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ST. CHARLES MEDICAL CENTER
A Green Lights / ENERGY STAR Case Study

Teaching Note

The St. Charles Medical Center case is designed to give students an introduction to basic financial analysis, while exposing them to common environment-related business issues. Special attention is paid to the intangibles that enter into the consideration of a project, factors which a strict financial analysis may not completely address. By using this case, the instructor can show many of the strengths and weaknesses of financial analysis.

In the case, Michael Severns, a manager at St. Charles Medical Center, must decide first on the profitability of several energy-efficient retrofitting proposals, and then whether to join the US EPA's Green Lights and **ENERGY STAR** Buildings Programs. Several questions are posed to the reader at the end of the case, and are discussed below.

This teaching note was prepared by Julie Jubeir and Robert Day of World Resources Effect (WRI) to stimulate class discussion rather than to document effective or ineffective management strategies. Funding was provided through Lisboa Associates from the U.S. Environmental Protection Agency.

1) *What factors should be considered when deciding whether to undertake these projects?*

This first question can be used to introduce the idea of intangible factors, Of course, factors such as the project costs, the Bonneville Power Authority (BPA) incentive, and the energy savings should be included in the decision.

However, the students should also consider intangible factors, including:

- The enhancement of the hospital's public image from joining the program;
- The possibility of productivity gains from better lighting;
- The consistency of this program with the St. Charles mission of public service;
- The possibility of future CFC phase-outs, which would force the hospital to undertake the Stage III retrofits anyway;
- The limitations of the present chiller system's capacity;
- Improved employee morale as a consequence of better lighting.

2) *What financial tools, such as Payback Period, IRR, and NPV***,** *should be used to analyze the profitability of the ECMs?*

This question can be used to discuss the merits of these three primary methods of financial analysis. Payback period is deceptive because it depends on the choice of an arbitrary cutoff date and ignores all subsequent cash flows, which may be important because energy-efficiency upgrades can deliver cash flows over a period of many years. IRR can rank mutually exclusive projects incorrectly if they have different cash flow patterns or investment scales. For example, if St. Charles, like many non-profit organizations, faced a capital constraint that prevented it from investing in all projects that cleared its IRR hurdle rate, an incorrect ranking by IRR would result in lower-value projects being implemented. The table in Exhibit A shows that IRR ranks the projects very differently than NPV. In particular, ECM 9, the variable volume retrofit, has the highest NPV but has the lowest IRR of the five projects that clear EPA's recommended hurdle rate of 20%.

Usually, the preferable method is net present value (NPV). An NPV test, however, does force the analyst to decide on the cost of capital (r). Estimating the appropriate cost of capital is especially difficult, due to:

(1) Sponsor-related risks (including leverage, liquidity, etc.).

(2) Project-specific risks (both intertemporal and relative to other projects).

(3) The opportunity cost of the required investment.

The weighted average cost of capital (WACC) is a common formula for capturing these factors.

3) *Based upon a spreadsheet analysis of the available information, which ECMs should be chosen and undertaken?*

The students should prepare a spreadsheet based upon the information given in Exhibit A in the case. The results are given in Exhibit A, at the end of this note. The first column in Exhibit A is the basis of the analysis -- net cost is derived by subtracting BPA incentives from the estimated project costs. Results are given for payback period, IRR, and NPV of each ECM, for which a time period of 8 years was chosen, to match the time period Severns used in estimating the maintenance savings. Severns chose this period because JCI was considering giving St. Charles either a 7- or 8-year payback guarantee. Thus, students may choose other, longer time periods, such as a 20-year period based upon the normal lifespan of HVAC equipment, for example. Also, note that tax considerations are not applicable because of St. Charles' non-profit status, and that for simplicity the case assumes zero inflation. JCI's actual model factored in a 2% escalation rate for fuel costs and other savings.

In the analysis in Exhibit A, maintenance savings are averaged over each of the 8 years. Students may choose not to do it this way, opting perhaps to consider the savings as a lump sum. Also, EPA recommends that a threshold of 20% IRR be used to evaluate projects in the Green Lights and ENERGY STAR Buildings Programs, so this is the (r) that was used in the NPV analysis. The results of 8-year NPV analyses of the ECMs with rates of 5% and 10% are also given.

The results suggest that ECMs 1, 2, 3, 5, and 9 are profitable and should be undertaken. According to a strict financial analysis, this means that the other projects are not acceptable. This will be discussed below.

4) What intangible benefits for St. Charles are there to joining Green Lights and ENERGY STAR Buildings?

This question directly addresses the intangibles that were not considered in the financial analysis. Some of the benefits were described in question *(1),* but others may include (and not be limited to) marketing considerations, the availability of EPA assistance, avoided future costs by upgrading the chiller system, and the relationship with BPA and Johnson Controls Incorporated (JCI), which could be useful for future projects. There is no wrong answer to this question; it is included to give the student a chance to explore a variety of intangible considerations.

5) How does considering all Stage I ECMs as one project change the analysis? Stages I and II together? Stages I, II and III together?

