GreenStar Project - Part II
EESOR 483
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Nirvana

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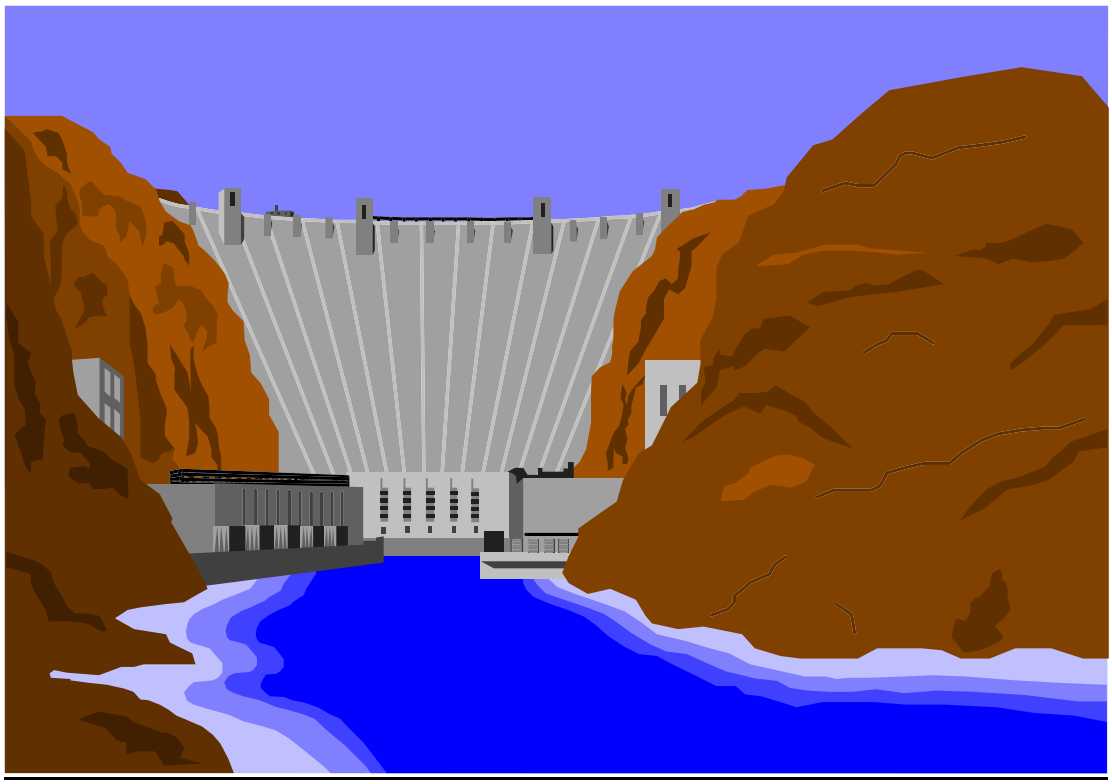

Objective

As the first part of the report explained, GreenStar has two fundamental goals: as a start-up company, GreenStar wants to become a viable, self-standing entity, and it is also looking to increase the portion of green electrons in the California energy market. Part one focused on how to determine GreenStar's role and position in the deregulated electric utility industry. The report included a simple appraisal of green energy demand. We would like to extend this part of the analysis. We will focus on developing a more thorough understanding of consumer demand for green energy. By improving our understanding of demand, we can get a better idea of the best way to package a green energy program in a deregulated environment. Once packaged, we can estimate the potential revenues in California. Our analysis will not consider supply side constraints.

Background Information

Studies have shown that up to 80% of consumers would be willing to pay a premium for environmental protection or renewable electricity [1, 2]. These numbers seem promising, but when actually presented with the opportunity to pay extra for green energy, consumers' actions do not match these figures. Most of the recent green-pricing programs have initial subscription rates of approximately .05-2 % [3]. It should be noted that extensive advertising did not accompany these programs. Instead, the utilities used direct mailing solicitations or utility bill "stuffers". With no pertinent data on this green-energy advertising, attempts to quantify its effects would be mostly speculation.

