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TRANSFORMING THE MARKET FOR SOLAR WATER HEATERS: A NEW MODEL TO BUILD A PERMANENT SALES FORCE

by John S. Hoffman and John Bruce Wells, with William T. Guiney¹

Solar water heaters work, they save money, and they are ready for the market today. Yet the industry remains tiny. Rather than asking what public subsidies could best support the solar water heating sector, this paper asks what form the industry could take to become successful. It recommends the “insurance agent model” to create a committed, permanent sales force.

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A Message from the Staff of the Renewable Energy Policy Project

Proponents of household solar water heating (SWH) tell us that the technology's promise remains bright: solar water heaters work, they can save money for their owners, their use reduces air pollution and greenhouse gas emissions, and they are ready for the marketplace. Yet sales remain anemic, with an installed national base of under three-hundred thousand units (according to the U.S. Census Bureau) and a few thousand units sold nationwide per year. According to the Department of Energy, the SWH sector consisted in 1997 of 29 companies — one more than the year before, but fewer firms than any other year since before 1974, and far below the triple-digit figures of 1977 to 1984. Worse, most of the systems shipped heat swimming pools; household SWH accounts for a measly 7.3% of the market. To put it bluntly, that's not really an industry. It's a craft — albeit a craft pursued by a cadre of dedicated, hard-working professionals who believe in the value of their product.

The fragile state of the industry presents serious obstacles to consumers with even the best intentions. The authors of the following report tell us that they called all the SWH vendors in their local telephone directory to “price” a unit. Their attempts yielded a series of answering machines, but not a single human. None of the vendors responded within two days. Worse, the directory listed the vendors under “solar,” rather than water heaters generally. Given that most people only buy a new water heater when their old unit fails, one would expect even many environmentalists to give up and purchase some other variety of water heater in order to take a hot shower again.

Policy analysts have given much thought to public programs able to provide appropriate subsidies for the purchase of solar water heaters. For instance, the Clinton Administration's “Million Solar Roofs” initiative, intended to remove market barriers and strengthen demand for solar energy, includes a proposed \$6.3-billion package of Federal tax and research incentives. One component of the ambitious plan would be a 15% income tax credit (limited to \$1000 per household) for rooftop SWH. Solar supporters justify such public support by pointing to the environmental value provided by SWH but ignored in market energy prices. Supporters also hope that providing such subsidies will expand markets for the technologies in question to the point where manufacturers can bring down prices.

In the following paper, Hoffman, Wells and Guiney pose a different question. Rather than asking what type of subsidy could best sustain the SWH industry, or what subsidy precisely represents the environmental benefits of SWH, this report instead considers what business structure could best enable the industry to succeed. Their answer is provocative, and so far only preliminary. But it is a new answer, and worthy of consideration.

Solar water heaters work. They can also compete commercially. They should play a role in a renewable energy future. We believe SWH has a better chance of surviving and contributing to that future if it frees itself of transitory political support — no matter how sincere — and vulnerable subsidies — no matter how well deserved. SWH entrepreneurs must instead organize their businesses so as to take best advantage of those things on which they know they can rely: their own efforts, and basic consumer for the product they sell.

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August 17, 1998

Executive Summary

Direct solar water heating (SWH) is an environmentally attractive and potentially economic means of providing homes and commercial institutions with hot water. Using the sun's energy to warm water directly appeals to many people, not just those who identify themselves as environmentalists. Despite this appeal, however, the solar water heater industry has had difficulty gaining a permanent share of the hot water market. Solar water heater sales have fallen to dangerously low levels, with most stemming from repairs and replacements. SWH is achieving minimal sales in the market for new homes. The continuing demise of utility programs that offer rebates or support SWH further threatens the industry.

Current efforts to promote energy efficiency and renewable energy increasingly use “market transformation” strategies, which seek to create self-perpetuating markets that do not rely on continued subsidies. For solar water heating, several such programs could assist in the development of a more viable industry, especially:

- Energy Star™ Homes and Home Energy Rating Systems, which can legitimate SWH by integrating them into certified, energy-efficient, low life-cycle-cost homes (i.e., homes that cost less per month to own, when considering principal, interest, taxes, mortgage insurance, and energy costs);
- new financial services aimed at efficiency investments in homes, which can provide rapid approval of credit with loan periods consistent with the life of the equipment; and
- the Million Solar Roofs program, which can provide public visibility and capital for creating SWH sales.

By themselves, however, these market transformation tools cannot create a sustainable industry because they do not address the key issue that past programs have failed to address — *the lack of a viable, committed, and permanent sales force*. Because the profits from selling SWH alone are

unlikely to create sufficient profit to attract a viable sales force, development of a permanent group of effective salespersons will probably require adaptation of the *insurance agent model*, which has successfully allowed small entrepreneurs to bring a variety of insurance products to market by carrying more than one kind of insurance. Preliminary analysis indicates that selling other efficiency and environmental products that add to the profit margin of each transaction may create sufficient profit to attract entrepreneurs to sell SWH as part of their livelihood, thereby transforming the market for SWH sales.

However, private corporations and investors are unlikely to invest in promoting this model for SWH, given the past history of the industry and the uncertainties associated with making the model a success. Public-policy-oriented organizations (such as foundations or public institutions disbursing market transformation funds in New England, California, or the Northwest) that want to support SWH should consider developing investment funds that help finance a few entrepreneurs to enter the business of bundling SWH with other efficiency and environmental products. The paper concludes with recommendations for other groups — federal and state governments, utilities, environmental and consumer groups, builders associations — who can play supporting roles in developing the insurance agent model.

Additional resources need to be dedicated to improving the marketing and business assessments contained in this paper so that the best bundles of goods and means for operating a combined sales agency can be developed. What is clear is that the proposed organization must operate in a lean and efficient manner, as do small insurance agents and other professionals. The embryonic business plan provided in this report is probably insufficient to secure the larger investments needed. Further assessments are needed of the logistics and profits associated with various technologies that could be handled by the combined sales agency.

TRANSFORMING THE MARKET FOR SOLAR WATER HEATERS: A New Model to Build a Permanent Sales Force

by John S. Hoffman and John Bruce Wells, with William T. Guiney

Direct solar water heating (SWH) is an environmentally attractive and potentially economical means of providing homes and commercial institutions with hot water. Using the sun's energy to warm water directly appeals to many people, not just those who identify themselves as environmentalists. Despite this appeal, however, the solar water heater industry has had difficulty gaining a permanent share of the hot water market.

Rather than asking what type of subsidy could best sustain the SWH industry, this report instead considers what business structure could best enable the industry to succeed. In particular, we ask these key questions:

- Can a set of programs be developed to transform the market for SWH so that self-sustaining growth can occur?
- If so, who should implement them?
- How can the solar industry and other interested parties organize to implement the solutions?

