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I INTRODUCTION:

Beginning in 1973, IEEE embarked on new professional programs of a nontechnical nature. These followed approval by the IEEE membership of constitutional amendments that enlarged the Institute's objectives to include "professional activities directed toward the advancement of the standing of the members of the professions it serves."

Included in these activities are programs directed toward improvements in pension plans; the preparation (with other engineering societies) of guidelines to the professional employment of engineers and scientists; a series of surveys and reports on engineering manpower needs and resources, including those of minority groups and women; career development; surveys of salaries and fringe benefits in specialized branches of electrical and electronics engineering; and legislative liaison with the Congress and the Federal agencies. Similar programs having technical content include technological forecasting and assessment; ecology studies; health studies; and urban science and engineering.

These programs have attracted the attention of many observers in other engineering disciplines and in industry. This report has been prepared to supply the factual background and policy considerations that underly IEEE's professional programs.

II. HISTORICAL BACKGROUND:

For many years, but especially in the period of widespread engineering unemployment from 1968 to 1971, members of IEEE have expressed interest in new activities that IEEE might undertake, beyond the traditional roles of collecting and disseminating technical information, to enhance the standing of its membership. Following a detailed questionnaire survey in 1971 of all its members in the U.S.A., the IEEE Board of Directors prepared several amendments to the Institute's constitution. The content of the proposed amendments and the rationale behind them were published in IEEE SPECTRUM in June 1972, (Annex I of this report). When the amendments were put to the vote of the IEEE members a substantial majority approved (42,899 for, 6,508 against). The amendments became effective in February, 1973, following conforming changes to IEEE's incorporation documents.

The amendments call for new objectives of a professional nature, the means to include "the conduct and publication of surveys and reports on matters of professional concern to the members of such professions, collaboration with public bodies and with other societies for the benefit of the engineering professions as a whole, and the establishment of standards of qualification and ethical conduct. The IEEE shall not engage in collective bargaining on such matters as salaries, wages, benefits, and working conditions, customarily dealt with by labor unions."

"The IEEE shall strive to enhance the quality of life for all people throughout the world through the constructive application of technology in its fields of competence. It shall endeavor to promote understanding of the influence of such technology on the public welfare."

Prior to the vote on the proposed amendments, queries were directed by the IEEE officers to officials in the IEEE organization, to other technical and professional societies, and to members of engineering management in industrial companies. The reaction was, with few exceptions, highly favorable. The principal concerns expressed were not aimed at the content of the proposed new activities themselves, but rather raised the question of whether the Institute had the resources of volunteers and staff support to mount the new programs without detriment to the established, unique role of the Institute as the primary source of reliable, refereed technical information in its fields of competence.

The Board of Directors accordingly made plans to assure that the technical activities of the Institute would not suffer and, in particular, arranged for an additional assessment of $5.00, paid by members in the United States (and in Canada for the support of Canadian activities) specifically to underwrite the administrative and staff costs of the proposed new programs.

The implementation of the new amendments has brought about programs in socio-economic, legislative and ethical areas. The emergence of the energy crisis in 1974, with rising demand for reliable and authoritative technical testimony to guide legislative actions at national and state levels to meet the crisis, is evidence that IEEE's decision to involve itself in matters of sociotechnical concern was indeed timely.

Since 1973 IEEE professional activities in the United States have been carried forward by the United States Activities Committee (USAC), which comprises nine members of the IEEE Board of Directors, a secretary and a treasurer. Thirty subsidary committees and legal counsel are engaged in specific programs, projects, planning and administration. The following paragraphs outline the major areas of USAC activities.

III GUIDELINES TO PROFESSIONAL EMPLOYMENT:

The respondents to the 1971 Professional Activities Questionnaire voted by better than 3-to-1 in favor of IEEE publishing recommendations on professional employment practices.

This project was undertaken by IEEE with 16 other societies and councils and resulted in the joint preparation by representatives of these bodies of the first edition of the document "Guidelines to Professional Employment for Engineers and Scientists" (Annex II of this report). Endorsed by the IEEE Board of Directors in January, 1973, the Guidelines have since been endorsed by 24 other societies and councils.

