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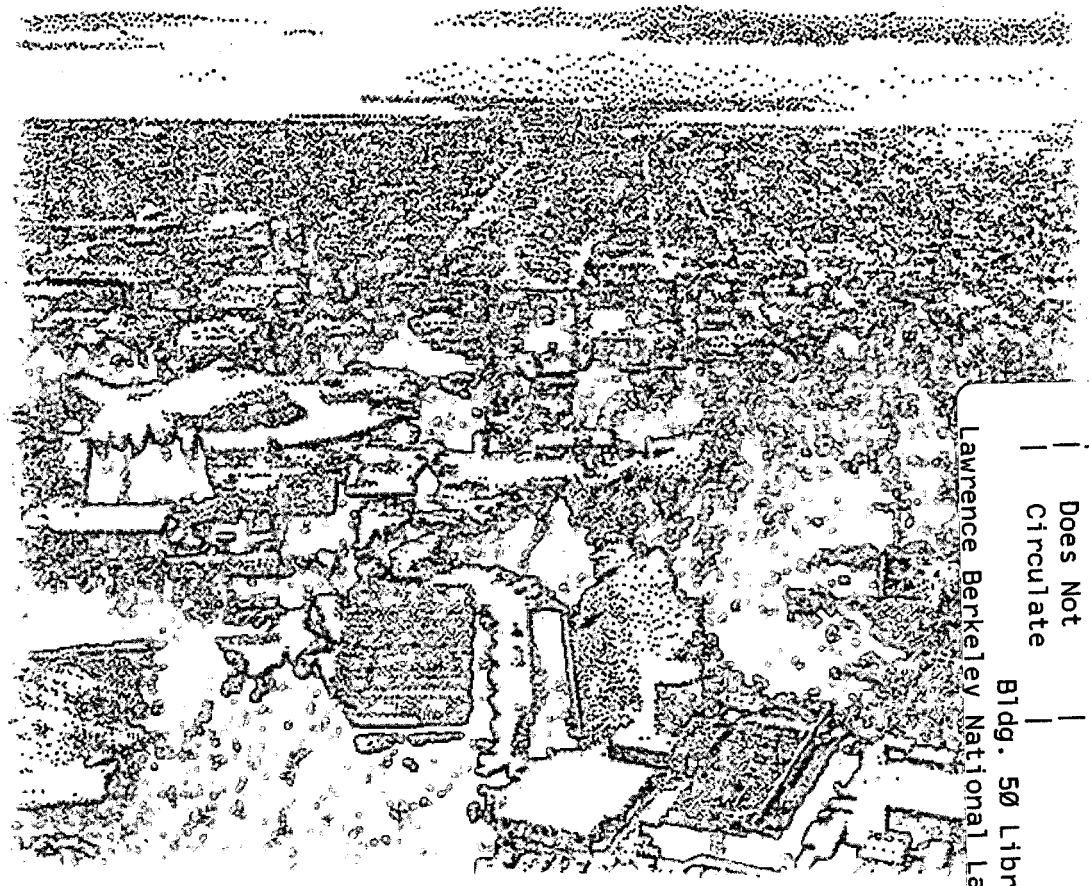

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Executive Summary

Retail electricity competition will allow customers to select their own power suppliers and some customers will make purchase decisions based, in part, on their concern for the environment. Green power marketing targets these customers under the assumption that they will pay a premium for "green" energy products such as renewable power generation. But renewable energy is not a traditional product because it supplies public goods; for example, a customer supporting renewable energy is unable to capture the environmental benefits that her investment provides to non-participating customers. As with all public goods, there is a risk that few customers will purchase "green" power and that many will instead "free ride" on others' participation. By free riding, an individual is able to enjoy the benefits of the public good while avoiding payment.

This report reviews current green power marketing activities in the electric industry, introduces the extensive academic literature on public goods, free riders, and collective action problems, and explores in detail the implications of this literature for the green marketing of renewable energy. Specifically, we highlight the implications of the public goods literature for green power product design and marketing communications strategies. We emphasize four mechanisms that marketers can use to increase customer demand for renewable energy. Though the public goods literature can also contribute insights into the potential rationale for renewable energy policies, we leave most of these implications for future work (see Appendix A for a possible research agenda).

Green Marketing in the Electricity Industry

Green power marketing offers utilities and power marketers a way to differentiate their products. To date, utility experience with green pricing has been mixed. Some programs have met their goals easily, while others have been unable to elicit significant customer response or have encountered stiff resistance from environmental and consumer groups. Though market research shows a significant *stated* willingness-to-pay (40-70%), *actual* participation in utility-supplied programs has not been nearly as strong—typically running under 3% of electric customers. The market for green power is growing, however, and future programs may be more effective than current ones. Limited evidence from retail competition pilot programs in Massachusetts and New Hampshire confirms that suppliers will use environmental claims to capture a segment of the residential market. Nonetheless, the pilots also suggest that a large fraction of residential customers are likely to stay with their existing utility rather than switch suppliers, and that suppliers may find cheaper ways of "greening" themselves than by purchasing significant quantities of renewable energy.

Public Goods and Free Riders

The extensive social science literature on public goods, free riders, and collective action is relevant to green power marketing because renewable energy offers a mix of both private and public benefits. Renewable energy is frequently claimed to provide three forms of public benefits which, because of their nonrival and nonexcludible characteristics, cannot be captured fully by participating customers: (1) environmental benefits that spill over to non-participants; (2) research and development and the potential for long-term electricity cost reductions; and (3) reductions in fuel price and supply interruption risks that cannot be fully captured through private contracts.

For a public good to be provided at an economically efficient level, the sum of all individual marginal valuations of the good (e.g., the marginal social benefit) should equal its marginal cost. Absent policy intervention, however, public goods are susceptible to underprovision because individuals have strong incentives *not* to contribute, but rather to free ride on others' contributions. By free riding, the rational individual is able to enjoy the benefits of the public good—given its nonrival and nonexcludible characteristics—while avoiding payment. Because of this incentive to free ride, the standard presumption of neoclassical economics is that private, decentralized markets cannot be relied upon to provide public goods efficiently.

In more recent academic work, however, the pervasiveness of the free-rider problem has been questioned, and the degree and conditions under which individuals actually do voluntarily contribute to public goods has been more thoroughly explored. Though this literature is often contradictory, the bulk of the evidence suggests that people contribute toward public goods at levels that exceed that predicted by traditional economic theory. At the same time, it is clear that there continues to be a significant level of free riding in a wide variety of situations and that the public goods market failure constitutes an important rationale for government involvement in the provision of public goods.

Reducing Free-Riding in Green Power Programs: Recommendations for Marketers

Given evidence of free riding in green power programs, green marketers should be interested in ways to reduce the level of free riding and thus increase demand for their products. Using the public goods literature as a guide, we find that there are practical ways for marketers to boost participation in green power programs. Though we do not believe they will "solve" the public goods market failure and thus eliminate the need for public policy, we identify four mechanisms that can be used by green marketers to reduce the level of free riding and thereby foster measurable support for renewables. We describe the specific implications of each of these mechanisms for green power programs and highlight how they can be and have been used by marketers and utilities.

Mechanism #1: Take Advantage of Community and Social Dynamics
A number of authors suggest that increased communication in conjunction with reduced group size can boost contributions to public goods. As group size increases, however, the traditional economic literature generally concludes that communication will not alleviate free riding because efforts to coordinate contributions, develop implicit contracts, and exert social pressures become more difficult. Others, however, persuasively argue that communication, social sanction, and decentralized cooperation for public goods occur more frequently than is often assumed, and that neoclassical economic theory underestimates the importance of social norms and values even in large-scale settings. At a minimum, green marketers should consider: (1) appealing to a sense of community and developing visible, community-based projects; (2) creating local, renewables-only subsidiaries; and (3) targeting marketing and communications strategies to take advantage of various forms of social pressure.

Mechanism #2: Assure Customers that They Can "Make a Difference"
Voluntary contributions to public goods can often be increased if individuals feel that their own participation is pivotal to the provision of the good. Because of this, public goods contribution programs should be (and often are) conducted under the condition that the good will only be provided in the event that a certain minimum level of funding—a provision point—is surpassed. If the provision point is not met, customers can be refunded their contribution (a give-back). If the provision point is surpassed, excess funds can be used to reimburse customers or to purchase more of the public good. More generally, we expect that any mechanism that is used to empower consumers to act and to ensure them that they are "making a difference" will increase demand for renewables. Likewise, it is critically important that customers feel that their dollars are being managed appropriately and are being used to support renewable energy projects. Whenever feasible, marketers should therefore: (1) utilize provision points, give-backs, and reimbursements in program design; (2) communicate the importance and effectiveness of individual action in supporting renewables and protecting the environment; and (3) establish credibility in the management and use of funds.

Mechanism #3: Emphasize Customer Retention
In experimental settings, two of the most important determinants of free riding are repetition and experience. In a "single-shot" game, 40-60% of individuals are willing to contribute to a public good, but these contributions often decline dramatically with repetition. Participants may learn that free riding is more profitable only after observing several instances of free riding by others and becoming disenchanted by their uncooperative behavior. Because of this, marketers should: (1) consider urging or requiring customers to make longer-term commitments to the program; and (2) place special emphasis on customer retention by maintaining an ongoing relationship with customers, offering additional private rewards to longtime customers, and continually informing existing customers of how their own commitment is making a positive impact on the environment.

Mechanism #4: Enhance Private Value
Finally, and perhaps not surprisingly, bundling private goods with public goods can greatly increase the degree to which individuals will voluntarily participate. Marketers should therefore: (1) bundle value-added private goods with renewable energy, increase private value

with the level of customer support for renewables, and personalize the environmental benefits of the product; (2) be product-oriented and make green products tangible; and (3) offer a full line of green products, each with a different mix of public and private attributes.

1.0 Introduction

Price-based competition is expected to be fierce as the U.S. electricity industry is restructured. Yet retail competition may also create new markets for higher-cost renewable energy resources. Retail competition will allow customers to select their own power suppliers, and growing evidence suggests that some customers will make purchase decisions based, in part, on the environmental characteristics of the power supply. Green power marketing seeks to target such customers under the assumption that their attitudes toward the environment will prompt them to pay a premium for "green" (i.e., environmentally preferable) energy products, including renewable power generation. Green power marketing has been heralded as offering significant, new, "market-based" opportunities for renewables such as solar, wind, biomass, and geothermal (Nakarado 1996), causing some to suggest that public policies supporting these technologies will no longer be needed (Bohi and Montgomery 1997).

