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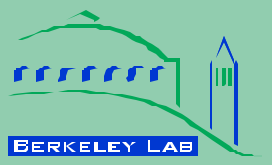

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Using Contingent Valuation to Explore Willingness to Pay for Renewable Energy:

A Comparison of Collective and Voluntary Payment Vehicles

Executive Summary

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For full report see: http://eetd.lbl.gov/ea/EMS/EMS_pubs.html#RE

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Disclaimer

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Executive Summary

Introduction and Purpose

There are a variety of ways to support renewable electricity production. Common approaches currently in use include renewables portfolio standards, system-benefits charges, and voluntary customer demand for renewable energy through green power marketing. Support for renewable energy is often paid for through explicit or implicit increases in electricity rates. Historically, all electricity consumers have been required to pay these costs, though with green power marketing some of these costs are paid through voluntary customer contributions. An ongoing debate exists on how renewable energy might best be encouraged.

Relying primarily on a national contingent valuation (CV) survey of U.S. households, but supplemented by an opinion survey, this report explores the preferences held by U.S. residents for different ways of supporting and paying for renewable energy generation. In particular, this study evaluates preferences for *collective* renewable energy policies relative to *voluntary* purchases of "green power" by individual customers, as well as preferences for the degree of government involvement in these programs.

As summarized in the full report, several opinion surveys have been conducted over the last five years that also explore household preferences for supporting renewable power generation. This previous research provides some evidence that U.S. residents prefer collective, mandatory payments for renewable energy to voluntary ones. None of these opinion surveys have relied on the contingent valuation method, however, and the exploration of consumer payment preferences was not the principal purpose of study for any of this previous research.

Results of the present study provide practical insight on the preferences of the U.S. populace towards various approaches to encouraging the development of renewable energy, and highlight possible limitations and barriers to voluntary green power demand. In addition to having tangible relevance to policymakers and green power marketers, results presented here also have important implications for a variety of academic areas of study:

- Contingent Valuation: By evaluating stated willingness to pay (WTP) for renewable energy under both voluntary and collective payment vehicles, our results shed light on strategic response and free-riding behavior and the incentive compatibility of different CV designs, as well as the appropriate interpretation of criterion validity studies in CV.
- Bandwagon Effects: The report also tests whether individuals who state a higher willingness to pay for renewable energy are more likely to think that others will also contribute, and explores the implications of this work for what is sometimes called the "bandwagon" or "reciprocity" effect.
- Discrepancy Between Environmental Attitudes and Behavior: More generally, this work helps one better understand the discrepancy between environmental attitudes (and purchase intentions) as expressed through consumer surveys and actual consumer behavior.
- Profiling the Environmentally Responsible Individual: Finally, by examining what types of individuals state a willingness to pay for renewable energy under different payment contexts,

this report builds on an extensive literature in marketing, psychology, and economics that profiles the environmentally motivated customer.

Though this executive summary principally emphasizes the practical and policy-relevant implications of the survey findings, the reader is referred to the full report for a more academic treatment of the results.

Methods and Data

The principal purpose of this report is to use CV surveys to explore the sensitivity of stated willingness to pay for renewable energy to different payment and provision contexts. The two payment methods considered are *collective* and *voluntary* increases in electricity bills, while the two provision arrangements are *government* and *private* collection and expenditure of funds.

Table ES-1. Four Contingent Valuation Scenarios

		Voluntary or Collective Payment
Degree of Gov't Involvement	SCENARIO 2 Voluntary Payment, Government Provision	SCENARIO 1 Collective Payment, Government Provision
	SCENARIO 3 Voluntary Payment, Private Provision	SCENARIO 4 Collective Payment, Private Provision

The resulting four CV scenarios, shown in Table ES-1, are valued at three hypothetical bid points (i.e., payment levels): \$0.5/month, \$3/month, and \$8/month. The hypothetical payment was limited to three years to make the payment more tangible than a longer or indefinite payment duration.

