August 23, 2002

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Re: *National Electric Power Policy*

Dear Dr. Oren:

For some time I have wanted to respond to your views in your E-mail message of July 31, 2002 to Tom Schneider, Chairman of the IEEE Energy Policy Committee, relating to the Institute of Electrical and Electronic Engineers (IEEE) policies and activities.

My objectives in doing this are to provide to you, and many others, a better understanding of the positions of some electrical engineers who are deeply concerned about the future welfare of our country and our profession, and to provide to our economists, business school professors, government officials, regulators, and yes, some members of the electrical engineering faculties in our universities, with a sadly lacking understanding of our electric power systems, the electric power business and the ethics required of the electrical engineering profession. I will do this by responding to the specific issues you raised, particularly:

1) The need to get on with use of market forces to solve our electric power policies;

2) The reasons for the lack of national analyses of the results of regulatory and legislative actions;

3) The failure of IEEE to take a proactive role in the development of electric power policy;

4) The undesirability of reviewing the ethical issues in past engineering behavior;

5) The past role of our universities.

I will try to respond to your comments by focusing on the issues rather than attacking individuals. In our professional careers we all are involved in activities from time to time which, taken out of context, might seem questionable. I will address the failures of the engineering profession and the university community, particularly the departments dealing with economics and business, to make adequate analyses of existing and proposed policies. In conclusion I will provide some suggestions that could lead both the economics and engineering profession to steps which will benefit all our citizens, not just the stakeholders.

Before proceeding, I will present a brief summary of my qualifications. I am 78 years old, and have spent almost 60 years as an engineer, executive, consultant, and educator dealing with electric power systems, electric power economics,[1] and the electric power business. Let me assure you I am not senile as suggested by some who wish to censor my activities and publications and prevent review of the results of restructuring to date.

I have been an officer for a major utility in charge of the planning and research in providing the supply of both electricity and gas for most of the state of New Jersey. I was in charge of an investigation of the use and limits of the Pacific Intertie in the 1980s, in which seven years of hourly loading and voltage data for the transmission system delivering power from the northwest and Arizona to California was reviewed. (This system has had only a few additions since then.) I served for four years in the early 1990s on the Energy Engineering Board of the National Research Council where I sat at the table with a former Energy Commissioner for the State of California and with a key consultant of the California Public Services Commission. In the late 1990s I served for two years on the Board of Adjustment reviewing in detail the operations and management of the Commonwealth Edison Company in Chicago.

As a result of these and other activities I became deeply concerned with the lack of knowledge about electric power systems and the electric power business. (The same degree of ignorance still exists). A friend of mine, the late Joseph Swidler, former Chairman of the Federal Power Commission and the New York State Public Service Commission had also become concerned about what was happening. Joe was a non-political person who was dedicated to the welfare of the American people. He encouraged me to establish the American Education Institute (AEI), a not-for-profit organization, to which I have contributed more than $100,000. Before he died, Joe completed his memoirs of which I have a copy. They are invaluable in understanding the key elements of past electric power policy.

The core of my position in connection with electric power policies is that our current problems lie not with business alone, but with our total society. Our government is presently focusing attacks and corrective action only on business and the accounting profession. We need to review and disclose the roles of my beloved electrical engineering profession, the other professions and our universities, and to take appropriate

corrective action. I will now discuss the issues you raised as I see them.

1. We need to get on with the use of market forces to solve our electric power problems.

You state:

I. "Many of the growing pains associated with the emerging electricity markets can be attributed to structural problems resulting from a lack of appreciation for the scientific principles governing the economic behavior." (This focuses attention only on market behavior. You fail to pay any attention to the power system, its functioning, its economics and costs. I believe all new approaches for electric power policies need be analyzed for their impact on costs. If costs are not reduced, there is no way that prices can be reduced and profits increased.)

I. "The principle of marginal cost pricing as a means of achieving economic efficiency is as valid and scientifically grounded as Kirchoff's Laws." (Engineers have known this since the 1920s and have used this as a basis for determining most economic power system operation. The ability for markets to achieve this kind of economic efficiency has been clearly demonstrated to be inferior).

Questions needing answers are:

* What specific costs have been or could be lowered by market forces?

* What specific costs have been or could be increased by market forces?

* How can the motivation for "profit now" be balanced by the need to obtain the lowest cost long range solutions?

* How can the coordination be obtained between power producers, transmitters and distributors that will reduce costs?

Your reviews are based on the unproved economic assumption that market forces will produce lower electricity costs and a reliable system. The focus on market forces and other institutional mechanisms shows a basic lack of technical knowledge. The need to coordinate our technical and institutional solutions has been demonstrated by past history.[2] We need to recognize:

1. Our electric power systems are highly complex technical systems different from any other business system. The institutional mechanisms, whether developed by business or government, must be coordinated with the technical and operational

characteristics of this complex system. This is not being done. For example, a transmission line can be providing required services for the delivery of power even though it is delivering no power or carrying any current. The retirement of a generator by one party can require major transmission additions by another party. Another important example is that the locations of transmission economic constraints are often not the locations where the major reliability risks exist. (No checks are being made of available data to make the needed comparisons.)