Skeptics, however, have countered that because renewable energy provides public goods, few customers will voluntarily purchase "green" power and most will instead "free ride" on others' participation (Rader and Norgaard 1996). Because the benefits of a public good cannot be captured solely by the purchasing customer, traditional economic theory suggests that individuals have strong incentives *not* to contribute but to free ride and enjoy the benefits of the public good while avoiding payment. This situation constitutes a market failure and is often a rationale for government intervention. In part because of the environmental, risk reduction, and other public benefits provided by renewable energy, renewables have historically received various forms of public policy support, but these support programs are threatened by restructuring.[1]

Individuals' interest in and ability to free ride has important implications for green power marketing. If individuals typically free ride on rather than contribute to public goods, then they may be unwilling to pay a premium for renewable energy. If this is the case, green marketing may not substantially increase renewables development and green power marketers may not be particularly successful. On the other hand, if people—for whatever reason—are willing to pay for public goods, then they may participate in green marketing at levels sufficient to create a large new market for renewable energy developers and marketers.

Given the growing number of green marketing programs for renewable energy, the potential for public goods free riders, and the suggestion that green marketing may be able to supplant traditional renewables policies, important research questions emerge: (1) Will customer-driven markets for renewables really develop? (2) What factors influence individuals' incentives to free ride? (3) How might green marketing programs be designed to reduce free

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[1] Renewable energy policies have included long-term power sales contracts, resource set-asides, and tax incentives. These public purpose programs have, in large part, been funded and administered by electric utilities under the supervision of regulatory agencies. This form of funding and administration will no longer be feasible in a restructured industry, and some therefore believe that renewable energy development could be an inadvertent casualty in the transition to competitive power markets.

riding and thus increase customer demand for renewable energy? (4) Does the establishment of green markets obviate the need for explicit public policy support for renewables? (5) What economic and public policy justifications ultimately exist for continued support?

The purpose of this report is to begin to address the first three of these questions by applying the extensive economic, public policy, behavioral, and marketing literature on voluntary contributions to public goods and the "free-rider" problem. This academic literature cannot be used to precisely estimate the level of free riding in the green power market, but it can provide recommendations to green power marketers on how to reduce free riding and therefore increase customer demand for renewable energy. Though the literature can also contribute insights into the potential rationale for renewable energy policies (questions 4 and 5), we leave most of these implications for future work.

This report is organized as follows:

- In Section 2, we review existing green marketing efforts in the electric industry, highlighting both utility green pricing programs and the retail competition pilot programs.

- In Section 3, we introduce the relevant academic literature on public goods and free riding. We define public and private goods, identify the public benefits supplied by renewables, and review the literature on the pervasiveness of the free-rider problem.

- In Section 4, we provide anecdotal evidence of potential free riding in the green power market. While not irrefutable, this evidence suggests that free riding could significantly reduce customer demand for renewable energy and that free riding should therefore be of concern to green power marketers.

- In Section 5, we highlight the implications of the public goods literature for green power product design and marketing communications strategies. The major contribution of the report lies in this section. Specifically, we focus on four mechanisms that marketers can use to increase customer demand for renewables by reducing the incentive to free ride, and we highlight examples of their use by marketers. Though we do not believe these mechanisms can "solve" the public goods dilemma and thus eliminate the need for public policy, we contend that they offer realistic ways to foster measurable support for renewables despite the public goods problem. These mechanisms, and the specific marketing strategies that derive from them, should also find broader use by marketers of other (non-renewable) forms of "green" power and, in fact, by all classes of marketers who attempt to sell a product with public goods attributes.

- In Section 6, we provide general conclusions. Finally, though this report emphasizes the implications of the public goods literature for marketing and product design strategies, in Appendix A we outline a research agenda to better explore the possible roles and rationales for government intervention in the development of renewable energy markets.

This report targets two very different audiences: (1) practitioners (green marketers, policymakers, and renewables advocates); and (2) academics (economics, marketing, public policy, etc.). For the practitioners, we hope this report summarizes and extends the academic literature in ways that provide valuable insights into the necessary modifications of traditional marketing practices in public goods contexts. For the academics, our review of green power marketing experience and use of the academic literature is intended to contribute new insights into the applicability and limits of existing public goods theories.

2.0 Green Marketing in the Electricity Industry

2.1 What Is Green Power Marketing?

Regulated electric utilities have historically been charged with providing a commodity product to their ratepayers at minimum cost. While some product and service differentiation exists (e.g., energy efficiency, interruptible power, and time-of-use metering), it has typically been limited in scope and scale (Nakarado 1996, Hirsh 1989). As retail electricity competition is introduced, however, electric suppliers are increasingly seeking to add value by further differentiating their products and targeting unique services to niche markets. Utilities will no longer be monopoly providers of electric service, and, as is widely recognized in economics, multiple firms operating in a competitive market and producing perfect substitutes face immense price competition. To be successful in a competitive marketplace, product differentiation and a customer orientation are essential (Levitt 1960, 1980).[2]

Green marketing takes advantage of customers' willingness to purchase, and sometimes pay a premium for, products that provide private benefits as well as public environmental benefits.[3] Though attitudinal studies typically overestimate actual market response, they consistently report that a large number of residential customers (40-70%) are willing to pay a 5-15% premium for "green" products, including renewable energy (Baugh *et al.* 1994, Farhar and Houston 1996, Nakarado 1996, Farhar 1994, Ottman 1993). Numerous examples of products sold, in part, based on their environmental characteristics exist in industries as diverse as forestry to household detergents, and for many electric service providers, differentiation based on environmental attributes is likely to become a key marketing tool.[4] Residential customers are expected to provide the largest "green" power market, though business customers have also expressed some interest (Holt 1997a, Byrnes *et al.* 1996, Lamarre 1997).

In a regulated environment, electric utilities will continue to be the primary providers of "green" power. These programs offer utility customers an optional service to support the acquisition of renewable energy, and are often termed "green pricing" programs (Moskovitz 1993). Under retail competition, however, unregulated electricity suppliers will also develop full-fledged green *marketing* programs. Though this report emphasizes the impact of such

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2 In the parlance of marketing, electricity suppliers will have to move from a product or sales philosophy to a marketing, or customer-oriented, one. Some firms may go a step further, and incorporate an eco-marketing, or enviropreneurial, strategy (Miles and Munilla 1995, Menon and Menon 1997).

3 Polonsky and Mintu-Wimsatt (1995) define green marketing broadly as, "the application of marketing concepts and tools to facilitate exchanges that satisfy organizational and individual goals in such a way that they preserve, protect, and conserve the physical environment."

4 Customer motivations to conserve resources for the future and promote technical innovation may also be important in "green" power purchases. These benefits of renewables are also public, however, so much of the discussion in this report is also applicable for these motivations.

marketing efforts on renewable energy, power marketers will make many types of environmental claims and not all "green" products will include renewable energy. Experience is limited in this area, but retail competition pilots in New Hampshire and Massachusetts are instructive and are discussed below. Table 1 provides a brief, non-exhaustive overview of some of the utility green pricing and retail competition pilot experience.[5]

2.2 *Utility Green Pricing Experience*

The first utility-run green pricing programs were initiated in 1993 by Public Service Company of Colorado, the Sacramento Municipal Utility District, and Gainesville Regional Utilities. Since then, a number of utilities have launched green pricing programs and many others have explored the option (Holt 1996). Today, approximately 20 U.S. utilities have announced and are marketing green pricing programs. At least nine utilities have already installed renewables capacity or are supporting existing renewable facilities based, in part, on customer response (see Table 1).

Utilities have structured their programs in a number of ways, including:

- **Renewable Energy Purchase:** Offers renewable power, often at a premium electricity rate or with fixed monthly premiums, to customers.
- **Renewable Energy Donation:** Offers optional donation programs, the proceeds of which are used to support renewables projects.
- **Renewable Energy Facility on Customer Premises:** Leasing/ownership options that result in the installation of small renewables projects (typically photovoltaics) on customers' premises.

Donation-based programs typically have the lowest average per-customer contributions (often $2/month or less). Renewable energy purchase programs frequently induce higher contributions of up to $10/month. Customer-sited facilities generally require the highest premiums.[6]

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5 Specifically, the table lists utility programs that have already installed renewables capacity or are supporting existing renewable facilities. It excludes programs that are not yet supplying renewable energy to customers (e.g., Public Service Company of Colorado-Windsource, Fort Collins Light and Power, Portland General Electric, Cooperative Power Association, Dakota Electric, City of Austin, Arizona Public Service, Hawaiian Electric, etc.). For a more comprehensive listing of utility programs, see the U.S. DOE's Green Power Network (http://www.eren.doe.gov/greenpower/).

6 The Sacramento Municipal Utility District's PV Pioneers program is an exception because their program is heavily subsidized.

Table 1. Experience with Green Power Marketing in the Electric Industry

Utility Programs	Product	Customer Funding	Participation Results
Traverse City Light and Power	Wind power (600 kW)	$7.6/month premium	245 residential and 20 business customers have signed up*
Sacramento Municipal Utility District	Rooftop photovoltaics (total 1.2 MW)	$4/month premium	350 residential customers have signed up*
Sacramento Municipal Utility District	Geothermal (3 MW contracted; approx. 1 MW customer demand)	50% and 100% blocks averaging $3.6 and $7.2/month	900 residential customers have signed up, with most opting for the 100% block
Detroit Edison	Photovoltaics (28.4 kW)	Average $10/month premium	195 residential customers have signed up*
Public Service of Colorado	Photovoltaics (15 kW)	Average $1/month donations	16,000 customers have donated
Northern States Power	Rooftop photovoltaics (total 34 kW)	$36/month (effective) premium	17 residential customers have signed up*
Gulf Power	Photovoltaics for lighting (100 W)	$1.75/month premium	510 residential customers have signed up
Gainesville Regional Utilities	Photovoltaics (10 kW)	Average $3.3/month donations	650 customers have donated
Wisconsin Public Service	Photovoltaics on school rooftops (total 36 kW)	Average $1.7/month donations	2,600 residential customers have donated
Wisconsin Electric	Biomass and hydro (5 MW)	25, 50, and 100% blocks averaging $2.75, $5.5 and $11/month	7,100 customers have signed up, with most opting for the 25% block
Retail Competition Pilots	**Product(s)**	**Customer Funding**	**Participation Results**
New Hampshire	No-nuke/no-coal/no-Hydro-Quebec; hydro; pumped hydro; conservation; bird feeders; seedlings; charitable donations	Premiums generally less than 1¢/kWh**	20% of customers claim that environmental factors strongly influenced decision; 40% of pilot participants did not switch suppliers
Massachusetts	SO2 allowances; solar panels; charitable donations; hydropower; conservation; no-nuke/no-coal/no-Hydro-Quebec; electric car raffle	Premiums generally less than 1¢/kWh**	Most customers chose supplier based on price; of the 3.5% residential customers that chose to switch, 30% selected "green" service

*Participation limited by size of project

**The power supply offerings in both New Hampshire and Massachusetts by non-utility marketers were lower-cost than the franchise utility provider. The "green" cost premiums stated here are relative to other non-utility product offers.