PART I: THE STATE OF THE SOLAR WATER HEATER INDUSTRY

SWH history has been one of boom followed by bust, which has left the industry at the margins of viability. In the decades prior to World War II, millions of units were sold. After the war, consumers sought "higher quality" hot water, and the industry faded. In the 1970s, the energy crisis and environmental consciousness reinvigorated the industry, however, and since 1970 more than 1.8 million units have been sold.² Federal and state tax credits, as well as utility rebates, were extended to SWH systems, stimulating a major expansion of growth that lasted through the mid-1980s. Yet simultaneously, in the eyes of some, the reputation of the industry

suffered, as "quick buck" artists and unqualified vendors provided poorly installed, oversized and inadequate systems.³ With the expiration in 1985 of federal tax credits for SWH, demand fell significantly. In response, the number of solar thermal manufacturers declined from 225 in 1984 to 98 in 1986.⁴ Currently, the industry is dormant in most parts of the country.

New threats on the horizon promise to make a bad situation worse. The prospect of retail competition has led utilities to scale back their relatively meager commitment to SWH as a demand-side management measure. In addition, if retail competition lowers electricity prices, the financial advantages for homeowners of SWH systems over electric resistance heating will decrease further.

Natural gas has become the fuel of choice for new housing. In the Washington, DC region, for example, more than 95% of new homes sold in 1997 use natural gas. And gas companies are extending access to existing housing developments. Since natural gas water heating costs much less than electric water heating, this further reduces the market potential for SWH.

Finally, new water heating technologies, such as heat pump water heaters and Lennox's "CompleteHeat" (a combination gas heating and hot water system) further threaten the viability of the solar thermal market. The new Lennox system works as both a furnace and a water heater to provide high efficiency home and water heating, with an Annual Fuel Utilization Efficiency of 90%.⁵ A heat pump water heater provides hot water equivalent to 50% solar energy and 50% from whatever is the source of the electricity generation. GeoExchange™ systems that take heat from the ground would achieve the equivalent of 75% of water heating derived from solar.

² E. Smeloff and P. Asmus, *Reinventing Electric Utilities: Competition, Citizen Action, and Clean Power* (Washington DC: Island Press, 1997).

³ On a personal note, the house owned by one of the authors had a solar water heater when he moved in. The expert hired to evaluate its reconstruction advised that it probably had never worked.

⁴ Smeloff and Asmus, op. cit. note 2.

⁵ AFUE ratings measure how much of each dollar's worth of gas burned by a furnace goes toward heating a home. U.S. Department of Energy standards require that new gas furnaces rate at least 78%, which means that 78 cents out of every dollar's worth of burned gas translates to heat.

Nevertheless, there may be hope. The technology of SWH has improved significantly. (See Box One.) Manufacturers control quality more rigorously. Government programs have begun to remove barriers to efficient markets. Many Americans have made a permanent commitment to environmentalism. And unlike high prices for oil in the 1980s, which drove an earlier boom for SWH, the threat of global climate change will not go away.

Market Shares for SWH

The market for residential water heaters has two segments: new construction and replacement. Solar water heaters have captured approximately 0.2% of the total market over the last 15 years, but constitute a smaller part of today's market.

Approximately 1.1 million new homes are constructed each year in the United States, each of which has a water heater. SWH is virtually a non-player in this market.

The replacement market can be calculated in two ways. With gas and electric water heaters having an average lifetime of 10–15 years, and with an installed base of approximately 90 million water heaters, the total replacement market for water heaters is estimated at 6–9 million units a year. The installed base of solar water heaters in both homes and businesses has been estimated at “more than 1.5 million.”⁶ The most recent Census data shows 281,000 solar thermal systems currently installed in residences alone.⁷ This equates to a share in the installed base of residential water heating systems of approximately 0.2%.

Calculated by shipments, the figures are equally unimpressive. In 1996, a total of 765,000 square feet of solar thermal collectors were shipped for the residential non-pool water heating market, according to the Energy Information Administration.⁸ With the average size of a solar collector system estimated at 50 square feet, this suggests that about 15,000 solar thermal heating systems are sold per year in the United States, in a total market (both new home construction and replacement) of 7–11 million water heaters, yielding a current market share of 0.1–0.2%.

Box One: Solar Water Heaters — Do They Work?

In the past, the SWH industry tended to install expensive and oversized systems to meet almost all (80–90%) of a household's hot water needs. Prone to fail from overheating, these systems had higher repair costs than smaller, properly installed systems. This increased the average cost of the heating, as much of the system's capacity was unnecessary in bright sun and during high summer.

Today's SWH industry tends toward smaller, cost-effective systems that are easy to install and that require little, if any, maintenance. The Solar Weatherization Assistance Program in Florida has installed more than 800 50-gallon systems at an average cost of \$1,550, demonstrating that low-cost, simple retrofits of existing electric water heaters can be performed cost-effectively. Performance monitoring by the Florida Solar Energy Center shows annual energy savings of more than 52%. These smaller systems cost half as much as the larger systems described above. Some of these low-cost systems use a passive design with no moving parts, removing or reducing the potential for repairs.

There have also been some remarkable breakthroughs in technology development. These include new, low-cost, high-performance absorber plates with a heat-absorbing and heat-transferring component inside the thermal collector box. In addition, 1998 saw the introduction of a new coating process for the heat absorber, which replaces the toxic, black chrome plating process in use previously. A technology improvement for safe drinking water using solar thermal collectors has also been developed, completed field testing with very good results. Lower-cost collector designs for the new home construction market are now being tested and manufactured.

⁶ Energy Alliance Group, “Business Opportunity Prospectus for Utilities in Solar Water Heating,” Boston, MA (20 March 1997).

⁷ U.S. Census Bureau, *American Housing Survey* (Washington, DC: 1993).

⁸ U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Renewable Energy Annual* (Washington, DC: 1997).

Structure of the SWH Industry

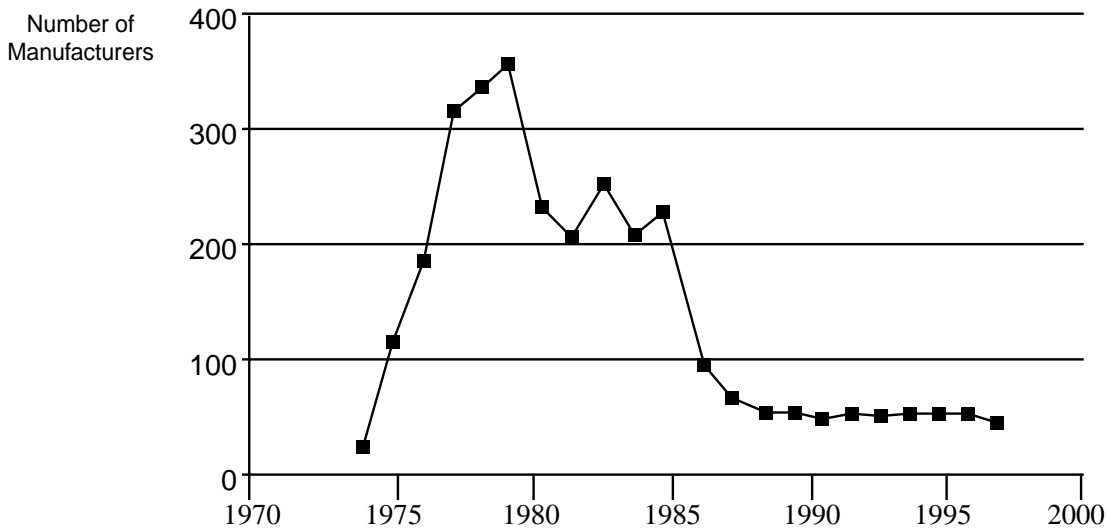
In the United States, fewer than 50 companies manufacture residential SWH systems.⁹ As noted earlier, participation in the market has followed a “boom and bust” cycle (see Figure One), just as it did before and after World War II. A relatively small number of companies play in the SWH industry, from manufacture through installation. (See Table One.) This small number can be put in perspective by reviewing the total number of companies throughout the water heating industry, based on a review of business telephone registrations classified by Standard Industrial Classification codes. This shows that the solar water heating industry is nearly invisible throughout the supply and distribution chain, which has serious implications for the success of the SWH industry.

