

# PROMOTING SOLAR PV DEPLOYMENT THROUGH MICRO-INVESTMENTS

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## ABSTRACT

Micro-investments are the crux of financing a solar program that will give consumers and businesses the opportunity to accelerate the adoption of solar energy. This concept, which is an extension of existing financial micro-investment models, lowers the cost of investing in solar PV projects to a level that most consumers can afford. In addition, a micro-investment program will provide investment opportunities to consumers who have properties unsuitable for solar panels and consumers who rent. By pooling resources, micro-investors can take advantage of the lower overall costs of large-scale solar projects as well as their optimal placement.

As an example, if the Tennessee Valley Authority (TVA) were to develop a micro-investment program and if all ratepayers became micro-investors at a rate of \$5 per month, each year TVA would generate \$135 million for constructing small community solar farms and larger regional solar farms.

## 1. INTRODUCTION

While many consumers and businesses favor renewable energy, they find that the cost of entry for solar power is far too expensive, whether outright purchasing, leasing, or funding community solar. As a result solar investments have been limited and are not creating the demand that it should. Most solutions to promote solar power are in the form of tax incentives. A federal income tax credit of 30% is available through 2016, and many states provide exemptions from sales tax. Such tax credits still require the purchaser to finance the project first and later receive the tax credit. Other state

programs, which vary widely from state to state, include personal tax credits, grants, and low-cost loans. In addition, many utilities, especially those facing renewable energy standards, also provide incentives to their customers.

Another barrier that many consumers and businesses face is in the placement of solar panels. Trees, roof alignments, shade from nearby buildings, lack of space, and the perception of unsightliness all hinder the deployment of solar panels. Adding to this are state and local barriers, including regulatory hurdles, paperwork, the cost of permits, and absolute bans.

A third barrier is the cost of financing to obtain the necessary capital. Although technological innovation has dramatically reduced the cost of solar technologies, financial innovation has not kept pace. A recent proposal is to allow solar projects to be treated as Real Estate Investment Trusts (REITs), which would make low-cost capital available<sup>1</sup>; however, there is no assurance that the federal government would adopt such a proposal.

This paper focuses on lowering the financial barrier and making it easier for consumers and businesses to finance solar projects, even as the cost of technology lowers over time and the tax incentives remain in place. There are already some efforts around the U.S. to address some of these financial barriers. One example is the Sacramento Municipal Utility District (SMUD) SolarShares Program, started in 2008, with 600 participants using 1 MW of solar and a planned expansion to 25 MW by 2016.<sup>2</sup> To buy into the SMUD solar farm, customers pay a flat fee based on the number of kW they want to subscribe to, in 0.5kW units, and received a credit on their bills equal to the amount of power generated by their shares. This

program gives customers a benefit similar to owning on-site solar generation, and many customers appear to be motivated by the energy credit and the opportunity to invest in solar. In another successful program, the City of Ellensburg, WA, installed a community solar energy system in 2006 with 73 utility customers investing more than \$120,000. The utility framed it as a solution for residents who can afford \$2,000 for solar, but not \$20,000, and who want to do more than just participate in a \$5-\$10 monthly green power program.<sup>3</sup> The Clean Energy Collective<sup>4</sup> in Carbondale, CO, has member-owned renewable-energy facilities and helps members finance the projects. In Maryland, University Park Community Solar LLC<sup>5</sup> placed solar panels on a church roof, financed by its members at a minimum cost of \$2,000. Such initiatives rely on tax credits and utility net metering to help manage the cost of building and operating the projects.

The proposal described in this paper takes such concepts one step further by allowing any individual or business to invest in solar energy with a small monthly purchase, perhaps as little as \$5 per month, using a micro-investment plan to fund solar projects.

## 2. MICRO-INVESTMENTS IN SOLAR

Micro-investments are a way to allow anyone to invest in a project because the cost of a single share is low and affordable. A recent micro-investment concept was developed by Muhammad Yunus, a Bangladeshi banker who won the Nobel Peace Prize in 2006 for his work in creating economic and social development for the poor. A similar concept was used in the U.S. and other countries in the last century to finance costs for World War I and World War II. The U.S. Government sold “savings stamps” for an affordable 10 cents and 25 cents each week. The stamps were pasted into a booklet until they totaled \$18.75, which was enough to buy a U.S. Savings Bond yielding \$25 at maturity.<sup>6</sup> During World War II, 85 million Americans – half the U.S. population – purchased approximately \$186 billion worth of Savings Bonds, accounting for nearly three quarters of total federal spending from 1941-1945, all this from families whose average wage was \$50 per week.