Utility experience with green pricing has been mixed (Holt 1997c). Some programs have met their goals easily, while others have been unable to elicit significant customer response or have encountered stiff resistance from environmental and consumer groups. Though market research shows a significant *stated* willingness-to-pay (40-70%), *actual* participation in utility-supplied programs has not been nearly as strong—typically running under 3% of electric customers. To date, less than 20 MW of renewables have been supported by these programs, compared to total U.S. non-hydroelectric renewables capacity of approximately 9,500 MW. The market is growing rapidly, however, and future programs may be much more effective than current ones.[7]

2.3 *Retail Competition Pilot Programs*

Under retail competition, green power marketing may come from both incumbent utility companies and unregulated retail suppliers. Though a number of states have passed legislation to open up their electric industries as soon as January 1, 1998, at this point only two states, New Hampshire and Massachusetts, have established comprehensive retail competition pilot programs that include residential customers and green power suppliers.

New Hampshire[8]

The New Hampshire Public Utilities Commission's two-year pilot program encompasses 3% of the state's electricity load, prorated across all customer classes (approximately 17,000 customers). More than 30 companies have registered as electric suppliers, and a wide array of marketing claims and value-added products and services are being offered. Of the dozen suppliers marketing to residential customers, at least six are engaged in some form of green marketing. As noted in Table 1, these "green" offerings range from bird feeders and tree seedlings to a no-nuclear/no-coal/no-Hydro-Quebec portfolio. Based on a customer survey, the environmental message of power suppliers appears to have strongly influenced 20% of the pilot participants that switched suppliers; 40% of those who *elected* to participate in the pilot decided not to switch suppliers, however (Myers 1997). Though the average customer in the pilot will save at least 10% on their electric bills, "green" suppliers in New Hampshire charge up to 1¢/kWh more for their services than their "non-green" counterparts; some of the "green" suppliers offer prices that are competitive with the non-green products.

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7 A recent program introduced by the Public Service Company of Colorado, for example, appears to be having good success in signing up customers, and at least 10 MW of wind power are expected to be supported by this program.

8 For an excellent description of the New Hampshire pilot program, see Holt (forthcoming).

Massachusetts[9]

The Massachusetts Electric Company is conducting a one-year pilot program. Whereas New Hampshire set few restrictions for supplier participation, the Massachusetts pilot has taken a more controlled approach, selecting six companies to offer a number of different products in just four cities and preparing a booklet for customer participants describing their options. Approximately 4,750 residential and 550 business customers have subscribed to the pilot and have switched suppliers. Though most selected the lowest-cost suppliers, 31% of the residential and 3% of the business customers signed up with providers that offered "green" options. Most residential electricity customers (96.5%) elected to stay with their existing supplier, however, and the pilot is therefore not fully subscribed.[10] As in New Hampshire, "green" products vary substantially, ranging from charitable donations targeted to environmental groups to the retirement of sulfur dioxide allowances. Green marketers charge up to 1¢/kWh more than their "non-green" counterparts, though some of the "green" suppliers offer prices that are price competitive with the non-green products.

Lessons from the Pilot Programs

There are clearly limits to what can be learned from these pilots (see Landon and Kahn 1996, Lineweber 1997) and we have no intention of fully evaluating them here, but a number of preliminary conclusions can be reached. First, environmental claims can clearly be used to capture a segment of the residential market. Second, a good fraction of residential customers who decide to select an alternative supplier may base their decision, in part, on environmental concerns. Third, in the near term, a majority of residential customers are likely to stay with their existing utility rather than switch, thus limiting the size of the "green" power market. Finally, there is clearly no single definition of a "green" product, and suppliers will use an array of environmental claims to attract customers. It is not yet clear whether non-hydro renewables projects will be a significant component of these "green" offerings.

2.4 *Merits and Drawbacks of Green Power Marketing*

Given the emerging nature of the green power market, it is not yet analytically possible to estimate its ultimate size or its potential to create significant new markets for renewable energy. However, because the public benefits that renewable energy provides cannot be captured solely by those individuals that make voluntary purchases or donations, some question whether many customers will voluntarily pay more for renewables (Rader and Norgaard 1996). Moreover, if renewables are perceived as overly expensive, customer demand may be especially low and the "green" market will only achieve a fraction of the

9 For a description of the Massachusetts pilot program, see Rothstein (forthcoming).

10 Overall then, only 30%*3.5% = 1% of residential customers selected a "green" option.

support for renewable energy that might be socially desired and possibly attained through public policy. Given this concern, skeptics further worry that the initial enthusiasm for "green" markets could eliminate or delay the establishment of new policies designed to benefit renewables (Serchuk and Miller 1996). Finally, absent mandatory fuel source and environmental disclosure, green marketing may be particularly susceptible to misleading environmental claims, and marketers may easily discover cheaper ways of "greening" themselves than by purchasing power from renewable facilities (Holt 1997b).

Supporters of green power marketing, on the other hand, argue that it has the potential to create a new, long-term, customer-driven market for renewables that does not hinge on government policy (Nakarado 1996). They frequently point to surveys, which indicate a large, latent demand for renewables, and argue that accessing that demand will be critical for the long-term success of the renewables industry (Serchuk and Miller 1996). They do not believe that green marketing will doom renewables policy, and in fact some assert that by educating customers of the merits of renewables, the establishment of new governmental programs may be facilitated (Harrison 1997). While these proponents do not necessarily dismiss the economic legitimacy of the "free rider" problem, they argue that marketers will find ways to successfully sell renewable energy products.

3.0 Public Goods and Free Riders

There is an extensive literature in the social sciences on public goods, free riders, and collective action. This academic literature has important implications for green power marketers and provides tools for understanding: (1) the nature of renewable energy as providing both public and private goods; (2) the degree to which individuals will voluntarily pay a premium for or donate funds to renewables; (3) ways to reduce free riders; and (4) the appropriate roles of public policy and green consumerism in renewables development. We introduce this literature in this section by describing the characteristics of public and private goods, the public good attributes of renewable energy, and the nature and extent of the free-rider problem. Then, in Section 4, we provide anecdotal evidence of potential free riding in the green power market. In Section 5, we identify the implications of the public goods literature for green power marketers seeking to increase customer demand and reduce free riders. Though we do not fully address the policy implications of the public goods literature or assess many of the issues discussed in Section 2.4, we outline a research agenda in Appendix A that could be used to better explore the possible roles and rationales for government intervention in the creation of renewable energy markets.

3.1 Private Goods and Public Goods

Economic goods can be broadly separated into two categories: private goods and public goods. A *pure private good* is one in which the producer unilaterally bears the cost of production and a single consumer enjoys all of the benefits of consumption. In contrast, a *pure public good* has the defining qualities of nonrivalry and nonexclusivity. Nonrivalry means that one person's consumption of the good does not limit the capacity of others to consume the same good, and nonexclusivity implies that it is not feasible to prevent consumption by those who fail to pay for the good. Common examples of public goods include national defense, lighthouses, and clean air. In reality, of course, most goods are neither purely public nor purely private.

3.2 Does Renewable Energy Supply Public Goods?

If renewable energy only supplied private goods, the academic literature on public goods and free riders would have no relevance. Renewable energy, however, provides a mix of private and public benefits. The commodity supply of electricity produced by a renewable energy project and transmitted to an electricity customer is clearly a private good. It is equally clear, however, that renewables also contribute toward public goods. Specifically, three characteristics of renewable energy are often claimed to have public benefits because these

benefits exhibit the traits of nonrivalry and nonexclusivity and therefore cannot be captured fully by individual customers; instead, these benefits accrue to all customers, irrespective of individual participation in green power programs.[11]

First, renewables often supply significant public environmental benefits compared to other forms of electricity generation (Proops *et al.* 1996, Chupka and Howarth 1992). An individual customer who purchases renewable energy is unable to enjoy the full local, regional, national, and even international environmental benefits that their purchase provides. Instead, these benefits spill over to all customers affected by the cleaner environment.

Second, the research and development and "intellectual property" that goes into creating renewable energy systems and components is a public good because private actors often cannot easily appropriate the *full* social surplus from their innovations, even with patents and property rights (Teece 1986, Fisher and Rothkopf 1989). In other words, by helping to commercialize new renewable energy technologies, green power customers are benefitting all of society in the form of possible long-term electricity generation cost reductions, and may be unable to capture the full social benefits of their efforts.[12]

Finally, the reductions in fuel price and supply interruption risks provided by renewables (Hoff and Herig 1996) are claimed by some to have public characteristics. Though, at first glance, it might appear that these risk reductions are largely private goods because they can be captured by individual customers who purchase renewables, Rader and Norgaard (1996) argue that risk reduction is systemic and has public benefits because it reduces shocks to the economy as a whole. Specifically, the authors contend that "electricity producers do not have sufficient incentives to diversify adequately to avoid the above [fuel] risks because their profits depend on their diversity relative to other producers and because most of the costs of the shock reverberate throughout the economy rather than being concentrated among electricity producers (Rader and Norgaard 1996)."[13]

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11 Our intent here is to describe the characteristics of renewable energy that are often claimed to have such public benefits, without commenting on the persuasiveness of the claims or the magnitude of the benefits.

12 This public good is not, of course, limited to renewable energy technologies. Because many of the traditional electric generation technologies are mature, however, they are unlikely to be plagued as seriously with this form of market failure.

13 Given the reduced reliance on oil in U.S. electricity generation, this public benefit of renewable energy has likely decreased (Hirst and Eto 1995); however, the potential for natural gas price shocks remain (Jaccard 1995).

3.3 *The "Free Rider" Problem*

Most broadly, for a public good to be provided at an economically efficient level, the sum of all individual marginal valuations of the good (e.g., the marginal social benefit) should equal its marginal cost. Absent policy intervention, however, public goods are susceptible to underprovision because rational individuals have strong incentives *not* to contribute, but rather to free ride on others' contributions. This situation arises because any individual's contribution to a public good has a negligible effect on its provision, and by free riding the rational individual is able to enjoy the benefits of the public good—given its nonrival and nonexcludible characteristics—while avoiding payment. Because of this incentive to free ride, the standard presumption of neoclassical economics is that private, decentralized markets cannot be relied upon to provide public goods efficiently (see, for example, Samuelson 1954, Olson 1965).[14] This underprovision constitutes a form of market failure and is often a rationale for intervention by the government to encourage or mandate the provision of public goods.