Table One: Composition of the Water Heater Distribution Chain

Type of Company	Electric Resistance & Gas	Solar
Wholesalers	468	19
Dealers	8,073	12
Contractors	46,127	9
Repair Companies	4,059	NA

Data for electric resistance and gas from the *PhoneDisc Name and Business Type Index*, 2nd Edition 1997. While these numbers may underestimate contractors handling SWH due to omission under the “Solar” heading, the paucity of listed contractors is evident whatever the actual number of contractors. Data for solar from U.S. Department of Energy, Energy Information Administration, “Annual Solar Thermal Collector Manufacturers Survey,” Washington, DC, 1998.

Figure One: Domestic Manufacturers of Solar Thermal Collectors



Source: Energy Information Administration, 1998

⁹ DOE, EIA, *Annual Solar Thermal Collector Manufacturers Survey* (Washington, DC: 1998).

Sales Process in New Home Construction Market

Most new home buyers consider the water heating system one of the least important attributes in home selection. This may be because concerns such as location and building material dwarf its importance, and because builders offer little if any choice in systems. Home buyers rarely exert any influence over the type of water heater installed in a new home.

Builders do not offer significant choices for water heaters because of:

- lack of perceived interest by home buyers,
- higher first cost of non-standard systems, and
- perceived performance and consumer acceptance risks in deviating from normal trade practices.

Thus, builders usually determine the type of water heater, and builders are likely to be most sensitive to minimizing construction costs. Builders currently have no incentive to increase cost of construction from about \$300 for an electric resistance or gas water heater to \$2,000 for a solar water heater if the cost increase does not yield a commensurately higher sales price for the home.¹⁰ The choice between electric and gas probably depends on whether the home is being connected to gas lines for heating. Even in homes with gas, electric water heaters are sometimes installed due to lower first cost.

Sales Process in the Replacement Market

Consumers rarely, if ever, replace water heaters until they break. At that time they focus on obtaining a replacement as quickly as possible in order to minimize disruptions in their lives.

Most consumers purchase replacement water heaters through contractors — either plumbing or HVAC (heating, ventilation, and air conditioning) companies. Although more than 46,000 U.S. contractors install water heaters, few install solar water heaters. Given the ease in connecting a water heater to pipes and electrical or gas lines versus the complexity of sizing a solar system, installing collectors on a roof, and running pipes throughout a home, there is probably no cross-over in the market. In other words, it is unlikely that any significant number of plumbers or heating contractors who handle gas and electric water heaters could be found to install SWH systems. Contractors responding to calls for emergency replacement or repair are unlikely to spend time trying to sell someone a several-thousand-dollar SWH system when they know from experience that consumers overwhelmingly choose the least expensive option. Thus consumers who purchase water heaters from contractors are currently closed out of the solar water heating market.

Consumers who choose to avoid contractors typically purchase water heaters through home improvement and hardware stores such as Home Depot and Lowes. Such stores do not sell SWH systems.

In addition, few organizations or institutions that influence consumer purchasing decisions promote SWH. Groups that affect homeowner choices, such as mortgage companies, consumer information networks, and allied groups mostly say nothing on the topic. *Consumer Reports*, for example, makes no mention of SWH systems. The only voices currently heard promoting SWH are those of environmental groups, a few state energy offices, and a few utilities.

The bottom line: consumers cannot buy what is not offered to them.

PART II: OPTIONS FOR MARKET TRANSFORMATION

This section describes ten options for transforming the fundamental conditions of the water heater market so that SWH systems can gain market share.

1) Mass Purchasing

Mass purchasing pools create sufficient volume to help pull new products to market. This allows companies to reach sufficient sales volume to reach lower target production costs. In capital-intensive industries, in which high-tooling costs must be offset by high sales, mass purchases can be an important market transformation tool.

They have been used successfully in several cases. For example, in 1992, an industry-led consortium offered a “Golden Carrot” — \$30 million in pooled purchasing commitments — to the manufacturer that could bring to market the most efficient household refrigerator. Whirlpool won this Super Efficient Refrigerator Program (SERP) contest by designing a unit that used approximately 40% less energy than the Federal standard. Today, the new Federal standard requires that level of efficiency in all refrigerators that will reach the market in a few years. Several energy and environmental groups are developing a mass purchasing program aimed at creating markets for more fuel-efficient vehicles.

Although mass purchasing can create an initial burst of sales, the strategy does not automatically create continued sales. New products such as the SERP refrigerator have been brought to market under mass purchasing initiatives, but manufacturers have limited their production runs to meet signed commitments and have not pushed output beyond that required to meet the purchase agreement. In the case of SWHs, large

¹⁰ Average cost to builders of \$293 for 40-gallon electric resistance and gas residential water heaters is reported in *R.S. Means Building Construction Cost Data*, R.S. Means Company, Inc., Kingston, MA, 1998.

sales in the past did nothing to create a viable sales force. Nevertheless, combined with initiatives to improve manufacturing processes, mass purchasing can significantly lower costs in the SWH industry, although it is unlikely to bring costs down to a point that creates sustainable production and sales from current distribution systems.

2) Tax Credits

Tax credits can apply to either manufacturers or consumers. When directed at manufacturers, credits improve profitability. In theory, when offered to consumers they lower the real cost of goods and services. The Clinton administration has proposed a consumer tax credit for SWH systems of 15% of the system cost, up to \$1,000. For a system priced at \$4,000 for purchase and installation, the tax credit (assuming no changes in pricing) would be \$600.

The initial burst of sales created by tax credits can rarely, if ever, be sustained. The burst usually turns to bust when the credits terminate. In 1986, after tax credits expired for residential SWHs, sales fell by 50% and the industry contracted significantly, as noted earlier. As larger tax credits failed to create a permanent sales force in the past, there is no reason to believe that smaller tax credits will do so today.

These credits should only be supported, therefore, if they are coupled with means to develop a viable and permanent sales force that can make money off selling SWH systems without credits. The industry should carefully analyze the particulars (such as a flat credit versus a percentage of cost credit) to ensure that the most appropriate system is developed.

3) Rebates

Rebates lower the real cost of goods and services to consumers. They were used from the late 1980s through the mid-1990s to encourage consumers to purchase energy-efficient products, such as compact fluorescent lamps and more efficient heating and cooling appliances. These programs were commonly part of utility demand-side management programs, which are disappearing in the advent of residential retail competition.

Rebates can create immediate sales, but they can also “poison” a market by conditioning consumers to rely on the rebate, and by suggesting that the goods and services eligible for rebate are not economically viable on their own. They are unlikely to be effective in the SWH industry.