2. A synchronous AC network has unique characteristics, technically and from a business viewpoint. Whatever any one participant does or does not do in connection with their business activity, whether operating the system, dispatching generation, planning the system, retiring generating capacity, or pricing its services affects the costs and reliability of all other parts of the synchronous system. What transmitters do affects distribution and generation. What generation does effects transmission and distribution. What distribution does effects the other two, and what is done in any one geographic region affects all other geographic regions. Again, no other industry has this characteristic where actions by one party can affect the total regional costs and reliability.

3. Electricity is not a product. It is a service. The brief submitted on behalf of a group of engineers to the Supreme Court[3] about a year ago provides educational background which I think many economists lack.

4. There are six networks[4] which need to be considered in developing electric power policy. The vast majority of the analyses of these networks has been done by engineers and is published in various places. The networks are:

* *The physical network* that supplies electric power consisting of generators, transformers, circuit breakers, transmission lines, conductors, substations, etc. A diagram can be drawn for this network and used in its analysis.

* *The energy network*. This network shows all sources of energy and fuel which are converted by various means, delivered by various means, and utilized by various means.

  This network can be diagramed and used for analysis. (I have a copy of the complete network drawn years ago).[5] The energy network supplies the physical electric network in various ways. The various paths of fuel delivery and the efficiencies of the various parts of the network are shown and are helpful in understanding how all of our energy is consumed. For example, the losses in electric transmission and distribution can be compared with the losses with the energy required to ship gas through pipelines, etc. The losses in the energy network are a significant

portion of the total energy resources consumed and require far more attention.

* *The money network* This network shows all sources and flow of money. Money sources are similar to generators in electric power systems. These sources are the stockholders, consumers, taxpayers, banks, etc. By drawing the diagram for the money network and analyzing the sources of money, its flow through the network, and the losses or consumptions for various functions, we can get a far better understanding of how our financial systems works. These money networks have been drawn in the past by engineers, starting in the early 1960s. Again, there are transformation points, or coupling points, between the money network, the energy network, and the power network. What happens in one affects the others. (Analyses of this network would have provided an early detection of Enron's procedures. It would also show what happened to the $38 billion in extra costs that occurred in California).

* *The communication network* through which information is transferred. This network is used in the operation of the power market, for E-commerce and for the control of the power system or other energy systems. This network is coupled to the other networks at various places.

* *The regulatory network* which diagrams how the government controls the power industry. In the case of the USA, this includes the Federal Government, the State government, etc. This network can be drawn and most lawyers are aware of it. Again, this network and the communication network couple into the other networks at various points.

* *The business and contracting network*. This includes the procedures for pricing and the contracts between the various parties. By drawing this network one can see the interrelationship between various contracts and pricing procedures.

It is by understanding the operation of these networks and the coupling between the networks and how the operation of one affects the other that one can begin to comprehend what needs to be done to have sound electric power policy.

A specific example of the need for such analyses is the large increase in transmission losses that has occurred with deregulation increasing national electricity costs, fuel consumption, and environmental impacts by at least several percent. About 60% of these losses are conductor losses which vary as the square of the current. How

much has the use of locational marginal pricing (proposed by Mr. Hogan) and other marketing procedures increased these losses? About 40% of these losses are transformer core losses which vary about as the 3rd to 5th power of the voltage. How much has the use of competitive markets for reactive supply increased these losses? These analyses have not been made.

2) Lack of national analyses of regulatory and legislative actions .

You stated:

I. "It is premature to determine whether deregulation has been a success or failure since the primary benefit of deregulation will come in the form of investment, innovation, and empowerment of customer choice."

I do not believe that any sound business would be run based on policies whose results are not evaluated from time to time. The continuing failure of the economics profession and the engineering profession to make evaluations of the results of restructuring is hard to understand. Are they afraid of the answers? Do they wish to conceal the answers?

A few pointed out the lack of analysis in early 1990s, including Joe Swidler[6], and a group of electrical engineers.[7] About two years ago I made an analysis of the national results of "deregulation" that was published in the March 2001 issue of *Public Utilities Fortnightly*.[8] This showed that our steps toward deregulation had increased our total national costs of electricity at least 10% in the past and for many years in the future. No one has cared or dared to challenge this analysis. Again, no sound business would be run based on policies whose results are not predicted in advance and not reviewed from time to time. Yet our government and universities do not deem such analysis as being required.