There have been two fundamental attempts to capitalize on the professed willingness to pay for renewable electricity: green pricing programs and green electricity options. Utilities

offer green pricing programs as an optional service. There are only a few programs that exist today, and little data is available. The green pricing programs exist in a monopoly environment, and can be divided into two main groups: project specific programs and contribution based programs. In a project specific program, customers agree to pay a premium in order to get all or a portion of their electricity from a specific renewable electricity project. Customers in a contribution based program contribute money each month to a "green energy" fund. The utilities use these funds to develop renewable energy resources.

Somewhat different from the green pricing programs is a green energy option, where customers choose their own general electricity provider. Here, instead of choosing options from their utility, customers choose between various electricity providers. Each provider attempts to distinguish their product by marketing its benefits (the main benefit being that the consumer is protecting the environment). In one deregulation pilot study, individual companies offered green energy options (solar, wind, hydro, etc.) to their customers.

General Approach

We set out to analyze the various program options in order to determine the best strategy for launching a green energy product. By comparing the success of the different programs that exist, and modeling how they might do in California, we hoped to gain insight on how to structure a successful green energy program. GreenStar can use this information, alongside other information from Part I, to develop a fundamental business strategy and decide how to market their product. Our analysis and results are somewhat limited since the green pricing programs we studied existed without competition. Any product that GreenStar offers will exist in a competitive market.

The Model

Overview

In order to gain insight into how to structure a green pricing program, we gathered data from various programs recently launched around the United States. These included programs from Traverse City Light and Power (program 1), Wisconsin Public Service Company (2), Public Service Company of Colorado (3), and Massachusetts Electric (4). These program's successes were slight, but were sufficient enough to keep them going. We modeled four scenarios after these four programs.

In relation to forming a green energy program, we see two critical characteristics: the circumstances under which the green product is offered, and the product itself. These will strongly influence the total amount of additional "green" revenue generated from these programs. GreenStar has yet to determine their program characteristics.

The Scenarios

Our four scenarios represent three different *types* of programs. Scenarios 2 and 3 are contribution-based green pricing programs, so there are price effect to consider. Scenarios 1 is project-based, and Scenario 4 offered green energy from different suppliers. We explain these below. For scenarios 2 and 3, time dependent data allowed us to create product diffusion models to estimate revenues over time. We made simple estimates on scenarios 1 and 4, because we did not have time dependent data..

Scenario 1: In this program, which is modeled after the Traverse City program, customers pay a premium for energy from a specific renewable energy project (in the Traverse City case, it was a 600-kW wind turbine). Customers contract or pledge to be a supporter of the green power for a specific period of time (either monthly or yearly). In return, customers receive

a portion of their energy from the project. Monthly contributions per person for this program tend to be high (around $6.00).

Scenarios 2 and 3. Customers contribute a sum each month to support a fund. Monthly premiums average $1-2. The fund then supports community based renewable energy projects. The projects in scenario 2 are highly visible, whereas the scenario 3 projects are remote and less specific. Scenario 3 is the lower cost option, but both cost less than the scenario 1 option. These programs have initial subscription rates of around 1%.

Scenario 4. Massachusetts Electric created this program to simulate deregulated market conditions. In the program, an electricity provider bundles renewable energy. By bundling the energy from different suppliers *and* including hydropower, the provider charges prices only slightly higher than the standard electricity rates. This is feasible since, in a deregulated market, the customer may be able to buy renewable energy at a 0.5 cent/kWh premium over the generic energy. This is largely due to the low-cost of hydroelectric power. As developed in this analysis, the program does not include a guarantee on how the utility spends the additional revenue.

