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EXECUTIVE SUMMARY

Program Overview

The Northwest Energy Efficiency Alliance (Alliance) has implemented the Billing Simulation for Small Commercial Facilities Venture (Venture) with the primary goal of increasing the viability of privately funded energy efficiency projects by reducing the costs and uncertainties associated with delivering energy efficiency services and verifying their impacts. This increase in efficiency projects is anticipated through the promotion and use of EZ Sim, a building analysis software tool developed by Stellar Processes.

As noted in the Venture Statement of Work, performance-based efficiency improvement projects face the following market barriers:

- Inability to economically measure and track energy performance over time in small commercial facilities
- General lack of confidence among building owners in the performance of energy efficiency measures and reluctance to use performance-based contracting
- Difficulty of cost-effectively delivering performance-based services

In an effort to reduce these barriers and accomplish the Venture’s goal, Stellar Processes is refining and creating acceptance of a billing-based simulation software package that can be used to:

- Diagnose energy patterns and consumption
- Calibrate savings estimates to agree with actual energy usage
- Estimate energy end uses within a facility
- Verify vendor claims for energy products and services
- Generate performance targets and compare against actual energy bills
- Provide a picture of current operations
The Venture’s goal translates into an exit strategy of developing a stand-alone, for-profit savings validation service.

The target audience for EZ Sim software is primarily existing small commercial buildings, local governments, and the utilities and energy service companies that serve them. A significant emphasis of the Venture is to target businesses and utilities in rural, dispersed locations that are overlooked by the mainstream energy services industry.

**Evaluation Overview**

As part of program implementation, the Alliance contracted with Pacific Consulting Services (PCS) to perform an evaluation of the Venture. The evaluation objectives are three-fold:

- Measure progress toward overcoming identified product and market barriers
- Measure progress toward the Venture’s exit strategy
- Provide periodic and timely feedback to refine the Venture

As part of the evaluation, PCS has committed to performing a number of tasks over the course of the Venture, including:

- Perform a baseline assessment of the software's market potential
- Assess program research and verification activities, focusing on EZ Sim case studies and interviews with case study participants
- Assess training and technical assistance, focusing on participant feedback from user training sessions
- Perform a follow-up assessment of Venture marketing and promotion

This initial Market Progress Evaluation Report (MPER) focuses on the first item; that is, performing a baseline assessment of the software’s market potential. This baseline assessment builds on the market assessment conducted as part of the Venture. Our research focused on refining the estimate of baseline market potential for the software, establishing measures of potential viability of the software, and evaluating how well the objectives
of the original baseline survey were met. Information on the following have been identified as particularly useful for refining the Venture:

- Potential conflicts between the exit strategy of developing a sustainable business and the Venture’s focus on servicing small, rural customers
- Viable market segments that may have been overlooked
- Potential market barriers that may have been overlooked
- Refined estimates of near-term market potential

For this review, we interviewed 13 industry experts and potential product users. Interviewees represented utilities, ESCOs, and government agencies (primarily resource conservation managers for county and state agencies). These segments were selected as being the most likely users of the software, based on the market assessment. In determining who to interview, we aimed for a mix of people with actual experience using the software and people from the software’s target audience with no specific experience using EZ Sim.

**Evaluation Conclusions**

**Conflicts between the Venture's exit strategy and its focus on small, rural customers**

Baseline results suggest a potentially significant conflict between the exit strategy of developing a sustainable business and the focus on servicing small, rural customers. This potential conflict arises because, on the one hand, the prospect for a self-sustaining business enterprise centered on the EZ Sim software appear reasonably bright while, on the other hand, prospects look dimmer for EZ Sim's widespread adoption leading to expanded private sector energy efficiency initiatives aimed at small, rural customers. Our pessimism relating to benefits accruing to small, rural customers stems from survey respondents' reports that the factors that lead them to favor large projects over small projects are things like overall earnings potential—that is, factors that are, for the most part, unaffected by adoption of EZ Sim.

It must be emphasized that any conclusion regarding the degree of any future conflict between program goals is necessarily somewhat speculative. Concern that a conflict may be brewing between the exit strategy and the focus on small, rural customers could prove misplaced as more information becomes
available over time. In particular, the above conclusion may be based on respondents' underestimation of the software's added value due to new capabilities such as savings prospecting. Initial findings suggest that respondents, particularly non-users, underestimate the software's value added to some degree but it is unknown whether the true value added will prove sufficient to make energy efficiency projects at small, rural facilities lucrative once the industry recognizes the software's true potential.

**Viable market segments that may have been overlooked**

Organizations with multiple facilities, franchises, or branch locations could make effective use of EZ Sim. Particular opportunities seem apparent in large property management firms, such as Cushman Wakefield. These types of organizations are large enough to have well-trained facility managers and resource conservation managers on staff. They deal with large numbers of facilities, some of which are not large or complex enough to warrant the hourly load modeling capabilities of DOE2 and similar software packages.

**Potential market barriers that may have been overlooked**

Market barriers identified in the Venture Scope of Work may not be the key factors limiting performance-based or user-funded energy efficiency projects. In particular, we found that:

- While EZ Sim may make it more economical to measure and track energy performance over time in small commercial facilities, this added economy appears unlikely to give projects in small commercial facilities that earnings potential needed to be attractive to ESCOs.

- Building owners are generally confident in energy savings estimates. Any lack of confidence among building owners in the performance of energy efficiency measures is apparently unrelated to the modeling algorithm for estimating savings.

- Modeling costs apparently represent a small fraction of the overall cost of delivering performance-based energy efficiency services, therefore any reduction in the modeling costs will have little effect on the overall cost-effectiveness of potential projects.
Access to financing is unanimously seen as the biggest barrier to getting efficiency projects underway. Addressing this barrier falls outside the Venture's scope of activities, leading us to question whether widespread adoption of EZ Sim will translate into significant expansion in private-sector energy efficiency projects.

While EZ Sim may not provide the magic bullet for overcoming barriers to performance-based contracting, we view the prospects of market success for the software with guarded optimism. The tool is viewed with enthusiasm by those familiar with its use and with interest by those who just learned of its capabilities. EZ Sim seems to be on target in a number of areas. However, EZ Sim is likely to face a certain amount of inertia among potential users. Experienced software users have generally figured out how to accomplish tasks using their existing software that they would otherwise use EZ Sim to accomplish. While EZ Sim is generally recognized as being simpler and more elegant, potential users may need to be convinced that the gains in performance and efficiency justify switching software. Our basis for guarded optimism stems from the fact that potential users do not appear to fully appreciate the value that EZ Sim offers. Thus EZ Sim could achieve widespread use if and when a critical mass of influential software users fully realize its potential.

**Refined estimates of near-term market potential**

Our review of the likely number of ESCOs and government agencies in the Alliance service territory gave us no reason to question the validity of the market potential estimates included in the May 1998 Venture market assessment. Our confidence in those results is further enhanced by the overall consistency we observed between the qualitative results reported in the market assessment and our own findings in this study.
1 INTRODUCTION

Program Overview

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- Inability to economically measure and track energy performance over time in small commercial facilities
- General lack of confidence among building owners in the performance of energy efficiency measures and reluctance to use performance-based contracting
- Difficulty of cost-effectively delivering performance-based services

In an effort to reduce these barriers and accomplish the Venture’s goal, Stellar Processes is refining and creating acceptance of a billing-based simulation software package that can be used to prospect for savings opportunities, verify savings performance, and commission new and existing buildings. The Venture’s goal translates into an exit strategy of developing a stand-alone, for-profit savings validation service.

The target audience for EZ Sim software is primarily existing small commercial buildings, local governments, and the utilities and energy service companies that serve them. A significant emphasis of the Venture is to target businesses and utilities in rural, dispersed locations that are overlooked by the mainstream energy services industry.
Evaluation Overview

As part of program implementation, the Alliance contracted with Pacific Consulting Services (PCS) to perform an evaluation of the Venture. The evaluation objectives are three-fold:

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- Perform a baseline assessment of the software's market potential
- Assess program research and verification activities, focusing on EZ Sim case studies and interviews with case study participants
- Assess training and technical assistance, focusing on participant feedback from user training sessions
- Perform a follow-up assessment of Venture marketing and promotion

This initial Market Progress Evaluation Report focuses on the first item; that is, performing a baseline assessment of the software's market potential.

Baseline Assessment Background

The PCS evaluation was designed based on findings and results from a market assessment previously performed by Stellar Processes. As part of the Venture planning process, Stellar Processes conducted a market assessment to accomplish the following objectives:

- Identify the market segments that would use the product and quantify the number of such customers in the Alliance region
- Document the current state of opinion regarding the practice of commercial conservation among practitioners as a benchmark for describing a transformation of these opinions in the next two years
- Identify barriers to use of the product and possible remedies
Expose the product to the subjects and solicit responses

The market assessment was conducted using in-depth interviews of twelve persons representing a range of roles in commercial energy efficiency. They included a utilities manager for a large private health care organization, representatives of major energy services contractors, utility energy conservation specialists, and public sector energy efficiency specialists, including a resource conservation manager, a facilities manager, and a state energy extension agent. Respondents were interviewed regarding general issues relating to the broad market and their reactions to specific case studies involving the EZ Sim software.

