



# The Retention and Renewal of Women in Engineering

*An IPENZ Plan to encourage diversity in and  
sustainability of the engineering profession*



# Foreword

In 2010, one of the key objectives for the IPENZ President was to increase the diversity of the pool of professional engineers. A Women in Engineering Task Force was created to investigate and develop a strategy together with the justifications for developing and encouraging the retention of practising women engineers.

Studies indicate that in New Zealand there is an increasing pool of female students who become high achievers in science. However, the number of young women completing tertiary studies in engineering is low and women are under-represented in achieving professional recognition, and being in upper echelons of management of engineering-related businesses. The loss of these trained women to the profession potentially reduces the opportunity for innovation, productivity and business competitiveness.

A number of factors discourage women from continuing to participate in the engineering field. These include few successful engineering women role models and evidence that the culture of many engineering workplaces are female- and family-unfriendly, with behaviours that overtly reduce or discourage promotion, recognition and rewards.

This Plan acts as the IPENZ Women in Engineering foundation document and outlines an affirmative action plan with goals to aspire to and a vision to achieve. This will require commitment by all practising engineering professionals to actively support the Institution's aims over several years to increase the number of young women completing engineering tertiary education and ensure their retention as future emerging engineers and leaders.

Our success will be measured by our profession being "gender neutral" and by practising women engineers being commonplace. My sincere thanks to the members of the Task Force for offering their wisdom and time for developing this robust plan, the IPENZ staff who undertook the analysis for the Task Force as well as the assistance from the staff of Ministry of Women's Affairs.



**Elena Trout**  
Task Force Chair



“ We have always embraced diversity throughout our business; increasingly we believe that this diversity is critical to our ability to challenge the status quo and innovate – a key source of competitive advantage for Air New Zealand. The recent appointment of Vanessa Stoddart as Group General Manager Technical Operations and People is further demonstration of our commitment to attract more women into engineering and senior management roles. Already she is seen as a great role model for women within Air New Zealand and throughout the Global Airline community.”



**Rob Fyfe**  
Chief Executive Officer, Air New Zealand

# A Commitment from The Institution of Professional Engineers New Zealand

## **IPENZ President's statement:**

“Whilst it is pleasing that female participation in engineering study has risen from near zero 50 years ago, to about 20 per cent overall today, the proportion of women who continue an engineering career throughout their working life is still too low. This is a concern for the IPENZ Board. It has set two relevant goals – ensuring that there is a sufficient number of engineering graduates, and secondly, that all graduates, including women, are able to enjoy rewarding engineering-based careers.

I look forward to the implementation of The Retention and Renewal of Women in Engineering Plan and IPENZ taking action to encourage more women to take up fulfilling careers in the engineering profession.”



**Garry Macdonald FIPENZ**  
IPENZ President

## **IPENZ Chief Executive's statement:**

“Level 3 NCEA results show that female students have a very high aptitude for physics and mathematics, and that those who choose to study engineering generally do well. It is a matter of concern that all the talent available to the engineering profession, that often quotes skills shortages, is not being fully utilised. The male-dominated engineering workforce needs to understand what changes must take place for women to enjoy positive experiences as engineers at all career stages, from study onwards. As a profession, we need to ensure that any barriers to continued participation are removed. IPENZ, through the implementation of the The Retention and Renewal of Women in Engineering Plan, sets out to begin this task.”



**Dr Andrew Cleland FIPENZ**  
IPENZ Chief Executive



# The Desired Outcome

## **The IPENZ long-term vision for women in engineering:**

“As a result of its diversity, engineering is seen as making a highly relevant contribution to New Zealand’s economic growth and well-being. The engineering profession is recognised as an employer of the best and brightest. Engineering workplaces are diverse and have exemplary employment practices. The number of engineers is sustainable in the long term.”

The success of this vision will be reflected in the diversity of the Institution’s Membership and the successful completion of the actions planned.