The Product Diffusion Model

We used the classic Bass model [4] to forecast the potential growth of scenarios 2 and 3. By determining the values of α and β (the coefficients of innovation and imitation, respectively), we could forecast how each of these programs would fair in the California market. We used the following equation:

$$q_t = \alpha(\mathrm{M} - \mathrm{Y}_{t-1}) + \beta\frac{\mathrm{Y}_{t-1}}{\mathrm{M}}(\mathrm{M} - \mathrm{Y}_{t-1}) \qquad \text{where}$$

q_t = sales in period t,

M = market potential, equal to the total number of households in California,

$Y_{t-1} = \sum_{t=0}^{t-1} q_t$, cumulative sales through period t-1,

$\alpha =$ coefficient of innovation,

$\beta =$ coefficient of imitation.

According to [5], there are currently around 10,850,000 households in California. Because the capacity of renewable energy can expand over time, the potential market limit would be all households. This makes sense since all houses use electricity, except for possibly the Unabomer's. Please see [4] for the algorithm used to solve for α and β.

Effect of Repeat Purchasers in Product Diffusion Model

One of the decisions facing GreenStar is determining how long the subscription periods should be for its program(s). For our model, we used a period of one year for each GreenStar purchase. After that one year, customers would have the option of keeping GreenStar or canceling their subscription. To model repeat purchases, we used the following equation:

$$\Phi(t) = \gamma \times q_{t-1}, \quad \text{where}$$

$\Phi(t) =$ unit sales to repeat purchasers in period t,

$\gamma =$ the rate at which new customers in period t-1 become repeat customers in period t,

$q_{t-1} =$ sales to new customers in period t-1.

By adding this factor into the original Bass equation, we can determine the total number of new and repeat purchases per year. We set the units per purchase of GreenStar to one since each household participates in a green energy program on a one-time basis. So the revenue generated depends on one-time purchases, and not on multiple purchases.

To estimate the number of repeat purchasers, we used information from Wisconsin Public Service Company. Of the initial customers who made a commitment to the program, 84%

remained committed once the premiums were charged. So we let gamma equal .84. In our model, the number of repeat purchasers, not the total number of previous purchasers, influences the coefficient of imitation. In other words, repeat purchasers who show dedication to GreenStar influence the people deciding whether or not to try the green pricing program for the first time.

Results

Using the two product diffusion curves for scenarios 2 and 3 (please see Appendix Z) we estimated potential revenues for the fist six years of the programs. We set the premiums per household to $1.70/month (2) and $1.00/month (3), which is very close to what the actual programs took in. We came up with the following:

Scenario 2 - $10.3 million

Scenario 3 - $15.8 million

Scenario 2 established market share more rapidly than 1, taking 25% after 10 years. Scenario 1 took 10% after 10 years.

Price Effects

We did not explicitly include price effects in the diffusion model, but the price did influence initial demand, which in turn influenced α and β. Scenario 3 was more successful than 2 for just that reason. It had the lowest premium, and generated the most demand. This additional demand was enough to give it greater revenues over a more expensive program.

Evaluating 1 and 4

We did not develop diffusion graphs for scenarios 1 and 4 since there no time sensitive data was available. Rather, we assumed a no-growth customer base for the first five years, with premiums remaining constant. These conservative estimates showed the following after 5 years:

Scenario 1 - $145 million

Scenario 4 - $360 million

The Traverse City (scenario 1) program's participation rate is 1.8%, with a waiting list of an additional 1%. It's priced at a $6/month premium. We just multiplied the participation rate by the premium (times 12) by the California population = $21.9M/year. We did similar calculations for scenario 4 (Massachusetts Electric) which had a participation rate of approximately 15% and monthly premiums of .6 cents/kWh. As of 1995, California residents used an average of 6,260 kWh per year [6].

For all our calculations, we assumed, when faced with programs like 1-4, that California residents will act in the same manner as the other program participants. This seems reasonable, and may even be conservative. Californians are well known for being environmentally conscious.

Insights and Recommendations

The most popular of the utility-based green pricing programs was scenario 1, in which people were buying their electricity from a renewable energy resource. This aspect of the program is very enticing. By buying their power from the wind turbine, customers disassociate themselves from pollutant causing coal plant stacks. They see themselves as progressive members of society. This reasoning also seems to be motivating customers in choosing scenario 4. We think that the most successful programs will stress the fact that its customers are **not** contributing to pollution.