This preliminary research suggests that the most viable market appears to be among resource conservation managers, who expressed a need for a limited, but easily accessible, modeling capability. The least receptive market segment appears to be among large facility energy engineers, who believe that they already have the capabilities offered by the model. Interview results were used to estimate the software’s market potential in each of five market segments*: Total near-term (two year) market potential in the Alliance region was estimated to be about 85 users, with a national market of about 1,700.

Stellar Processes also conducts post-training surveying of EZ Sim users. An eight-question survey form is fielded at the completion of each EZ Sim training seminar. To date 17 of 40 participants have completed the survey, and the results of these surveys indicate that users are enthusiastic about the quality of training that they receive. (On a scale of 1 to 5 with 5 being excellent and 1 being poor, all elements of training receive a rating greater than 4.0.) Most users (88%) expect to use EZ Sim for purposes of on-site audits and to diagnose problem buildings. Users are least likely to use EZ Sim for verifying vendor claims regarding equipment performance (41%).

EZ Sim Development

Staff at Stellar Processes of Portland Oregon developed EZ Sim and began using it for in-house projects during 1995. Over the next two years, EZ Sim

was improved and developed as a tool for utility representatives under the CARES program in 1997. Currently, Alliance funding is used to train users of EZ Sim in its latest version, 4.05.

**Summary Product Description**

EZ Sim software, which is the focus of this program, is a building simulation model capable of being reconciled with monthly billing data for electricity and other energy purchases. The product is designed to operate with monthly average data instead of hourly data, making it simpler to use than other engineering models. Nevertheless, it is intended to be more physically descriptive than the simple statistical models used in most energy accounting software. The software is intended to be used to:

- Diagnose energy patterns and consumption
- Calibrate savings estimates to agree with actual energy usage
- Estimate energy end uses within a facility
- Verify vendor claims for energy products and services
- Generate performance targets and compare against actual energy bills
- Provide a picture of current operations
- Prospect for energy savings by developing "what if" scenarios, calculating savings under differing scenarios

Because the software relies on seasonal load variations to decompose metered whole-building monthly electricity consumption into its end-use components, it is most applicable to facilities with significant heating and cooling or other seasonal loads. It is less applicable to facilities with little load variation, such as industrial facilities.

In addition to software development, the Venture includes a number of activities aimed at commercializing the software and supporting software users. For example, purchasers of EZ Sim software pay $350 and receive the software, a training manual, an all-day seminar on using the software, on-line support for their first two projects, and access to the EZ Sim website, which includes case studies and weather data.
EZ Sim is targeted for use by those in the energy management and conservation fields. Primarily, the market consists of energy service companies (ESCOs), energy consultants, utility representatives, and government energy conservation managers. EZ Sim is a spreadsheet-based program that uses basic building parameter information combined with utility billing data (energy consumption) to develop simulations of commercial building energy consumption. EZ Sim provides a simplified engineering simulation of energy consumption in a building. Users can change the engineering parameters to model the impact of changes in the building such as the installation of energy conservation measures or changes in building operation practices. It is designed to provide a low-cost, quick scoping method to diagnose problems, break energy consumption into end uses, and predict savings.

Figures 1, 2, and 3 show sample results from an EZ Sim analysis. Figure 1 shows a break down for a building’s consumption by end use. Figure 2 is a savings presentation from the results section for an EZ Sim report and Figure 3 is an estimation of the monthly bills based on recommended changes.

Figure 1. Monthly Demand by End Use
Figure 2. Proposal Report

Energy Usage Index (EUI)

Weather adjusted consumption is 109 kBTU/ft² per year for this facility.

The low, median and high ranges of consumption are 19, 86, 219.

Potential Conservation Savings

<table>
<thead>
<tr>
<th>Annual Consumption, kWh</th>
<th>Annual Consumption, Therms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
<td>373,451</td>
</tr>
<tr>
<td>With ECMs</td>
<td>292,836</td>
</tr>
<tr>
<td>Savings</td>
<td>80,614</td>
</tr>
</tbody>
</table>

The breakdown of energy use is shown throughout the year.

Figure 3. Proposed Monthly Bills

Monthly Electricity Bills
Normal Weather Year

Monthly Bills
- Current Bills
- With Conservation
EZ Sim Market

EZ Sim is marketed through the efforts of Stellar Processes staff who attend industry functions such as meetings of professional associations and trade shows. EZ Sim information is also available from web sites by both the Alliance and Stellar Processes.

To date, 40 users have been trained to use EZ Sim at three training sessions. This exceeded a Venture training goal (20 users within one year) by 100%. In addition, the 40 trained EZ Sim users represent almost 50% of the originally estimated total regional market for EZ Sim. Table 1 indicates the breakdown of user types. Training continues to be provided at sites around the region by the staff of Stellar Processes.

<table>
<thead>
<tr>
<th>User Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Utility</td>
<td>20</td>
</tr>
<tr>
<td>Investor Utility</td>
<td>6</td>
</tr>
<tr>
<td>Local Government</td>
<td>7</td>
</tr>
<tr>
<td>Consultant</td>
<td>3</td>
</tr>
<tr>
<td>ESCO</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

Table 1. Attendees of EZ Sim Training Class
2 METHODOLOGY

This baseline assessment builds on the Venture’s market assessment. Our research focused on refining the estimate of baseline market potential for the software, establishing measures of potential viability of the software, and evaluating how well the objectives of the original baseline survey were met. Information on the following have been identified as particularly useful for refining the Venture:

• Potential conflicts between the exit strategy of developing a sustainable business and the Venture’s focus on servicing small, rural customers
• Viable market segments that may have been overlooked
• Potential market barriers that may have been overlooked
• Refined estimates of near-term market potential

For this review, we surveyed a sample of 13 industry experts and potential product users. Interviewees represented utilities, ESCOs, and government agencies (primarily resource conservation managers for county and state agencies). These segments were selected as being the most likely users of the software, based on the market assessment. In determining who to interview, we aimed for a mix of people with actual experience using the software and people from the software’s target audience with no specific experience using EZ Sim. Targeted responses were allocated between current software users and potential users as shown below.

Table 2. Targeted Sample Allocation

<table>
<thead>
<tr>
<th></th>
<th>Current Users</th>
<th>Potential Users</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource conservation managers</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Utilities</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>ESCOs</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>9</td>
<td>15</td>
</tr>
</tbody>
</table>
The sample included 180 contact names from utilities, ESCOs, and local government agencies. Leads for local government and utility contacts came from the Alliance's list of member organizations. Leads for ESCOs came from the membership list of the National Association of Energy Services Companies, while leads for current users came from Stellar Processes. After aggregating multiple contacts from the same organization and removing the contacts from non-qualifying positions and/or organizations, a final sample size of 81 was used for interviewing. A call disposition is shown in Table 3.

Table 3. Survey Call Disposition

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>81</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call attempt</td>
<td>29</td>
</tr>
<tr>
<td>Refusals</td>
<td>2</td>
</tr>
<tr>
<td>Unqualified</td>
<td>18</td>
</tr>
<tr>
<td>Completes</td>
<td>13</td>
</tr>
</tbody>
</table>

To permit the timely delivery of this report and due to the consistency of interview results the survey process only 13 interviews of the targeted 15 were completed. The analysis presented here is based on completed interviews with 13 respondents. Table 4 shows the distribution of these respondents by market segment, software user status, and by state.

Table 4. Completed Interviews by User Status and Geographic Location

<table>
<thead>
<tr>
<th>Market Segment</th>
<th>Current Users</th>
<th>Potential Users</th>
<th>MT</th>
<th>OR</th>
<th>WA</th>
<th>ID</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Conserv. Mgr.</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>ESCO</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Utility</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

As part of these interviews, we explored respondents' primary issues relating to energy efficiency performance measurement. Respondents were surveyed on the topics shown in Table 5. To aid interviewees in responding to
questions directly related to EZ Sim, we faxed interviewees advance copies of EZ Sim case studies. The interview guide and case studies used in the data collection effort are attached in Appendices A and B.