“ The NZ Transport Agency plays a lead role in developing and maintaining New Zealand’s infrastructure and I fully support initiatives that encourage women to take up engineering as a profession. Broadening our workforce will expand the perspectives and approaches used to meet the transport challenges of the future.”



**Geoff Dangerfield**  
Chief Executive, NZ Transport Agency

“ Opus encourages women to its worldwide workforce and has seen the number of women increase in the professional category from 90 to 276 over the last 10 years. This equates to over 25 per cent of our total workforce. We have achieved this through a work practice that encourages and supports a high level of flexibility in terms of our working environment and a good gender mix throughout our organisation, resulting in a high level of diversity among our people; which is a key strength.”



**Dr David Prentice**  
Chief Executive, Opus International Consultants

# The Case for Women in Engineering

Generally, New Zealand's engineering workplaces are not diverse. The profession is missing out on a significant portion of the best and brightest as they choose not to join the engineering profession.

For women who do enter the profession, IPENZ Membership statistics indicate low retention rates.

All of this is occurring at a time when New Zealand needs more engineers. Thus, there are significant benefits to increasing the number of women entering and remaining in the profession.

## The best and brightest

Every profession wants to attract top-quality graduates. Data suggests that women are capable of entering engineering but are choosing not to<sup>1</sup>. Increasing the number of women in the profession presents the opportunity to tap into more skilled individuals and ensure the engineering profession employs the best and brightest graduates.

## Increase the numbers

Engineers experienced strong employment growth over the five years from 2004 to 2009<sup>2</sup>. At that time it was expected that an additional 1,700 to 1,800 engineers would be required per annum over the next five years. The National Engineering Education Plan project<sup>3</sup> similarly found that an additional 1,100 to 1,400 professional engineers are needed annually.

Increasing the number of women entering and remaining in the profession will help provide the additional engineers that New Zealand needs annually.

## Increase diversity and ensure the profession is relevant, representative and competitive

Women represent approximately 51 per cent of New Zealanders<sup>4</sup> and are gaining more decision-making and purchasing power<sup>5</sup>.

Women are involved in procurement in virtually all sectors, and are stakeholders or users of the products or services engineers provide.

Thus, increasing the involvement of women in the engineering profession will help ensure the profession remains relevant and representative of the society it serves. It may help to increase the competitiveness of the profession and associated organisations.

# Where Change is Needed

## In the profession generally

There are approximately 31,000 architects, engineers and related professionals employed in New Zealand<sup>6</sup>. Of these, only 13.2 per cent are female.

In addition, there are approximately 22,000 physical science and engineering technicians employed in New Zealand<sup>7</sup>, 16.1 per cent of whom are female.

At the same time, women represent 51 per cent of the population and 47 per cent of the workforce. The current level of female representation is low compared to other professions, such as accountancy<sup>8</sup>, law<sup>9</sup> and medicine<sup>10</sup>. IPENZ intends to change that.

## Through engineering education providers

Female representation in enrolments and completions in tertiary engineering studies is low. In 2009, only 23 per cent of enrolments in Bachelors or Bachelors with Honours degrees in engineering were female.

Again, this level of female representation is low compared to other professions and something IPENZ is seeking to change<sup>11</sup>.

## Within the IPENZ Membership

Women make up 10 per cent of the IPENZ Membership. However, there are only approximately 207 female Professional Members of IPENZ (four per cent of Professional Members) and a total of 16 female Distinguished Fellows, Honorary Fellows and Fellows (two per cent of all Fellows).

New Zealand has 156 female Chartered Professional Engineers, of a total of 2,604 Chartered Professional Engineers.

With 23 per cent of enrolments being female, there is plenty of room to increase the involvement of women in the IPENZ Membership.

## Within senior roles of engineering organisations

IPENZ reviewed the composition of boards and senior management teams of 41 engineering organisations. Of these organisations, 20 have at least one woman on their board and 21 have at least one woman in their senior management team. However, these women are most likely to be in roles associated with human resources, legal or support roles.

