12 Oct 1976

Human Resources in Electrical Energy Conservation

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HUMAN RESOURCES

IN

ELECTRICAL ENERGY CONSERVATION

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Abstract

With America's increasing inability to produce, secure and conserve its own energy resources, many social and technical changes will have to take place in order to shift the tide of events from an increasing dependence upon foreign imports of energy stocks. The first change which must take place is within us: To be aware of the need and impetus to conserve energy of all forms so that we may buy time in which to properly assess where we are going, how we are going to achieve energy independence and once we get there, how it will be managed. Electrical energy conservation is but one means to help in this uncertain and timely journey.

INTRODUCTION

In the final analysis, people will make the difference whether or not we become self-sufficient in providing for our future energy requirements. Time scales are rather meaningless now as it is time to "pay the piper" for the way we have been using our energy resources for the past 90 years.

What is critical now is our approach to the all encompassing, little understood "electric economy" during this transitional storm of energy base changes.

In a continuing effort to keep you informed of electrical energy usage on a national scale, I have obtained data from the Edison Electric Institute, which has been monitoring the production of electricity. (Figure 1)

Electricity in America represents 27% of its energy base. An estimated 7 times our current generating capacity would be required to have an "electric economy", whereby transportation, industrial, commercial and residential sectors would be operated completely or at least 90% from electrical energy generation with today's technologies.

We have spent a lot of time and money discussing the merits and disadvantages of one energy form over another as the system or systems to "go with" in the future. In dealing with electrical energy generation we have all become knowledgeable in the area of prime movers and associated alternate heat sources used in the generation of electrical power and have painfully concluded that tomorrow's energy requirements will have to be met with a combination of yet to be fully developed energy means.

Some have prematurely concluded that our energy dilemma is over while others contend that the real crisis has just begun--and yet, there are still those who profess that we have no energy problems at all.

There are two broad energy fronts where people and energy conservation come together to do battle: Point of electrical energy generation and the point of electrical energy application. (Figure 2)

ELECTRICAL ENERGY CONSERVATION AT THE POINT OF GENERATION

Regardless of the heat source used, the heat loses are terrific at the point of generation, because the system must work against mechanical stress vectors which are an inherent characteristic of such systems. The heat rate of conversion for thermal power plants has now been set at a constant of 10,250BTU/kWh. (1)

The power pattern of current electricity from the point of generation through distribution to application, as previously given to you last year, is inadequate. (2) I refer to this mechanical system as the thermal and nonthermal FSR, (Field Stress Rotoration) which takes in the whole series of salient and copolar wound generators in comparative studies with newer systems. The FSR system is inflexible in design and for this reason, regardless of how big or shiney we can make the standard generators, the fact remains: 10,250BTU/kWh is an optimum level (equivalent for nonthermal) of energy conversion performance at the point of generation. Although the greatest potential of energy conservation exists at this point, capital requirements and governmental concurrence of physical changes are extensive in terms of time and cost passthroughs. With this in mind, the thermal FSR system represents an historically acceptable institution with few prospects of alternation within a short period of time. Conservation efforts have indeed produced new concepts which suggest that the FSR system need not be the only way to look at the process.

ELECTRICAL ENERGY CONSERVATION AT THE POINT OF APPLICATION

In Total Energy Management (TEM) quantitative evaluation of your particular energy profile begin quietly and patiently at the source of your own distribution system--the familiar kilowatt-hour meter. You have all heard of cookbook chemistry, not let me introduce you to suitcase physics.

I will begin immediately with the first case history by asking the question: Do you know how much electrical energy you are using at any one given time? After establishing a set of procedures from trial and error methods, it was proven to a customer that in his energy case, with the aid of a stop watch and a little homework, his peak demand could be cut by 15% and his kWh/hr usage rate would drop 5% with minor alterations within his plant operations. (Figure 3) Expanding upon correlations of data determined from your meter, many interesting studies can be derived concerning your electrical energy costs, power usage, load factor and projected energy needs. These brief procedures, although not 100% accurate, do represent a starting point which I recommend as your initial fact-finding mission in learning more about how your particular power needs are met at the point of electrical energy application.

Once you have determined the power nature

of your incoming feeders, then you can start thinking in terms of power factors, overload conditions, underload conditions, inadequate wiring, inefficient equipment, wasted lighting and formal power surveys. In case history #2, a low voltage condition was attributed to a low power factor. Another set of procedures, which are still being developed, indicated to this customer the amount of correction required.

Whatever alterations you make within your particular plant or office operation, you can be the judge of the results where such alterations mean the most to you--at the kilowatt-hour meter and your wallet.

Electrical energy conservation rightfully begins in the home. The homeowner can train himself and members of his family these same procedures of conserving electrical energy on his single phase service. With safety being paramount, your in-home studies can be done without exposing a single wire or live bus bar at the fuse box.

Informational systems must now be developed in preparation of satisfying the concerned public's need to know and desire to take action. Low cost digital meters for monitoring kWh/hr usage rates will aid in the logistics problem you will encounter with this technique.

CONCLUSION

For the generation of massive amounts of electricity as an energy form, which we link to our material prosperity, we are being asked to commit the balance of our heat generating resources to be at least 60% wasted if no changes are made to depart from the inflexible FSR systems of electrical energy production without heat recovery sub-systems. There is a trend toward an electric economy which I believe is inevitable, but the prospects of maintaining it for any length of time with the present day heat waste factors, excessive lead times for power plant construction and an increasing dependence upon foreign energy supplies are rightfully diminishing. This pending energy bust is the best thing that could have happened to us--now we can get down to the real nuts and bolts of problem-solving a few of our coming energy supply adversities.

In this Bicentennial era, in the midst of the pomp, pageantry and profiteering--we are faced with another battle for independence. It is not a war of guns and military strength, but a battle of wits, brains and a lot of hard work and financial support to find and build improved systems of electrical energy means which require less heat to function. This represents an actual starting point of the many energy conservation efforts and innovative changes which will:

1. Slowly reduce our dependence upon foreign imports of oil, natural gas and nuclear concentrates;
2. Extend our declining domestic energy resources;
3. Prevent us from being "locked in" on one energy form;
4. Immediately reduce thermal and particulate entries into our biosphere.

Only we can make the difference now, as a technical community of individuals by teaching our legislators what the battle lines are all about; preaching energy conservation for the sake of economic

preservation and building time to refit and revamp, but most important--to encourage and guide our youth in the participation of this battle. We do not have all the answers yet, but there is one we know for sure: There is no substitute for our Energy Independence in this quest for continuance of an evolving open and democratic society.

ACKNOWLEDGEMENTS

1. I wish to thank Mr. Paul Rederer and his staff of the Edison Electric Institute (Economics and Statistics Department) in New York for providing data and forecasting information used in the development of Figure 1.
2. I am grateful for the help of Mr. Clarence Davis and his students of the Media and Graphic Arts Department, Missouri School for the Deaf, Fulton, for preparing the visual aids used in the presentation of this paper. And a special thanks to Mrs. Harrison and her class in typing the support manuscript used with the presentation.

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