Table 5. Interview Elements

<table>
<thead>
<tr>
<th>1. EZ Sim Compared to Competing Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sources of information for determining whether a software package is professionally credible</td>
</tr>
<tr>
<td>2. Perceived credibility of EZ Sim, based on case studies and any other information sources interviewee may have</td>
</tr>
<tr>
<td>3. Nearest software competitors</td>
</tr>
<tr>
<td>4. Perception of EZ Sim relative to the competition</td>
</tr>
<tr>
<td>5. Value respondent attaches to various software attributes that distinguish it from competing products, such as savings prospecting, scenario testing, and reconciliation of engineering calculations and energy bills</td>
</tr>
<tr>
<td>6. Respondents' willingness to pay for software with EZ Sim's attributes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Market Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Existing market of EZ Sim</td>
</tr>
<tr>
<td>2. Near-term market potential</td>
</tr>
<tr>
<td>3. Viable market segments that may have been overlooked</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Decision-making Process for Energy Efficiency Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General decision-making process</td>
</tr>
<tr>
<td>2. Criteria for pursuing particular projects.</td>
</tr>
<tr>
<td>3. Criteria of EESP for pursuing particular types of customers or clients, especially small commercial facilities</td>
</tr>
<tr>
<td>4. Level of confidence among building owners in the performance of energy efficiency measures</td>
</tr>
<tr>
<td>5. Sources of information for judging credibility of energy performance claims</td>
</tr>
<tr>
<td>6. Relationship between building owners' confidence in the performance of energy efficiency measures and their willingness to use performance-based contracting</td>
</tr>
<tr>
<td>7. Potential market barriers that may have been overlooked</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Familiarity with EZ Sim and its Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General computer proficiency of staff likely to use software</td>
</tr>
<tr>
<td>2. Willingness to invest time and resources into mastering new software packages</td>
</tr>
<tr>
<td>3. Level of effort required to become proficient in using EZ Sim</td>
</tr>
<tr>
<td>4. Requirements for ongoing software support</td>
</tr>
<tr>
<td>5. Interest in learning more about EZ Sim</td>
</tr>
</tbody>
</table>
3 FINDINGS

The following findings are broadly analogous to those presented in the Stellar Market Assessment. The earlier market assessment was focused on identifying and quantifying EZ Sim market segments and defining market barriers to EZ Sim’s use. This PCS study tested for the validity of market barriers identified in the earlier study but also investigated functional software features and related decision-making processes.

In areas such as market characteristics, potential customer segments, and current practices, the two studies are in close agreement. The one area of divergence between the two reports is described in the following section on overlooked market segments.

EZ Sim Compared to Competing Products

Determination of Software Credibility

Respondents were asked to describe the sources they referenced and the process they used to determine the credibility for a building simulation or analysis tool. The results show that no single process serves as a "standard" testing procedure. It is also apparent that determining the relative credibility of a software product is considered a straightforward process by respondents. Primarily such determination is based on an individual's own expertise. The process ranges from simply "eye-balling" the product to ensure that it is logical and practical—based on the reviewer's own expertise—to actually testing the product against known benchmarks such as completed projects with data known to be accurate. One respondent described this as looking at how reasonable the basic approach used by the software designers to calculate savings and consumption was.

Regarding the level of trust in results generated by modeling and diagnostic software, only two of the 11 who responded to this questions said that they thought it advisable to verify the results of analyses from major software products. Both of these respondents were from utilities. One said that his
verification process is simply to perform a spot check of the simulation results using hand calculations. He does this to ensure that the provider of the engineering analysis (usually an ESCO) has used the software properly. In general, respondents did not think that results generated by a software tool warranted close scrutiny. Rather, the value of such tools is seen as resulting from the expertise of the operator. As one respondent said, "If you ignore the old adage 'garbage-in-garbage-out' and instead think 'garbage-in-gospel-out' you can get yourself in plenty of trouble." Another respondent confirmed this need for user expertise saying, "I know what is reasonable and if a software program comes up with out-of-whack findings, I question its value."

Most respondents seem to view modeling and diagnostic software as tools that must be used carefully. The user's own experience serves as the "reality check" on the output generated by the tool. As one ESCO respondent said, "The key is that the user behind the tool must have expertise. The tool is used to verify user's own judgment. So, further verification isn't necessary. The expertise is what customer is hiring, they're not renting a software package."

Respondents' comments indicate that it is a standard practice to stick with the software tool they are familiar with as long as the tool meets their needs. Respondents do not seem to actively seek out new software tools. If a tool is found to be adequate for the user's needs, it is likely to be used. One respondent said that his current tool met his needs simply because he is unfamiliar with any other tool. Awareness of new products is primarily carried out by word-of-mouth and learning what the "experts" are using. These experts are people whom the software user trusts, such as colleagues or acknowledged experts in a building-related field.

**Perceived Credibility of EZ Sim**

Only one respondent said that he was not yet confident in the accuracy provided by EZ Sim. This respondent qualified his statement by acknowledging that the buildings on which he has used EZ Sim have been "problem" buildings characterized by unusual conditions. He said that Stellar Processes continues to be very helpful in working with him to ensure that EZ Sim is correctly applied to these projects. All respondents were asked their opinion regarding EZ Sim's accuracy (non-users based their opinion on the
case studies provided to them). Six of nine respondents said that they feel EZ Sim's accuracy is comparable to available alternatives. Three of the nine said they think EZ Sim's offers greater accuracy than available alternatives. One of these three specified that he thought EZ could be more accurate on smaller (<50,000 square feet) buildings but probably not on large buildings. Another said that EZ Sim's potential for greater accuracy is due to the function of “tuning.”

As one ESCO respondent noted, it is a tool's ability to determine the delta, the change, resulting from differing conditions within a building that is most important. He feels that EZ Sim is potentially better at pin-pointing the delta value than are competing products. In his mind, accuracy in determining potential or realized change is more important than accurately determining a buildings consumption level and erring on the shifts in energy consumption.

Reasonable accuracy with reasonable effort seems to be the value that respondents favor. As one respondent said, "If EZ Sim can be within ±5% and another tool claims ±2% but requires twice the data collection and effort then who's the winner?" EZ Sim's ease of use and simple inputs are seen as distinct advantages. Since the tool can be effectively used in an economical manner, it provides data that may be more useful than that generated by more complicated tools such as DOE2. This is due to the fact that when DOE2 is used on small buildings it is applied in a “short-hand” manner based on square footage and not including much detail. Thus, as applied in real world conditions, EZ Sim offers users more detailed results on smaller buildings.

When EZ Sim users were asked how well EZ Sim has met their expectations for accuracy, three said that it has exceeded their expectations and a fourth said that it has met his expectations. The other three said they had not used the software enough to offer an opinion.

Software Competitors to EZ Sim

ESCOs are the most intensive users of analysis software. It is normal for an ESCO to use multiple tools. For example one uses DOE2, Trane Trace, and also Utility Manager, its own software product. Conservation managers for government agencies and respondents from utility companies are less likely to have used any of EZ Sim's competing software tools. Overall, DOE2, Trane
Trace, and Utility Manager are the three competitors mentioned most often by those familiar with building analysis tools. Only two respondents said that they were not familiar with any competing software products. Both were conservation managers.

While utility respondents and some conservation managers are generally aware of competing products, they are less likely to use these products than are ESCO respondents. This high awareness/low usage rate reflects the fact that utilities and conservation programs often depend on outside service providers to perform complex building analyses. The resulting data is then used by utility staff and conservation managers in consultation with service providers to determine the recommended actions for a given project.

Table 6. Awareness of Competing Software Tools

<table>
<thead>
<tr>
<th></th>
<th>DOE2</th>
<th>Trane Trace</th>
<th>Utility Mgr</th>
<th>Micro Access</th>
<th>Market Mgr</th>
<th>Other**</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESCO</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Conserv Mgr.</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Utility</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total*</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

* Totals represent number of times the software tool was mentioned.
** Other includes APEC, Visual DOE, Track Load, and Enact.

Of the nine respondents who had an opinion regarding their current software's ability to meet their needs, 6 said it did meet current needs. However, some also complained of the data intensive nature of DOE2 and Trane Trace. It was also mentioned by two respondents that programs and/or customers determine which software is used. For example, the Rebuild Idaho program is designed to be implemented using Utility Manager as the analysis software. An ESCO respondent mentioned that it is often required to use DOE2 by utilities with whom it partners on projects. The utilities and their customers feel comfortable trusting the results of DOE2 analyses. However, this ESCO also performed parallel analyses with its own proprietary software that more closely meets its needs.

Key benefits provided by competing products can be summed up as "they do what they're supposed to do." In general, it seems that respondents are
satisfied by the familiar. DOE2's strength is in its wide acceptance and perceived legitimacy as an unbiased and accurate tool. It was also described as being very effective on large, complex buildings. However, DOE2 was also cited as cumbersome and overly data-intensive. As one respondent described it, the primary function of using DOE2 is to establish a benchmark that the customer is comfortable with. In addition, utilities are familiar with DOE2 reports—there is a comfort level with DOE2's look and feel.