Thus, there is scope for increasing the involvement of women at higher levels of organisations, assuming sufficient senior female engineers exist and have the appropriate skills and training.

# Perceptions and Barriers

Studies<sup>12</sup> suggest that perception, belief and experience affect educational choices, which in turn may limit career options for school leavers. There are a number of perceptions and barriers to women entering, remaining and advancing in the engineering profession. Some of these are identified below.

## Entering the profession

### Girls do not have the aptitude to enter tertiary level engineering

There is a perception that girls do not have the aptitude in mathematics and science to go on to study tertiary level engineering.

This perception is incorrect. In 2009, females represented 38, 35 and 53 per cent of enrolments in Year 13 mathematics with calculus, physics, and chemistry, respectively. In 2009, females represented 53 per cent of all Year 13 enrolments.

Girls perform as well as boys in Year 13 mathematics with calculus, physics, and chemistry.

Girls and young women are completing secondary school with the subjects required to study tertiary-level engineering.

### Those women who do study engineering are more likely to fail

In 2009, females represented 23 per cent of students enrolled in undergraduate engineering studies and 26 per cent of those enrolled in postgraduate engineering studies. Data shows that the proportion of females completing engineering qualifications is similar to those embarking on those qualifications.

## Remaining and advancing in the engineering profession

There has been little formal research undertaken to identify potential barriers for women remaining and advancing in the engineering profession.

Anecdotally there is the suggestion that, as well as losing qualified engineers to other roles, perceptions of ability, work/life balance, career breaks and lack of support and recognition affect the long-term retention rate of women in the engineering profession.



# Current IPENZ Actions

## Schools Programme – Futureintech and Techlink

Futureintech is a New Zealand Trade and Enterprise-funded, IPENZ-run initiative to promote careers in technology, engineering and science to students in primary and secondary schools, and to their teachers and caregivers. Promotion is undertaken by taking technologists, engineers and scientists into classrooms to support curriculum-based activity. This is supported by Futureintech's publications and website.

The Futureintech team works to ensure good representation by women in all its activities. Currently, approximately 40 per cent of Ambassadors are female. All print and electronic publications feature women, and two of the four videos produced in 2008 profile females.

IPENZ also manages Techlink which is a Ministry of Education-funded online resource for teachers of Technology education. The Techlink team work to ensure balanced ethnic and gender representation in all materials they publish.

## Annual Remuneration Survey

IPENZ surveys its Members annually to assess the remuneration rates of engineers. In 2010, the survey data was analysed to compare remuneration of male and female engineers.

At younger ages male and female respondents received similar base salaries and total packages. However, from the age of 40 years, a gender gap exists, with male engineers reporting higher base salaries and total packages than their female counterparts.

## The National Engineering Education Plan project

The National Engineering Education Plan project (NEEP) is a collaborative research and development venture between all major participants and stakeholders in the New Zealand engineering education sector. The project seeks to develop a coherent national plan for ensuring that the right number of the right types of graduate is produced to meet New Zealand's needs.

The project has five areas of work, one of which involves considering "the factors affecting the success of minority groups in engineering (women, Māori, Pasifika)".

The report from this area of work notes that women limit their study options by their choice of secondary school subjects, and that they are less likely to choose mathematics with calculus and physics which would prepare them for entry to engineering qualifications. The report recommends that more research be undertaken to consider why this is, and that universities evaluate their support programmes for minority groups and consider how they might co-ordinate their support programmes.

## Liaison with other industry groups

In 2010, IPENZ began partnering with the Wellington Branch of the Institution of Civil Engineers and the National Association of Women in Construction to hold networking events and provide low-cost continuing professional development. The partnership encourages collaboration on projects that offer help and support with career development and mentoring for women.