In more recent academic work, the pervasiveness of the free-rider problem has been questioned, however, and the degree and conditions under which individuals actually do voluntarily contribute to public goods has become the subject of a great deal of theoretical and experimental research in economics, political science, sociology, and psychology.[15] Davis and Holt (1993) review experimental (laboratory) investigations designed to assess the extent of individuals' willingness to contribute voluntarily to public goods. This literature offers divergent results, with outcomes heavily dependent on the specifics of the experimental design. Though nearly full free riding has been generated in some contexts (e.g., Kim and Walker 1984, Isaac *et al.* 1985), a number of studies reveal that 40-60% of individuals are willing to contribute even though, *individually*, they would be better off not contributing (Marwell and Ames 1981, Isaac *et al.* 1984). Noting these and related findings, Green and Shapiro (1994) criticize what they see as an insufficient empirical foundation for neoclassical free-rider theory, writing that "...the empirical basis for the standard rational choice claims derived from the work of Olson is quite thin." Green and Shapiro conclude that, at least as far as collective action and voting behavior are concerned, no causal link has been established between the incentive to free ride and actual mass behavior.[16] Though Ostrom (1990) does not believe that free-rider-based models are wrong per se, she contends that they utilize extreme assumptions and that "we do not learn from these models what individuals will do

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[14] Hardin (1968) suggests a similar result for open access resources.

[15] Two collections of essays encompassing the range of perspectives in this general debate are: Friedman (1996) and Hogarth and Melvin (1987).

[16] Johansen (1977) adds that there is little empirical evidence that the correct (i.e., socially efficient) revelation of preferences for public goods by *politicians* has been of any practical significance. Johansen claims that the two-tier system of electors and representatives tends to diminish the significance of the problem of true preference revelation in policymaking. He does not, however, provide a detailed commentary on situations in which individual (non-political) choice is involved.

when they have autonomy to craft their own institutions and can affect each other's norms and perceived benefits."

It is difficult to empirically evaluate the magnitude of free riding in real world situations (Green and Shapiro 1994, Smith 1980),[17] but actual observations of individual behavior can provide anecdotal evidence of the extent of free riding. Some individuals do indeed participate in and contribute to charitable and mutual aid organizations. Moreover, consumers have begun to purchase "green" products (Wasik 1996, Ottman 1993, Cairncross 1992, Vandermerwe and Oliff 1990, Simon 1992). Though the marketing emphasis for many such products focuses on personal health, convenience, quality, and price, and "green" product sales have not been nearly as robust as some had predicted, the recent proliferation of "green" products may provide some evidence of a willingness-to-pay for public goods. Finally, in as much as any one individual's vote is unlikely to decide the outcome of an election, rational individuals have a strong incentive *not* to vote, but to free ride on the public good of a functional democracy (Downs 1957, Tullock 1967, Green and Shapiro 1994); as political participation in the U.S. suggests, however, though many do free ride on the electoral process, millions also participate.

Even where people do contribute toward public goods, however, it is not clear whether they do so with the public good in mind. Where contributions exist, defenders of traditional economic theory counter that the contributions may not capture *true* willingness-to-pay (WTP) for public goods, but rather only the "warm glow" that comes from the act of giving (Andreoni 1988) or the presence of coercion or sanction, private inducement, or social pressure (Chong 1996). Olson (1965), for example, asserts that it is because of the free-rider problem that mutual aid entities such as labor unions resort to centralized enforcement mechanisms and private inducements (i.e., noncollective goods) to ensure contributions. Where public goods provision is motivated by these "private" interests, underprovision of the good may remain.

We believe the public goods theory as traditionally described by neoclassical economists provides a useful, if idealized, model of human behavior. Because it underestimates the complexity of influence processes, behavioral change, and human decision making, the theory is not perfectly predictive. Perhaps the most important lesson that can be gleaned from the diverse and sometimes contradictory academic literature described above is that people do, in fact, tend to contribute to public goods at levels that exceed that predicted by traditional economic theory. At the same time, it is clear that, even with private inducements, sanctions, or other experimental design variations, there continues to be a significant level of free riding in a wide variety of situations; indeed, the prevalence of free riding and the corresponding market failure is a key rationale for government involvement in activities ranging from environmental regulation to the provision of national defense. The bulk of the evidence therefore supports the conclusion that the voluntary provision of public goods will typically be suboptimal, but not zero.

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[17] Specifically, it is hard to establish what would occur in the absence of free riders.

4.0 Free Riders in Green Power Programs

Although the absolute magnitude of the free-rider effect has been questioned, it is apparent that free riding *can* present a significant problem in a wide variety of situations. Moreover, even if public goods provision is efficient from a societal point of view (i.e., if the market failure is already corrected through public policy), aspects of the free-rider effect are still relevant for green power marketers that attempt to sell a product whose public benefits are not fully appropriable by individual purchasers. If considerable free riding exists in green power programs, then marketers will have to adapt their product and marketing strategies for a public goods context. Before we address the ways in which green marketers can reduce the number of free riders (see Section 5), however, it is important to assess the potential magnitude of free riding in the green power market. Though the general academic debate on public goods and free riders provides some insights, more specific evidence of free riding in the green power market would be desirable. Unfortunately, because it is difficult to assess the true *social* WTP for public goods in a collective situation in which all must contribute, it is not possible to easily estimate the magnitude of free riding in green power programs.

Given current customer purchases of and donations to renewable energy, it is clear that either: (1) some customers are indeed willing to voluntarily contribute to products with public goods attributes; and/or (2) that sufficient private value is obtained from purchasing "green" power to partially mitigate the incentive to free ride on the public goods provided by renewable energy. At least three pieces of, albeit anecdotal, evidence can shed some light on the *magnitude* of free riding in existing green power marketing programs. Though not irrefutable, this evidence suggests that free riding is a meaningful issue for a large segment of electricity customers.

First, actual participation in existing green pricing programs (typically under 3%) is far lower than stated WTP as expressed in surveys and market research (40-70%).[18] One of the potential reasons for this divergent result is that there is no incentive to free ride in a hypothetical situation (i.e., a survey) but there may well be significant free riding when faced with an actual "green" product that provides public goods (Rose *et al.* 1997). It is important to note, however, that the difference between stated and actual WTP may be explained by a number of factors unrelated to program free riders, including:

- **Problems with the Surveys:** Strategic bias, starting-point bias, the lack of a perceived budget constraint, the "warm glow" associated with providing the "correct" answer, the lack of careful consideration on the part of the individual, and a shortage of information on the particular program;

[18] This attitude-behavior discrepancy is, in fact, quite prevalent in environmental and energy issues more broadly (Smith and Haugtvedt 1995, Gill *et al.* 1986, Richie and McDougall 1985).

- **Problems with the Products:** Green marketing products and services that do not meet customer needs, poor marketing of the product or program, and the "normal" product diffusion process.

Because of these "problems," even with private goods it is normal to use a calibration factor to adjust stated intent and produce an estimate of subsequent product demand (Morwitz and Schmittlein 1992, Dickie *et al.* 1987, Urban *et al.* 1983, Jamieson and Bass 1989), and actual purchases often bear a weak association with stated purchase intentions. For green power programs, isolating these various "problems," and determining the role (if any) of free riding in the difference between stated intent and actual participation, should be the subject of further study; for now, the divergence can only be used as anecdotal evidence of free riding.

Second, though it is difficult to explore the free-rider problem through survey research, as noted above, several results do provide some insight into the issue. When asked whether they prefer voluntary individual contributions to renewable energy or a mandatory (collective) program in which all must pay, a number of customers prefer the latter approach. Although not a scientific survey, 28 of the 30 customers that responded to the query by Salem Electric supported the collective payment approach while just two preferred voluntary action (Rader and Norgaard 1996). Given a more extensive statistical sample of seven utility service areas (each with a survey sample of at least 300), Freeman (1996) reports that, in six out of seven cases, customers preferred the mandatory (collective) approach but by close margins. Research conduced for the New England Electric System also found that a number of customers wanted the costs to be shared equally by all (Willard and Schullman 1994).

Third, based on the most comprehensive market research conducted to date, the Public Service Company of Colorado segmented their residential customers into three groups. The most ardent supporters of "green" power (39% of customers) were generally found not to care about "environmental" free riders. A large segment of the population (36%), however, was found to be deeply troubled about program free riders (Baugh and Byrnes 1994).

These three pieces of evidence suggest that a potentially substantial level of free riding will occur in green power programs. Free riders may therefore represent a significant lost market opportunity for green marketers. We turn next to strategies for reducing the level of free riding in order to increase customer demand for renewables.

5.0 Reducing Free-Riding in Green Power Programs: Recommendations for Marketers

Given the evidence described in Section 4 on free riding in green power programs, green marketers should clearly be interested in ways to reduce the level of free riding as a means of increasing demand for their products. Fortunately, the more recent public goods literature suggests marketing and product design strategies to do just that. Marketing professionals and academics are beginning to explore this literature, and the literature on social dilemmas[19] more broadly, as they seek to develop specific, tangible approaches to "selling brotherhood" (Wiener and Doescher 1991). More generally, Rothschild (1979) and Bloom and Novelli (1981) identify a set of problems that confront "social marketing" practitioners who attempt to transfer traditional marketing approaches to "social" products. The most general conclusion from this work is that traditional marketing strategies must be adapted for effective use in a public goods context.