When asked to describe the shortcomings of competing products, DOE2 was cited as having data intensive requirements, consequently resulting in expensive analyses. DOE2 is viewed as a tool to be used on large and complex buildings. As one ESCO respondent said, "DOE2 is very cumbersome and labor intensive. The results are no better, no worse than any other tool."

Trane Trace was also described as overly complex. One respondent singled out Trane Trace as inadequate because of the difficulty to generate a base-line building from which "what if" scenarios can be performed. Utility Manager was described as being difficult to learn. One respondent said that the complexity of its features made it cumbersome to take advantage of them.

Inadequate weather data was another area identified as a shortcoming for competing products. In existing software tools, weather data is restricted to historical values, users can not enter actual local weather data. In addition, weather data is only available for major towns and cities. For example, one respondent said that for the whole state of Montana DOE2 can process the weather data for six cities—far too few according to him.

Two respondents mentioned that all the competing software packages do a poor job of accounting for energy control systems. They both felt that the complexity of modern systems was not taken into account and, consequently, savings potential was under-reported. One ESCO that specializes in control systems has developed its own proprietary software tool to adequately account for the benefits of a well-planned control system.
To further identify the features that respondents value in analysis software, they were asked to rate the relative value of six characteristics dealing with the ability of software to:

- Diagnose energy patterns and consumption
- Calibrate savings estimates to agree with actual energy usage
- Estimate energy end uses within a facility
- Verify vendor claims for energy products and services
- Generate performance targets and compare against actual energy usage
- Prospect for energy savings by developing "what if" scenarios, calculating savings under differing scenarios

As shown in Figure 4, respondents' rating of software capabilities was consistently high. The ability of a software product to diagnose consumption and to serve as a prospecting tool were the two most valued characteristics. All respondents rated a software's capability to validate the claims of equipment vendors as a low priority. Variances between respondent types were greatest regarding the capabilities to estimate energy end uses within a facility and to verify vendor claims regarding energy products and services. Utility respondents valued these the least while conservation managers valued them most.
For all programs, it was noted that the user has to have some expectation regarding the analysis outcome. One respondent said, "Inexperienced people can easily be fooled. All software is based on assumptions and these can, after a number of layers of calculation, lead to inappropriate findings."

**Perception of EZ Sim Relative to the Competition**

In general, EZ Sim is not viewed as a tool that generates unique information. Rather, it is seen as a tool that is unique in its combining a useful set of features with an intelligent simplicity. Only one respondent said that EZ Sim generates data that is not available from competing software. One respondent summed it up as, "In one way or another, you can do all these things with other software. The problem is that it’s difficult and cumbersome and can require the use of multiple software products to get a result."

(Scale 5 = most valuable, 1 = least valuable)
Two EZ Sim users said that the software's performance has been good enough that they can imagine using EZ Sim as their primary tool. However, among current users of other analysis software tools, EZ Sim is viewed as a tool to augment existing tools such as DOE2 and Trane Trace. On the other hand, among EZ Sim users who had previously not used building simulation software, EZ Sim is viewed as a new tool that offers greater utility than the previous methodologies, such as simple hand calculations and vendor's advice.

As noted earlier, six of nine respondents said that they feel EZ Sim's accuracy is comparable to available alternatives. Three of the nine said they think EZ Sim offers greater accuracy than available alternatives. Respondents tended to portray EZ Sim as a simple yet powerful tool that they would use in conjunction with other software tools. It is not generally thought of as a tool that will replace the more complex competing software such as DOE2. However, this attitude may vary with project size. Due to the acceptance of EZ Sim as an excellent tool for smaller projects, it may be that EZ Sim would be viewed as a replacement to “shorthand” use of DOE2.

**Valuation of EZ Sim Features**

When asked to describe the most valuable benefits available from EZ Sim, ease-of-use was the primary benefit cited by respondents (8 of 13). Next, the simplicity of inputs and the "prospecting" features of EZ Sim were cited most often (6 each). Three respondents said that the ability to "tune" EZ Sim to a particular building was one of the best features. Other benefits described were: EZ Sim results are easy to understand and communicate to non-technical people; weather data is real local data rather than generalized historical information; and EZ Sim functions on real-world conditions. One utility respondent noted that it is a great advantage to be able to generate an initial analysis before going on-site. He noted that, since he has access to billing data, he can generate a preliminary analysis before meeting with the customer. Then, armed with the bulleted analysis results generated by EZ Sim, he finds it easier to communicate with customers.

As noted, the ability of users to prospect with EZ Sim was cited as a primary benefit. Respondents liked that EZ Sim offers a method for field staff to
quickly assess whether a candidate building is worthy of closer scrutiny. This ability to "prospect" economically for savings potential was noted by three of the four ESCO respondents. A utility respondent described his use of EZ Sim: "...it [EZ Sim] allows me to make decisions without getting into the project too deeply. EZ Sim allows me to do 'first cut' without even going into the building. ...Is the building even worth dealing with? Within a few hours I can figure out whether or not an on-site is worthwhile...."

Three respondents commented on the direct and effective logic on which EZ Sim is based. One ESCO respondent defined EZ Sim as "transparent." He appreciated that EZ Sim was not "black box-based as is most software." He also felt that EZ Sim does a better job of concentrating on the aspects that make the most difference to energy consumption. He gave as an example the quality of a building's construction. He said that the quality is more critical than the materials used in the building. A DOE2 analysis will treat two buildings as the same if they are made of the same materials. However, according to this respondent, the quality of construction plays a much larger role in energy usage than do materials. As another respondent worded it, "Because EZ Sim is thermodynamically based it is founded on real world principles and not a structure of assumptions." He too commented on the effectiveness of EZ Sim's transparent logic, "Users can examine and see where and what energy is going to which building element. Then you can ask, 'Is this what should be expected?' This ability to correlate different building traits and performance allows EZ Sim to serve as a diagnostic tool."

To identify the characteristics of EZ Sim software that respondents value most, they were asked to rate the relative value of six characteristics.

- EZ Sim uses monthly average billing data instead of hourly consumption data. It is designed to compare against actual monthly utility bills
- EZ Sim requires simple weather data—just average daily temperature
- EZ Sim is based on building physics, not a statistical curve-fit, so you can change a physical parameter to see what difference that would make in your facility
- EZ Sim provides information as graphical pictures
• EZ Sim allows predictions of future utility bills and energy efficiency measure savings

• EZ Sim can be used to verify performance targets

When asked to rate six features of EZ Sim's features on a scale of 1 to 5, respondents varied somewhat by business type. As evident in Figure 5, ESCO respondents tended to rate all EZ Sim features as less valuable. That EZ Sim calculates findings based on a specific building's physics and that it provides this data in an easy-to-read graphical format are the two features valued most by respondents.

Figure 5. Valuation of EZ Sim Features

(Scale 5 = most valuable, 1 = least valuable)

Regarding perceived flaws or omissions in EZ Sim's capabilities, respondents were asked to describe what they thought was missing from EZ Sim. Ten of
the thirteen respondents either had no opinion or recognized no problem areas. One respondent mentioned that EZ Sim was originally missing separate scheduling data for lighting and HVAC but noted that this omission had been corrected in the latest version of EZ Sim. Another respondent wanted access to localized weather data and felt that the available weather data for one of his buildings represents a micro-climate too far from the site to be accurate. The third respondent stated that EZ Sim should not be billed as an accounting tool. The user felt that EZ Sim does not perform these functions sufficiently well to be marketed as an accounting tool.

Respondents were also asked to identify an area, feature, or detail of EZ Sim that raises questions for them. Tuning was mentioned most often—by three of nine respondents. As one respondent said, "Tweaking the overall building is easy but refining the tuned model is challenging." Other areas of concern, mentioned once each, were the ease of convincing customers of EZ Sim's accuracy, proper use of the commissioning report function, ensuring that EZ Sim was not marketed as a tool for non-technical users, and dissatisfaction with EZ Sim's spreadsheet-style interface.

None of the four conservation managers had anything to suggest when they were asked to describe what they thought was missing from EZ Sim's capabilities. However, one manager did note that he found the spreadsheet interface to be unacceptable and that this alone would keep him from purchasing the software. He suggested that EZ Sim be designed to mirror other Windows-based programs. He mentioned that he had just made the decision to purchase Visual DOE largely due to its "modern" interface. One of the four ESCO respondents had the suggestion, as mentioned above, to stop marketing EZ Sim as an energy accounting tool.

