Energy Management in the Synagogue

Mike Fischer, Chairman of the Membership Committee, came to the Synagogue one Sunday morning to interview a prospective member couple. Religious School was not in session that particular Sunday morning and there was no scheduled activity, but there was a custodian on duty. At Mike's request to make the building comfortable, so that he could better show the facilities to the prospective members, the custodian went to the control box and simply turned on all of the air-conditioning systems. That particular action cost the Synagogue approximately $680 extra on their electric bill that month.

One Thursday night, when the Synagogue facility was already being well used for meetings and a special event, an unscheduled wedding rehearsal commenced in the Sanctuary. In order to provide comfort, the late shift custodian had turned on the air-conditioning systems for the Sanctuary zone. That custodial action cost the Temple approximately $600 more on the building's electric bill that month.

One late afternoon, Rabbi Barnett took a Bar Mitzvah student to the Sanctuary in order to have an unscheduled final rehearsal. He went to the control panel and turned the switches on for the two air-conditioning units used to cool the Sanctuary. That control switching resulted in all of the air-conditioning systems that were then in operation to shut down. Although there was much excitement about why the air-conditioning for the scheduled important functions went
off, there was no added cost to the Synagogue and the maintenance supervisor was quickly able to explain what was happening, to the satisfaction of all concerned.

All of these occurrences are quite realistic in any Synagogue operation and similar types of events are always taking place. Simply explained, the added electrical costs were incurred by the first two sample events because the Temple had no positive "foolproof" control over the operation of its air conditioning equipment, especially that which required high electrical usage. The third event, which actually shut down equipment which was already in operation, was such that the Synagogue did have a control system and that certain equipment did shut down because, in the overall, the building had exceeded certain pre-set conditions for use of electrical power.

Energy conservation; energy management; utility usage, especially electricity; cost of electricity; congregant comfort; scheduling and notification of comfort requirements - are all very much inter-related items. Electric utility charges are probably the largest single expense item that most Synagogues have, excluding payroll. The cost of electricity all over the United States is continuing to increase at a rapid pace so that control of electrical usage is becoming much more important than it ever has been before. In the state of Missouri, electric utility rates have been increasing at the annual rate of 8% for the past several years, and the utility company has already announced that they will be increasing utility rates in the amount of 46% during the next five to eight years. The Synagogue's bookkeeping department should not be directed to simply
write a check when they receive the electric bill each month. The costs of electricity are skyrocketing, and this matter should be dealt with in a sound energy management manner.

Throughout the country, most electric utility companies base their monthly charges to commercial and industrial users (Synagogues are in this category) on two separate items: consumption (kilowatt hours) and demand (kilowatts). **Consumption** is the total amount of electricity used during any given billing period, much like we all experience at our homes. The amount of electricity required to keep an electric light bulb illuminated for an hour is an example of consumption. When the light is turned off, electricity is no longer being consumed. The amount of consumption is determined by a utility meter that records this item.

The electrical **demand** portion of an electric bill is another specific part of the billing and is measured on a separate utility company demand meter. The monthly demand charge is based on the maximum amount of power used within any given 15 or 30 minute interval during the usual 30 day billing period. The intent of the utility company is to be adequately paid for the electrical generating equipment that must be in operation in order to meet these demand requirements of its overall users. Even when not in use, this electrical generating equipment must still be paid for, maintained, and ready for instant use by the utility company. More simply stated, any Synagogue not only pays for the amount of electricity it consumes, but that Synagogue must also pay a demand charge for the **highest** amount of electricity that it uses during only a given **15** minute or **30** minute period during the total
30 day billing period. In the state of Missouri, this time interval is only 15 minutes. During the past several summer months, as an example, my congregation paid an average of $1450 for consumption and $2700 for demand.

Although there are other charges on the standard electric utility billing there is one charge that has proved to be very beneficial to Congregation Shaare Emeth here in St. Louis, Missouri. One day, as Temple Administrator, I decided to call Union Electric Company (the electric company in this area) and inquire as to why Churches are given a price break on Sundays while Synagogues are actually penalized because of their electrical demand requirements that take place during the High Holy Day period. One recent year, this penalty occurred in two successive months because of the billing period timing. I was pleasantly surprised to find that the utility company did have an arrangement where, for a minimal installation charge and a very small monthly charge, they would install a special type of demand meter that would effectively record only one-half the demand requirements that occur during what is known as off-peak hours. The utility company explained that the demand that occurs between 10:00 p.m. and 10:00 a.m. every day of the week, and the demand that occurs all day Saturday and all day Sunday, is considered off-peak demand (versus the normal on-peak usage during the balance of the hours). Further, the Synagogue would only be required to pay on the basis of half of the demand used during these off-peak hours. Since my particular synagogue made extensive use of its religious school facilities on Sunday, it could be readily noted that there would be extensive savings by the installation of these off-peak meters. In addition, with the forthcoming advent
of Sunday School on Saturdays because of crowdedness, during which time there was already higher electrical usage (Saturday Sanctuary Services), the use of off-peak billing became that much more advantageous. Also, there were many events during the course of the year that a Temple would be able to pre-cool certain areas prior to 10:00 a.m. (off-peak time) so that it could decrease the amount of electricity required for cooling during the higher cost on-peak hours.