Reference to Annex II shows that the Guidelines are intended to apply equally to employees and employers. The specific obligations of each party to the other are spelled out in four main areas: Recruitment, Terms of Employment, Professional Development, and Termination and Transfer. The document is under continuing review by a joint committee of the sponsoring societies, (in IEEE, by the USAC Employment Practices Committee), and successive editions are planned.

Particular attention is directed to the Foreword of the Guidelines, which points out that their implementation in specific situations depends on many local factors, and that they represent goals rather than specific minimum standards. The endorsing societies are aware that in many companies, particularly smaller companies devoting a high proportion of their resources to capital growth and development, the level of conventional benefits provided (e.g. pensions) may be lower than those provided by well-established firms. In such situations, other forms of compensation, mutually advantageous to the employer and the employee, are often provided.

Before the intersociety activity leading to the preparation of the Guidelines was undertaken, IEEE, NSPE and ASME held an industry conference (Pheasant Run, Illinois, May, 1972) to which representatives of the managements of a number of employers of engineers were invited. At that conference, attended by representatives from 43 such firms, the majority of the industry representatives present urged the sponsoring societies to undertake an intersociety effort to produce a single set of Guidelines. It was hoped that these would be endorsed by many engineering and scientific societies and would replace the several employment practice documents, with differing objectives and emphases, previously drawn up by individual societies. These were proving to be a source of confusion in personnel administration.

Since the Guidelines were drawn up and published, additional meetings with industrial representatives have been held, sponsored by enlarged groups of societies, in February, May and September 1973. At these meetings the substantial majority opinion has been that the Guidelines, as published, are a constructive contribution to better understanding between employees and management, and that they are of substantial value in the support and administration of professional employees.

IV PENSIONS:

The shortcomings of pension plans have received general public attention from studies conducted by the U.S. Senate. The resulting recognition of the need for reform has led to the passage of pension legislation in the U.S. Senate by a vote of 93 to 0, and of similar legislation in the House of Representatives by a vote of 375 to 4. At present (June, 1974) this legislation is in conference committee between the Senate and the House. Its passage and signature by the President are anticipated by the Fall of 1974. In anticipation of its passage, the Internal Revenue Service issued new rulings effective

April 15, 1974 which permit professional societies to set up, in cooperation with industrial concerns, nondiscriminatory pension plans which would provide immediate eligibility and vesting on a multi-employer basis.

This new Federal legislation and the concomitant change in regulations received substantial support in appearances before the Congress by the engineering societies, with IEEE taking a leading role. IEEE's participation in the debate on pension reform began in 1970, when it became clear that a substantial number of its members faced involuntary termination of their employment before they had achieved any vested interest in their pension rights. While the majority of IEEE members responding to the 1971 Questionnaire indicated that they were satisfied with their pension coverage, a large number, nearly 25,000, indicated that they would be interested in a pension plan established and sponsored by IEEE.

In February 1973, IEEE joined with five other societies in establishing the Joint Committee on Pensions (JCP), to recommend to the Congress changes in pension law that would rectify the substantial exposure to forfeiture of pension rights faced by engineers and scientists. The Chairman of the IEEE/USAC Pension Committee and its legal counsel served the Joint Committee on Pensions, as Chairman and legal adviser respectively. The provisions of the Federal legislation to protect the pension rights of mobile professional people were presented to Congress by JCP; the wording of these provisions is substantially identical in the House and Senate versions of the pending legislation.

The non-discriminatory requirement in this pension legislation has the effect of limiting the employer contributions to the new pension plan to the same percentage of compensation as is paid in to the account of the employee in his present coverage. The cost of pension coverage is not increased, while the benefits, in actuarially equivalent terms, remain constant. Thus the possible loss of all pension rights, due to terminations due to changes in government funding and similar situations over which neither the employer nor the employee has control, is avoided.

IEEE has also under way the preparation of a pension plan which is intended to be supplementary to pension coverage held by the individual engineer or scientist in his present employment. Such a plan is not qualified for tax deferral under IRS regulations, i.e. it must be paid for by the individual from after-tax income.