One of the utility respondents said that he would like to have EZ Sim characterize a building's approximate cooling and heating load (this is now a feature in EZ Sim's latest version). He said that when customers have problems stabilizing their building's temperature it is often difficult to locate the problem. It could be due to insufficient capacity or to a control system error. The more HVAC details EZ Sim can process the more likely he thinks it will be to pin-point problem areas within a building.
Willingness to Pay for EZ Sim

Respondents were asked if they were familiar with the cost of energy audit and management software. If so, they were then asked if the cost of EZ Sim was an underpriced bargain, just about right given the competition, or a bit overpriced. Seven of the 12 respondents said that, at $350, the cost of EZ Sim is a real bargain and is probably underpriced. Utility respondents seemed to be the most impressed with EZ Sim's low price. One respondent characterized EZ Sim as "way underpriced" and mentioned that Trane Trace costs $3,000 plus $1,000 per year for product support. ESCO respondents also felt that EZ Sim represents a good deal. However, two ESCO respondents noted that, although the utility of EZ Sim was well-worth the price, EZ Sim is too new to have proven itself and therefore the initial price should be kept low.

Two respondents from Montana took issue with the price of EZ Sim. One said that he thought the tool was overpriced. He then qualified his statement by saying that, as a state employee, he is used to receiving cut-rate pricing on everything. The other Montana respondent said he knew that the price of EZ Sim is a bargain. However, he also felt that, since most users in Montana would be first-time users unfamiliar with analysis software prices, reaction to EZ Sim's cost might be a barrier to its use. He said that Montana has a poor economy and that wages are the lowest in the nation. He noted that few organizations would think to perform a full-building analysis using existing software tools. Until EZ Sim has a proven track record as a valuable tool, this respondent feels that its price will be an impediment to adoption.
Table 7. Opinions on EZ Sim Pricing

<table>
<thead>
<tr>
<th>Response Category</th>
<th>ESCO</th>
<th>Utility</th>
<th>Cons. Mgr.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>It's a bargain and probably underpriced</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Sounds just about right given the competition</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Sounds a bit overpriced</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I don't know enough about market to have an opinion</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>No opinion</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>13</td>
</tr>
</tbody>
</table>

Market Potential

Existing Market of EZ Sim

Among users and non-users, awareness of EZ Sim is high. Only one conservation management non-user said he was not aware of EZ Sim before the survey. All respondents recognize the value in EZ Sim. It faces little resistance from potential users in terms of being viewed as a viable tool. Rather, it seems that the market for EZ Sim is largely satisfied with current products. Unless and until they are educated regarding the benefits in ease-of-use and flexibility of EZ Sim, they have little incentive to switch. Those respondents who have actively used EZ Sim were more enthusiastic in their praise of EZ Sim than were non-users who based their answers on knowledge acquired from the EZ Sim case studies that were faxed to them as part of the interview process. The general comments made by EZ Sim users suggested to the interviewer that, due largely to EZ Sim's ease-of-use, they were applying the tool in innovative ways—exploring its capabilities in ways that current products would not be applied.

Near-Term Market Potential

As part of the Stellar Market Assessment Study, the potential market for EZ Sim was characterized and quantified. This PCS study was not intended to further quantify the market. The findings of this report largely parallel the findings presented in the Stellar report.

Largely as the indirect effects of deregulation, appreciable levels of funding from electrical utility and other government-sponsored energy-related
projects are drying up. As a result, many energy conservation programs that formerly offered free or subsidized services to building owners are no longer readily available. In some cases, small utilities and local governments can no longer depend on outside agencies to provide formerly available technical expertise. The result is a potential user base that is aware of the benefits of building analysis but that has limited funding and less access to such services.

One respondent noted the example of the Oregon Municipal Energy & Conservation Agency (OMECA). Originally formed and funded by six Oregon municipal utilities with the purpose of identifying and funding energy conservation projects, OMECA will cease operations as of September, 1999. As a result, the respondent said that his organization will no longer be able provide technical expertise and energy conservation projects that were available due to OMECA funding.

One respondent described an area for potential EZ Sim users as independent consultants. He said that many now use DOE2 but EZ Sim could enhance their portfolio of tools and make it possible to prospect for savings on smaller buildings. He said that the standard method for using DOE2 on small buildings is to apply a "shorthand" that produces "close enough" results. Calculations are done on a per square-foot basis using existing models as a base reference. With EZ Sim, he sees that more accurate reviews could be performed using the actual building data, resulting in less time and more accurate results.

One ESCO respondent described EZ Sim as a tool potentially very useful to ESCOs with undertrained engineering staff. He said that many ESCOs have grown accustomed to utility-sponsored programs and "cream skimming." In a more competitive market, where customers are funding their own projects, he sees the strength of an ESCO's engineering department as a much more important factor in its success. A lower-skilled engineering department can use EZ Sim very effectively since its use requires that users have only a basic knowledge. However, over time, the nature of EZ Sim's data needs and interface can "educate" users and improve their understanding of how a building's systems interact with each other. He said that competing products are often used by "...dumping in values and turning the crank, then blindly following the resulting numbers"—they do not require that the user
understand the process. EZ Sim results require that an engineer take a close look and, by using the tool, sleuth out effective options. He thought this ability to enrich the knowledge of the user offers an excellent benefit.

**Overlooked Market Segments**

Based on respondent feedback, the market sector that may offer the best chance for growth is in the area of facilities management. As mentioned, respondents were quick to point out that most facilities do not have sufficient staff with the necessary technical proficiency to use EZ Sim successfully. However, it was repeatedly noted that there are many opportunities in this area among large buildings with full-time maintenance staff and among firms that offer property management services. Resource conservation managers, building managers, and maintenance staff could all make use of EZ Sim to provide continual information to identify areas of potential improvement and efficiency gains—especially at facilities with high tenant turn-over and those requiring changes in equipment.

Contrary to the findings of the Stellar Market Assessment Study, the PCS study suggests large organizations with sophisticated facilities management departments may be good candidates for EZ Sim. Organizations with multiple facilities, franchises, or branch locations, and those with corporate energy conservation goals could make effective use of EZ Sim. One ESCO respondent felt strongly that to penetrate this market, it is necessary to interest corporate decision-makers as well as potential users. This distinction was noted due to what the respondent felt was a culture among building staff whereby the focus is on day-to-day operations—there is never enough time and consideration of long-term goals is thought of as a luxury. Whereas, building decision makers might have a greater appreciation of the financial benefits offered by an effective energy conservation policy. Buy-in among management could facilitate an acceptance of changed or improved practices such as might result from use of EZ Sim.

In an effort to identify potential markets for EZ Sim, respondents were asked to comment on the applicability of EZ Sim to a variety of building-related professions. Of the six professions listed in the survey, no respondent thought EZ Sim would be applicable to the needs of construction engineers and
architects. On mention of these two categories, respondents would often laugh and describe how little people in either of these positions tended to value energy efficiency. It was also mentioned that although EZ Sim is a tool that can be used by non-engineers, it does require technical aptitude and therefore would necessarily be useful to only well-trained building and facility managers. As one respondent said, "From an engineer's point of view, EZ Sim is very easy to use. However, if getting into areas such as facilities managers who may not be very technically aware, EZ Sim could be a blessing or a curse."

Those respondents who identified another profession as likely to benefit from EZ Sim named conservation managers, system designers, and utility reps. Conservation managers and utility reps have certainly been included in EZ Sim marketing efforts. The intriguing suggestion is that of system designers. The respondent explained that those people in a position to specify equipment for a building are the ideal target for a tool such as EZ Sim. This is because of EZ Sim's capabilities to show the interaction between building systems (e.g., lighting and HVAC). The respondent suggested that system designers are technically well-trained but very unlikely to be interested in using EZ Sim or its more cumbersome competitors.

Table 8. EZ Sim’s Applicability to Other Professions

<table>
<thead>
<tr>
<th>Profession</th>
<th>Applicable? (no. of responses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government auditor</td>
<td>7</td>
</tr>
<tr>
<td>ESCO auditor</td>
<td>7</td>
</tr>
<tr>
<td>Facilities manager</td>
<td>6</td>
</tr>
<tr>
<td>Building manager</td>
<td>5</td>
</tr>
<tr>
<td>Construction engineer</td>
<td>0</td>
</tr>
<tr>
<td>Architect</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
</tbody>
</table>

Respondents were evenly split regarding the usefulness of EZ Sim to building end users (i.e., facilities managers) versus service providers. Half of respondents think that EZ Sim is a tool that can be useful for end users and half view it as a tool solely for service providers. ESCOs were more likely to
view EZ Sim as a tool for service providers and conservation managers were more likely to see it as a tool for end users. Among the respondents who said that EZ Sim would be useful for end users, most qualified this opinion by stressing the importance of proper training. Typical was the answer by one respondent that EZ Sim could prove very useful to building end users but only at facilities large enough to employ full-time facilities managers.

One supporter of EZ Sim use by building end users described how important he feels it will be in the deregulated market for customers to know their own buildings. He thinks EZ Sim can provide the means for educating non-engineers about energy impacts. He thinks that building owners and operators will be motivated to learn about their building so that they are better qualified to deal with ESCOs and utilities in a marketplace less likely to offer unbiased advice. Basically, he described the situation as "buyer beware." He said that customers are better off knowing about their own facilities and then making deals directly with their utility rather than depending on an ESCO and giving up a large cut of the savings for the convenience.