As mentioned before, scenario 3 was more successful than scenario 2. This was probably due to the price difference, since the programs were very similar in nature. So if a program is simplistic in that it merely asks for a monthly contribution to promote green energy, the cheaper the better. However, price difference is not the most important aspect of a program. The popularity of scenario 1 shows us that a successful program will promote renewables cost-effectively.

We believe that the way in which a provider offers green energy affects enrollment significantly. In scenario 1, the essential question was: "Do you want to support a green energy technology? If you pay a premium each month, you can buy your electricity from a wind turbine." In scenario 4, the essential question was the same, but it was phrased differently: "Would you like to buy low-cost energy at $0.023/kWh or environmentally conscious renewable energy at $0.028/kWh?" Forcing the customers to actively choose between polluting or environmentally-safe technologies is an effective way to increase enrollment rates. How many people would actually want to consciously choose polluting the environment? This means that how GreenStar is initially offered is critical to its success.

So what should GreenStar do, in light of this information?

- Try and offer renewable energy as cheaply as you can (no big news here). Even with low premiums, initial enrollments could be small (maybe as low as 2%). Make sure GreenStar is designed to function with a small customer base.
- Give customers the option of choosing their own energy resource. Educate them on the importance of using renewable technologies. Make them feel important and that they make a difference.

- Offer a program designed to make customers active participants in the fight against pollution.
- Begin marketing GreenStar as soon as possible. As explained below, there are other players who will be offering consumers green pricing programs. Capturing the initial demand is important, for we feel that once customers make a commitment to a green energy program, they are unlikely to change in the short run.

Additional Comments

Additional Information which was not incorporated into the analysis but may be of considerable interest to GreenStar.

a• Traverse City Light and Power was able to install the Wind Turbine locally. This would be very difficult to do cost effectively in most areas of California. This would limit scenario 1. The same type of program may occur with customer purchasing electricity from photovoltaic systems (comparable customer support levels have been observed); however, the higher cost of photovoltaics may be prohibitive.

b• The California Energy Commission (CEC) recently wrote the "Policy Report on AB 1890 Renewables Funding." Assembly bill 1890 authorizes the deregulation of the California electric utility industry. The policy report includes a mechanism for certifying renewable resource providers. Thus, the certification aspect of GreenStar may not be a needed service.

c• The CEC policy report also gives a mechanism for distributing per kWh consumer incentives. A hybrid green product which includes hydropower may not be eligible.

d• There are four energy providers preparing to sell green energy in California once deregulation hits: Foresight, Working Assets, Green Mountain Resources, and Enron. (This information was provided by Ralph Cavanaugh, National Resources Defense Council, in a lecture given at Stanford on May 30, 1997). It's possible that these providers (and others) may be put on a state-wide ballot which would give consumers options for their energy providers. The originator of such a ballot would be the assigned independent power broker for the deregulated market. GreenStar should see if such a ballot exists and then get their name on it.