“ We have recently launched our long-term strategy for transmission – demand for electricity in the future will continue to grow and technology will change the way we develop and operate the power system. As a result, there will be more engineering roles and more diverse engineering opportunities. In today’s environment and into the future we can offer a good work/life balance for women who want to combine their engineering work with family commitments and we strongly support and actively encourage women to choose engineering as a profession. ”



**Dr Patrick Strange**  
Chief Executive, Transpower

“ With a growing workforce across New Zealand, Australia and Asia, Beca fully supports any initiatives to increase the number of women in engineering roles. We often find the diversity of male and female mindset working in teams will lead to better solutions and richer relationships with our clients. ”



**Keith Reynolds**  
Group Chief Executive, Beca Group Ltd

# New Actions

The actions to be undertaken are divided into four key areas – research, leadership, culture, and recognition. A brief summary of the proposed actions is below.

## Research

There are three main pieces of research IPENZ intends to do.

- Investigate the barriers to women remaining and advancing in the engineering profession.
- Investigate the economic benefits of diversity in the engineering profession.
- Investigate the choices of female students at secondary school and university.

Following this research, IPENZ will be able to put in place work programmes to better manage the barriers and to encourage more women into the profession.

## Leadership

This key area aims to identify learning opportunities available to engineers, with particular focus on self awareness and leadership courses. By assessing the benefits and availability of these types of programme, IPENZ will determine whether to offer or create a course targeted to engineers.

## Culture

Using the Professional Development Partner scheme as a vehicle for consultation, IPENZ intends to showcase good employer practices. These include flexible work practices, continued professional development opportunities and support for staff undertaking the competence assessment process.

## Recognition

This key area focuses on the celebration of senior women in the profession and will investigate how IPENZ can assist more senior women to become:

- IPENZ competence assessors
- recognised for their contribution to the profession via Fellowship recognition
- considered for nomination to governing boards.

## Delivery and monitoring of actions

Measures for the success of the proposed actions will include, but not be limited to:

- perceptions surveys
- focus groups (of Members and Professional Development Partners)
- regular review of the IPENZ Membership statistics.

## IPENZ as a Leader

IPENZ is also committed to taking a leadership role in addressing issues of gender balance. IPENZ will be auditing its own practices and policies and the involvement of women at IPENZ National Office. Reflections on this experience will be shared with IPENZ Members.



# About IPENZ and the IPENZ Women in Engineering Task Force

## About IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the lead national body representing all the engineering profession disciplines in New Zealand.

The terms “engineering profession” and “professional engineer/engineering” are used by the Institution in the broadest possible way. The terms adopted do not specify how such skills are achieved, and thus IPENZ seeks to include people from widely varying educational backgrounds.

IPENZ provides services for about 12,000 Members, who are at all stages of their careers, from engineering students through to practicing engineers and senior Members in positions of responsibility in business.

IPENZ assesses foreign qualifications, encourages and assists continuing professional development, and provides awards and scholarships that recognise achievement. IPENZ provides a widening range of Membership services. It also represents engineers’ interests with the Government, provides contact with other professionals through Branches and technical groups, and maintains a vigorous publication and conference programme. IPENZ promotes public debate on engineering issues in the community, and seeks to contribute, on behalf of the engineering profession, to the resolution of issues affecting the wider community.

IPENZ is governed by an elected Board, chaired by the President and includes nine other members. This Board sets the Institution’s strategy and employs the Chief Executive, who manages the expenditure of the budget to provide services to Members and to fund activities defined by the strategy.

## About the IPENZ Women in Engineering Task Force

In 2010, the IPENZ Board established a Women in Engineering Task Force. The Task Force comprises successful leaders of the profession, with support from IPENZ staff. The creation of this publication is the first step in a long-term programme of work which will take positive steps to address the issue of diversity and sustainability of the engineering profession. The Task Force will monitor progress of the actions outlined in this plan.

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March 2011