Figure 1 provides a roadmap for this discussion and lists some of our key conclusions. While there are overlaps, we identify four mechanisms that can be used by marketers to reduce free riders: (1) take advantage of community and social dynamics; (2) assure customers that they can "make a difference"; (3) emphasize customer retention; and (4) enhance private value.[20] We describe the specific implications of each of these mechanisms for green power programs, and we highlight how they have been used by marketers and utilities. Our application of these ideas to the green power market is exploratory in nature, and the effectiveness of each of these mechanisms has been the subject of some academic debate, but our hope is to provide concrete recommendations to green marketers on how to increase customer demand for renewable energy through product design and communications strategies that encourage

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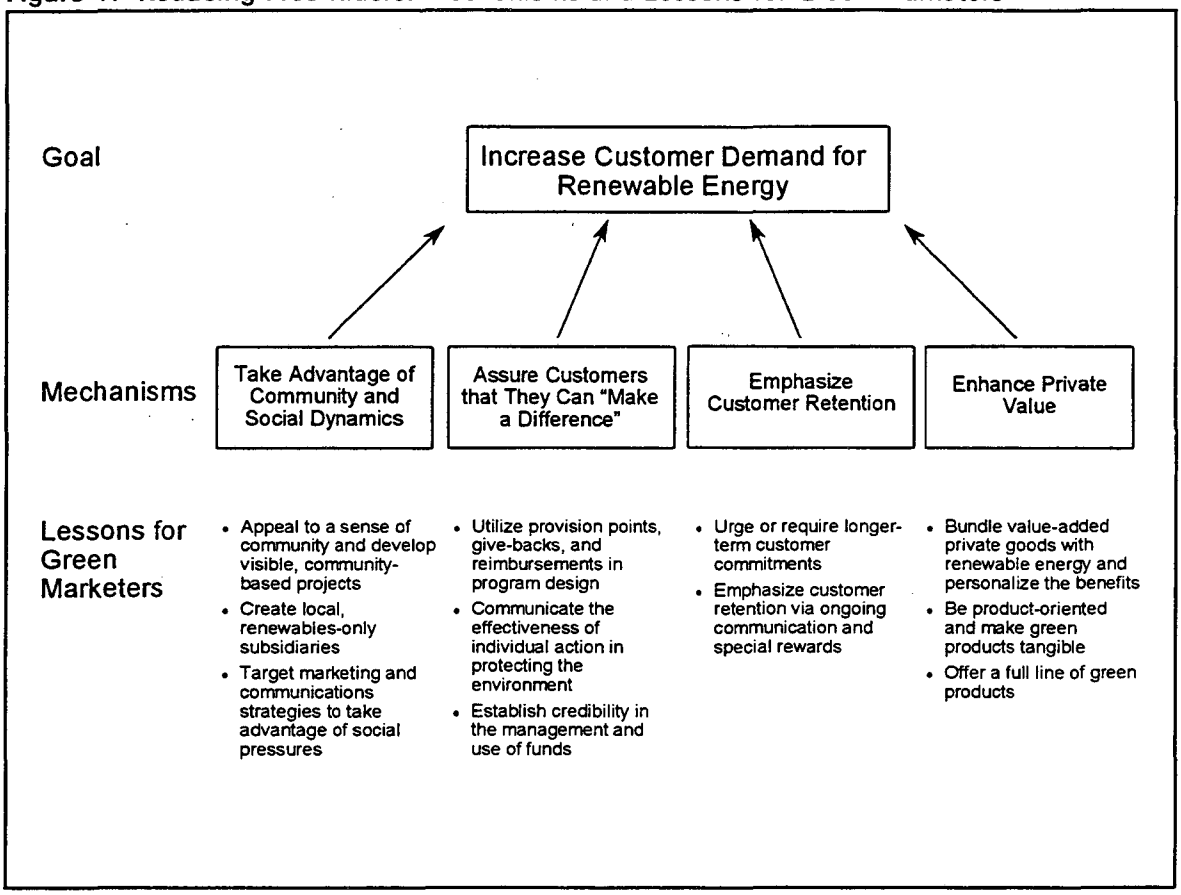
19 Dawes (1980) defines a social dilemma as a situation characterized by two properties: (1) the payoff to each individual for defecting behavior is higher than the payoff for cooperative behavior; and (2) all individuals in society receive a lower payoff if all defect rather than cooperate. Based on this conceptualization, social dilemmas include public goods, collective social traps, prisoner dilemmas, social fences, and the "tragedy of the commons" (Wiener and Doescher 1995).

20 Economists have also developed a number of sophisticated "incentive compatible" mechanisms to encourage the honest revelation of preferences for public goods and have designed efficient cost sharing mechanisms. These mechanisms, which include Clarke-Groves (Clarke 1971), Groves-Ledyard (Groves and Ledyard 1977), and the Smith public good auction (Smith 1979, 1980), are typically relatively complex and require a centralized authority and iterative rounds of interaction. They are therefore unsuitable as tools for the *private* provision of renewables via green marketing and are of little use to marketers who are interested in increasing customer demand for their products.

Figure 1. Reducing Free Riders: Mechanisms and Lessons for Green Marketers



customers to contribute toward the public good (see Figure 1).[21] Though we do not believe these mechanisms can "solve" the public goods dilemma and thus eliminate the need for public policy, we contend that they offer realistic ways to foster measurable support for renewables despite the public goods problem. We also believe that most of our suggestions are cost effective, as evidenced by their use in existing green power marketing efforts. In practice, of course, the green marketer will have to trade-off the costs of these mechanisms with their potential benefits. Finally, though we do not emphasize this application, we think that many of the recommendations discussed here also have implications for the design of public information programs on renewable energy.[22]

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21 As one might expect, designing an effective "green" product is more involved than simply reducing the number of free riders. Holt (1997c), Farhar and Houston (1996), Swezey (1997), and LAW and CORE (1997) all provide additional recommendations to green power marketers.

22 As part of California's renewable energy policy, for example, the state legislature has passed a bill to set-aside approximately $5 million for public information and education efforts on renewable energy and green power markets.

5.1 *Take Advantage of Community and Social Dynamics*

A number of authors have suggested that increased communication in conjunction with reduced group size can boost contributions to public goods. For example, in an experimental setting, Dawes (1980), Isaac and Walker (1988b), and Isaac *et al.* (1985) demonstrate that nonbinding communication among a small number of individuals can reduce free riding. In effect, in a small group situation, individuals are able to establish implicit contracts among themselves and to exert social pressure so that the "nonbinding" contract is followed.[23] As group size increases (beyond 10 individuals), however, the economic literature generally concludes that communication will not alleviate free riding because efforts to coordinate contributions and attempts to "punish" free riding become more difficult. Olson (1965) argues that, absent a central authority or other significant inducements, large groups are typically unable to provide themselves public goods. Though Olson (1965) recognizes the possibility for social, psychological, and moral pressures to increase contributions, these elements are downplayed except in small group situations. Even where social factors are considered in economic models of collective choice, they often serve as post hoc rationalization of research results rather than as critical explanatory variables upfront (Green and Shapiro 1994).

Ostrom (1990), however, suggests that communication, social sanction, and decentralized cooperation for public goods occur more frequently than is often assumed, and documents multiple cases of collective management of common pool resources. More generally, authors such as Granovetter (1985) have taken issue with the undersocialized or atomized-actor explanations of neoclassical economic theory, which are claimed to not accurately reflect social and cultural constraints inherent in human behavior, and which may therefore underestimate the importance of social norms even in large-scale settings. Granovetter observes, "Much of the utilitarian tradition, including neoclassical economics, assumes rational, self-interested behavior affected minimally by social relations." Indeed, studies of economic behavior suggest that all forms of exchange are strongly influenced by social obligations (e.g., to friends or family) and normative expectations (e.g., community standards).[24] Ultimately, however, even Ostrom admits that the effectiveness of communication and community sanction are affected by group size. Others note the "distancing" and dislocation that occur as markets and economies grow in scope and scale, and argue that, at a certain point, these effects inhibit communication and community structure (Princen 1997, Norgaard 1995).

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[23] Isaac and Walker (1988b) also note that communication helps individuals learn the optimal group strategy of full contributions.

[24] In the energy efficiency literature, there is a growing consensus that important social and behavioral aspects of energy use have been neglected in favor of technical-economic analysis (see, for example, Stern 1986, Lutzenhiser 1993, Gonzales *et al.* 1988, Costanzo *et al.* 1986, Dennis *et al.* 1990).

Numerous studies have attempted to identify and profile environmentally motivated customers based on demographic, socioeconomic, cultural, personality, and attitudinal variables (see Schwepker and Cornwell 1991 and Granzin and Olsen 1991 for good literature reviews). Many of these studies have found that individuals who are less alienated from their social world and are more involved in community affairs are also more likely to participate in environmentally friendly behavior, and that interpersonal influence is linked to consumption-related behavior. Indeed, Wiener and Doescher (1991) contend that the problem of selling a public good can be viewed as a problem of gaining cooperation in a social dilemma. Communications strategies must therefore directly attack the barriers inhibiting cooperation, thus inducing individuals to take actions that are not in their narrow self-interest. Clearly then, the lesson for green marketers is that size, social pressures, and communications strategies matter. Three specific recommendations merit further discussion.

1. Appeal to a sense of community and develop visible, community-based projects: Green power programs are likely to be more successful when they appeal to a sense of community and can rely on implicit or explicit social norms and values. Locally sited, visible projects, and community-based marketing should be considered. Messages that emphasize the collective harm that environmental problems cause and the need for everyone to work together to help solve the community problem can foster a sense of "we-ness," and such messages should be used wherever feasible (Granzin and Olsen 1991). Traverse City Light and Power, a small (8,000-customer) municipally-owned utility in Michigan, successfully used community-based marketing to build a 600-kW wind turbine that is visible from town. The community enthusiasm for and success of Traverse City's green pricing program supports the general idea that local and community-based programs may do well (LAW and CORE 1997). At the same time, the success of the Sacramento Municipal Utility District program demonstrates that the program sponsor does not necessarily have to be small to build on this sense of community pride. Finally, in the Massachusetts pilot program, AllEnergy's emphasis on its local roots and commitment to the local environment demonstrates that community-based appeals are likely to be made by marketers post-restructuring.

2. Create local, renewables-only subsidiaries: An important extension of the discussion above is that local subsidiaries may be more successful at green marketing than multinational corporations seen as having little or no interest in any one community. If this is true, size and community focus may require larger companies to spin-off and decentralize their green marketing efforts, and maintain a local presence in different communities. A local, renewables-only subsidiary might be most successful. Companies must trade off these benefits with the potential loss of corporate brand identity, but subsidiarization is, in fact, already underway. For example, ReGen Technologies, though not locally based, is the "green" power division of Allenergy, which is itself a joint venture between two eastern electric utilities (New England Electric Systems and Eastern Enterprises); and, though green power is not a primary focus, Enron has registered a local subsidiary in California under the name South San Francisco Utility Solutions, Inc.

3. Target marketing and communications strategies to take advantage of social pressures: Wherever possible, marketing messages and product positioning should be targeted to the

most effective forms of social pressure and social norms.[25] The Roper Organization (1992) and others have identified a number of consumer segments, each with a different level of environmental commitment and each with a different set of motivators. Some of these consumers will be inspired to purchase "green" energy by the environmental and other benefits of their action (i.e., true altruism) and by social norms. In these cases, marketing messages might be best targeted to the seriousness of the environmental problem and to the benefits of individual action.[26] Other customers may be more influenced by the possibility of recognition in the local community, by gaining the approval of others, and/or by knowing who else is contributing (i.e., status and peer pressure); marketing messages and product positioning should be targeted accordingly.[27] A final group of customers may be guided by

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25 As early as 1976, Henion and Wilson (1976) predicted that as the environmental movement grew, the uniformity of the group would dissipate. The challenge for marketers would therefore be to identify the motivations of various customer segments and to target messages directly to those motivations.