4) Energy Star™ Homes and Home Energy Rating Systems

Voluntary public-private partnership programs, when properly constructed, can overcome several problems. For example, the EPA Green Lights program significantly reduced the cost of selling energy-efficient lighting by securing top-level commitments for entire organizations to upgrade their lighting systems.

In the case of the SWH industry, the EPA Energy Star™ Homes program may overcome some barriers, particularly builders’ resistance to increasing construction costs. This initiative provides technical advice to builders on the construction of energy-efficient homes and certifies the new units by awarding an easily recognized seal of approval. By doing so, it facilitates consumer demand for energy-efficient homes with lower operating costs and higher resale values.¹¹

Home Energy Rating Systems (HERS) rate the energy efficiency of homes based on their thermal envelope, glazing strategies, siting, HVAC system, and other criteria, following an on-site inspection.¹² (See Box Two on Page 7 for an example of how SWH systems can fit into HERS.) HERS ratings are used by lenders participating in energy-efficiency financing programs. Under such programs, owners of energy-efficient homes can increase their buying power by qualifying for larger and longer-term loans, by obtaining lower interest rates, and by realizing the tax benefits of mortgage financing.

Programs such as Energy Star™ and HERS may be very important tools for building a front-line sales force and should be vigorously supported for that purpose. Merely including SWH as an option for Energy Star™ and HERS homes will not, however, be enough to entice salespeople to sell these systems. In the absence of other steps, SWH would likely remain an “unchosen” item on the menu.

Currently the EPA Energy Star™ Homes program does not include SWH systems as an option that it promotes to builders. The industry should work closely with EPA to secure a prominent position for SWH within the EPA literature.

¹¹ Information about Energy Star Homes is available at <<http://www.epa.gov/appdstar/homes>>.

¹² Information about Home Energy Rating Systems is available at <<http://www.hers-council.org>>.

Box Two: Home Energy Rating Systems and the SWH Industry

Long considered too costly or of little benefit to anyone in the housing industry but the property buyer, energy efficiency will now play a major role in transforming the housing industry. Through energy rating systems, SWH could be a part of this emerging trend. Equally important, energy rating could represent a value-added service offered by SWH contractors and similar firms, affording SWH valuable new links with the building industry.

For many years, even if home buyers sought energy efficiency, they faced more questions than answers: How can you tell if a building is efficient? Does having a good air conditioner or lots of insulation suffice? How can one distinguish between the work of two builders? Buyers had no way of knowing whether nontraditional technologies such as SWH would perform as promised. Mortgage lenders were reluctant to cover the higher cost of efficiency measures, having no proof that they would lower a building's operating costs in the future. Today, however, energy rating systems can determine the efficacy and cost of energy efficiency measures, bringing order to the marketplace, and security to confused consumers.

One model in use in a growing number of states is the Home Energy Rating System (HERS). The Florida legislature, for example, passed the Florida Buildings Energy-Efficiency Rating Act in 1993 to provide home buyers with a yardstick that measures the benefits of energy efficiency improvements. The mid-1990s have been spent developing the ratings system, training and certifying individuals to do the actual rating and integrating the ratings system into the Florida Building and Energy Code. Many states have similar procedures and guidelines, all leading to easier and more easily available energy-efficient mortgages (EEMs).

HERS ratings estimate the total energy use of a home and its annual energy costs. Somewhat like having miles-per-gallon stickers for cars or appliance efficiency labels on new refrigerators, the HERS program provides a gauge for the whole house, although actual energy bills will depend on individual families' usage patterns. The typical rating program provides separate energy end-use estimates combined to arrive at the overall rating. For residences, this includes air conditioning, space heating, water heating, lighting, cooking, clothes drying and pool water pumping.

With a high rating, consumers buying an existing home may qualify for an EEM or an energy improvement mortgage (EIM), which allows them to undertake energy improvements such as solar water heating after closing on the loan. Buyers can include the cost of the energy improvements in the mortgage, allowing them to finance the improvements and the rating. Owners of homes not eligible for the favorable financing can improve the energy efficiency of the house and qualify for the EEM.

Energy improvement companies such as SWH contractors, air-conditioning contractors, insulation companies, and window change-out firms see HERS ratings as a great opportunity to influence homeowners' choice of appliances. Yet these firms can provide more than just technology — they can themselves become qualified raters. Of course, such firms, guided by policy makers, must scrupulously avoid a conflict of interest between granting objective ratings and a desire to sell their own products. But by providing energy rating services, these companies will at long last have opportunities for business development within the housing industry. A working relationship with builders based on provision of ratings, recommendations for energy improvements, and other services or products will improve the likelihood that builders will in fact include solar water heating in their work.

Finally, qualifying the home for the EPA Energy Star™ Homes program or complying with local and state energy codes can be easier when energy ratings include efficient technologies like solar water heating. For instance, using SWH in a new Florida house can provide more energy rating points than other, more expensive measures such as high efficiency windows or very efficient mechanical systems.

5) *Million Solar Roofs Program*

Announced by President Clinton in 1997, the goal of this Department of Energy–led initiative is to “work with businesses and communities to use the sun’s energy to reduce our reliance on fossil fuels by installing solar panels on one million more roofs around our nation by 2010.”

The core strategies of the Million Solar Roofs initiative are:

- developing a pool of existing federal lending and financing options,
- soliciting voluntary participation by state and local governments and groups,
- accelerating the use of solar energy systems on federal buildings, and
- leveraging other financial support and incentives, both current and proposed.¹³

This initiative could provide valuable public relations help and outreach support to the SWH industry if it reaches homeowners who might otherwise be unaware of the advantages of these systems. In addition, the program may provide impetus to secure active support of other government and quasi-government institutions that can support the SWH industry. For example, it could encourage Fannie Mae to act more quickly in developing and instituting rapid-approval energy-efficient mortgages that could eliminate barriers to SWH sales posed by lack of financing or expensive and protracted financing programs.

The SWH industry should work to ensure that SWH systems are actively promoted as part of the Million Solar Roofs initiative. In addition, it should lend support to efforts to develop better consumer financing systems.

6) *Qualification for Emission Reduction Credits*

Several “markets” have developed that create explicit value for pollution reductions. For example, EPA’s acid rain allowance program, which began in 1994, allows utilities that reduced sulfur dioxide emissions beyond statutory limits to earn credits for their extra reductions; they can sell these credits to other utilities that choose not to reduce their own emissions.¹⁴ These credits are traded in an open secondary market.

There is considerable discussion among policymakers of incorporating emissions trading principles into greenhouse gas regulatory systems. This could have the effect of creating additional value for products and services — including SWH — that directly and indirectly reduce greenhouse gas emissions.

Emission reduction credits create a dynamic incentive for firms to extend efforts beyond legal requirements. In the case of greenhouse gas emissions, such emissions trading would create some incremental value to actions that reduce emissions, thereby improving the economics of the proposed action. Although the aggregate value of emissions credits to SWH manufacturers would enhance profitability, the credits would have little effect on direct sales.

Because the SWH industry would realize some incremental profit from greenhouse gas credits, it is in the industry’s interest to follow the policy debate and ensure that its products become eligible to earn credits.