This question is included to give the reader a different viewpoint on his or her analysis of the project. As Exhibit A shows, the overall IRR for Stage I was a high 29%. Stage II also had a high IRR of 30%, while Stage III seemed unprofitable with a (-16%) IRR. This suggests that Stages I and II should be pursued, and Stage III should not.

When JCI actually analyzed the ECMs for Severns, however, they lumped all Stage I ECMs together, and then added all Stage II and then all Stage III ECMs. This strategy for financial analysis is commonly used by performance contractors. David Meals, an Account Executive with JCI who worked on the St. Charles project explains:

> In our industry, it is inevitable that some projects are more cost effective than others when individually compared. Often, good energy managers will bundle opportunities or package recommendations for the following reasons other than individual bottom line

> return. Intangibles such as improved comfort, life-safety, increased life, reliability and necessary redundancy are often issues considered. Local, state and federal code may also be an influencer. The addition of [Stage III] to [Stages I and II] allows financial planners and forecasters to justify economically the decision to include [Stage III]… In our industry, we refer to the process of individually implementing ECMs one at a time, purely based on simple payback or other criteria, as *strip mining*. This results in lost windows of opportunity to address other needs and value.[1]

Accordingly, when Stages I and II are lumped together, they produce a clearly acceptable IRR of 30%. Then, by lumping Stages I, II and III together, Severns was able to show that the entire project had an IRR of almost 6%.

This question, then, directly addresses one of the most important limitations of financial analysis: accurately weighing the importance of intangible factors with tangible financial costs and benefits. An important lesson is that the best use of financial analysis still requires a certain amount of value judgment by the evaluator. The next question directly addresses this point.

6) *Severns thinks that the Stage III retrofits would put St. Charles in a better position for the future because they meet possible CFC-phaseout restrictions and also give the hospital greater capacity. Does this information change the answers to question 3?*

If Severns chooses not to pursue the Stage III ECMs at this time and CFC-phaseouts are indeed mandated in the future, he may have to undertake these retrofits anyway, without the support from EPA and JCI that he has now. Also, even though the retrofits seem unprofitable by themselves, by providing the hospital with greater capacity and eliminating CFC use, they would help avoid substantial, yet unknown, future costs. With this in mind, the students, like Severns, may choose to accept the Stage III ECMs. As explained in the answer to *(5)* above, there is no wrong answer to this question. Students must decide for themselves how to weigh both the quantifiable financial data and the intangible factors.

Please Note that the IRR and NPV results given in the teaching note are based on an estimated project time period of 8 years The Green Lights and ENERGY STAR Buildings program recommends using a period of twenty years, based upon typical equipment life.for these calculations. Additionally, St. Charles currently pays only 2.5 cents per kWh, but completed many upgrades in preparation for possible energy-rate increases.

[1] Correspondence with David Meals, JCI, 1/30/96.

Exhibit A

Spreadsheet Analysis of St. Charles Medical Center Energy Conservation Measures

ECM	Net Cost*	Avg. Annual Savings w/Maintenance	IRR (8 yr.)	NPV (8 yr., 20%)	NPV (10%)	NPV (5%)	Payback (yrs)
1. Exit Sign Conversion	-$1,248	$1,774	142.0%	$4,633	$7,469	$9,731	0.70
2. Energy Efficient Fan Belts	-$652	$832	127.4%	$2,117	$3,442	$4,500	0.78
3. Fluorescent Lighting	-$69,178	$37,093	51.7%	$60,961	$117,009	$162,440	1.86
4. Waterside Economizer	-$32,880	$6,739	12.5%	-$5,851	$2,793	$10,167	4.88
5. Incandescent to Fluorescent Conversion	-$40,130	$20,779	49.7%	$33,002	$64,295	$89,685	1.93
6. Parking Lights	-$14,498	$1,524	-3.7%	-$7,208	-$5,789	-$4,427	9.51
7. Energy Efficient Motors	-$65,328	$8,242	0.2%	-$28,085	-$19,416	-$11,484	7.93
8. Occupant Control of Lighting	-$6,536	$233	-21.7%	-$4,702	-$4,812	-$4,791	28.05
9. Variable Volume Retrofit	-$323,628	$111,345	30.3%	$86,350	$245,809	$377,160	2.91
10. Heat Recovery Chiller	-$540,512	$42,565	-9.3%	-$314,319	-$284,937	-$252,767	12.70
11. Variable Flow Pumping	-$380,063	$4,611	-34.5%	-$301,975	-$323,149	-$333,582	82.43
Stage I total: (ECMs 1-8)	-$230,450	$77,216	29.2%	$54,867	$164,992	$255,822	2.98
Stage II total: (ECM 9)	-$323,628	$111,345	30.3%	$86,350	$245,809	$377,160	2.91
Stage III total (ECMs 10-11)	-$920,575	$47,176	-16.4%	-$616,294	-$608,086	-$586,349	19.51
Stages I & II total	-$554,078	$188,561	29.8%	$141,217	$410,801	$632,983	2.94
Stages II & III total	-$1,244,203	$158,521	0.4%	-$529,944	-$362,277	-$209,189	7.85
All Stages total:	-$1,474,653	$235,737	5.8%	-$475,077	-$197,285	$46,634	6.26

***Project cost minus BPA incentive**