The continuing focus on "market forces" to develop future policies without any analyses of the effect of these market forces on the costs of electricity perpetuates past errors.

3) The failure of the IEEE to take a proactive role in establishment of Electric Power Policy.

You state:

I. "The IEEE community has done itself a great disservice by not being proactive in deregulation and by letting the few that are still trying to stop the moving train of deregulation speak on its behalf."

This comment shows a lack of knowledge. Many in the IEEE community have

been strongly proactive.[9],[10],[11], [12] Some have even been punished in their careers for opposing practices harmful to the public interest.[13] These efforts have been largely unsuccessful for a number of reasons:

a) For political reasons power policies have been based on the preferences of stakeholders with financial interests rather than competent professionals. They are the funders of the political process.

b) The economics and legal professions, and our universities, have deliberately saved for themselves the position of "authorities" and "key advisors" on deregulation. A specific example is provided in your letter. You mention that you and Professor Hogan disagreed on the reliability impacts of various proposals. What qualifications do either one of you have for assessing the reliability impacts of various business decisions? This would be like asking you to assess the benefits of various types of open heart surgery. You have no education and no experience -- you have no qualifications. All you know is what you've seen in reports. You need to understand that reports are often incomplete and tailored to suit the purposes of the organization preparing them.[12] (I'm sure you know this).

c) The control of the IEEE Power Society is in the hands of those having financial and legal interests. Expenses for attendance at meetings of the IEEE are paid by employers, since individuals generally do not have sufficient funds. This leads to those being approved to go to meetings and participate in committee activities being required to be supporters of their company positions. Presentations at the IEEE meetings for most of my life provided for intellectual discussions and not the promotion of commercial or business activities. This has changed considerably over the past 10 years with many, many presentations being unabashed promotions for specific software, specific company positions and supporting activities benefiting a company.

In summary, the IEEE ability to be proactive has been prevented by groups who would profit from deregulation. These groups have not been concerned with the overall public welfare, just their own profits. This is the worst kind of capitalism.

4) Lack of importance of review of ethical procedure.

You state:

I. "Arguing that engineers violate their code of ethics by supporting deregulation is equivalent to arguing that physicians who do not support socialized medicine violate their code of ethics."

This is a totally erroneous comparison. You apparently fail to recognize that the electric power industry is a unique, different, and distinct industry. Electricity is not a product -- it is a service. Any action taken or not taken by any participant in the market in

a synchronous network affects every other participant, whether transmitter, generator, distributor, or power marketer.[14] It affects their costs. It affects the system reliability. This requires that those who are developing competitive mechanisms need to recognize, and the IEEE Code of Ethics requires it, that their actions can affect the total societal cost of electricity and the reliability of supply. If their actions to increase their profits increase total electricity costs, the code of ethics requires that they not be taken.

What engineers have been doing would be equivalent to doctors proposing an inferior medical treatment that would increase profits for himself or a drug company while increasing costs to the patient. Unfortunately many engineers have been driven by greed and financial rewards, no different than Enron, WorldCom, DynCorp, or the other companies that have been driven by such forces. They have harmed the public by acts of commission and of omission. Some have become prostitutes, others eunuchs.

A failure to review past ethical behavior leads to its continuing acceptance.[15] I am sure you would want a complete and fair review of procedures used by businesses and by the accounting profession. Such a review is needed by the electrical engineering profession.

5) Role of our universities .

You state, referring to Bill Hogan:

I. "Trying to slander him because of positions he has taken is unhelpful and misguided."

I know of no other way to judge an individual, their competence and their ethics, but by the positions they have taken. My problem with Mr. Hogan, and I have corresponded with him several times, has been his failure to examine the impact of his ideas on the overall costs and reliability of the power systems and his failure to recognize all the cost effects of his proposals. I believe this failure on his part and the others at Harvard have done considerable harm to the American public. I note there has been no response by Mr. Hogan or any at Harvard to the charges raised by the *Harvard Watch*.[16]

I also note with interest that much of the opposition to review by groups such as the *Harvard Watch* comes from individuals at universities. Those in universities have a real ethical problem concerning from whom they accept money and for what purposes the money may be used. For many years I was involved in contributing a significant amount of funds to various universities for various types of research projects. I always tried to leave the universities free to go in the direction that seemed best to them. I have severe doubts, however, about the funding of university work by companies like Enron and some of the large utilities, the power generators, power marketers, etc. This may be just a matter of appearance, or it may be a matter of substance. Only if those in the universities receiving funds for a research project, or for personal consulting, will make a full disclosure of the funds they received, the purpose for which they received them, and the

services resulted, can this question be answered. Are you, your university, and other universities, willing to do this?