7) *Energy Efficiency Financing Programs*

Energy-efficiency financing allows homeowners and home buyers to borrow money to finance energy-efficient improvements and upgrades. Energy-efficient mortgages and other financing programs targeted to homeowners can eliminate first-cost disadvantages of technologies that have life-cycle cost benefits but that fare poorly based on initial capital requirements.¹⁵ A variety of current programs offer consumers attractive and convenient financing.

First-cost avoidance is a major goal of American consumers.¹⁶ Financing that is available at terms similar to the life of the equipment (10–15 years), favorable interest rates (6–9%) and quick qualification (an hour) would dramatically enhance the capability of a sales force to sell SWH systems. By itself, however, financing will not create a flow of deals or raise margins to an SWH sales force sufficient to gain a permanent group of salespeople.

In tandem with efforts to develop a sales force, the SWH industry should promote a pilot “1 hour” qualification program for SWH and efficiency investments that allows instant credit checking and approval and that is backed by Fannie Mae, Freddie Mac, and FHA repurchase agreements.

¹³ Information about the Million Solar Roofs initiative is available at <<http://www.eren.doe.gov/millionroofs>>.

¹⁴ Information about EPA’s acid rain allowance program is available at <<http://www.epa.gov/acidrain/trading.html>>.

¹⁵ Additional information about energy efficiency financing programs for homeowners is available at <<http://www.ase.org/finance.htm>>.

¹⁶ See, for example, H. Ruderman, M. Levine, and J. McMahon, *Energy Journal*, Vol. 8, No. 1, 1987.

8) US H2O

A consortium of utilities and SWH professionals formed the US H2O Initiative in 1993 to increase the rate of commercialization of SWH systems.¹⁷ The key product is a prospectus containing a detailed business plan for a utility to establish a new business to lease solar water heaters to consumers.

This initiative can potentially overcome the key barrier facing the industry — the lack of a front-line sales force. A utility that follows the strategy would make a sizable investment in the SWH business and develop a dedicated sales force.

Unfortunately, the US H2O business opportunity may not be viable, given its projected financial results (as presented in its prospectus of March 20, 1997). The plan requires a utility to invest \$17.7 million in a new business that does not reach a break-even point for 11 years. (See Figure Two.) Projected over 25 years, the business generates an internal rate of return (IRR) of 10.25%. It seems unlikely in this competitive environment that a utility would choose this opportunity above other, more profitable ones that yield IRRs of up to 30%.

US H2O could make a significant difference, however, if it succeeds, so the initiative and should be followed carefully.

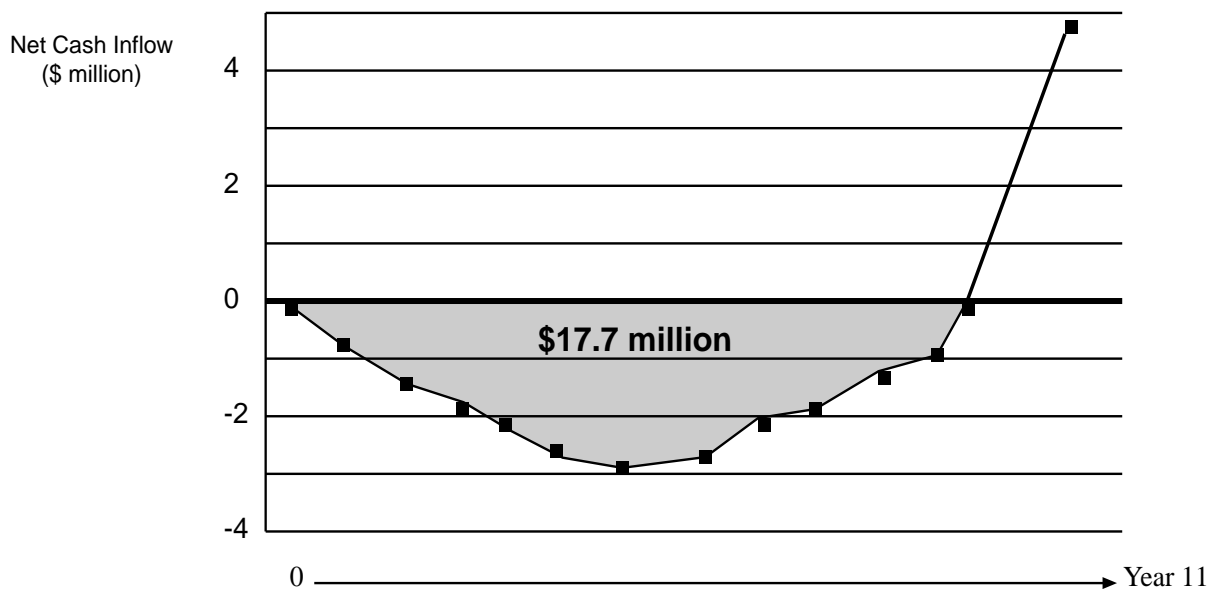
9) Marketing Cooperatives

Marketing cooperatives pool the resources of smaller companies in order to fund initiatives — such as mass advertising — that might otherwise be unaffordable. This can create “economies of scale” that yield industry-wide benefits. In addition, such cooperatives can reduce operating costs by aggregating purchasing power to secure volume discounts. Ocean Spray, which represents the interests of thousands of cranberry growers, is one of the most well known marketing cooperatives. Marketing cooperatives are most often used in commodity-based goods where product features are not significant points of competition.

These cooperatives alone do not create sales, however. And since the SWH industry is not a commodity-based industry, it is probably not a suitable candidate for development of a marketing cooperative.

Figure Two: US H2O Investment Requirements

US H2O: \$17.7 million investment required to reach breakeven in 11 years



¹⁷ Information about the US H2O Initiative is available from the Energy Alliance Group, 59 Dunster Road, Boston, MA 02130; 617-522-4815.

10) Insurance Agent Model

The “insurance agent model” is an innovative approach that seeks to create a direct sales force. It would be based on individual sales entrepreneurs who would constitute an exclusively sales-oriented front-line force for the SWH industry. By selling SWH as part of a package of home comfort and home energy services, an SWH entrepreneur could develop a profitable business.

This approach would overcome the most important barrier facing the industry — the absence of a dedicated, front-line sales force. The SWH industry therefore should develop a focused program that places several sales agents into the marketplace immediately. Such a program is described in the remainder of this paper. It should be coordinated with financing advances and incorporated into EPA’s Energy Star™ Homes program.

PART III: THE INSURANCE AGENT MODEL

More than 230,000 independent insurance agents serve virtually every American town with 5,000 or more residents.¹⁸ They typically are entrepreneurial and sales-oriented, with their key goal being to establish long-term relationships with customers, one at a time, at the retail level. They meet multiple needs of customers, offering a full line of insurance products such as life, automobile, and disability coverage. Their operations are usually “lean and mean,” some with as few as a single employee, such as a receptionist/administrator, serving their office. They rely on the insurance companies that they represent to service claims and provide adjunct services such as underwriting. Outside firms also provide convenient payment plans.

In summary, the fundamental characteristics of insurance agents are that they:

- have a front-line sales orientation,
- are committed entrepreneurs,
- represent multiple products,
- run lean operations,
- rely on others to provide products and service, and
- offer convenient financing.

We believe that the insurance agent model can fill the critical gap in the SWH industry.