Another supporter of EZ Sim use by end users was an ESCO respondent who described facilities managers as a potential "breakthrough market." He said that organizations operating buildings that are large enough to require in-house facilities management talent could make effective use of EZ Sim. He named the firm of Cushman Wakefield as an example of an organization that would be well-served by EZ Sim. Cushman Wakefield serves as both owner/manager and offers management services to other building owners. A large qualified staff is on hand to coordinate the numerous changes required at any sophisticated office complex—changing tenants, new equipment needs. He thought that, if marketed to the right people (i.e., management) the potential benefits to such an organization would warrant its adoption of EZ Sim. He described EZ Sim as an excellent tool to determine impacts on building and operations costs.

The view that EZ Sim would not offer enough benefit to building end users is summed up by a respondent who said, "Most maintenance and facilities managers have way too many responsibilities. Energy efficiency is frosting and no one has the time to devote regular attention to this one area. Keeping tenants happy, the heat on, and the lights working is job number one."
Although he was impressed with EZ Sim's capabilities, this conservation manager said that he definitely sees EZ Sim as a tool for service providers and not end users.

Table 9. End User Versus Service Provider as User of EZ Sim (by number of responses)

<table>
<thead>
<tr>
<th>Respondent Category</th>
<th>Service Provider</th>
<th>End User</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESCO</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Utility</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Conservation Mgr.</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Decision-making Process for Energy Efficiency Projects

General Decision-making Process

Although decision making processes are varied, in general, if savings can be realized within a pay back period of less than five years the project is considered as viable. Pay back time periods are dependent on the measure type (e.g., lighting installations should pay back within 2 years while HVAC measure may take five), and on the business type (the pay back period for a high-risk business would be shorter than for a government facility or low-risk business type). The measure-type dependency is due to the risk of technical obsolescence since, as time passes, new technologies may be available that outperform the installed measure. The business-type dependency is related to the risk of business failure and resulting financial loss.

Respondents were asked to describe the primary steps or stages that they use when analyzing a building's energy efficiency. Among utility respondents, the process was similar. Contact between customer and the utility is established—initiated by either party. An audit is then performed at the customer's facility. At this point, utilities either continue to participate in the project—usually if they are providing financing or some other incentive program—or the customer is provided the audit result and takes it from there. If the utility maintains involvement in the project, it is usually in an advisory capacity. The utility might coordinate the participation of an ESCO and oversee post-installation savings verification.
Utility respondents appear to make little direct use of DOE2-based tools. Rather, they depend on the results of such analyses as provided by an ESCO or other consultant. One respondent said that his utility uses on-site inspections and hand-calculations to verify the work of outside engineers. It is interesting to note that half of EZ Sim trainees have been from utility companies. Apparently, EZ Sim is not viewed by utility users as a tool directly analogous to DOE2 systems.

Conservation managers use a similar process in that they serve in the capacity of advisors and coordinators more than direct service providers. Again, ESCOs and other consultants play a large role in the actual implementation of energy efficiency projects. The dynamics are changing due to the loss of funding for energy efficiency projects. It is more common for local and state government agencies to fund their own projects. This has resulted in a greater challenge to "sell" a project to building administrators due to the lack of finance options.

For ESCOs, jobs often come to them through utilities who are serving as project coordinators. The ESCO performs an engineering analysis of the candidate building, examining the systems, controls, conditions, and usage. After modeling the results, recommendations are made to the customer. It was noted that today's projects are increasingly complex and often involve developing sophisticated energy control systems. The days of simply walking in and recommending a new lighting system be installed are over. Beside their engineering expertise, an important value that ESCOs bring to a project is the ability to finance the project.

Respondents were asked to describe the functions that they consider an absolute requirement for any energy simulation and/or billing analysis software. Accuracy was mentioned most often (5 of 11). One respondent's response was typical, "It must be accurate—especially for savings estimates. The basic logic must be well-thought out since the assumptions used in crunching the numbers determines a tool's value." Another area mentioned multiple times (3 of 11) was that it must offer users the ability to make comparisons between multiple scenarios for the same building. One respondent said that software needs to provide energy savings on a monthly basis, in values of both kW and kWh. Software should also specify the
amount and source for savings. He gave as an example a project that includes upgrading an air handling system. He said that it is easy to exaggerate savings and artificially inflate demand charge savings in such cases if one does not do a reality check. In Montana, temperatures are extreme and HVAC fans are usually running longer than they would in a more temperate climates, "Therefore, it isn't okay to use the standard value for fan load," the respondent said. It is important to have control over the way in which such values are accounted for in the software.

**Criteria for Pursuing Projects**

Organizations, such as ESCOs, that will benefit from the size of savings or the cost of installations resulting from a project define criteria by which projects are qualified for further pursuit. Organizations such as government agencies have no criteria for which building will or will not qualify (unless implementing specific programs that specify qualification characteristics). Utilities also tend to use criteria based on pay back period. This is especially the case if the utility is financing the energy-improvement changes for the customer.

When asked to describe the criteria by which they decide if an efficiency project is worth pursing, utility and conservation management respondents described a variety of criteria. For example, one utility uses a rough rule-of-thumb that all projects should result in a pay back period of less than 10 years. Since most private business owners expect a shorter pay back period, the utility assumes few missed opportunities result. It is assumed that business owners are unlikely to implement projects with more than a five-year pay back period. One conservation manager mentioned that the criteria his organization uses are based on the requirements of a particular program, Rebuild Idaho. Another respondent said his organization used a project completion rate as a target goal. They tried to ensure that 20% to 30% of all proposed projects were actually completed by their customers. One respondent from a state government office said that his organization uses a net present value formula—based on all costs and benefits associated with a project. There has to be a positive net present value or the project would not be pushed forward.
Due to their nature, ESCOs have specific criteria used to determine which projects are pushed. Also, ESCOs often offer to finance projects, and earn income from this service. Most ESCOs use a combination of earning from the internal rate of return (IRR) and from fees based on savings goals. For one respondent's ESCO, the IRR must be positive within four years. The pay back period serves as a reference point and usually is expected to be 3 years or less. Longer pay back periods are accepted if the client business is well-established and therefore less likely to fail (thus placing financing arrangements at risk).

Another ESCO respondent said that his firm does not base fees on savings. The complexity of a project determines whether they will proceed. If either the energy savings is too low to justify the cost to the customer or if the complexity of the project does not ensure adequate revenues for the ESCO, then the project is not pursued.

**Willingness to Target Small Commercial Facilities**

Larger buildings offer higher earnings potential than do smaller buildings. Therefore, for-profit energy service ventures tend to focus on larger buildings. The cost of analysis is not necessarily a determining factor—the cost itself is not appreciably different between software products. However, to effectively use complex programs such as DOE2 on a smaller building requires great expertise on the part of the user since a "shorthand" method is used. EZ Sim can potentially open new market areas in the small- to medium-sized building sector because it can be used effectively by technically proficient users without the need for specific engineering skills.

Users, such as utility and government auditors, who do not have building size restrictions due to revenue-based criteria, will be able to perform more accurate and consistent building analyses using EZ Sim—especially for those organizations that currently depend on hand calculations and vendors' recommendations to design efficiency projects.

To determine if smaller buildings represent an area of missed opportunity for energy efficiency projects, respondents were asked if they used a cut-off point, in terms of building size or energy consumption, below which they do not consider it economical to offer energy efficiency services. For utilities and conservation managers, there is no apparent cut-off. Basically, they will audit
any customer who requests it. Even though two of the three ESCO respondents said that they used no cut-off point, all three described some type of criteria. For one ESCO, a project must represent 0.5 million kWh per year or more. He admitted that, with this criterion, his company misses all of the smaller "Ma & Pa" sized buildings. The other ESCOs said that a project must qualify by offering enough revenue potential to justify the ESCO's participation—they did not define this further.

**Building Owners' Confidence in Efficiency Measures**

No respondent made note of customers having a lack of confidence in energy savings estimates. Consistently, it was mentioned that customers trust energy conservation projections. Rather, the area of concern among customers was identified as post-installation performance. Customers may become dissatisfied due to unmet expectations regarding overall savings due to a lack of understanding about the impacts of changes on building processes and the impact of installations on day-to-day business operations. As one respondent said, "They [customers] trust initial estimates but they are suspect of actual savings. Post-installation verification is where the challenge really becomes big. There are so many factors that impact this, and customers just don't want to understand the implications."