26 Scott (1977) examines the impact of one particular type of influence strategy on socially conscious behavior, namely the "foot-in-the-door" technique, which entails gaining compliance with an initial small request in order to facilitate subsequent larger requests. According to self-perception theory, this technique is effective because people use their own initial behavior to infer a positive disposition toward the issue (i.e., "I am an altruist, I really must believe in this action."), thus enhancing the likelihood of subsequent behavior. Scott (1977) provides modest support for this explanation of the success of the technique, and Gonzales *et al.* (1988) contend that the technique may be effective in inducing energy efficiency behavior. These results imply that green marketers may want to offer a low-renewables-content product initially, and only later ask their customers to purchase a more expensive product with higher renewables content. Another possible behavioral influence approach based on self-perception theory is to label someone a "green" or "altruistic" consumer before asking for a monetary commitment. Though these influence strategies have proven successful in some situations, Burns and De Vere (1982) demonstrate that, at least as a gasoline conservation device, they are not always successful.

27 Numerous studies have found that an important determinant of an individual's behavior is others' influence (Bearden *et al.* 1989). Though the most environmentally conscious consumers may generally be less status conscious than their counterparts (e.g., Anderson and Cunningham 1972), Pickett *et al.* (1995) suggest that individuals who exhibit a lower willingness-to-pay for environmental goods and services might be best targeted through interpersonal influence via peer pressure. For example, a green marketer could employ local opinion leaders and/or celebrities to deliver the appeal to "buy green." Smith and Haugtvedt (1995) and Wiener and Doescher (1991) go on to suggest that "green" purchases by some individuals may serve a social identity function, and that these people may only participate in a program if they are confident that others are as well (i.e., cooperation will be met with cooperation, and defection will be met with defection). In these cases, marketing messages should emphasize that others are participating or plan to participate, therefore exploiting the fear of social sanction to establish a "bandwagon" effect. Perhaps for this reason, in public communications green marketers regularly overstate the magnitude of customer interest in purchasing green power by using customer survey results. Because the influence of others can have a significant impact, Granzin and Olsen (1991) suggest that campaigns stress the importance of encouraging family and friends to participate. Costanzo *et al.* (1986) argue that "social diffusion" of this type offers a promising alternative to mass media appeals in inducing energy-efficiency investments because information that is obtained through personal communication is typically more effective than information obtained through the mass media (Kotler and Roberto 1989). Perhaps to take advantage of these pressures, in the Massachusetts pilot program Working Assets offers to send customers that sign up a friend a 30-minute pre-paid phone card. Finally, business customers may be most motivated by the possibility of recognition and improved corporate image, and green

a feeling of guilt over their contribution to environmental ills, and marketing messages might emphasize the personal responsibility each individual has in improving the state of the environment.[28] A mixture of marketing messages and product offers will be required to maximize residential and business customer purchases of or donations to renewable energy, and careful market research can help refine product communications strategy. The Public Service Company of Colorado, for example, has conducted detailed market research in order to develop more effective product features and communication themes. Not surprisingly, they have found that product demand varies with different marketing messages, and that target marketing based on attitudinal segmentation can be effective (Fish 1997).

5.2 *Assure Customers that They Can "Make a Difference"*

Related to the importance of group size and community is the issue of "making a difference." Voluntary contributions to public goods can often be increased if individuals feel that their own participation is pivotal to the provision of the good (Chong 1991). Because of this, public goods contribution programs should be (and often are) conducted under the condition that the good will only be provided in the event that a certain minimum level of funding is surpassed. If this minimum aggregate contribution level, frequently called a *provision point*, is not met, participants are often refunded their contribution. A combination of provision points and refunding mechanisms (also called a give-back option) can increase the incentive-compatibility of public goods provision and increase voluntary WTP because these mechanisms eliminate the risk that customers will "waste" their money if the provision point is not met.[29] Moreover, potential contributors face a risk that failure to contribute will result in the complete absence of the public good and each contributor may therefore perceive himself or herself as potentially pivotal to the provision of the good.

The game theory literature has evolved over time, but generally supports the incentive-compatibility of the provision-point/give-back combination (Palfrey and Rosenthal 1984, 1988, Bagnoli and Lipman 1989). An experimental assessment of provision points by Isaac *et al.* (1989) finds that a provision point alone can increase public goods provision, but that contributions decline rapidly with repetition. Provision points combined with give-back options, however, can increase contributions to 90% of the socially efficient level and the normal decay of the aggregate contribution level appears to be eliminated by the give-back

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marketers should devise a recognition program to attract these customers.

[28] Smith and Haugtvedt (1995) argue that promotions that induce customers to feel that it is their duty or responsibility to make environmentally responsible purchases are likely to be more effective than those that portray this behavior as idealistic.

[29] The provision-point/give-back combination thus attacks not only the public-goods/self-interest barrier to participation, but also the "sucker" barrier identified by the social dilemma literature (Wiener and Doescher 1991). An individual is a "sucker" if he or she contributes to a public good and that good is subsequently not provided.

option. Bagnoli and McKee (1991) report similar results. The provision-point/give-back combination does not always perform this impressively, however. For example, if meeting the provision point does not require contributions by all participants, as would typically be the case for green power programs, then the provision-point/give-back combination may provide a smaller incentive to contribute toward public goods, what Isaac *et al.* (1989) call the "cheap rider" problem. Under these conditions, though the provision-point/give-back combination can still be effective in increasing contributions, it seems unlikely that it would raise participation to 90% of the socially efficient level. Finally, equitably reimbursing contributors if total contributions *exceed* what is necessary to fund the project may be another way to reduce free riding (Schulze 1994, Smith 1980). Alternatively, money collected in excess of the provision point could be used to extend benefits and therefore increase the production of the public good (Rose *et al.* 1997).

Rose *et al.* (1997) perform a field experiment and a laboratory investigation intended to specifically test the effectiveness of these mechanisms in the context of a utility-run green pricing program. In the field experiment, only 16% of the individuals indicated that the provision point increased their interest in the green pricing program. The give-back option, on the other hand, was widely favored; 46% of the respondents indicated that this attribute increased their interest. Despite these results, econometric analysis of the actual behavior of the subjects suggests that interest in the provision point is a significant explanatory variable in the participation decision, whereas interest in the give-back option is not a significant explanatory variable. In their laboratory investigation, Rose *et al.* (1997) find that, while demand revelation is not perfect, the provision-point/give-back/extended-benefits combination results in nearly the efficient-contributions level. For green power marketers then, the following recommendations apply.

1. Utilize provision points, give-backs, and reimbursements in program design: Provision points and give-back options would be most appropriate in donation-based green marketing programs and for situations where a specific customer demand is necessary for the construction of or contract with a renewable energy project.[30] In these cases, the provision-point/give-back combination should be strongly considered; customers should be assured, for example, that if sufficient funds are *not* obtained to build a specific project, their contributions or premiums will be given back. Moreover, if contributions or customer demand *exceed* the amount needed for the specific project, green marketers should assure their customers that they will be reimbursed equitably (e.g., payments could be returned on a proportional basis) or that additional renewable energy will be supported (extended benefits). Provision points, give-back options, reimbursement, and extended benefits help customers feel that they are "making a difference" and have the ancillary benefit of reducing the likelihood of marketer mismanagement of funds. Though experience with these devices in the green power market is too limited to determine their overall effectiveness, a number of green pricing programs

30 Though provision points, give-back options, and reimbursement mechanisms could be used by unregulated electricity suppliers post-restructuring, they are more likely to be applied in utility-based green pricing programs.

pledge refunds if a given contribution level is not reached, and others will refund contributions if they exceed a pre-specified level.[31]

2. Communicate the effectiveness of individual action in protecting the environment: On a more general level, if individuals are to contribute toward a public good, we expect that any mechanism that is used to empower consumers to act and to ensure them that they are "making a difference" will increase customer demand. Schwepker and Cornwell (1991) and Balderjahn (1988), for example, find that individuals with a higher "internal locus of control" (i.e., people who feel they have more control and can "make a difference") are more likely to contribute toward public goods. Similarly, Ellen *et al.* (1991) and Webster (1975) show that "perceived customer effectiveness" contributes significantly to the prediction of many pro-environmental behaviors. These studies suggest that product promotion strategies that recognize that an individual can, by his or her own efforts, improve the environment can be very effective. Wiener and Doescher (1991) further advise marketers to use appeals that give individuals a sense of leadership, that is, the impression that they can lead their community. Marketing messages that emphasize (or even overstate) the marginal impact of an individual's investment in a public good *and* the importance of the collective cause are common and, despite theoretical prescriptions to the contrary, experimental assessments (Isaac and Walker 1988a) and practical experience (Walsh and Warland 1983) show that customers do respond to these variables (though outright dishonesty will likely result in a loss of credibility and consumer backlash).[32] Finally, "scope reduction" strategies that reduce the perceived size of the social dilemma by focusing on a smaller, distinct goal (such as the construction of a locally-sited PV project) can also increase participation by enhancing perceived customer effectiveness (Wiener and Doescher 1991).[33]

3. Establish credibility in the management and use of funds: It is also critically important that customers feel that their dollars are being managed appropriately and are being used to

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31 For example, Niagara Mohawk Power Corporation performed market research on provision points and give-back options (Miedema 1995, Rose *et al.* 1997), and had intended to include such mechanisms in their green power program. Their program has since been put on hold, however (note that the utility did return customer contributions when the program was put on hold). Traverse City Light and Power and Fort Collins have both successfully used provision point mechanisms.

32 Fine (1990) and Ellen *et al.* (1991) caution that emphasizing the severity of the social problem can be risky because it may enhance concern at the expense of perceived effectiveness. That is, at some point, the gain in terms of increased concern will be offset by making the problem appear to be so overwhelming that there is nothing a single individual can do. Instead of focusing on the magnitude of the social problem, marketers may instead want to emphasize, in a positive manner, that the problem can be solved. Wiener and Doescher (1991) argue that such an approach may reduce the "sucker" barrier discussed earlier.

