

Introduction

We often discuss differences in generations and how these differences can impact the ways we interact with each other in the workplace and particularly in relation to the way knowledge is transferred for the development of the next generation of engineers. This paper discusses some of the new ways we are helping to transfer knowledge in the industry in CIGRE and particularly in Australia.

The main working generation categories are generally considered to be:

- **Baby Boomers:** Baby boomers were born between 1946 and 1964. (918M, aged 58 – 76)
- **Gen X:** Gen X born between 1965 and 1980 (1.8B, aged 42 – 57)
- **Gen Y:** Gen Y, or Millennials, born between 1981 and 1996 (2.3B, aged 26 – 41).
- **Gen Z:** Gen Z is the newest working generation, born between 1997 and 2012 (2.6B, aged 10 – 25).

In Australia, and many other countries Generation Y make up a fifth of the population and are presently the largest group in the workforce. Gen Y's are comprised of today's parents, leaders, influencers, and increasingly, wealth accumulators. 1 in 3 are university educated (compared to 1 in 5 of Baby Boomers), they have grown up in shifting times and are digital in nature, global in outlook and are living in accelerated demographic times.

Generational Characteristics are Evolving

Baby Boomers are described as dedicated workers who value visibility. They are described as competitive and driven to succeed and faced a lot of competition in their career development. They learnt and adapted to technology rather than being born into it. They are generally retiring later than our parents did.

Generation X are independent and well-educated individuals. Generally, they were born into technology that we use today and they are comfortable with it. They value autonomy and a higher proportion are university trained. They want to be managers and leaders and are ready to take up from Baby Boomers. They also value personal time and time off work and so appreciate working flexibly and work-life balance. They value formal education and look for opportunities for further study.

The biggest group in today's workforce is "**Millennials**" or "**Gen Y**". They are currently aged between 26 and 41. This group of individuals value collaboration and will tackle problems from different perspectives to earlier generations. They want meaningful work they can be passionate about. They were born into the technology we use today, including social media. They can be called "digital natives" and their approach to engineering is based on the use of software and technology. They are generally in more junior roles but looking for feedback and advice on how to progress.

For **Gen Y** we need to offer opportunities to collaborate, we need to provide meaningful feedback and also explanation on how their work fits into the bigger picture. They need opportunity to bounce ideas and to receive feedback.

Gen Z are described as large, diverse and digitally entrenched generation that invest deeply in their work and understanding their time and effort have real meaning. They care most about work-life balance and personal well-being and expect transparent, top-down communication delivered to them from leaders. According to one researcher, a typical member of this generation is predicted to have 17 jobs and establish 5 different careers in their working life. They are visually engaged and seek instant gratification due to the rise of technology and 24/7 availability of information.

The changes in generation characteristics from the era of the Baby Boomer to Gen Z shows that as an industry we need to be more flexible in our knowledge sharing and in the development of engineering skills.

CIGRE Globally

The stated purpose of CIGRE is “to foster engagement and knowledge sharing among power system professionals globally to enable the sustainable provision of electricity for all”. Its Mission is “To contribute to the betterment of the power system by enhancing the expertise of the people within it.” It’s been doing that successfully for over 100 years. In that time, not only our members and customers have changed but also the technology available to us to share that information.

Even in the last 5 years we can see significant change for example:

- Publication of **Green Books** – these were initiated to share information in a more easily accessible way. Previously knowledge was available in the form of numerous technical brochures, some out of date. There are now 10 CIGRE Green Books on a range of topics including one on Substations. This book summarises the work of 100 years and previously published in over 600 technical papers and more than 75 technical brochures. The Substations Green Book is available in English and Chinese and other languages may be added with time.
- Development of a **Substation Training Course** to enable knowledge sharing on design and management of substations using the Green Book as reference. The course will be available in 11 modules and can be tailored with content to suit difference needs. Previously we used “Tutorials” based on Technical Brochures, but the new training course aims to cover the full Substations topic. See Hugh Cunningham (SC B3 TAG Convenor) for more details.
- **Working Group B3.58** – “Knowledge Transfer of Substation Engineering and Experiences”. This working group began in 2020 and aims to foster ways that we can better share information on our chosen field of Substations. It will consider how best to transfer knowledge from veteran to young engineers, including the use of mentoring.
- **Implementation of a Knowledge Management System (KMS)** – KMS has been one of the major successful changes to information sharing in CIGRE since it was implemented internationally in 2016 but used in Australia since 2010. Now with over 7000 members, KMS provides a low-cost, and stable platform for global knowledge sharing in a secure and accessible manner. It’s made a significant difference to the accessibility of information for our members. Study Committee B3 were one of the early adopters of technology including many of the features available in KMS.
- Establishment of **Next Generation Network (NGN)** with the aim to assist and foster engineers under the age of 35 to interact with and contribute to CIGRE and to share information.