It was noted that customers are not usually aware of the technologies that are being installed, nor do they appreciate the potential disruption to their business cycles due to complex installations and/or equipment adjustments. One respondent gave an example of how confusion can result from misunderstandings while both parties operate from the best intentions. In the example, a lighting project fails to produce the savings originally estimated. Usually, the respondent said, this is a result of bad data originally received from the customer. If, during the original audit, the customer said that the lights are used 12 hours a day but in actuality they are used for only 8 hours a day, the installed measures will produce less savings than expected.

**Sources of Information Used to Judge Performance Claims**

As noted earlier, respondents do not consider it necessary to verify the results of analysis software once it has been proven. Building simulation and analysis tools are viewed as means by which qualified technicians verify their
own initial hunches regarding building performance. Therefore, results are not viewed as being surprises generated by mysterious black-box software tools. Most respondents said that they use their own expertise as a double check on software-generated results and feel no need to perform further verification procedures.

Respondents were asked to describe what makes them trust building analysis software products. As noted earlier in this report, no single process serves as a "standard" testing procedure. It is also apparent that determining the relative credibility of a software product is considered a straightforward process by respondents. Primarily such determination is based on an individual's own expertise. The process ranges from simply "eye-balling" the product to ensure that it is logical and practical—based on the reviewer's own expertise—to actually testing the product against known benchmarks such as completed projects with data known to be accurate.

**Building Owners' Willingness to Use Performance-Based Contracting**

Only three of the twelve respondents said they had previously engaged in performance-based contracting (the thirteenth gave no response). No one said that they currently use performance-based contracts. One ESCO respondent said that performance-based contracting has earned a bad name in the Pacific Northwest and is not used very often. However, the current payment schemes used by this respondent's company are still based on achieving savings goals (their fees are based on a "margin" of savings. The customer has to achieve a certain threshold of savings before the "margin" is effective). ESCOs often offer customers financing services to implement efficiency projects; the financial services income makes it possible to enter into contracts where payment is not directly tied to realized savings because the ESCO's primary interest is the financing.

Respondents characterized financing as being the biggest hurdle to getting energy efficiency projects off the ground. Customers' trust in the estimated savings that is predicted by an analysis or audit is not a hindrance to projects—customers trust savings estimates. Accessing the funds necessary to install recommended changes is a customer's biggest challenge. Therefore, performance-based contracting does not necessarily offer the customer a
strong benefit unless it includes ESCO or utility help in financing the initial costs of a project.

Potential Market Barriers

The market barriers targeted by the Venture's previous market assessment and against which we compared our results were:

- The need to educate potential users to the product's value
- The investment of training time to learn the method
- Inability to economically measure and track energy performance over time in small commercial facilities
- General lack of confidence among building owners in the performance of energy efficiency measures and reluctance to use performance-based contracting
- Difficulty of cost-effectively delivering performance-based services.

Based on interviewee responses, we are not able to confirm that these are appreciable barriers to privately funded energy efficiency improvements. Regarding the first proposed barrier, the need to educate potential users to the product's value, among survey respondents EZ Sim was viewed universally as a valuable tool.

No respondents found EZ Sim's training requirement to be an impediment to using the tool. This second proposed market barrier does not seem to be a true impediment to EZ Sim adoption.

For the third proposed barrier, small facilities being overlooked, it seems that energy efficiency service providers such as ESCOs continue to find sufficient opportunities among customers with large buildings. These large buildings offer more savings potential than do smaller facilities and consequently provide ESCOs with great profits. As a result, this segment continues to be a prime target. ESCO respondents mentioned that, although EZ Sim makes it simpler to effectively prospect for savings in small facilities, current tools do not lack the capability to address small buildings. Rather, it is a market choice that, to date, smaller buildings have not yet been considered worthwhile candidates for conservation projects.
The fourth proposed barrier, the lack of confidence among building owners in performance of measures was not found to be an issue according to respondents. Only one respondent, from an ESCO, said that trust was an issue in keeping customers from moving forward on efficiency projects. All other respondents said that customers are sophisticated enough to realize how measures save energy. Rather, the problem was identified as being lack of awareness regarding project impacts. For example, a project that includes installation of a new HVAC system may result in numerous and lengthy disruptions among building tenants’ businesses. If the implications of such a complex installation are not made known, misunderstandings can result.

The fifth barrier, difficulty in cost-effectively delivering performance-based services, is a potential barrier only in that securing financing for efficiency projects seems to be the most likely factor to stall a project. However, the cost in the current market of an analysis itself is not an appreciable component of the total expense required to develop an energy efficiency project.

In terms of barriers to energy efficiency projects in general, there was unanimous agreement that access to financing was the most important key to motivating customers to commit to a project. Repeatedly, finance was mentioned as the area most likely to stall a project. Even with relatively short pay back periods, customers have difficulty accessing finance or committing funds.

For the most part, EZ Sim’s product characteristics do not seem to pose barriers to its adoption. EZ Sim seems to be on target in a number of areas:

- Price is considered a bargain
- Functions match those considered as mandatory in such software
- Accuracy is perceived as competitive if not better than alternatives
- Flexibility and ease-of-use allow EZ Sim to be used in new ways

EZ Sim’s performance and capabilities seem to be more than adequate to address the needs of the marketplace. In addition, awareness of EZ Sim is high. Only one respondent was not aware of EZ Sim before being interviewed. (Note that awareness of a product is not the same as familiarity with the product’s capabilities.)
The primary barrier to EZ Sim's adoption is likely to be the lack of motivation among users of competing products to switch. Although DOE2 and similar complex products were cited as being overly complex and too data intensive, it seems that users have learned to take short cuts and other techniques to make practical use of these tools. In addition, these competing products have established a legitimacy among utilities and customers. Respondents are not necessarily dissatisfied with their current software.

There are at least two possible explanations for the apparent complacency users have about their current software. On the one hand, it is possible that users have already solved the problems that EZ Sim addresses, perhaps not as elegantly as EZ Sim solves them, but adequately for their purposes. This explanation would indicate that EZ Sim is a solution in search of a problem and provides too little added value to merit widespread adoption. On the other hand, it is possible that potential users do not fully appreciate the value that EZ Sim offers. This explanation would indicate that EZ Sim could achieve widespread use if and when a critical mass of influential software users fully realize its potential. While we are not able to determine conclusively which explanation is closer to the truth, interview results tend to favor the latter explanation. Those respondents who have used EZ Sim are enthusiastic about its abilities and are actively using it in a broader context than they do competing products (i.e., EZ Sim's ease-of-use and multitude of features are being explored in creative ways). However, it does not appear likely that widespread adoption of EZ Sim will translate into a significantly expanded privately funded energy efficiency sector.

Familiarity with EZ Sim and Its Use

General Computer Proficiency

All respondents noted a high proficiency in the use of PCs. When asked to rate their skills at using a computer on a scale of from 1 to 5, three said 1 (excellent) five said 2 (above average) and five said 3 (average). All the respondents were familiar with and users of Microsoft Excel spreadsheet software.
Willingness to Learn New Software

Respondents were asked to define their willingness to spend a day in training to learn a new software tool if it was applicable to their job. No respondent felt that a full-day of training was an impediment to learning a new tool. Eight said they would be "very willing" to spend a day in training to learn a useful software, four said that they would be "willing" and one said that he felt "so-so" about such a training requirement. As it relates to EZ Sim, a couple of respondents noted that knowing a day was required to learn EZ Sim's further legitimized the product as a well thought-out and well-developed tool. Two respondents mentioned that training will be critical to EZ Sim's success. Both called for EZ Sim training to be offered regionally so that attendance would be easier on trainees. As on respondent said, "Training should be offered locally. Stellar needs to put it on the road."

Level of Effort Required to Learn EZ Sim

When asked if learning EZ Sim was more difficult for them than expected, three of the seven EZ Sim users said EZ Sim was easier to learn than they had expected. Two others said that they were impressed with how easy it was to use EZ Sim during the class. However, on applying it in the field, they found it was more complex than they had anticipated. As one said, "I didn't think any simulation program would be so easy. Then, I walked into work to use it and found that I didn't know as much as I thought. EZ Sim trainers presented it as easier to use than it actually is." Another user said that he is very proficient with many types of analysis software so that it was very easy for him to learn. The last user said that he does not yet feel prepared to use EZ Sim in the field.

While no one expressed the opinion that EZ Sim was difficult to learn, two respondents noted that it was more difficult to use than they anticipated after early successes during training exercises. They said that they were impressed with EZ Sim's ease-of-use while in class but when they ran into exceptions while in the field, they needed assistance from Stellar Processes. One respondent summed up the issue of training ease by saying, "Trace Trane was grueling training. This was much nicer."
Requirements for Ongoing Software Support

EZ Sim users were asked if they felt comfortable using EZ Sim without the need for assistance from Stellar Processes. Three of the seven users said they did not feel comfortable using EZ Sim on their own. When asked to describe the area in which they find support is necessary, two said they needed support in making tuning adjustments using the "detailed sheets." The third respondent did not find ongoing support necessary but commented that he too found it difficult to develop expertise at tuning a building. The last respondent said that he found EZ Sim difficult to use when he analyzed a building using two fuel types for HVAC. He said that, with assistance he was able to remedy the problem.

