

## **EDUCATORS, EMPLOYERS AND ENGINEERS DESIGN NEW BRIDGES FOR WOMEN IN ENGINEERING**

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### Introduction

The Canadian Committee on Women in Engineering (CCWE) was formed in February 1990 to investigate and make recommendations to improve the participation of women in engineering, both as students and as professionals. The process undertaken by the CCWE was participatory and consultative in nature.

In this presentation, I will outline the background and composition of the committee, its activities, and its final report. In doing so, I will highlight why this Committee was so successful, as well as some lessons learned. My perspective is that of project coordinator for the CCWE. Finally, I will describe how I intend to follow-up the work of the CCWE from my current position with Industry, Science and Technology Canada.

### The Committee

The Committee was created partly because of the predicted shortage of engineers in Canada by the year 2000. The shortage is attributed to engineering's decreasing share of total enrolment in university programs, the dwindling number of engineers immigrating from other countries, and economic growth. More women are becoming engineers; in the last decade, the percentage of registered professional engineers in Canada who are women increased from less than one percent to almost four percent. The increases, however, amount to less than one per cent per year.

One single event, however, proved to be a catalyst: the murder of 13 female engineering students at École Polytechnique in Montreal on December 6, 1989. That event jolted engineers and non-engineers alike into open discussion about the very issues we dealt with--namely, the status of women in the profession.

The formation of the Committee was instigated by Industry Science and Technology Canada, a federal government department with a mission to promote international competitiveness and excellence in Canadian industry, science and technology. A key factor in achieving this mission is human resources; Canada needs engineers and scientists. Because we appear to be attracting the maximum number of men, it is logical that we begin attracting women to engineering.

The CCWE was funded by the Industrial Adjustment Service of another federal government department, Employment and Immigration Canada. This service provides a process to manage change within organizations by creating committees that bring employers and employees together to study the changes required and to adopt realistic implementation strategies.

There were four signatories to the agreement. The Canadian Council of Professional Engineers is the national coordinating body for the provincial and territorial licensing bodies, and represents more than 146,100 professional engineers in Canada, of which only 3.4 percent were women in December 1991. The Association of Consulting Engineers of Canada represents nearly 900 independent consulting engineering firms that range from one-person practices to multidisciplinary corporations. The Association of Universities and Colleges of Canada represents 89 universities and degree-granting institutions in Canada. The Canadian Manufacturers' Association has over 2500 member companies representing all facets of manufacturing.

The Committee was chaired by Dr. Monique Frize, P.Eng., holder of the Northern Telecom-NSERC Women in Engineering Chair at the University of New Brunswick.

Other member organizations were the Canadian Education Association, the National Committee of Deans of Engineering and Applied Science, the Canadian Association of University Teachers, the Canadian Federation of Engineering Students, and the Association of Community Colleges of Canada. Two women engineers represented organizations of women scientists and engineers: Women in Science and Engineering and the Society for Canadian Women in Engineering, Science and Technology. Employer members were GE Canada, The SNC Group Inc. and Noranda. The committee members represented both genders, all regions of Canada, and both official linguistic groups, French and English.

### The Process

The process undertaken by the CCWE was consultative in nature. The major stakeholders, as the Committee saw them, are: primary and secondary school educators; universities and faculties of engineering; employers of engineers in the public and private sectors; and the engineering profession itself.

The process had three stages: the first was to listen to the stakeholders describe the issues, possible solutions and current initiatives; the second to discuss solutions and formulate recommendations, and the third to solicit support for the recommendations from senior representatives of the major stakeholders.

### Regional Public Forums

The first step of the process was to identify barriers and bridges to the participation of women in engineering. Six regional public forums were held across the country from September 1990 to March 1991. These forums were organized by volunteers: women engineers, professional associations, universities, women in engineering organizations, primary and secondary school educators, and employers. Some forum organizers went so far as to raise funds in their communities.

Over 160 briefs were presented by elementary and secondary school educators, engineering deans and professors, representatives of associations of professional engineers and employers of engineers, as well as male and female engineering students and engineers. More briefs were received from educators of engineers than from any other stakeholder group. This participation was an indication not only of the impact of the Montreal murders but also of the groundwork laid by the National Committee of Deans of Engineering and Applied Science, which had recognized the need to recruit more women into the profession even before that dreadful day in December 1989.

The CCWE's public forums became a platform for women to recount their experiences as engineering students and engineers. Clearly, most women are glad they chose the profession, despite the obstacles they encounter and the feelings of isolation they experience because they are a minority in a profession that is profoundly male.

By sharing their experiences, they lessened the isolation felt by women engineers, many of whom are the lone woman engineer in their companies or at remote work sites. Hearing the stories, women realized that others have felt discouraged as members of a minority in a male-dominated profession.