Recommendations

In order to protect the long-range interests of the American public the following steps are needed:

I. We need to analyze the results of what has been achieved to date by the restructuring of the American electric power industry. This needs to be done by a competent group of professionals both engineers and economists. It should recognize all the cost effects of the restructuring that has taken place to date. As a part of this effort, we should develop the six networks and use them as a basis for the analysis.

I. We need to develop a better approach to developing coordinated institutional and technical procedures, and for analyzing preferred solutions. We need to stop the mad rush to market forces as always being the best approach.

I. We need to develop procedures for the optimizing of the total electric power system so that competitors will profit from actions that lower the total cost of electricity. The use of "coordination contracts" for this purpose is one approach. With this a competitor would receive compensation for actions it takes to lower costs of others in the synchronous system and vice versa.

I. Steps to enforce the existing ethical code and reform procedures need to be taken by the IEEE, other professions, and our universities. A major question for all professionals is one's loyalty to their employer versus their obligation to society. Only if we enforce our ethics and eliminate greed from the procedures used for establishing electric power policy can we take the necessary steps to correct our past errors and develop new policies going forward from where we are now.[15] A listing of these past errors and the future steps that are needed is essential.

I. We need to revisit the past work of the Center for Democratic Institutions in Santa Barbara.[17] They studied for many years the restructuring of our government needed for the technology of the future. As part of this effort they developed a constitution for the next 200 years. I would like to quote from one of the sections in the proposed constitutional requirements of the center for Democratic Institutions. "Enterprises may be restrained by the regulator when they restrict access to or increase prices of goods and services, or when their ecological effects are deleterious, and he shall see to it that external costs are assessed to

their originators."

Concluding Request

I hope this letter serves its purpose of having you, and hopefully many others, recognize your responsibilities to society. We all need to be concerned with the overall public welfare if capitalism is to survive.[18] [19] I am sending a copy of this letter to many of my friends with the request they forward it to all others who are concerned about our electric power policies. Any who would like to publish this letter have my permission to do so.

I also ask any interested in further information, or in participating in activities related to the above recommendations to contact me.

With hope,

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[1] J.A. Casazza citation for IEEE fellow for development of new economic methods.

[2] "The Development of Electric Power Transmission - The Role Played by Technology, Institutions, and People", a book published by the Institute of Electrical and Electronic Engineers in 1993.

[3] Amicus brief to Supreme Court August 2001, www.tca-us.com

[4] IEEE Electronic Distinguished Lecturers Program, www.ieee.org/organizations/tab/alljack/html,

[5] "Reference Energy Systems and Resource Data for Use In Assessment of Energy Technologies," Associated Universities for Office of Science and Technologies, April 1972.

[6]John A. Casazza, Allern J. Schultz, and Joseph Swidler, "A Brand New World: Let's Look Before We Leap," the *Electricity Journal*, November 1990.

[7] Open Letter from a Group of Concerned Engineers, full page ad (page 15) of October 1, 1992 "Roll Call", the newspaper of Capitol Hill.

[8] Electricity Choice: Pick Your Poison, Enact Economics? Lousy Law? Market Manipulation? All Three. J.A. Casazza, *Public Utilities Fortnightly*, March 1, 2001.

[9] Casazza, John A., "The Engineers Role in the Energy Crisis," *Public Utilities Fortnightly*, February 16, 1978.

[10] J.A. Casazza, "Technical Compliance, Engineering Leadership and Electric Power," Presentation at the Symposium on Public Policy at the Great Hall, the Cooper Union, December 3, 1991 (www.ameredinst.org) Library (with Comments by J.C. Swidler) also IEEE Aerospace and Electric Systems, February 1992.

[11] Transmission Access and Retail Wheeling: The Key Questions, pgs. 77-102, Electricity Transmission Pricing and Technology, our EPRI book, Kluwer Academic Publishers, 1996.

[12] "Reliability Criteria and Their Enforcement" (Value of a Human Life) www.ameredinst.org, LIBRARY, Jack Casazza.

[13] J.A. Casazza, "Sham? Shame! - Inside the Electric Power Industry," a book published by Mandrill, April 2001.

[14] J.A. Casazza, "Electric Power, National Security, and Economic Welfare," www.ameredinst.org, LIBRARY, Jack Casazza.

[15] Ethics and Profits – The Crisis of Confidence in American Business, Leonard Silk and David Vogel, Simon and Schuster, 1976.

[16] Deregulation Deception, *Harvard Watch* Report, May 21, 2002, http://www.harvardwatch.org.

[17] The Center Magazine, Center for Study of Democratic Institutions, Santa Barbara, California, Constitution for a United Republics of America, September/October 1970.

[18] Small Consumers – What has hurt them and what can be done about it? J.A. Casazza *Revue Etijdschrift*, Brussels, Issue No. 1, 2002.

[19] Profits now versus long range needs, J.A. Casazza, *Revue Etijdschrift*, Brussels, Issue No, 1, 2002.