Although no one stated it explicitly, respondents acted as if the need to contact Stellar in order to ask for advice and assistance was to be expected when using such a program. Those who mentioned Dave Robison by name, spoke of him in enthusiastic terms and as someone who could be relied on to solve users' problems.

Interest in Learning More about EZ Sim

Only one non-user was unaware of EZ Sim before the survey. He was intrigued by the product's claims and asked that he be contacted by Stellar to learn more about EZ Sim. As noted earlier, none of the respondents reacted in a manner that suggested they did not value EZ Sim. They all recognize some benefit in EZ Sim and most were enthusiastic about EZ Sim's capabilities. However, non-users seem to be satisfied with their current software and perceive little incentive to change.
4 CONCLUSIONS

Findings

EZ Sim Compared to Competing Products

Determination of Software Credibility

- Determining the relative credibility of a software product ranges from simply "eye-ball ing" the product to ensure that it is logical and practical—based on the reviewer's own expertise—to actually testing the product against known benchmarks such as completed projects with data known to be accurate.

- Respondents stick with the software tool they are familiar with as long as the tool meets their needs. Respondents do not seem to actively seek out new software tools.

Perceived Credibility of EZ Sim

- Respondents who have tested EZ Sim against the results generated by other tools are impressed with the software's capabilities for accuracy. All respondents said that EZ Sim's accuracy is comparable to or better than available alternatives.

Software Competitors to EZ Sim

- ESCOs are the most intensive users of analysis software. It is normal for an ESCO to use multiple tools. DOE2, Trane Trace, and Utility Manager are the competitors mentioned most often by those familiar with building analysis tools. The widespread perception of legitimacy seems to push the use of DOE2-based products.

- The ability of a software product to diagnose consumption and to serve as a prospecting tool were the two most valued characteristics.

Perception of EZ Sim Relative to the Competition

- EZ Sim is viewed as a tool that is unique in its combining a useful set of features with an intelligent simplicity.
• EZ Sim is valued as a prospecting tool that provides a useful amount of data with relatively simple input requirements. This saves users time and is less costly than prospecting with more data-intensive alternatives.

Valuation of EZ Sim Features

• Ease-of-use is the primary benefit of EZ Sim followed by the simplicity of inputs and the "prospecting" features of EZ Sim. Respondents also appreciated the direct and effective logic on which EZ Sim is based.

• Regarding particular features, that EZ Sim calculates findings based on a specific building’s physics and that it provides this data in an easy-to-read graphical format are the two features valued most by respondents.

• Regarding perceived flaws or omissions in EZ Sim’s capabilities, ten of the thirteen respondents either had no opinion or recognized no problem areas. However, the process of tuning using EZ Sim was an area that respondents identified as one which raised questions regarding process.

Willingness to Pay for EZ Sim

• Respondents consider the cost of EZ Sim to be a bargain.

Market Potential

Existing Market of EZ Sim

• Among users and non-users, awareness of EZ Sim is high. Only one conservation management said he was not aware of EZ Sim before the survey.

• All respondents recognize the value in EZ Sim. It faces little resistance from potential users in terms of being viewed as a viable tool. Rather, it seems that the market for EZ Sim is largely satisfied with current products.

Near-Term Market Potential

• Interviews provided no reason to question the general estimates as quantified by the Stellar Market Assessment.

• Small utilities and local governments have diminishing access to efficiency-related funds and therefore represent a market that is aware of
the benefits of building analysis but that does not have access to such services.

- Half of all EZ Sim trainees have been utility employees. However, this market segment also reports themselves as being infrequent users of DOE2 based analysis tools. It seems that EZ Sim is being used differently than anticipated. Future research efforts will attempt to define these uses.

Overlooked Market Segments
- Organizations with multiple facilities, franchises, or branch locations, and those with corporate energy conservation goals could make effective use of EZ Sim.
- No respondent thought EZ Sim would be applicable to the needs of construction engineers and architects.
- Those respondents who identified another profession as likely to benefit from EZ Sim named resource conservation managers (RCM), system designers, and utility reps.

Market Characteristics
General Decision Making Process
- Pay back is the primary criterion for determining if an energy efficiency project will be undertaken. The length of acceptable pay back period is dependent both on the measure and business types.

- Utilities, conservation managers, and ESCOs might all be involved in the same project. Each has a slightly different role. For example, a conservation manager might initiate the project for a government building. A utility might be asked to fund the project and serve as project coordinator. An ESCO may be called in to provide engineering analysis and work with installers.

Criteria for Pursuing Projects
- ESCOs benefit from the size of savings or the cost of installations resulting from a project and therefore use criteria to qualify projects. Utilities also tend to use criteria based on pay back period—especially if the utility is
financing the energy-improvement project. Organizations such as government agencies have no criteria by which to qualify a project.

Willingness to Target Small Commercial Facilities
• Larger buildings offer higher earnings potential than do smaller buildings. Therefore, for-profit energy services ventures tend to focus on larger buildings.

• For utilities and conservation managers there is no apparent cut-off below which energy efficiency services are considered uneconomical. ESCOs do use some type of cut-off point usually based on the potential savings and the complexity of a proposed job.

Building Owners’ Confidence in Efficiency Measures
• No respondent made note of customers having a lack of confidence in energy savings estimates. Rather, the area of concern among customers was identified as post-installation performance.

Sources of Information Used to Judge Performance Claims
• Respondents do not consider it necessary to verify the results of analysis software once it has been proven. Building simulation and analysis tools are viewed as means by which qualified technicians verify their own initial hunches regarding building performance.

Building Owners’ Willingness to Use Performance-Based Contracting
• No respondent is currently using performance-based contracts.

• Customers’ trust in the estimated savings that is predicted by an analysis or audit is not a hindrance to projects—customers trust savings estimates.

Potential Market Barriers
• Barriers identified in the Statement of Work may not be key.

• Access to financing is unanimously seen as the biggest barrier to getting efficiency projects underway.

• The barriers to EZ Sim’s adoption are not related to the product itself. The tool is viewed with enthusiasm by those familiar with its use and with
interest by those who just learned of its capabilities. EZ Sim seems to be on target in a number of areas.

- The primary barrier for EZ Sim is likely to be the lack of motivation among users of competing products to switch.

- A high-opportunity market sector for EZ Sim is facilities management—especially for large organizations with full-time maintenance staff.

**Familiarity with EZ Sim and Its Use**

**General Computer Proficiency**

- All respondents noted a high proficiency in the use of PCs. All the respondents were familiar with and users of Microsoft Excel spreadsheet software.

**Willingness to Learn New Software**

- No respondent felt that a full-day of training was an impediment to learning a new tool. As it relates to EZ Sim, a couple respondents noted that knowing a day was required to learn EZ Sim's further legitimized the product as a well thought-out and well-developed tool.

**Level of Effort Required to Learn EZ Sim**

- Users were impressed with EZ Sim's ease-of-use while in class but when they ran into exceptions in the field, they needed assistance from Stellar Processes.

**Requirements for Ongoing Software Support**

- The area of tuning raised the most questions for EZ Sim users.

**Interest in Learning More about EZ Sim**

- Only one non-user was unaware of EZ Sim before the survey.

**Recommendations**

- Include facilities management company corporate decision makers in EZ Sim marketing efforts. Do not depend solely on interesting end users in EZ Sim. Market directly to management as well. In this way, financial benefits of EZ Sim application can be made known (e.g., the building-specific nature of EZ Sim and how this can result in identify cost-saving
options and quantifying such results) and possibly result in management buy-in for what might otherwise be viewed as a disruptive change in operational practice.

- Market EZ Sim for use by equipment specifiers such as building system designers. People in a position to specify equipment for a building could benefit greatly from EZ Sim’s capability of producing simulations based on a variety of conditions and equipment types.

- Examine how EZ Sim users at utilities are using the tool. Although they report themselves as non-users of traditional DOE2-based tools, they account for half of the EZ Sim trainees.

- Garner interest in EZ Sim among engineers who are currently being trained in matters of energy management and conservation. In this way, well-trained users of EZ Sim will enter the market without a bias toward using the tried and true though cumbersome DOE2 products. (Stellar Processes has begun to build such alliances by integrating use of EZ Sim in education programs such as that of Lane Community College.)

- Produce an EZ Sim case study that applies EZ Sim to a fairly new building that does not require extensive retrofits or energy improvements. In this way, the tool can be further legitimized by indicating that EZ Sim will identify scenarios in which it may be most cost effective to take no actions on an existing building.