Three of the four CV scenarios have contemporary policy relevance:

- Scenario 4 is consistent with the renewables portfolio standard (RPS), in which electricity suppliers are required to purchase renewable energy and then pass on those costs to their customers.
- Scenario 1 is consistent with the system-benefits charge (SBC), in which an additional charge is added to electricity bills, the funds from which are used by the government to support renewable energy.
- Scenario 3 is consistent with voluntary green power marketing, in which individual customers have the opportunity to voluntarily switch to a new electricity supplier that offers renewable energy supply. [1]

We use a single-bounded, dichotomous choice contingent valuation survey of U.S. households that pay their own electric bill, using a split sample design. This means that each survey respondent was only asked to respond to one of the resulting 12 WTP questions (4 payment and

[1] The CV study did not consider green pricing programs, in which customers can purchase green power from their local utility without switching electricity providers.

provision scenarios crossed with 3 payment levels). The survey was conducted through the mail, with a national probability sample: 4,056 mail surveys were initially distributed, with 1,574 ultimately returned. Accounting for undeliverable surveys and ineligible participants, a 46% response rate was achieved after multiple contacts with each potential survey respondent.

The CV survey was supplemented with a smaller, national opinion survey: 544 opinion surveys were initially distributed, with 202 U.S. households ultimately responding. Accounting for undeliverable surveys and ineligible participants, a 45% response rate was achieved.

Both the CV and opinion surveys were formatted and administered in a fashion designed to maximize response rates at reasonable cost; survey administration included an advance letter, a mailing of the survey packet, a thank you/reminder postcard, a follow-up mail packet, and a follow-up telephone call. The CV surveys were 12 pages in length, and included "warm-up" questions, the valuation exercise, attitudinal questions, and demographic and socioeconomic questions. The opinion survey, at 16 pages in length, was structured similarly but replaced the valuation exercise with more general questions on renewable energy payment preferences.

Payment and Provision Preferences: Contingent Valuation Results

Based on the CV results, we find that reported willingness to pay for renewable energy is somewhat sensitive to the payment method and provision arrangement. As shown in Table ES-2, however, the data do not show substantial variation across different payment and provision scenarios. Overall, U.S. residents that responded to the survey express a somewhat higher willingness to pay for collective policy efforts – and in particular Scenario 4, the renewables portfolio standard (RPS) – than for voluntary green power options. That said, variations in stated WTP based on payment method and provision context are not particularly sizable, and statistically significant differences are discovered in only a subset of the comparisons.

- Collective vs. Voluntary Payment: Higher WTP is elicited under collective payment than under voluntary payment, suggesting that collective payment measures are preferred to voluntary ones. Though the variation in stated willingness to pay is modest, there seems to be some recognition by survey respondents that collective, policy-based approaches to supporting renewable energy will be more effective than voluntary green power marketing efforts, perhaps due to concerns for "free-riding" in the voluntary case; free-riding refers to the incentive for individuals to avoid voluntary payments for public goods because such goods benefit everyone, regardless of whether any individual has paid their share.
- Private vs. Government Provision: Private provision elicits a somewhat higher WTP than does government provision, suggesting a relatively lower faith in the government as an effective direct provider of public goods. While the results are again not definitive, they suggest that programs to support renewable energy that involve the private sector (such as the renewables portfolio standard) are somewhat more highly favored than those that involve higher levels of government administration (such as the system-benefits charge).

Table ES-2. Percent of Respondents Willing to Pay by Scenario and Bid

CV Scenario	Bid Amount		
	50¢ /month	$3/month	$8/month
Scenario 1: Collective Payment, Government Provision	62.9%	50.0%	43.5%
Scenario 2: Voluntary Payment, Government Provision	57.5%	47.7%	40.8%
Scenario 3: Voluntary Payment, Private Provision	59.1%	57.4%	44.3%
Scenario 4: Collective Payment, Private Provision	78.9%	60.0%	46.3%

The option that elicits the highest WTP in the CV survey is the RPS (Scenario 4). The SBC and green power marketing (Scenarios 1 and 3, respectively) are viewed almost equally. By way of example, and as illustrated in the table, at an incremental cost of 50¢/month, 79% of survey respondents indicate a willingness to pay for an RPS (Scenario 4), 63% for a system-benefits charge (Scenario 1), and 59% for a voluntary green power product (Scenario 3). At higher bid levels, the differences become more modest.