Front-line Sales Orientation

Successfully selling SWH systems is a time-intensive effort that requires a direct approach. As indicated earlier, SWHs

are an invisible part of the water heater market. The new home market is dominated by builders who are unlikely to install these systems, given the significantly higher construction cost and lack of perceived consumer demand. Trade contractors that do not install SWH dominate the replacement market.

Consumers do not buy SWH systems. They must be sold them, one at a time. Thus a successful SWH initiative can only be based on an intensive direct sales effort that includes telemarketing and personal visits to homeowners.

Committed Entrepreneur

Successfully selling SWH systems will not be easy. There is no momentum to tap, no customer list to use, and no repeat customers to approach. There is little perceived demand by homeowners, and the first cost of SWH systems is higher than electric and gas systems. This is a daunting list of challenges.

Only a committed entrepreneur with significant sales ability and perseverance can succeed. And only an individual whose financial success depends on sales results will have the motivation to persevere. For this reason, the SWH industry should not simply “hire” sales professionals; it should help individuals start their own small businesses. In addition, the entrepreneurs should be required to commit their own financial resources, both to help fund the initiative and to tie personal success to results.

Multiple Products

Insurance agents do not sell just one type of insurance. Having recognized that the most difficult challenge for an agent is to find a customer, the insurance industry is structured so that the agent can sell multiple products to that customer — life, automobile, disability, and other policies. This greatly expands the revenue generated by each customer.

The sales approach adopted by a SWH entrepreneur might, in fact, downplay solar water heating. One successful sales team in Florida positions their offerings as services that increase the overall efficiency of a home. (See Box Three on Page 11.) His bundle of products and services includes:

- solar water heating systems,
- compact fluorescent light bulbs,
- low-flow shower heads, and
- blower door test.

A similar approach might include a different bundle of services, such as duct testing, cleaning and sealing; insulation; and other home comfort and home energy services.

¹⁸ Based on an analysis of listings in the *PhoneDisc Name and Business Type Index*, 2nd Edition 1997.

Box Three: The Insurance Model in Practice

Donnie and Rosellen Nolley, a husband and wife team in Deltona, FL (50 miles northeast of Orlando), sell approximately 150 SWH systems each year. The Nolley operation embodies the principles of the insurance agent model described in the text.

With 30 years experience in home energy as an installer and salesman for solar water heaters and insulation in Indiana and Florida, Donnie Nolley is a talented salesman who establishes instant rapport with homeowners. He usually visits two homes per night and performs a free energy survey, recommends “do it yourself” measures (such as cleaning the coils of air conditioning systems), and attempts to sell a package of goods and services that save homeowners money by improving energy efficiency.

Rosellen supports Donnie’s sales effort with a team of part-time telemarketers. She develops leads by driving through neighborhoods and recording data used to qualify potential homeowners, such as sunny roofs and large families. The leads are then cross-referenced with commercially available telephone lists and given to the telemarketers, who contact homeowners to schedule free energy surveys. In a typical week, two telemarketers work a total of 16 hours and schedule 10 home surveys.

The Nolleys also launch regular “door knocking” campaigns in which they personally visit homes in a given neighborhood to schedule the free energy surveys. They receive no financial support from any outside organization. Their financial success depends entirely on generating sales leads, visiting homeowners, and selling SWH systems. Their ability to do this has generated an income that is well above average for the Orlando region.

Nolley’s sales effort focuses on the total energy efficiency of a home, not on SWH alone. He attempts to persuade homeowners of the benefits of improving the energy efficiency of their homes so that they qualify as four-star or five-star Home Energy Rating System homes, thereby saving money for homeowners and qualifying for energy-efficient mortgages.

To reach the necessary level of savings, Nolley supplements his SWH sales with additional products and services such as blower door test and duct repair, compact fluorescent lamps, low-flow shower heads, and routine maintenance of appliances.

Overhead costs in the Nolleys’ home-based business are limited to routine expenses such as telephone service, liability insurance, promotional materials such as flyers and magnets, and automobile costs. They do make wise investments that increase productivity and directly support sales. For example, they own and operate a state-of-the-art PC system with a high-quality scanner and printers in order to produce their own sales materials.

The Nolleys focus their operation on sales. An independent company provides SWH systems and also offers consumer financing. A licensed contractor install the systems. Supplemental energy efficiency measures are provided by others, often including the homeowner. For example, blower door tests and duct repair are performed by independent contractors subsidized by the local electric utilities. Nolley distributes coupons for routine air conditioning services offered by small HVAC companies. And he educates homeowners on “do it yourself” projects such as installing solar film on windows.

With Nolley’s package priced at a few thousand dollars, he would be unable to make any sales without consumer credit. Nolley currently offers 9.9% “revolving credit” financing through the firm that provides the SWH systems. This lowers the monthly payments by homeowners to several dollars per month below the guaranteed savings on their electricity bills — an equation central to Nolley’s sales approach. Nolley believes that his sales would increase even further if he could offer lower-cost financing such as energy-efficient mortgages.

Lean Operation

As a front-line sales-oriented operation, overhead should be minimized. Although the US H2O business opportunity envisions four front-office employees (general manager, engineering/operations manager, administrative aide, and sales manager) to support three full-time salespeople, in a leaner structure a single entrepreneur can be supported by a part-time telemarketing staff who pre-qualify leads and schedule sales appointments. The SWH agent opportunity is probably suitable for a home-based office, which further minimizes overhead costs.

Products and Installation Provided by Others

The typical independent insurance agent focuses on sales. Non-sales activities such as underwriting and policy servicing are provided by others. Similarly, in this model, technical support, administration, and installation should be provided by others. The SWH industry should develop a set of resources, such as collateral sales material, accounting systems, standard contracts, and financing guides, that can be adopted by the sales entrepreneur in a “franchise-like” approach.

Convenient Financing

One barrier identified by sales professionals in the SWH industry is the lack of convenient, low-cost financing for homeowners. The sales agent approach will require development of an “instant credit” system that provides one-hour qualification and simple procedures, comparable to those used in a car dealership, with competitive interest rates.

To illustrate the operation and economics of the independent agent concept, we have developed and modeled the financial implications of one scenario, in which an agent offers homeowners a bundle of energy services, such as:

- Water
 - SWH system
 - cleaning
 - conditioning
- Ducts
 - cleaning
 - sealing
- Lighting
 - security lighting
 - new fixtures
 - energy-efficient lamps
- Pest control products
- Health and Safety Testing
 - carbon monoxide
 - radon
 - lead
- Electrical system
 - surge protection
 - satellite television

The package needs to be developed and priced to yield an average gross margin of \$500 beyond the gross margin associated with SWHs. The financial assumptions and results are provided in Figure Three (See Page 14). Based on our illustration — which is just one of many possible outcomes — a SWH entrepreneur has the potential to earn significant profits.

Although greater research will be needed to determine the “optimal bundle” of options to be included on the menu, the analysis demonstrates that selling a range of related products that extends beyond SWH systems will be key to the success of a SWH entrepreneur. (See Figure Four on Page 15 for the operational plan and Table Two on Page 16 for the end-of-year financial scenario.)

