

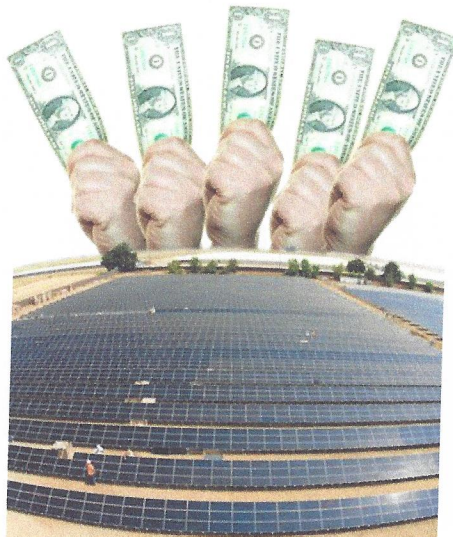
MAJOR FUNDING Through Micro-Investments

Consumers and businesses that favor solar energy often have good reason for being unable to invest in it, whether due to system cost, the cost of financing, or system siting challenges and regulatory hurdles. Solar leasing, tax incentives and rebates, and the opportunity to invest in community solar projects offer some relief for those challenges. Yet solar investments remain limited compared to the overwhelming public support for solar.

This article focuses on lowering the financial barrier and making it easier for consumers and businesses to finance solar projects, even as the cost of technology falls over time and the tax incentives remain in place. There are already efforts around the nation to address some of these financial barriers.

For instance, the Sacramento Municipal Utility District (SMUD) SolarShares Program launched in 2008. To buy into the SMUD solar farm, customers pay a flat fee based on the number of kilowatts they want to subscribe to, and receive a credit on their bills equal to the amount of power generated by their shares. In another successful program, the city of Ellensburg, Wash., 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. The Clean Energy Collective in Carbondale, Colo., develops and helps members finance community-owned renewable energy facilities. In Maryland, University Park Community Solar LLC placed solar panels on a church roof, financed by its members at a minimum cost of \$2,000 each. Such initiatives rely on tax credits and utility net metering to help manage the cost of building and operating the projects.

Our proposal takes these 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. Solar micro-investment



As a scenario for TVA demonstrates, such a program overcomes investment obstacles while spurring big benefits for investors, utilities, local economic development and the industry.

PHOTO ILLUSTRATION: SMUD, ISTOCKPHOTO.COM

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. It overcomes the financing and siting obstacles that can keep would-be investors on the sidelines.

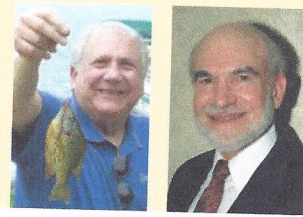
A solar micro-investment program would provide large sums to utilities and other solar companies that otherwise might not be able to finance a solar project. That would allow them to use economies of scale to create solar farms at the lowest possible cost and in the most optimal locations.

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 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.

Financing Solar Through Micro-Investing

Micro-investments allow anyone to invest in a project because the cost of a single share is 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, savings bonds, was used in the United States and other countries to finance costs for

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World War I and World War II. During World War II, half the U.S. population purchased approximately \$186 billion in savings bonds. This investment accounted for nearly three-quarters of total federal spending from 1941 to 1945 — all from families whose average wage was \$50 per week.

The Tennessee Solar Energy Association (TSEA), an ASES chapter, 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 will use the concept of micro-investment to provide opportunities to all ratepayers to invest in solar projects in Tennessee. The success of our endeavors in Tennessee will mean that the concept can easily be duplicated in other states.

Financing solar projects through micro-investments offers many advantages. First, consumers and businesses would neither have to finance nor build their own solar projects on their properties. This eliminates three barriers they often face: (a) unsuitable properties for solar because of trees or rooftop alignments; (b) building permits and grid interconnections; and (c) large financial investments with long payback periods. Second, by opening investment opportunities for all ratepayers, a micro-investment plan should attract customers who otherwise would or could not have considered their own solar projects. 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. Finally, micro-investments would provide large sums to utilities and other solar companies who might otherwise not be able to finance a solar project.

Stephen Levy has 40 years' experience in electric power, including 30 years at the Army Research Labs and then as director of the EPRI's Power Electronics Applications Center. An environmentalist when he lived in New Jersey, Levy, upon his retirement, merged both his advocacy and vocation into his study of solar photovoltaics. He teaches at the University of Tennessee's Materials Science and Engineering Department and is co-founder of the Tennessee Solar Energy Association.