33 Ackerman (1997), for example, argues that individual recycling efforts are driven by: (1) the ease with which individuals can participate; and (2) the visibility of the actions taken to promote the public good. Though individuals may care passionately about the threat of global warming, Ackerman argues that it is far more difficult to mobilize individual action on this issue because it is hard to have an immediate, perceptible impact on the problem.

support renewable energy projects.[34] A fundamental tenet of economic theory is that, when certain conditions are satisfied, profit-seeking firms will supply goods and services efficiently. Some of the most important of these conditions are that consumers can, without undue cost or effort: (1) make reasonably accurate comparisons of the products and prices of different firms before the purchase is made; (2) reach a clear agreement with the chosen firm concerning the goods and services that the firm is to provide and the price to be paid; and (3) determine subsequently whether the firm complied with the resulting agreement and obtain redress if it did not (Hansmann 1980). One can easily see that these conditions may be unmet when dealing with "green" power, especially due to the intangibility of the product, the public goods it provides, the separation between the customer and the power producer, and the difficulty in policing private marketers. In this case, a particular type of market failure has occurred, what Hansmann (1980) calls a "contract failure," and customers will under consume the good.[35] To reduce this principal-agent problem, enhance credibility, and increase customer participation in green power programs, marketers should consider:

- Alliances with environmental groups
- Customer advisory boards
- Comprehensive, company-wide environmental initiatives to improve corporate image
- Disclosure of fuel mix and emissions
- Certification or endorsement by third-parties
- Developing an industry-wide code of conduct
- Annual reports on the status of the program and use of funds
- Visible community-based projects with clear environmental benefits
- Product-related programs rather than donation-based ones

Finally, marketers should generally avoid vague environmental claims. Specific, factual claims can increase credibility.[36] Though individual green marketers can and have considered all of the mechanisms listed above, we believe that continued work to improve credibility and increase customer trust are necessary, especially as we move toward retail competition.

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34 As noted by Pieters (1991) with reference to recycling, "Consumers tend to be motivated to spend time and effort to separate their garbage if they perceive their behavior is effective. If actual recycling does not take place, the motivation to participate drops rapidly and dramatically."

35 Williamson (1985) refers to this as primarily a problem of opportunism combined with an information asymmetry between customers and marketers.

36 Many consumers view environmental claims skeptically (Cairncross 1992, Ottman 1993) and a large number of environmental ads contain misleading, vague, and deceptive claims (Kangun *et al.* 1991). The Federal Trade Commission's environmental marketing guidelines can provide some guidance as to the legal requirements of "green" claims. To further reduce the potential for customer backlash, Polansky (1995) lays out a checklist of nine guidelines for green marketing claims, most of which emphasize the need for clear, specific, substantiatable, product-related promotions.

5.3 *Emphasize Customer Retention*

In experimental settings, two of the most important determinants of free riding are repetition and experience (Davis and Holt 1993). Repetition refers to the iterative process of contributing where contributions are made not once but repeatedly over time. Laboratory experiments generally show that, in a single-shot game, 40-60% of individuals are willing to contribute to the public good, but that contributions decline with repetition, and sometimes dramatically. For example, in five sessions reported by Isaac *et al.* (1985), average contribution rates declined from 38% of the efficient contributions level in the initial period to 9% in the terminal period. As detailed by Andreoni (1988), it is not entirely clear why contributions decline with repetition. One hypothesis is that these reductions may come from "learning" effects. That is, participants may learn that free riding is more profitable only after observing several instances of free riding by others and becoming disenchanted by their uncooperative behavior. Perhaps for the same reason, Isaac *et al.* (1984) report that when participants are experienced with the contribution mechanism, free riding increases.

It is not yet clear whether repetition (and learning to free ride) will tend to reduce customer participation in green power programs over time; existing programs have not been operating long enough to test this hypothesis empirically. Customer retention is important for all types of goods, however, and the literature suggests that retention may be *especially* difficult when public goods are involved.[37] This has two important implications for program design.

1. Urge or require longer-term customer commitments: Green marketers should consider urging or requiring customers to make commitments to the program. If customers are given the option to participate or not participate on a monthly basis as might be the case under traditional electric utility billing cycles, repetition and learning effects would be exacerbated. Although one would not expect to be able to persuade many residential customers to sign long-term (> 3 years) contracts or commitments for the supply of renewable energy, shorter-term commitments (several years or less) might be imposed without a significant loss of customer interest. By establishing a longer-term commitment, repetition is reduced and the opportunities to "learn" to free ride are diminished. While there are trade-offs with customer acceptance and flexibility that must be carefully weighed, a number of utilities are already using customer contracts to reduce the participation risk in their green pricing programs (Wiser and Pickle 1997).[38] In the retail competition pilot programs, some suppliers require

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[37] A potential offset to this effect is that appeals to environmental values may create more customer loyalty than other marketing approaches.

[38] In the Traverse City program, for example, residential customers make a 3-year commitment and commercial customers a 10-year commitment to pay the specified price premium. Detroit Edison's program requires residential customers to sign a 2-year contract, which will be extended automatically after that period unless the customer requests in writing that the agreement be terminated; for commercial customers, a 10-year commitment is required. The Sacramento Municipal Utility District, Northern States Power, and Wisconsin Public Service also ask for 5-10 year customer commitments.

customers to stay with them throughout the duration of the program, whereas others put no restrictions on switching.

2. Emphasize customer retention via ongoing communication and special rewards: Customer retention must be a top priority. Rothschild (1979) suggests that, while communications tools may be used to induce customers to purchase a product that supplies public goods on a trial basis, only ongoing product benefits and positive reinforcement will lead to repeat purchases; otherwise, there will be little reason to integrate the behavior into the belief structure and incentives to defect will be high. Therefore, it is critical that marketers not only expand their customer base, but also maintain an ongoing relationship and marketing presence with their existing customers and be constantly vigilant of defectors that learn to free ride. To counter the tendency to defect, a marketer may want to offer staged private rewards to long-term customers.[39] For example, if a customer purchases "green" power for a year, offer that customer one free month of electricity; after the second year, offer the customer discounts on environmentally friendly products and honor the customer through public recognition. In the Massachusetts pilot program, for example, Working Assets offers a selection of special offers (Ben & Jerry's ice cream or free long distance service), and will provide a $25 gift certificate from Real Goods to customers that stay with Working Assets for 5 months. Marketers should also continually inform their existing customers of how their own personal commitment (and the commitments of other participants) are making a positive impact on the environment.

5.4 Enhance Private Value

Only the "greenest" of consumers will be satisfied solely with an opportunity for altruism. Therefore, the bundling of private goods with public goods can greatly increase the degree to which individuals will voluntarily contribute. Olson (1965) notes the importance of private value for large organizations providing a public good, writing, "large organizations that are not able to make membership compulsory must also provide some noncollective goods in order to give potential members incentive to join." The joint production of private goods with public goods can be critical in providing positive inducements to individuals to contribute (Cornes and Sandler 1996). The key recommendations for green power programs are threefold.

1. Bundle value-added private goods with renewable energy and personalize the benefits: Wherever possible, green marketers should bundle features that add private value beyond the public benefits that renewables provide (Swezey 1997, Holt 1996). For any individual

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[39] O'Brien and Jones (1995) describe the benefits and pitfalls of rewards more generally, and argue that rewards, if designed appropriately, can increase customer loyalty. They write, "A company must find ways to share value with customers in proportion to the value the customers' loyalty creates for the company. The goal must be to develop a system through which customers are continuously educated about the rewards of loyalty and motivated to earn them."

customer, marketers should increase the value of the private goods with the size of their donation or renewable energy purchase, therefore providing a positive inducement to customers to maximize the size of their contribution. Moreover, wherever possible, green marketers should make the environmental benefits of their products as personal as possible; for example, appealing to personal health rather than general reductions in air pollution levels.[40] In point of fact, most "green" products are sold only in part based on their environmental and other public benefits (Ottman 1993). Product qualities such as price, quality, convenience, and personal health are often emphasized first.

Some green power marketers have heeded this advice and have been innovative in supplying private value to their customers. Examples have included:

- Price stability on the renewables-component of electricity purchases
- Stickers, decals, and other promotional and/or informational material
- Membership kits including discounts on environmentally friendly products
- Tax deductibility of donations
- Matched donations to local environmental projects
- Ancillary products that provide additional visibility such as a tree planting program
- Tree seedlings and bird feeders
- Energy efficiency products and services
- Bill round-ups (i.e., rounding up bills to the nearest dollar and using the funds thus collected to support renewable energy)

Business customers, in particular, may secure private value from the promotional material and recognition offered by the green marketer, which can improve the business's image and therefore increase sales and improve employee morale.[41] Using a limited survey of businesses in Traverse City, Michigan, Holt (1997a) finds that smaller business customers may be more motivated by the owner's personal philosophy than by the business advantage gained through improved image. Larger business customers, on the other hand, may be more influenced by

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40 In the marketing of a Public Service Company of Colorado green pricing program, the Land and Water Fund has found that personalizing the environmental message is essential. A clear, concise message that emphasizes the benefits of participation in terms of the elimination of the adverse environmental effects of a household's energy use has been successful, and translating those environmental benefits into specific terms (i.e., lbs of CO_2 offset) has proven effective (Mayer 1997).

41 There is a growing awareness that a firm's image impacts its ability to sell products (Michman 1985). Brown and Dacin (1997) provide an interesting study of the impacts of corporate social responsibility associations (i.e., corporate social responsibility image) on the perception of the company's products by consumers. They argue that paying attention to and managing the associations that people have about a company are important strategic tasks, as these associations can significantly impact the success of new product introductions.

business interests than personal ones.[42] A recognition program that includes stickers and other display items, and newspaper adds featuring a list of business participants should be considered by green marketers. In the Massachusetts pilot, for example, Northfield Mountain Energy offers its business customers community recognition in the form of free advertising and a plaque that publicizes the business' environmental commitment. Similarly, Enova Energy offers its business customers cost-saving energy efficiency advice and environmental promotional material.

Very little market research on the value of bundling these ancillary products and services is publicly available. However, Osborn (1997) reports the results of market research conducted by the Sacramento Municipal Utility District. Customers were asked if they were willing to pay a 15% premium for electricity generated from rooftop photovoltaics; 26% of the general population responded affirmatively. However, when offered the same product but with rate stabilization (i.e., a guarantee that electricity prices will not vary), a full 49% of the population expressed interest. Clearly, bundling private goods with public goods represents an important way of increasing interest in a "green" product, and price stability may be a particularly valuable private good.