PART IV: CONCLUSIONS AND RECOMMENDATIONS

As noted throughout this paper, the SWH industry’s most serious problem is complete lack of a sales force. The Insurance Agent Model represents the most likely viable initiative to create such a group of people. Currently, it is extremely unlikely that a profit-oriented entity will spend the cash needed to develop the model for SWH. Past failures with this industry and the lack of high growth margins would tend to lead investors to seek their fortunes elsewhere. Thus there is a public policy need to invest in this model. The investment could be rather modest, probably under \$3 million.

Additional market research and business analysis could be undertaken to sharpen the design of the possible business models. Research into the appeal of the concept to potential entrepreneurs would be worthwhile. Exploration of potential related sales forces, perhaps including insurance agents themselves, may be warranted.

In developing the insurance agent model, a variety of organizations can play supporting roles:

- **Federal Government**
 - Promote value of Energy Star™ Ally designation to homeowners
 - Require Fannie Mae, Freddie Mac, and FHA to offer convenient financing to meet their mission requirements
 - Provide collateral that contractors can customize to promote benefits of energy upgrades
 - Develop simple procedures to establish greenhouse gas reductions from home energy upgrades

- **States**
 - Direct market transformation money¹⁹ to venture development organizations that implement the insurance agent model
 - Provide advertising air time when agents are on the ground
- **Local Governments**
 - Provide information about SWH systems and dealers
- **Utilities**
 - Include SWH as recommended technology in consumer education materials
 - Use market transformation money to fund venture development organizations that implement the insurance agent model
 - For municipal utilities, finance SWH systems on monthly utility bills
- **Environmental Groups**
 - Promote benefits of SWH and solar systems
 - Co-market with SWH companies and sales forces
- **Consumer Groups**
 - Include SWH as reviewed and recommended technology for water heating
 - Educate consumers on life cycle costing and benefits of energy savings
- **Banks, Finance Companies, and Mortgage Companies**
 - Provide one-hour financing to SWH contractors based on online “credit scoring” systems
 - Provide lower-cost financing for SWH
 - Implement and aggressively promote energy-efficient mortgages
- **Secondary Market Organizations**
 - Develop guidelines for pooling energy-efficient mortgages and financing
 - Purchase commercial paper for SWH/bundled loans
- **Builders Associations**
 - Educate builders and consumers about benefits of SWH

¹⁹ A renewable energy market transformation fund is a dedicated pool of funds with a mandate to identify barriers to the expansion of markets for production and use of renewable energy, and to develop and fund programs that address them. These funds, which are usually raised through a public funding mechanism such as a tax, wire charge, or other levy, can be expended on programs to increase demand for and supply of the desired products, as well as building the value-chains that connect to deliver the products to market. More specifically, disbursements of funds will be for customer education programs, feasibility studies, business plans for new businesses, risk sharing with private investors, investments in renewable energy businesses, and other financing mechanisms. Although some of these types of expenditures may be possible under a more conventional policy framework, their effect is different because they are used within an explicit strategy of transforming the market to provide competitive advantage for the companies whose businesses are part of the solution. Market transformation funds also differ from conventional policy instruments in their organization because they combine the analysis of market transformation needs (analysis) with strategy and program development (design) and execution and/or funding (implementation). This co-location of critical functions enhances the coordination of these activities and provides for essential organizational learning and continuous improvement. Dedicated renewable energy market transformation funds, such as those in Massachusetts, can provide a critical mechanism to focus efforts to promote renewable energy markets.

Figure Three: Financial Scenario for SWH Entrepreneur

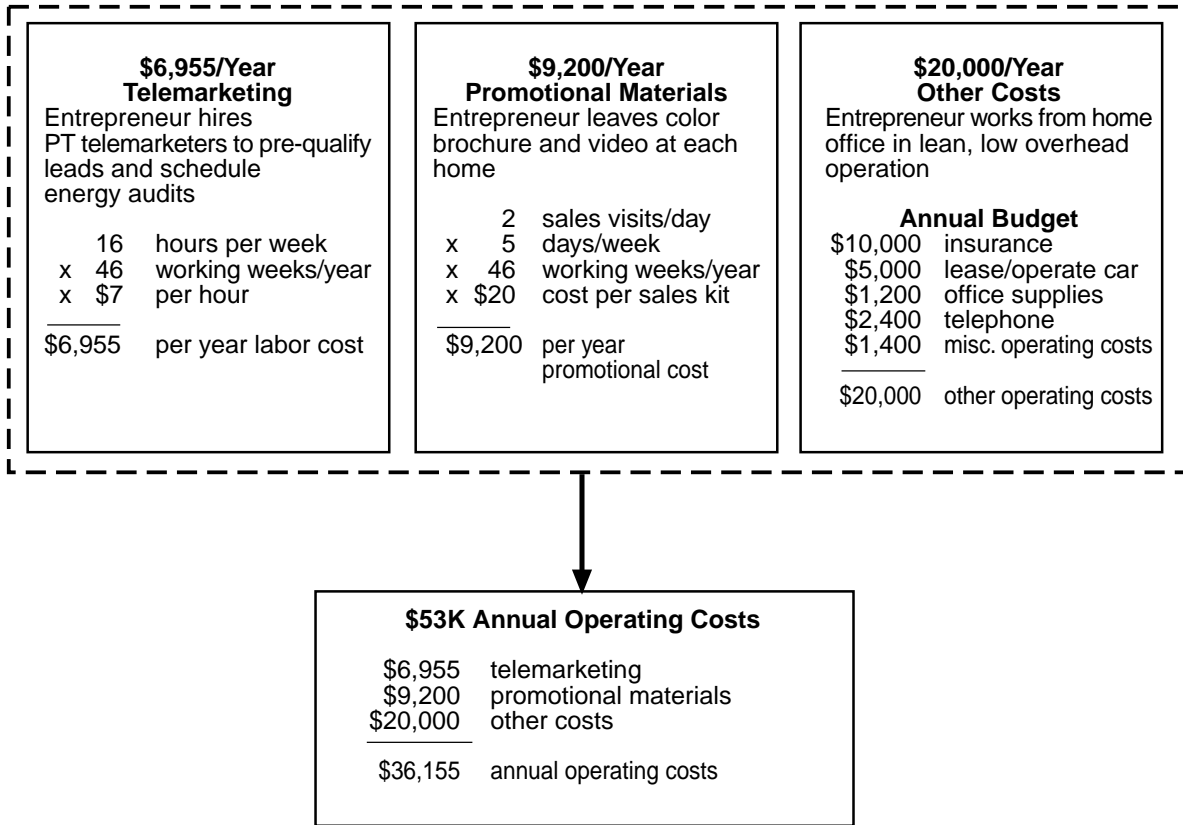
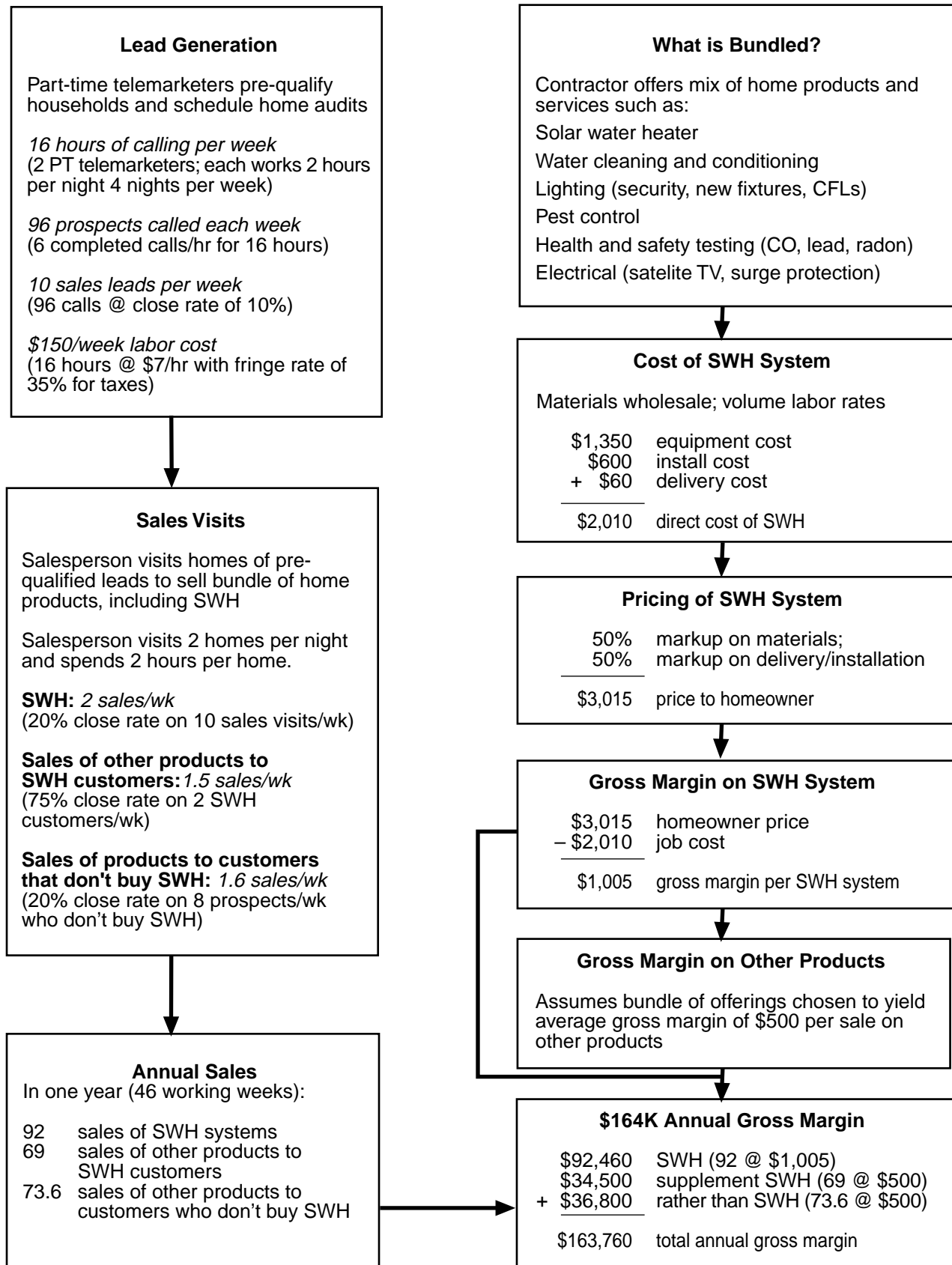