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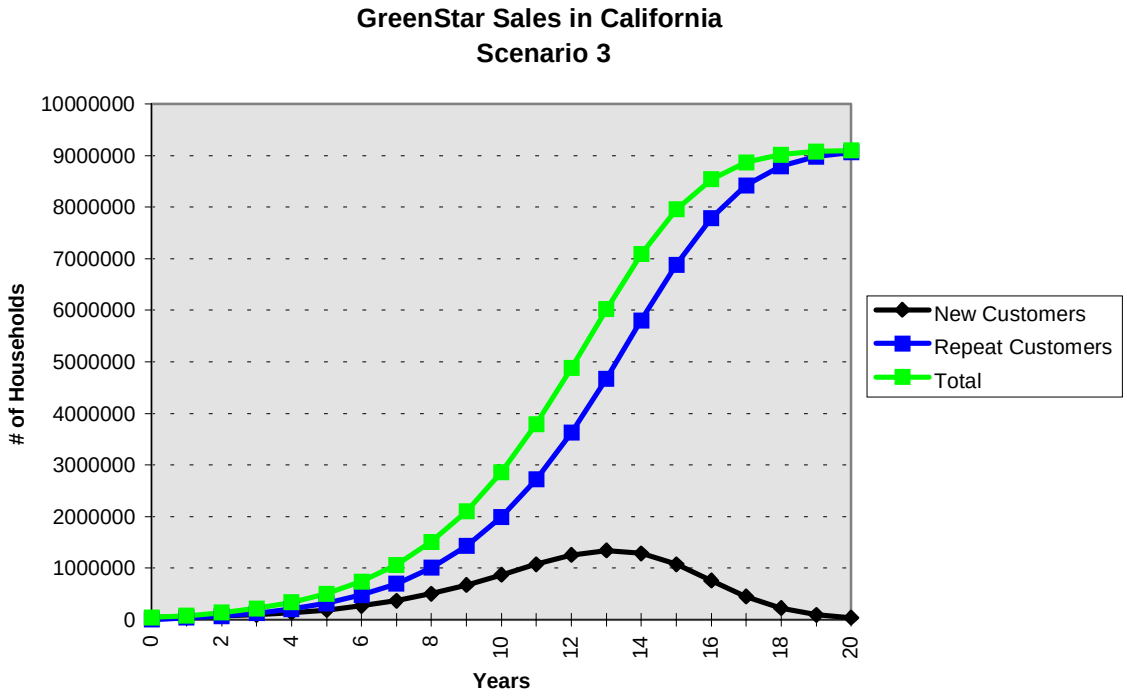
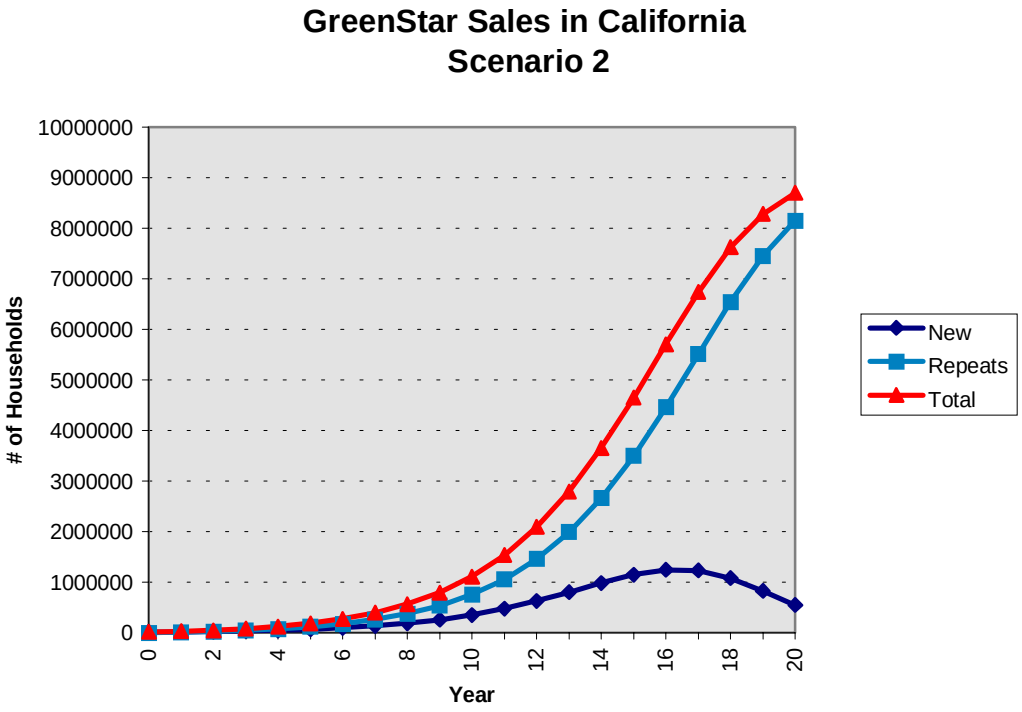
Appendix Z


GreenStar Sales in California
Scenario 3
# of Households
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0
2
4
6
8
10
12
14
16
18
20
Years
New Customers
Repeat Customers
Total