### Private briefs

The CCWE chair also received over 40 private submissions from women who shared their experiences as engineering students and engineers. Anonymous extracts from these letters were distributed to the CCWE members and included in the final report.

### Research on Effective Practices

To determine effective practices to recruit, retain and advance the careers of women engineers, the Committee commissioned a study of seven faculties of engineering and six workplaces. The purpose of the research was to determine which practices lead to success in recruiting and graduating female engineering students in universities, and which policies and practices are effective in recruiting and advancing the careers of female engineers. The universities and workplaces were chosen because they had deliberately sought to increase women's participation in the engineering profession. They also represented the regions of Canada and the two linguistic groups. The research sites were small and large universities and public and private workplaces. The findings of the research were consistent with the statements made by the participants in the public forums.

### National Conference

In May 1991, the CCWE held a three-day national conference in Fredericton, New Brunswick. The main purpose of the conference was to present for discussion the draft recommendations of the Committee--developed with input from the public forums and the research project.

Over 240 Canadians, one-third of them men, participated in the conference. During the first half of the conference, researchers presented papers, senior educators and employers outlined their views and the CCWE presented its research. On the final day, the participants evaluated and expanded on the CCWE's draft recommendations. The conference participants were assigned to one of 13 workshops that were lead by the CCWE members.

### Endorsement meeting

Following the conference, the Committee reworked the recommendations and again presented them for review, this time to specially invited senior representatives of the four stakeholders: primary and secondary school educators, educators of engineers, employers of engineers and professional associations. The major goals of this meeting, held in Ottawa in September 1991, were first to identify reasonable objectives and time frames for implementing the recommendations, and second, to suggest ways to monitor their implementation. By involving senior managers, the Committee gained a commitment to implement the recommendations--at least from most of the organizations represented.

### The final report

The report of the CCWE, entitled *More than just numbers*, reflects the Committee's consultative approach. Emphasis is placed on quotes, both from women engineering students and engineers as well as from experts in the education and employment sectors. None of the issues addressed is new, but they are comprehensive and range from the early socialization of girls to the promotion of women to senior management. The report is divided into four sections, each addressing a particular stakeholder.

**Laying the Foundation** (Chapters 1-6) addresses issues concerning the socialization and education of girls and young women in the pre-university years. Discussion centres on parental and social influences, and the role of educators and others in developing the interests and talents of girls and young women in science and mathematics as prerequisites for engineering.

**Education For and By Women Engineers** (Chapters 7 - 12) outlines how universities and faculties of engineering can create woman-friendly environments, and attract and retain women in undergraduate and graduate engineering programs. Great emphasis is placed on the recruitment and career advancement of women faculty and on the development of a curriculum that is relevant to societal needs and appealing to women.

**Engineering Workplaces for Women** (Chapters 13 - 17) discusses how employers can change the corporate culture to ensure support for women in non-traditional roles. Specific strategies to recruit and advance the careers of women engineers are proposed, and policies that support men and women in the workplace are outlined.

**Support by Association** (Chapters 18 - 20) describes the role of associations of professional engineers in the promotion of engineering as a viable career for women. It also outlines how associations can support women members and co-operate with educators and employers of engineers.

The CCWE's 29 major recommendations include specific strategies with time frames for implementation. A section entitled **Making it happen** proposes ways to monitor, measure and report on the implementation of the CCWE's recommendations. To recognize progress, the report also contains a list of initiatives to attract and retain women in engineering.

### Conclusion

Because of the consultative and participatory nature of the CCWE project, much was accomplished even before the report was released. The public forums, national conference and endorsement meeting involved key people and gave them a stake in the success of the project and its ultimate outcome. Because of limited funds, organizers of the regional forums and national conference were almost all volunteers. We got people involved at the grassroots, and by doing so, we got them committed.

By creating a forum for open discussion of the issues, the CCWE created an understanding and stimulated individuals and organizations to improve the environment for women in engineering. Both men and women were sensitized to the particular situation of women who study and work in male-dominated engineering environments. Hearing of initiatives, educators and employers implemented them in their own organizations.

Women engineers discovered they were not alone, that their experiences were not unique. Networks were formed; in at least two provinces those networks have become formalized.

Finally, because engineers, educators and employers were involved in the process, many of the objectives of the CCWE were achieved even before the final report was released in April 1992.

The next step is implementation of the recommendations. To ensure this happens, Industry, Science and Technology Canada, one of the two federal government departments that initiated the formation of the Committee, hired me, the CCWE coordinator, to work on implementation strategies. My tasks include: encouraging ISTC clients--universities and industry--to implement the CCWE's recommendations, developing ways to monitor progress and designing a method to report on progress.