The Tennessee Solar Energy Association (TSEA) has as its mission the promotion of the widespread use of solar energy in the state of Tennessee. Unlike most states, Tennessee is served entirely by electric distribution companies who purchase power from the Tennessee Valley Authority (TVA). The TSEA intends to promote the principle of micro-investments to finance solar

projects within the TVA area. Rather than focusing on the poor, as Muhammad Yunus did, TSEA will use the concept of micro-investment to provide opportunities to all ratepayers to invest in solar projects in Tennessee. Even in today’s economic times, which has reduce our discretionary spending significantly, we believe that consumers and business are willing to invest small amounts in solar projects that will ultimate provide them financial benefits. The success of our endeavors in Tennessee will mean that the concept can easily be duplicated in other states.

The advantage of financing solar projects through micro-investments are many. First, consumers and businesses would neither have to finance nor built their own solar projects on their properties. This eliminates three barriers: (a) consumers who have unsuitable properties for solar because of trees or rooftop alignments can participate in and benefit from solar projects; (b) consumers will not have to obtain building permits and grid interconnections; and (c) consumers will not have to make large financial investments with long payback periods. Second, a micro-investment plan for solar opens up investment opportunities for all ratepayers, which should attract customers who otherwise would not or could not have considered their own solar projects, for example, residents and business owners who rent properties, residents of multi-tenant buildings, and those who cannot afford the full cost of a solar energy system. Third, micro-financing can be used for large solar projects to benefit entire communities, taking advantage of the lower overall costs of large-scale projects and providing more solar power than individual rooftop units could. Finally, micro-investments would provide large sums to utilities and other solar companies who might otherwise not be able to finance a solar project.

In the micro-investment model, a distribution utility (distributor) would establish a micro-investment program for its customers to finance a solar project that will benefit them. After projecting the total amount of investment needed and securing the base of micro-investors, the distributor would embark on a solar project by either building a solar generation facility directly, building through a subsidiary, or contracting with a third party to build and operate the facility.

Financing a solar program through micro-investments is likely to be successful because each distributor has a large number of customers who are billed every month and who will see the return on their investments directly on their bills. Any company other than a distribution utility would have to search for micro-investors from a

non-captive audience and convince them to invest in a project that may or may not provide them with a return.

Fig. 1 shows an example in which a distributor has created a micro-investment program to invest in a solar utility to provide power to its customers. Customers would elect to invest in the solar project, with their micro-investments paid through an additional charge on their monthly electric bills from the distributor. The micro-investment plan would have a minimum amount for the monthly investment, but low enough to allow every customer to participate, for example, \$5. The plan could also impose a maximum amount for each monthly investment. The distributor then credits each investment to the customer's account, deducts a percentage of the investment for expenses for managing the finances and deducts a tariff for distribution line infrastructure maintenance, and then passes the remainder to the solar utility. As the solar utility generates revenue, it returns some of it to the investors in the form of rebates that reduce the customers' utility bills. In the long term, after the financing is paid off, the customers would no longer have to keep investing, but will begin to see even greater returns on their bills.

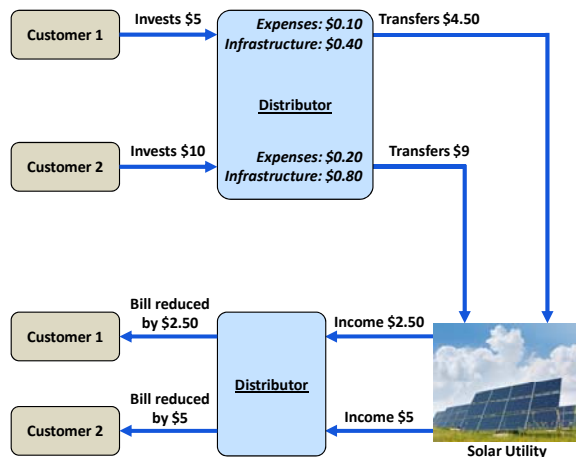


Fig. 1. The Investment Chain.