From a policy standpoint, however, such comparisons are not as meaningful as looking *across* payment levels. Green power products on the market today often cost $5-10/month more than traditional electric service for a typical household, while the cost of RPS and SBC policies is often estimated to be below $1/month for residential customers. Comparing the RPS and SBC at 50¢/month to green power marketing at $8/month leads to an attenuation of preferences. The RPS and SBC are still supported at 79% and 63%, but stated participation in voluntary green power programs drops to 44%.

As discussed in the body of the report, these findings also have significant implications for understanding the incidence of strategic behavior in CV settings, and should influence: (1) the interpretation of CV-derived welfare impacts of environmental programs, (2) beliefs about the incentive properties of various payment mechanisms commonly used in CV surveys, and (3) the interpretation of criterion validity studies in contingent valuation.

Bandwagon Effects: Contingent Valuation Results

The CV survey also explored the expectations of the survey respondents about the willingness to pay of other U.S. residents. Specifically, each CV survey asked what percent of U.S. residents the respondent believes would be willing to pay the specified premium for renewable energy. The results are presented in Table ES-3. Not only do these results allow one to evaluate the relationship between stated willingness to pay and expectations for the willingness to pay of others, but they also allow one to assess how survey respondents believe others would respond to different payment or provision contexts.

Table ES-3. Expectations of the WTP of Others by Scenario and Bid

CV Scenario	Response to WTP Question	Bid Amount		
		50¢ /month	$3/month	$8/month
Scenario 1: Collective Payment, Government Provision	Yes	62.1%	50.6%	49.5%
	No	37.9%	23.5%	30.7%
	Overall	52.9%	37.4%	38.7%
Scenario 2: Voluntary Payment, Government Provision	Yes	49.3%	42.9%	36.3%
	No	31.7%	23.2%	23.4%
	Overall	41.5%	32.8%	29.2%
Scenario 3: Voluntary Payment, Private Provision	Yes	49.5%	37.1%	39.8%
	No	28.4%	22.2%	25.4%
	Overall	40.7%	31.0%	31.9%
Scenario 4: Collective Payment, Private Provision	Yes	59.1%	50.3%	46.8%
	No	29.6%	28.3%	26.9%
	Overall	52.4%	42.0%	36.6%

Note: "Response to WTP Question" refers to the individual's own WTP for renewable energy. For example, consider those respondents who were asked about their own willingness to pay for renewable energy under Scenario 1, at a payment level of $3/month. Those respondents who indicated that they themselves were willing to pay this amount also indicated, on average, that they thought that 50.6% of other U.S. residents would similarly be willing to pay. Those survey respondents who indicated that they were not themselves willing to pay under this scenario indicated that they believed that just 23.5% of other U.S. residents would be willing to pay. Combining both sets of respondents to this question, on average, 37.4% of other U.S. residents were expected to be willing to pay.

Several important tentative conclusions emerge from these data:

- Payment Method Affects WTP Expectations. As with the direct valuation question reported earlier, a greater willingness to pay is expected under collective payment methods than under voluntary payment. In fact, whether payment is collective or voluntary appears to have a greater impact on the survey respondents' perceptions of what others will do than on their own stated willingness to pay. On average, the collective WTP of others is expected by our survey respondents to be approximately 25% higher than voluntary WTP. Survey respondents seemingly understand the nature of the free-riding effect: respondents expect more U.S. residents to support a collective payment approach for renewable energy than a voluntary one.
- Individuals Who are Willing to Pay Often Expect Others to Reciprocate. Those survey respondents who indicate a willingness to pay for renewable energy are also far more likely to believe that many other American households will also contribute. In fact, those who indicate a willingness to pay for renewable energy themselves sometimes expect twice as many people to do likewise than do those who indicate they are not willing to pay.
- Respondents Perceive Themselves to be More Willing to Pay than Others. Comparing overall responses from Tables ES-2 and ES-3, it is clear that respondents' perceptions of the WTP of others is lower than their own stated willingness to pay.