Figure Four: Operational Plan for SWH Entrepreneur



**Table Two: Scenario *Pro Forma* for an Entrepreneur in the Insurance Agent Model^a
(for the year ended December 31, 19xx)**

Revenue from SWH Systems^b	\$277,380
Direct Costs of SWH Systems	
Materials ^c	124,200
Installation and delivery ^d	60,720
Subtotal	\$184,920
Gross Margin	
SWH systems ^e	92,460
Other products to SWH customers ^f	34,500
Other products to non-SWH customers ^g	36,800
Subtotal	\$163,760
Cost of Operations	
Telemarketing ^h	6,955
Promotional materials ⁱ	9,200
Insurance ^j	10,000
Business vehicle lease & operation ^k	5,000
Office supplies ^l	1,200
Telephone ^m	2,400
Other operating costs ⁿ	1,200
Subtotal	\$36,155
Net Income (before taxes)	\$127,605

sales visits to these 10 homes each week (two sales visits per night) and achieve a close rate of 20%, resulting in two SWH sales per week. Assuming 46 standard work weeks in a year, this will yield 92 sales per year. Revenue for these is calculated based on an assumed markup of 50% on materials (anticipated wholesale cost of \$1,350) and 50% on delivery and installation (anticipated contract installation cost of \$600 and delivery cost of \$60), for revenue of \$3,015 per sale. In sum, 92 sales per year at \$3,015 equals \$277,380 in annual revenue.

- ^c Assumes wholesale price of \$1,350 per system (the same assumption incorporated in the US H2O prospectus).
- ^d Assumes entrepreneur engages independent installers at \$600 per installation (price based on long-term relationship and volume orders) and pays \$60 for delivery (the same assumptions incorporated in the US H2O prospectus). For 92 installations, the total annual cost is \$60,720.
- ^e Gross margin on SWH systems equals projected SWH revenue minus direct costs of SWH systems.
- ^f Assumes that 75% of customers who purchase a SWH system also purchase additional goods and services from the contractor, and that these additional goods and services yield an average gross margin of \$500.
- ^g Assumes that 20% of visited prospects who do not purchase a SWH system are sold other goods and services, and that these yield an average gross margin of \$500. If 460 sales visits per year result in 92 SWH sales, there are 368 prospects who do not purchase SWH systems. A 20% close rate on this group yields 73.6 sales per year.
- ^h Assumes (as reviewed in footnote b) 16 hours per week of part-time labor at an assumed rate of \$7 per hour; over 46 weeks, this means \$5,152 in labor costs. Assuming a fringe rate of 35% to account for payroll taxes, the fully burdened labor cost of telemarketing is \$6,955 per year.
- ⁱ Assumes that a standard kit is developed that includes a video and color brochure, at a cost of \$20 per kit, with one kit left at each of 460 annual sales visits.
- ^j Liability insurance.
- ^k Assumes \$325/month lease payment on a three-year lease and \$91 per month for gas (25,000 miles driven per year at 27.5 mpg and \$1.20/gallon).
- ^l Assumed to be \$100 per month.
- ^m Assumed to be \$200 per month, which includes reimbursement for telemarketers and cellular phone/pager for entrepreneur.
- ⁿ Budgeted at \$100 per month.

Notes for Table Two

- ^a This scenario illustrates but does not project future earnings. These notes detail the assumptions on which they are based. We use the term “scenario” carefully: a scenario represents one story; others are possible, some of which could have negative financial results.
- ^b Revenues for SWH systems are based on a hypothetical direct sales effort by the entrepreneur. It assumes that the entrepreneur hires two part-time telemarketing staff who work two hours per night, four nights per week (for a total of 16 hours per week) attempting to pre-qualify homeowners and arrange for free home surveys. Assuming 10 minutes per completed call over the 16 hours and a 10% “close-rate,” 96 completed calls in each week will yield 9.6 (rounded to 10) appointments per week. We assume that the SWH entrepreneur will make personal

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