To be of most use, all such pension coverage should be available in one plan covering engineers and scientists of many disciplines. For this reason, IEEE has actively pursued an intersociety posture in its pension efforts. Recently this has led to an agreement to merge between two profession-wide pension organizations (PFP and ptp) initially set up by the American Chemical Society and the IEEE respectively. At present 11 of the major engineering and scientific societies are involved in the PFP/ptp organization, and substantial further participation is anticipated.

V SURVEYS OF SALARIES AND FRINGE BENEFITS:

By a vote of 2 to 1, the respondents to the 1971 Questionnaire endorsed a program to collect data on the salaries and fringe benefits afforded to its members. While data on salaries had been available through the publications of the Engineering Manpower Commission, to which IEEE had contributed data from its members, the EMC reports lumped together many of the specialized branches of electrical and electronics engineering, and it was difficult for employees and employers to determine what the established rates were in given individual situations.

Accordingly a questionnaire was prepared and submitted to the 121,000 IEEE members (other than Students) in the United States. The Salary and Fringe Benefit Survey Report, published by IEEE in October 1972 gave data from 43,400 respondents covering 16 of the principal specialties in the electrical/electronics field. Also included were results on such benefits as pensions, insurance, vacations, holidays, sick leave, education and professional societies. Summaries of the results were published in the August, September and October, 1972, issues of IEEE SPECTRUM.

In June, 1973 these survey results were up-dated in a second survey conducted on a sampling of the Institute's membership worldwide. The nearly 10,000 respondents to this second survey provided a statistically valid extrapolation of the 1972 results. Summaries of the results were published in the October and November 1973 issues of IEEE SPECTRUM. One interesting result was that whereas in 1972 the majority of members responding had a salary of less than $19,000, in 1973 the figure was over $19,000.

As in the case of the Guidelines, the Salary and Fringe Benefits surveys are of mutual interest to employers and employees. A substantial number of industrial companies (approximately 300) have purchased the Survey Report from IEEE as an aid in engineering personnel administration. The individual member is also interested - as an employee in most cases, but often as a member of management - as is attested by the high degree of readership afforded the IEEE SPECTRUM articles on the subject, and by the purchase of the full Report by 1300 members.

VI MANPOWER PLANNING:

Predicting the future demand for employment of engineers is made difficult by many imponderable forces at work in the fields of electrical and electronics engineering. Most important is the rapid pace of innovation (e.g. integrated circuits) which creates obsolescence of the educational background and on-the-job competence of engineers on the one hand, and the replacement of engineer manhours by automated design and production methods (e.g. computer-aided design) on the other. Another difficulty is the traditional recurrence of periods of over-supply and under-supply of engineering manpower, over a cycle of approximately seven years. The phasing of this cyclic trend is such that young people are attracted to take up engineering careers during periods of engineering manpower short-

age, only to find after entering the field, that a surplus manpower situation has appeared. Attempts to determine future trends and to forecast manpower requirements have accordingly been matters of primary concern to IEEE for many years.

In early 1971, the IEEE President appointed a special ad hoc Committee on Economic Conditions in the Electronics, Electrical and Related Industries under the chairmanship of W. O. Fleckenstein. The Committee consisted of nine outstanding members of industrial management, all at presidential or vice presidential level in their respective organizations, appointed without regard to membership in IEEE. These men brought their substantial company resources to bear on a careful study of industrial trends in the electrical/electronics fields, with particular reference to manpower projections through the year 1980. Their Report, which gained wide recognition as the "Fleckenstein Report", predicted a compound growth in employed engineers of 2% per annum over the period 1970-1980.

When USAC was formed in 1973, it set up a Manpower Planning Committee to continue such studies on a regular basis. Its first report "Career Outlook in Engineering" was published in September 1973. A second report "Your Job in E/E Engineering" is under preparation and will be issued in September, 1974. The USAC Manpower Committee has also sponsored publication of a 400-page book "Long Range Forecasting of Manpower Requirements" by Roger H. Bezdek, Ph.D. of the Bureau of Economic Analysis, U.S. Department of Commerce. This book is also scheduled for availability in the fall of 1974.

The widespread use of these publications is intended to reduce, insofar as possible, the uncertainty in future projections and to permit engineers to plan their careers on a more reliable basis than has been possible in the past.