These findings and other evidence discussed in the main report provide tentative support for a "bandwagon" or "reciprocity" effect in CV responses, though additional research will be needed to confirm and understand this result.

Multivariate Regression Analysis: Contingent Valuation Results

Statistical analysis using multivariate regression also confirms that stated WTP varies with socioeconomic, demographic, and attitudinal factors. This report therefore highlights the characteristics of respondents that are correlated with a positive willingness to pay for renewable energy. When attitudinal variables are excluded, we find that WTP is often higher among those respondents who have higher-incomes, are more liberal, are female, do not have children, and are more highly educated. When attitudinal variables are included, socioeconomic and demographic variables become less important and model accuracy improves greatly. In particular, socioeconomic and demographic variables still have some effect: we find that WTP is often higher among those respondents who are younger, do not rent their home, are female, and have higher education and income levels. More importantly, however, certain attitudinal variables are highly significant. For example, those survey respondents who believe that their family and friends would also support renewable energy are far more likely to be willing to pay themselves, while a belief that the government should require everyone to pay for environmental improvements is positively related to WTP for renewable energy in all of the payment and provision scenarios (though more so in the collective payment scenarios). Those who express a greater trust in the government are also more likely to state a willingness to pay for renewable energy; this is true in all four scenarios, but far less so under voluntary payment and private provision, as one would expect. Finally, those who indicate that they would only pay more for environmentally friendly products if they received a direct benefit from doing so are less likely to be willing to pay for renewable energy.

Opinion Survey Results

As shown in the body of the report, results of the companion opinion survey are found to be consistent with the basic results of the contingent valuation survey presented above. In particular, the opinion survey directly asked whether survey respondents would prefer that collective or voluntary payment methods be used to support renewable energy. A very narrow majority of U.S. households (53% to 47%) indicate a preference for collective payment vehicles. As expected, those U.S. residents who show a strong affinity for renewable energy generally prefer collective payment methods (70% prefer collective over voluntary), while those U.S. residents who do not believe renewable energy is a priority prefer voluntary payment (71% prefer voluntary over collective). Similarly, a small majority of opinion survey respondents prefer private provision mechanisms to government provision (54% vs. 46%). Perhaps surprisingly, just 55% of respondents believe that "renewable energy production should be increased, even if it costs more than other electricity production options." Results from the opinion survey also provide a more detailed view of the green power market, and the respective roles of voluntary and policy-based approaches to supporting renewable energy.

The Barriers to Voluntary Green Power Markets

Though the research presented in this report shows that collective measures of policy support are generally viewed as somewhat more preferable to voluntary efforts, 44% of survey respondents still indicate a voluntary willingness to pay for a green power product priced at $8 per month. Moreover, respondents believe that 32% of other U.S. residents would be willing to pay this

same level on a voluntary basis. Both of these WTP numbers are considerably above the 1-3% market penetration rate that is typical of voluntary green power offerings to date in the U.S. These results are typical: stated willingness to pay for renewable energy generally exceeds actual participation in green power programs by a wide margin.

Results from the contingent valuation and opinion surveys shed some light into possible explanations for this discrepancy.