### 3. MICRO-INVESTMENTS UNDER TVA

In the Tennessee Valley, TVA is a closed system in which all 155 distributors buy power from TVA, making it an ideal utility for studying this micro-investment model. Moreover, as a Federal Power Authority, TVA plays an important role in the Tennessee Valley as the

regional stewardship agency and supplier of public power.<sup>7</sup> TSEA envisions that TVA would establish a micro-investment program, achieving even greater economies of scale than the individual distributors could achieve.

TVA, serving 9 million people in the Tennessee Valley, can play a large role in finding the relationship between how much the public says it wants in solar energy and how much the public is willing to invest. Hart Research recently performed a survey, funded by the Solar Energy Industries Association (SEIA), and found that 92% of voters "believe it is important for the United States to develop and use solar power."<sup>8</sup> What we do not know is under what conditions the average American consumer would be willing to invest small amounts each month if they were given partial ownership of a solar energy system.

TVA has promoted nuclear energy as its principal power source for the region's electric needs. Its aging coal-fired plants are over 50 years old and are depleting TVA funds to meet the EPA's stricter air quality standards. The result is the TVA has little funding available for solar energy. Although TVA has a renewable energy program, known as Green Power Providers, which provides long-term power purchase agreements, the program has not produced very many solar installations.

As a federal authority, TVA is in an ideal position to undertake a micro-investment program. Under the TVA charter, the President can direct the Department of Energy to provide support and resources as requested by the TVA board, which is directed to make studies "in the application of electric power and a better balanced development of the resources of the region."<sup>9</sup> Furthermore, TVA pays no property tax, has a plethora of sites where large solar installations can be located, knows where in its power system to best locate large solar farms to provide the greatest return on investment, has the staff to manage the program, can handle the procurement actions, and can set aside a percentage of the installations to local installers. Thus all the soft costs that ordinarily burden other solar purchasers can be avoided by TVA. In addition, its purchasing power, backed by the aggregated micro-investments, will produce the lowest cost through competitive bidding.

Such a project would provide enormous benefits to small businesses in the area. As a federal entity, TVA is required by the Federal Acquisition Regulations to have set-asides for small businesses as long as there are at least two companies that can provide the product or service. Contracts over \$100,000 can be set aside if enough small

businesses are able to do the work, and contracts over \$500,000 have to include a small business subcontracting plan so that small businesses can get work under these large contracts. These regulations protect the in-state solar installers and ensure that they will be able to participate competitively in the program.

Fig. 2 shows an example in which multiple distributors participate in TVA's solar micro-investment program, giving an even wider range of customers the opportunity to invest. TVA would have the financial resources to build several solar facilities to provide power to its various distributors.

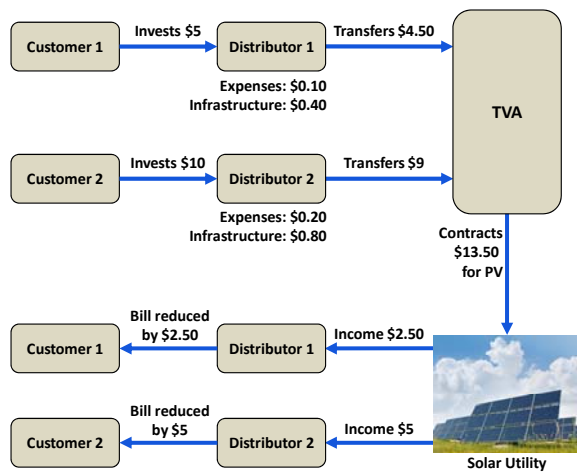


Fig. 2. The Investment Chain under TVA.

If TVA were to develop a micro-investment program, it could raise enormous sums for solar projects. For example, if all ratepayers became micro-investors at a rate of \$5 per month, each year TVA would generate \$135 million for constructing small community solar farms and larger regional solar farms, assuming that all of the 155 distributors in the TVA system participated in this venture. Using its aggregated micro-investments, TVA would be able to solicit bids for the construction of solar farms in the appropriate locations.

