### Additional info on website

#### *Participants:*

- I have never been through hiring contractors, passing permits, navigating building project against a timeline. Some "how-tos" or "things to keep in mind" would have been helpful
- An accurate statement of the interest rate and the most up-to-date information on funding dates.
- It would be nice if contractors could upload themselves some of the required documentation (invoice, CSI letter, city permit, etc.), as a sort of document repository that could be available to both the applicant and the FIRST administrators.

#### *Applicants:*

- Clearer info about details, how to apply, etc.

#### *Withdrawals:*

- An honest analysis and disclosure that the interest rate is unusually high.
- real information about total costs over time

### Overall Program

#### *Participants:*

- A lot (see below). In a nutshell, reduce the focus on the bond issue and property tax aspects of the loan, and treat it as an ordinary commercial mortgage, with appropriate disclosures and documentation.

#### *Withdrawals:*

- Lower interest rates, and encourage anyone who wishes to participate to do so.
- Lower the interest rate to 3 or 4%
- The RECO requirements take so much money and time in old Berkeley homes - ours is from the 19th century. We can't possibly fix all of the windows.
- Make the interest rate competitive. The add-ons to the basic rate were totally excessive.
- Yes, by developing programs to address the problems I encountered. There are many 50 plus year old homes in Berkeley with similar conditions to mine, owned by people with limited disposable income, and (at least in this economic period), limited credit options.
- It should be made available to everyone in Berkeley.
- lower the interest rate
- Make it ACCESSIBLE to middle-income people like me.
- loan rate