- Preferences for Collective Payment Vehicles and Free-Riding: Consumer preferences for collective action rather than reliance on voluntary demand may be a stronger factor in an actual payment condition than under the hypothetical survey situation tested in this report. In fact, in the opinion survey, we asked respondents to tell us what concerns they might have about voluntarily purchasing a green power product; 38% of respondents identified the fact that "renewable energy benefits everyone, so everyone should be required to pay" as a key concern.
- Upwards Bias in CV WTP Questions: As discussed in the full repot, survey results offer some evidence of an upwards bias in responses to hypothetical CV questions – that is, survey respondents may be overstating their actual willingness to pay when confronted with hypothetical WTP questions. As shown above, when asked whether they would be willing to pay a $3-8 per month premium for renewable energy, 40-60% of U.S. residents say they would not pay this amount, regardless of whether payments are collective or voluntary. Given the possibility of upwards bias, the estimate that 40-60% of U.S. residents simply do not value renewable energy sufficiently to be willing to pay at the $3-8 level should be considered a lower bound.
- Bandwagon Effects, Critical Mass, and Reciprocity: Though the findings are tentative, the survey results suggest that anemic participation rates in actual green power programs may, in part, be a self-fulfilling prophecy. Without a critical mass of participants to create a "bandwagon" effect, households may become disillusioned and choose not to participate. The most difficult part of developing the green power market may therefore be to develop a stable base of contributors on which further contributions can grow.
- Lack of Knowledge of Green Power Availability: As with any new product on the market, heavy marketing is often needed to inform potential purchasers of the product and its benefits. Opinion survey results show that just 8% of respondents believe that a green power product is available for purchase in their region. With actual availability at approximately 40% nationwide, it is evident that a large number of potential green power buyers are simply unaware of the products that are available.
- Hesitancy in Switching Electricity Providers: Survey results show a high degree of hesitancy in switching electricity providers more generally. In the opinion survey, for example, utility provision of green power was preferred on a 67% to 33% basis over purchasing green power by switching to a new electricity supplier. In the CV survey, 24% of those respondents who indicated they were *not* willing to pay for renewable energy under Scenario 3 indicated that a key reason was that they would not want to switch electricity providers for other reasons.
- Distrust in the Product and Supplier: Survey results also suggest that a good fraction of potential green power customers may simply distrust electricity suppliers in effectively providing renewable energy. For example, 41% of respondents to the CV survey who indicated that they were *not* willing to pay for renewable energy under Scenario 3 (green

power marketing) also indicated that they would not trust electricity suppliers to effectively provide renewable energy. Similarly, 42% of respondents to the opinion survey indicated that a key concern in voluntarily purchasing green power is lack of trust in electricity suppliers to effectively provide renewable energy.

Based on these findings, it is clear that one cannot reasonably label all those who do not voluntarily purchase green products as public-goods free riders; free riding incentives and preferences for collective payments do not appear to be the only explanations for the wide gulf between positive environmental attitudes and actual purchase decisions. Apparently, if voluntary demand for green power is to increase appreciably, not only will the standard economic barrier of free-riding stand in the way, but so too will a host of other barriers to volunteerism in the green market.

Conclusions and Next Steps

This report shows that households express a somewhat higher willingness to pay for collective over voluntary efforts to support renewable energy, and that similarly weak preferences exist for private over government provision. A payment and provision arrangement that is similar to an RPS received the highest reported willingness to pay. Interestingly, households' own stated willingness to pay for renewable energy appears to be strongly related to what they perceive others to be doing. A number of socioeconomic, demographic, and attitudinal variables are also shown to impact stated WTP. Each of these findings derives principally from contingent valuation survey results, but many are also confirmed by a smaller opinion survey. We also find that a host of barriers to voluntary green power demand exist – "free-riding" or collective payment preferences may not be the dominant barrier.

The apparent preference of U.S. residents for collective payment measures over voluntary ones is lower than one might expect for a good (renewable energy) that provides public benefits. Moreover, past research in this area has found a stronger preference for collective payment vehicles. At least in the survey setting presented in this report, however, U.S. residents do not appear to recognize the need for collective action for renewable energy to the same degree found in past research. These findings may be somewhat puzzling to those who believe that free-riding incentives and basic fairness dictate that collective payment measures should be preferred when public goods are involved. Three possible rationales for this finding are noted in the full report. First, survey respondents express a belief that voluntary green power programs will elicit a much higher level of positive response than actual experience shows, perhaps indicating a belief that voluntary payments really can be an effective means of supporting renewable energy. Second, general support for renewable energy as expressed in the survey results reported here appears more tepid than one might expect based on past surveys. Third, the survey uncovered some distrust for the government's ability to provide renewable energy effectively; people may therefore believe that "governmental failure" is just as significant under collective payments as "market failure" is under voluntary payments. Additional research is needed to explore the relative influence of these various factors.