#### 4. FEASIBILITY OF THE PROGRAM

For a single investor, a large-scale investment in solar power in Tennessee is not financially practical because the expected return on investment (ROI) is very low compared to other investing options. However, the rapid growth of socially responsible mutual funds indicates that

investors are willing to forgo some financial return on investments if they perceive there is a benefit to society. Fig. 3 shows supply and demand curves for solar investments. Micro-investments will increase the amount of money invested into solar energy, which will shift the supply curve to the right. Micro-investments will also increase demand for solar energy as the investors insist on having solar power provide their electricity. As the supply and demand curves shift to the right on the graph, the ROI will increase, which will produce additional incentives for investing. Ultimately, the increased demand for solar will increase the number of jobs in Tennessee and throughout the Tennessee Valley.

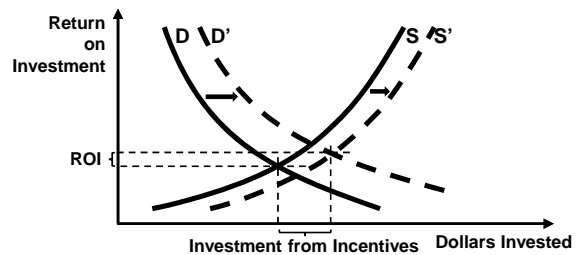


Fig. 3. Benefits from new incentives and policies.

TVA could begin a micro-investment program with a pilot involving one or more distributors willing to participate. It would begin with a feasibility study of sites suitable for solar farms and a promotion campaign for the customers. The rate at which customers sign up for the micro-investment program will indicate the success of the promotional campaign. A threshold should be set for the total investments to indicate that there is widespread acceptance and that the actual construction can begin. Once the threshold has been reached, TVA can begin to replicate the program throughout its region.

#### 5. SUMMARY

Solar micro-investment is a new concept that is intended to increase financing for solar installations through the aggregation of small investments from a large population of ratepayers. Such a program has many benefits, especially because it provides the opportunity for all ratepayers to invest in solar projects that would directly benefit them through lower electricity rates and return on investment. Today, numerous barriers stand in the way of consumers and businesses, including high capital and

financing costs, properties unsuitable for solar panels, and renters who do not own their buildings.

A solar micro-investment program would provide large sums to utilities and other solar companies who might otherwise not be able to finance a solar project. This would allow them to use economies of scale to create solar farms at the lowest possible cost and in the most optimal locations.

The Tennessee Valley Authority (TVA) region is an ideal test bed for the concept. Our investment chain shows the flow of capital to TVA for the purchase and operation of large solar installations, with the majority of the funds from the sales of the solar power being returned to the micro-investors. As an example, if all TVA ratepayers became micro-investors at a rate of \$5 per month, each year TVA would generate \$135 million for constructing small community solar farms and larger regional solar farms. We expect that by increasing the investment in solar systems, the return on investment will increase and the number of solar-related jobs would expand. This would stimulate the economy of the Tennessee Valley and other areas as additional utilities adopt the micro-investment model.

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<sup>8</sup>“America Votes Solar - National Solar Survey 2012,” <http://www.seia.org/research-resources/america-votes-solar-national-solar-survey-2012>

<sup>9</sup>Tennessee Valley Authority Act of 1933, Section 10.

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<sup>1</sup>“Smarter Finance for Cleaner Energy: Open Up Master Limited Partnerships (MLPs) and Real Estate Investment Trusts (REITs) to Renewable Energy Investment,” Mormann, Felix, and Reicher, Dan, November 2012, The Brookings Institution, Washington, DC, USA.

<sup>2</sup><https://www.smud.org/en/residential/environment/solar-for-your-home/solarshares/>;  
“Sacramento Municipal Utility's (SMUD) Solar Shares Program,”  
<http://nwcommunityenergy.org/solar/solar-case-studies/navajo-nation>

<sup>3</sup>“Ellensburg, Washington's Community Solar Project,”  
<http://nwcommunityenergy.org/solar/solar-case-studies/chelan-pud>

<sup>4</sup><http://www.easycleanenergy.com/>

<sup>5</sup><http://universityparksolar.com/index.htm>

<sup>6</sup>Kimble, James J., *Mobilizing the Home Front: War Bonds and Domestic Propaganda*, Dallas, Texas A&M University Press, 2006.

<sup>7</sup>Tennessee Valley Authority Act of 1933, 48 Stat. 58-59, 16 U.S.C. sec. 831.