VII GOVERNMENT RELATIONS AND LEGISLATIVE LIAISON:

It is apparent that IEEE, in the professional area, has a double obligation to maintain close contact with government and legislatures: to gain acceptance of the valid claims of the engineering professions to the economic and societal support of the government on the one hand, and on the other to supply needed expertise and sound judgment on matters of public policy and decision-making in areas dependent on technology for their resolution. Since most of this interaction occurs at the Federal level, USAC supports an IEEE Office in Washington, D.C. to assist all its professional activities, as well as to maintain contact with the officers and technical staffs of the Federal agencies. This Office, co-located with those of the National Society of Professional Engineers and the American Society of Mechanical Engineers, maintains liaison with the members of Congress and their staffs, with the chairmen and staffs of such Federal Agencies as the National Science Foundation, the Atomic Energy Commission, the Federal Communications Commission, the Federal Power Commission, and the Office of Technology Assessment. It also assists the USAC Committees on Government Relations and Legislative Liaison in preparing both for IEEE and in cooperation with other societies, testimony and documents relating to the attitudes and interests of the engineering community.

The USAC Government Relations and Legislative Liaison activities are, of course, specifically directed toward such USAC programs as pension legislation, technology forecasting, manpower planning and urban science, as described elsewhere in this report.

VIII WASHINGTON ACTIVITIES:

In its two years of existence, the IEEE Washington Office has become recognized, with other similar offices of the major scientific and engineering societies in the Capitol, as a major private-sector resource of the Federal Government. IEEE has been requested to nominate, or comment on the nomination of, appointees to Federal agencies, notably the FCC and the OTA. Direct contact of IEEE officers and staff with members of Congress was fostered in February, 1974 by a reception for all members of Congress and their staffs, in the U.S. Capitol Building hosted by IEEE and sponsored by Senator Moss and Representative Teague, the chairmen of the science and technology oriented committees of the Congress.

IX CONGRESSIONAL FELLOW PROGRAM:

Another aspect of the Government Relations program is the appointment of a knowledgeable member by the IEEE to serve for a stated term with one of the Congressional Committees and its staff. This effort, which operates under the aegis of the Congressional Fellow program set up by Congress some years ago, has been carried out in 1973-74 by Dr. Ronal Larson, the first IEEE Congressional Fellow. Dr. Larson's assignment was to the House Committee on Science and Astronautics, and in particular to its Energy Subcommittee. He assisted in preparing and reviewing legislation on solar heating (H.R. 11864) throughout its history from preliminary hearings to passage by the House. In other assignments with the Science, Research and Development Subcommittee he has worked on government science policy, the OTA, and on its oversight activities of the National Science Foundation. At the conclusion of his Fellowship, he accepted a one-year appointment to the OTA, to lead a project on solar power production assessment. Appointment of additional IEEE Congressional Fellows is planned by USAC.

X URBAN SCIENCE AND TECHNOLOGY:

Starting as an activity on the West Coast, i.e. by local IEEE section participation with local units of other societies in that area, this project has as its objective the presentation to city officials of the procedures and substance of the urban science projects sponsored by the National Science Foundation. NSF and the Department of Housing and Urban Development have expressed interest in an expansion of this program on a nationwide basis, and IEEE is currently preparing a proposal to HUD for funding of such an expanded program over a three-year period. IEEE has also supported increased Congressional Funding for this program. The IEEE local organization, with 165 Sections and 454 Chapters embracing nearly a thousand towns cities and metropolitan areas in the United States, is capable of identifying the needs of municipal governments and of serving as a non-political source of education and support of local officials in need of technological assistance.

XI CAREER DEVELOPMENT:

One of the most important services of an engineering society to its members is a program of continuing education and career development, including the preparation and distribution of material for short courses, seminars, lecture tours and the like. This material may be made available to the individual member for his own use, or to local Sections and Chapters for groups of members in a given locality. Such activity is an established program of the IEEE Educational Activities Board (EAB). By agreement between USAC and EAB, a portion of the cost of the materials prepared and supporting activity of primary interest to members in the United States has been supported by USAC funds, i.e. from the $5.00 fee paid by U.S members.