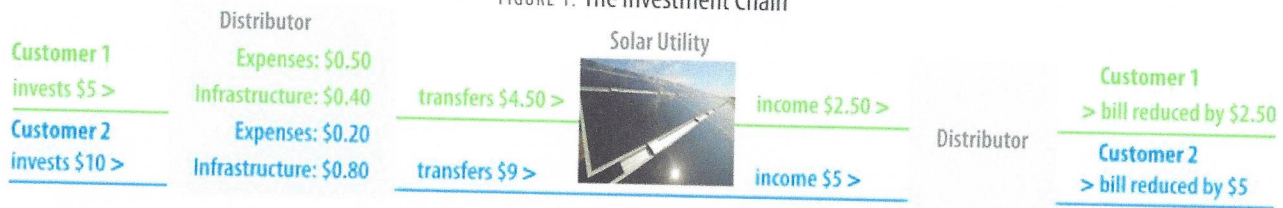
Kenneth J. Lutz (kjlutz@amr-strategies.com) founded AMR Strategies LLC to apply his decades of expertise in energy, public policy and telecommunications to help utilities modernize their grids, with smart grid technologies, renewable energy sources, energy storage and other technological improvements. He has a Ph.D. in electrical engineering from the Johns Hopkins University.



Through SMUD's SolarShares Program, customers pay a flat fee for each 0.5-kilowatt unit of the solar farm, and receive a credit on their bills equal to the amount of power generated by their shares. Micro-investing goes a step further by allowing anyone to invest in solar energy with a small monthly purchase, perhaps as little as \$5 per month.

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 solar farms.

FIGURE 1: The Investment Chain



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 either build a solar generation facility directly, build through a subsidiary or contract 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 will see the return on investments (ROIs) directly on their bills. Any other company would have to search for micro-investors from a non-captive audience and convince

them to invest in a project. nance, 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. After the financing is paid off, the customers would no longer have to keep investing, but would begin to see even greater returns on their bills.

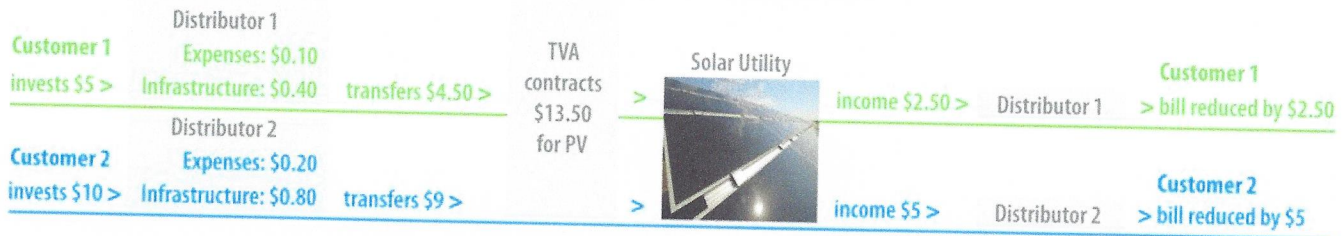
Proving the Model at TVA

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

As a result, 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 produced few 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 U.S. 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" (Tennessee Valley Authority Act of 1933, Section 10). Furthermore, TVA pays no property tax, has a

FIGURE 2: The Investment Chain under TVA



them to invest in a project.

Figure 1 above 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. The micro-investment plan would have a minimum amount for the monthly investment, but one low enough to allow every customer to participate. The distributor then credits each investment to the customer's account, deducts a percentage of the investment as expenses for managing the finances and deducts a tariff for distribution line infrastructure mainte-

public power. TSEA envisions that TVA would establish a micro-investment program, achieving even greater economies of scale than the individual distributors could achieve.

A 2012 Hart Research survey, funded by the Solar Energy Industries Association, found that 92 percent of voters "believe it is important for the United States to develop and use solar power." 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 solar energy and how much the public is willing to invest.

TVA's aging coal-fired plants are more than 50 years old and are depleting TVA funds to meet increasingly strict air-quality standards.

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 ROI, has the staff to manage the program, can handle the procurement actions and can set aside a percentage of the installations for local installers. Thus TVA can avoid all the soft costs that ordinarily burden solar purchasers. 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 Federal Acquisition Regulation to have set-asides for



A micro-investment program would provide utilities with large sums to fund solar projects, using economies of scale to create them at the lowest possible cost and in the most optimal locations. Shown, the 12-megawatt PSEG Wyandot Solar Farm in Ohio spans 80 acres.

KENNETH CHAMBERLAIN, COURTESY OF PSEG

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 in-state solar installers and ensure that they will be able to participate competitively in the program.

Figure 2 on page 26 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.

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

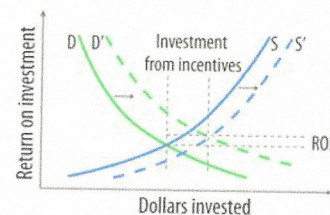
farms and larger regional solar farms, assuming that all of the 155 distributors in the TVA system participated in this venture.

Demonstrating Benefits for the Industry

Figure 3, right, 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-generated 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.

TVA could begin a micro-investment program with a pilot involving one or more willing distributors. It would begin with a feasibility study of sites suitable for solar farms and a promotion campaign for the customers.

FIGURE 3: Benefits from New Incentives and Policies



The rate at which customers sign up for the micro-investment program will indicate the success of the promotional campaign. TVA should set a threshold for the total investments to indicate that the actual construction can begin. Once the threshold has been reached, TVA can begin to replicate the program throughout its region. As the programs are proven and refined in Tennessee, utilities nationwide can confidently launch their own micro-investment programs. 57