*2. **Be product-oriented and make green products tangible:*** Green marketers should be product-oriented (emphasizing that this is a premium product, not solely a social program) and "green" products should be as tangible as possible so as to increase perceived private value (Moskovitz 1993). The limited evidence we have suggests that a program based on paying a premium electricity rate for renewably-generated electricity elicits a higher monthly financial commitment than programs asking for optional donations (Farhar and Houston 1996). Because customers seem to like the flexibility that the donation approach provides in the level of financial commitment, however, a number of green pricing programs are now offering renewable electricity in blocks (i.e, individuals can purchase 25%, 50%, 75%, or 100% of their power from renewables). Though this approach maintains the product focus and longer-term customer contracts are possible, it allows flexibility in the level of financial commitment.[43] To make the purchase even more product-oriented, marketers may also want to consider selling project shares (i.e., kW) rather than energy output (i.e., kWh).[44] As further evidenced by existing programs, tangible rooftop or community-based photovoltaic systems and local wind projects are likely to be more attractive to customers than purchases of unspecified renewables from another state because they provide visible proof of the

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[42] Given experience with a Public Service Company of Colorado green pricing program, Mayer (1997) confirms Holt's findings about small business customers. She has also found that larger businesses are far more interested in the public relations benefits of participation, though additional study will be needed to determine precisely what benefits are most valuable to different types of businesses.

[43] By selling in blocks, the green marketer is likely to capture a greater market share because the flexibility allows customers to select their own optimal "price point."

[44] Several utilities have used the project-share approach. Though it may be more product-oriented, green marketers should trade-off these benefits with the potential difficulty in explaining the concept to customers.

customer's own personal commitment (Holt 1996). In fact, this type "private good" is particularly useful as it also plays into the community and social value dynamic described earlier.

3. Offer a full line of green products: Marketers should also explore offering an array of "green" services and products, each of which may have a different mix of private and public attributes that appeal to different market segments (Weijo and Boleyn 1996). For example, one product offering could include rooftop photovoltaics and price stability, whereas another could include renewable power purchases and discounts on environmentally friendly merchandise. By developing a product line, a marketer will be able to expand and segment their total market and may be more successful at positioning and marketing their products to a range of residential and business markets (Bloom and Novelli 1981). Though early experiments with green power programs typically emphasized a single product, utilities and marketers are now beginning to offer a wider diversity of products and services. The Public Service Company of Colorado and the Sacramento Municipal Utility District, for example, both began with a single green pricing program, but both have now expanded their programs to include several product options. Post-restructuring, a number of green power marketers are also likely to offer multiple "green" products.

6.0 Conclusions

In this report, we have reviewed current green power marketing activities and have begun to assess the academic literature on public goods, free riding, and collective action. We find that green marketing does present important new opportunities for renewables and that there are practical ways to strengthen green power programs and reduce the level of free riding.

We believe the public goods theory as traditionally described by neoclassical economists provides a useful, if idealized, model of human behavior. Because it underestimates the complexity of influence processes, behavioral change, and human decision making, the theory is not perfectly predictive. One of the most important lessons from the more recent academic literature is that people do, in fact, contribute toward public goods at levels that exceed that predicted by traditional economic theory. At the same time, it is clear that there continues to be a significant level of free riding in a wide variety of situations.

Given the evidence of free riding in green power programs, green marketers should clearly be interested in ways to reduce the level of free riders and thus increase demand for their products. We have identified four types of activity that, by either changing the structure of the public goods dilemma or by adding nontraditional private benefits, can be used to do just that: (1) take advantage of community and social dynamics; (2) assure customers that they can "make a difference"; (3) emphasize customer retention; and (4) enhance private value. We have highlighted how each of these can and have been used by marketers and utilities to increase customer demand for renewable energy. Our basic conclusion is that green marketers should take into account consumer free riding and seek to reduce it by adopting practical changes in product design and communications strategies tailored to "green" power products.

Though the strategies described in this report can reduce the number of free riders and therefore help foster measurable support for renewable energy, there are clearly limits to voluntary contribution mechanisms for the provision of public goods. Specifically, we do not believe that the mechanisms described in Section 5 can "solve" the free-rider problem from a societal perspective and thus eliminate the pubic-goods market failure. Thus far, however, we have carefully avoided the specific implications of the public goods literature for renewable energy policies. But we are still left with the following question: Does the establishment of green markets obviate the need for explicit public policy support for renewable energy? Green power marketing can contribute to the provision of public goods, but we believe it imprudent to rely exclusively on green consumerism as a substitute for more overt policy approaches. Therefore, we feel that the cultivation of green power markets should be encouraged in conjunction with the development of state and federal renewable energy policies. We recognize, however, that these beliefs are not shared by all. Therefore, while we do not address this issue in depth in this report, Appendix A outlines a research agenda that could be used to better explore the roles and rationales for government intervention.

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Appendix A: Policy Implications—A Research Agenda

We structure this Appendix as a list of research questions. The first four questions explore whether there is an economic case for government intervention, whereas the final one addresses what specific forms of intervention might be warranted. None of these questions can be answered unambiguously and there must always be a role for broader non-economic considerations (e.g., intergenerational equity and other non-pareto-efficiency criteria). We believe, however, that a more detailed assessment along these lines could provide valuable (though not complete) insights into the role and rationale for government intervention.

Question #1: What Are the Limits of Customer-Driven Markets for Renewable Energy?

The academic literature on public goods suggests that free riding will limit voluntary customer demand for renewable energy. At the same time, however, it is clear that at least some individuals are willing to participate in green power marketing programs and that a number of relatively simple mechanisms can be used to reduce the propensity to free ride. Even where green marketers avail themselves of these mechanisms, however, economic theory still suggests that rational individuals will face strong incentives to purchase electric power on a least-cost basis and free ride on the public benefits provided by renewables. But the mere existence of free riders is *not* a sufficient condition for public policy intervention. In cases where externalities and other market failures are small or are already corrected, or where there is only a limited amount of free riding, a market outcome absent new policy may be acceptable. Where significant market failures remain, however, and where substantial free riding exists, there may be a rationale for government intervention.

Question #2: What Market Failures Can Impede the Development of Renewables?

Economists recognize a variety of market failures that can impede the achievement of economic efficiency (Fisher and Rothkopf 1989, Jaccard 1995, Harris and Carman 1983), three of which have the potential to thwart the continued development of renewable energy: (1) public goods and externalities associated with environmental costs, research and development, and fuel price and supply risks; (2) price distortions related to unequal tax treatment and subsidies provided to traditional forms of electricity generation; and (3) lack of accurate, unbiased information on the benefits and costs of different electricity products available to customers at low cost in a form that can be assimilated and processed. The mere existence of market failures provides a necessary, though not sufficient, condition for some forms of public policy,[45] and an assessment of the magnitude of these failures could help inform as well as lend insight into the proper design of policy intervention.

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[45] Specifically, market failure provides a necessary condition for government intervention when pareto efficiency is the only public policy goal.

Question #3: Have These Market Failures Already Been Corrected?

Some of the potential market failures listed above may already be partially or entirely corrected. For example, existing environmental regulations, government R&D programs, and renewable energy tax credits all play a role in energy markets. Whether there is a need for further intervention is determined, in part, by the magnitude of the remaining market failures.

Question #4: What Are the Costs and Benefits of Further Government Intervention?

Identifying the remaining market failures is an important first step in determining the rationale for government involvement. But market failures are common, if not pervasive, in the real world (Sanstad and Howarth 1994). If the existence of market failures was a sufficient condition for government intervention, the role of government would be sweeping (Friedman 1981). More generally, policymakers must recognize that the institutions that seek to correct these failures are neither perfect nor costless, and that public policies can have negative side effects (Harris and Carman 1986, Williamson 1996, Golove and Eto 1996). Therefore, an assessment of the costs and benefits of specific forms of intervention in the renewable energy market would be desirable; this form of analysis requires moving beyond the neoclassical theory of market failure and towards a comparative institutional framework (Friedman 1981). Where the social benefits of government intervention outweigh the social costs, there is an economic rationale for correcting market failures through public policy (Harris and Carman 1983).

Question #5: What Form of Intervention Is Most Appropriate?

Ideally, support might be targeted directly to the relevant market failure. In the "first-best" world of neoclassical economics, this might include pollution taxes for environmental externalities, government R&D and patent protection to promote innovation, removal of subsidies and uneven tax treatment, and government provision of information. Though such "first-best" strategies should be explored, in the "nth-best" world in which we live, sacrifices must often be made for the sake of expediency, simplicity, and feasibility. Formidable barriers confront policymakers who attempt to establish a carbon tax, eliminate subsidies to the nuclear and fossil fuel industries, and increase R&D budgets. Even establishing the "correct" level of a carbon tax is no easy task because this determination will depend not only on uncertain scientific evidence and imprecise economic modeling, but also on societal decisions on intergenerational equity. In neoclassical economics, it is customary to evaluate efficiency by comparing an actual form of organization with a hypothetical ideal. In transaction cost economics, on the other hand, the standard is one of "remediableness." As Williamson (1996) describes, "hypothetical ideals are operationally irrelevant. Within the feasible subset, the relevant test is whether (1) an alternative can be described that (2) can be implemented with (3) expected net gains." Inefficient results are thus sanctioned because inefficiencies are often "intentionally created in the public sector as a means by which to protect weak political property rights and/or to obtain approval for programs that would otherwise be defeated

(Williamson 1996)." Moreover, in the presence of uncertainty, imperfect information, transaction costs, and bounded rationality, "first-best" policy may require regulatory mechanisms that do not directly attack the market failure (Friedman 1981, Sanstad and Howarth 1994). Given these observations, policies designed to aid renewable energy technologies directly should also be considered.

Policies are often classified based on the magnitude of the regulatory intervention (Harris and Carman 1984). One set of policies works within the existing "market" structure, and some of these would help green marketers capture customers who might otherwise free ride. For example, mandatory fuel source and environmental disclosure targets the information market failure and would facilitate the comparison of competing "green" claims post-restructuring (Holt 1997b, Moskovitz *et al.* 1997, Levy *et al.* 1997). In addition, mandatory disclosure is expected to reduce the number of green power free riders by enhancing the credibility of "green" claims and ensuring customers that they are "making a difference." Another set of policies is more interventionist in nature, including: (1) a renewables portfolio standard, which would require each electric supplier to purchase a fraction of their electricity from renewables[46]; and (2) a system-benefits charge, which would impose a ¢/kWh surcharge on electricity rates to provide support for renewables (Rader and Norgaard 1996, Wiser *et al.* 1996, Wiser and Pickle 1997, Kirshner *et al.* 1997). Though not mutually exclusive, a more thorough evaluation of the merits and drawbacks of these, and other forms of support is needed.

[46] Individual obligations could be made tradeable to increase flexibility and reduce costs.

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