XII USAC SUPPORT FOR LOCAL ACTIVITIES:

In addition to the programs of Urban Science and Manpower Development described above, other USAC programs require, for effective implementation, direct involvement of the IEEE member at his home or place of employment. For this reason, the geographical organization of IEEE in the United States (the six Regions, comprising the U. S. local Sections, Chapters and Student Branches) is supported by USAC funds. This program brings to local areas the applicable information on pensions, manpower planning, employment practices, technology forecasting, etc. At present, some 70 IEEE Sections have appointed Professional Activities Committees to coordinate this work, at the local level, with the nationwide programs as they emerge from IEEE Headquarters and the Washington Office.

XIII PUBLIC RELATIONS:

To provide information on its programs, USAC supports the IEEE Public Relations Committee (PRC) in funding the dissemination of publicity of interest to the membership, other societies, industry and the public in the United States. A key element in this program is the "IEEE Professional Newsletter", sent by USAC to all members in the United States on a bi-monthly basis. Close coordination between USAC and PRC is also involved in intersociety programs, including a current proposal which would involve the Advertising Council in the preparation of material for U.S. news media - tv, newspapers and magazines - emphasizing the value to the U.S. citizen of the contributions of engineers to his daily life and future outlook.

XIV TECHNOLOGY FORECASTING AND ASSESSMENT:

As has been pointed out in connection with Manpower Planning in this report, much of the difficulty in career planning arises from uncertainty concerning future trends in technology. This has led to a concerted effort to forecast as accurately as possible the probable course and impact of technical innovation and change. In addition, the need to assess the impact of new technology on the public welfare, particularly in respect to energy resources, pollution and manpower utilization, has impelled the Congress to set up an Office of Technology Assessment. Accordingly USAC has supported

the IEEE Technology Forecasting and Assessment project. Since major roles in this work are played by technical experts and systems analysts, USAC has requested the IEEE Technical Activities Board (TAB) to conduct the study. TAB has, in turn, set up a T F and A Committee, supported by a qualified staff specialist, Dr. William Morsch, who is located in the IEEE Washington Office. Dr. Morsch maintains close contact the OTA Director Daddario (who has himself served as a member of a USAC Committee before his appointment to the OTA) and his staff. Long range forecasting is often upset by the unscheduled appearance of unforeseen technical break-throughs (for example, the transistor and the laser), but shorter range projections can be made by established techniques that can provide substantial insight in advanced planning.

XV TECHNICAL STANDARDS:

There are many areas of technology that have universal application to all nations, but pose particular challenges or opportunities to particular nations. The United States is no exception, as the present debate on the national adoption of the metric system of measurement clearly indicates. Accordingly, USAC has taken an interest in technical standards where the special interests or obligations of United States engineers are of major concern. One avenue of such support is through the United States National Committee of the International Electrotechnical Commission to which support has been given by USAC. Another emerging area is in the field of standards relating to the safety, energy conservation, and similar matters of public interest in consumer goods. In this area, the possibility of joint program by IEEE and the National Academy of Engineering is under current discussion.

XVI OTHER PROJECTS:

On a regional basis, the legislatures of several states are seeking advice on the technical content of legislation intended to protect the environment and to measure ecological impact. USAC supports IEEE participation in the Western States Intersociety Legislative Advisory Committee (WSILA), which is active in various technical areas, but is principally concerned with ecological systems and standards. In New York State, a similar organization, an Intersociety Liaison Committee on the Environment (AISLE), met with the legislative members and staff in a Conference on Energy and the Environment, with representatives of IEEE and other societies. Legislation to set up a State Energy Resources Office resulted, and has since passed the State Assembly unanimously.

XVII CONCLUSION:

Comparison of the projects described in this report with the plans projected in 1972 (Annex I), shows that a large majority of the programs then envisaged have in fact taken root and a substantial record of accomplishment is being posted in the first two years of the Institute's new professional outlook. Substantial new resources of

funds, volunteer contributors and staff have been assembled, without adverse effect on the IEEE's established technical roles. The additional fees now paid have not led to any loss of membership; in fact in early 1974, the Institute established a new high of 170,900 members. It thus appears that the belief expressed by the Board of Directors in 1972 that "IEEE has the resources and talent required to proceed confidently along the new road" has been amply confirmed.

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