Z1


GreenStar Sales in California
Scenario 2
# of Households
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0
2
4
6
8
10
12
14
16
18
20
Year
New
Repeats
Total

GreenStar Demand Scenario 3

M	10850000
alpha	0.003846
beta	0.749266
gamma	0.84

Year	New Customers	Repeat	Total
	0	0	0
0	41729.1	0	41729.1
1	41568.61	35052.444	76621.05388
2	67470.71	69970.076	137440.7867
3	92846.945	126645.47	219492.4177
4	133552.71	204636.91	338189.6152
5	188276.01	316821.18	505097.1948
6	264566.59	474973.03	739539.6218
7	367193.59	697208.97	1064402.553
8	501877.83	1005651.6	1507529.41
9	670698.72	1427229	2097927.678
10	868423.87	1990615.9	2859039.748
11	1075634.3	2720091.9	3795726.232
12	1252895.6	3623624.7	4876520.365
13	1342381.8	4676057.1	6018438.836
14	1287720.8	5803657.8	7091378.589
15	1073543.6	6885343.3	7958886.899
16	757151.89	7787119.9	8544271.803
17	445447.76	8423127.5	8868575.261
18	220752.46	8797303.6	9018056.083
19	95535.324	8982735.7	9078271.012
20	37906.595	9062985.4	9100891.955

GreenStar Demand
Scenario 2

M	10850000
alpha	0.001511
beta	0.694046
gamma	0.84

Year	New Customers	Repeat	Total
	0	0	0
0	16394.35	0	16394.35
1	16369.5781	13771.25	30140.83
2	25873.8654	27521.7	53395.56
3	35303.8425	49255.75	84559.59
4	50142.1704	78910.97	129053.1
5	70217.1896	121030.4	191247.6
6	98412.0868	180012.8	278424.9
7	137258.155	262679	399937.1
8	190464.931	377975.8	568440.8
9	262274.727	537966.4	800241.1
10	357339.414	758277.2	1115617
11	479650.901	1058442	1538093
12	630585.466	1461349	2091934
13	805485.069	1991041	2796526
14	988998.136	2667648	3656646
15	1150885.44	3498407	4649292
16	1246859.56	4465150	5712010
17	1231086.81	5512513	6743599
18	1082368.28	6546625	7628994
19	829648.167	7455815	8285463
20	547517.928	8152719	8700237

What we learned:

Andra

First of all, I learned an immense amount about the state of green pricing in the United States today. More in the spirit of the course, I learned a lot about setting up a fundamental question about a strategy or a plan. This was not without a great deal of initial stress and floundering. Initially, we were caught in the desire to gain more and more information, because the information that we had did not tell us what we wanted to know. In this sense, I learned what we ought to have done. We should have taken up a fundamental strategy decision from the start. Choosing a downstream decision is dangerous, because it may turn out to be an inappropriate question.

In working through our project in particular, I learned about product diffusion models. I found that variations of the Bass model can allow it to better capture the essence of the market. However, the assumptions that a Bass product diffusion model makes, limits its general use. Other models that are still unknown to me, may be a better choice for analyzing green energy as a product. Also, the course in general introduced me to conjoint analysis.

Greg

In terms of concepts and techniques, I learned a great deal about the Bass model and its numerous applications. It is an extremely flexible model. I also enjoyed learning about conjoint analysis, and would like to get the chance to use it in a real-world situation someday. Overall, I feel the course has really improved my skill-set and given me a broad range of tools to use when I start my consulting job in a few weeks.

From the project itself, I found out how difficult it is when someone is trying to establish a new business. Now I know why venture capitalists are the cream of the crop. It takes a lot time and analysis to extract useful information from an abstract situation such as GreenStar's. To be an expert at such a thing is definitely a special skill. I also learned much about the renewable energy industry, and, if given the option, I will certainly purchase green electricity in the future. What was surprising to me was the size of the utility and power exchange market. I never thought that it was so massive, in terms of structure and money.