After an extensive amount of investigation and research by one of the congregants, Congregation Shaare Emeth in St. Louis decided to buy a Honeywell Energy Management Micro Processor System at an installed cost of $22,000 in 1982. It was determined that the Synagogue could expect enough utility savings during the next three or possibly four years to pay for this energy management system. This analysis proved very accurate and after three years, the energy manager has been paid for out of electrical and gas savings. In addition, Shaare Emeth looks forward to the forthcoming savings during the known next eight years of utility rate increases.

The operation of the Honeywell Energy Management System is comparatively easy. After gaining experience, by just plain working with the units, most maintenance personnel can make it function well. Basically the intent is to pre-set the start and stop time of the desired electrical units. At most Synagogues, because of the high electrical requirements involved, the greatest benefit would occur when one would control the operation of the air-conditioning equipment. With the master calendar on hand and the specific weekly schedule
readily available, the energy management unit can be pre-set. Each piece of equipment is listed alongside the days of the week, and it is necessary to set the time that each unit should start and stop. For instance, for the Sanctuary Sabbath services that are scheduled for next Saturday at 10:30 a.m., the maintenance person would probably pre-set 9:45 a.m. for the time for that air-conditioning unit to go on (allowing ample time to cool the room down). And, assuming service would last one and a half hours, he would push the right timer control buttons so that the unit goes off at approximately 12:00 p.m.

The second important control that would have to be pre-set is known as the peak demand setting. This setting would be defined as the maximum amount of kilowatts to be used before various units begin to "shed." "Shed" refers to the actual stopping of a running unit that has been automatically set to stop when the peak demand setting is reached. After experience, it will become quickly evident just how high the peak demand setting should be set in order to maintain adequate comfort conditions in the Synagogue.

The final important area of control is to determine the priority of what order the Synagogue would want equipment to shed. In the event that the peak demand setting was reached, because of the number of pieces of equipment that are preset to operate, units would begin to automatically shut down by the priority setting, continuing to do so until such time that the peak demand setting is reached.

It is not my intent to explain the detailed operation of the Honeywell Management System, but rather only to try to indicate the compara-
tive easiness of pre-setting the controls required so as to have the Honeywell Energy Management Unit function.

Because of the extreme cooperative spirit of a volunteer member of the congregation, who was willing to devote extensive time, energy and perseverance, Congregation Shaare Emeth (with assistance and monitoring by its very interested maintenance personnel and Temple Administrator) was able to install additional features to assist in energy conservation that resulted in electrical cost savings. Electrical controls were installed so as not to allow two particular compressor units to operate at the same time, unless the electrical demand was low enough. By a priority setting, each compressor would shut down indiviuually and automatically (shed by the energy management system) and the air conditioner's chilled water would be allowed to warm up slowly. What happened then was that the fan unit continued to operate and provide adequate comfort because of the air movement. Adequate comfort was able to be maintained until such time that the energy management system returned to below the pre-set peak demand setting. The compressor would again start up and chill the air-conditioner's continually circulating refrigerated water. As an emergency, a switch was installed that would bypass this compressor shutdown arrangement.

Another feature was installed which made use of the Religious School's existing Apple computer. A modem connection was made between the Apple computer and the Honeywell Management System. The Honeywell system was capable of storing extensive information, but it required the use of the school's computer and printer in order to extract this stored information and get a readable printout.
At Shaare Emeth, the maintenance supervisor is able to pre-set the starting time and stopping time of all of the equipment by using the computer, and then to make a printout of what information he had inserted in order to verify all of the times and dates used. Also, he is able to see on the computer screen the information he had inserted into the Honeywell unit. Each day he is able to get a printout of what had occurred the day before, and then this information could be discussed with the Temple Administrator on a timely basis. In addition, and most important, he can get a 30 day printout of what day and what time the peak demand occurred, so that he can compare and monitor against the actual utility billing. Coincidentally, a record of the outside temperatures that occurred during the corresponding 30 day period would also be recorded for any future reference.

Throughout the country, there are any number of energy management control systems available. In the St. Louis area, in addition to the Honeywell system, there are other control companies that package an energy management system. In addition, one of the large local electrical contractors is capable of assembling a very sophisticated system that will produce an extensive amount of information, perhaps too much for a Synagogue operation. Congregation Shaare Emeth chose the Honeywell system, basically because of its particular ease of installation in their facility; and, also because of the simplicity of the operation of the unit. Although we have the capacity to control 20 different electrical systems, we have chosen to control only those involved with our air-conditioning units and various bypass switches. We still have additional capacity, in the event we would later want to control certain lighting, electrical water heaters, etc.
Because the heating system at my Synagogue is also an integral part of the cooling system or air handler system, the conservation of heating energy and the resulting savings in gas usage automatically takes place during the winter heating season. Because the energy manager turns units on and off at predetermined times, heat systems are controlled to operate only when required, with no need to "remember" to turn off a unit.

Although I have made numerous comments with regard to my own Congregation, I believe that the information and examples used throughout this report can be easily identified with by most other congregations. At Congregation Shaare Emeth, we are currently being billed nearly $65,000 for yearly electric and gas utility costs, so the potential of sizable savings certainly exists. A congregation could assemble the necessary ingredients of a very interested and capable volunteer, an interested and qualified maintenance man, an interested and knowledgeable Temple Administrator, and an understanding and cooperative Rabbinical staff – that it could go through the procedure of acquiring an energy management system and make it work to the pleasant satisfaction and benefit of the congregation in terms of substantial savings.

Submitted by:

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September 3, 1985