CIGRE has adapted its methods of information sharing in response to user needs and this will continue as our workforce and our membership changes, our baby boomers retire and more Gen Y’s become dominant.

CIGRE in Australia

Australia is said to be a young country, but its history actually goes back more than 60,000 years. Like the rest of the world, we have also recognised the need to change the way we interact with Gen X and Y to help in meeting the large demand in industry for skilled engineers, especially with our vast mining economy and our fast transition to a carbon-free power system. Australia now has one of the highest penetrations of renewables in the power system in the world requiring new skills and technology development. In 2021, renewable energy sources contributed 32.5% of total energy generated¹. Mining is a cornerstone of the Australian economy contributing 10% of Gross National Product and our largest single export.

In addition to contributing and participating in broader CIGRE programs there are a number of CIGRE Australia initiatives to foster knowledge sharing and skills development in power engineering:

- The **Australian Power Institute (API)** was founded in 2005, originally as an initiative of CIGRE Australia and the power industry to provide a sustainable supply of quality power engineers to meet industry demand. The organisation has been successful with initiatives such as:
 - Building STEM skills at Primary and Secondary school level

¹ <https://www.cleanenergycouncil.org.au/resources/resources-hub/clean-energy-australia-report>

- Facilitate a strong power engineering education platform
- Coordination of industry and university innovation initiatives
- A scholarship and bursary program to encourage and attract quality under-graduates
- Summer schools for mid-level engineers to develop and enhance skills

Major Australian power utilities and industrial corporations are members of the API. More information here: <https://www.api.edu.au>

- NGN in Australia is extremely successful with over 200 members. In 2022, CIGRE initiated the **NGN Mentoring program** to provide further opportunities to foster younger engineers by connecting them with earlier generation engineers. More information here: <https://www.cigreaustralia.org.au/about/next-generation-network-ngn/>
- Use of **KMS** to share knowledge. KMS has become the key method of sharing and distributing knowledge within the CIGRE community. One of the new ways we are doing that is to maintain a database of useful resources for Substation engineering, stored in KMS and available to all members and Observers on the Australian CIGRE pages and mirrored on the relevant NGN space. This includes over 40 listings of textbooks, CIGRE and other papers, Standards, brochures and other publications relevant to aspects of a diverse range of Substation engineering.

	Year	Title	Author	ISBN/Reference	Web Link	Description
General Reference						
	2018	Contemporary design of low cost substations in developing countries	WG B3.43	TB 740	https://e-cigre.org/publication/740-contemporary-design-of-low-cost-substations-in-developing-countries	
	2018	Substations	T. Krieg, J Finn (Eds.)	ISBN:9783319495736 ISSN:2367-2625	https://e-cigre.org/publication/GB-5-substations	
	2018	Switching Equipment	H. Ito	ISBN:9783319725376	https://e-cigre.org/publication/GB-6-switching-equipment	This CIGRE Green Book includes circuit breaker distribution systems.
	2021	Handbook of Power Systems	K. Papailiou	ISBN:9789813299375 e-ISBN:9789813299382	https://link.springer.com/book/10.1007/978-981-32-9938-2	https://wetransfer.com/downloads/157544ad5
	2018	Electrical Substations for Electrical Engineering	A. Mahdy		https://amzn.asia/eIENPK9	
	2014	GIS - Gas Insulated Substations	H. Koch	ISBN:9781118570722	https://books.google.com.au/books?i=KrrFAwAAQBAJ	Comprehensive reference covering all aspects of testing and ownership issues
	2012	Electrical Power	J. D. McDonald(Ed.)	ISBN:0849373832		This course is designed in the form of a book .

Figure 1 Australian KMS Substations Reference List (part shown)

CIGRE Australia Mentoring Program

Commencing in 2022, the CIGRE Australia scheme now has nine pairs of mentors-mentees and aims to connect appropriate mentors with suitable candidates in one-on one partnerships.

The Business case for Mentoring

Mentoring is a proven business strategy and 71% of Fortune 500 companies run formalised mentoring programs.

Research studies show that:

- 87% of Millennials say that professional development is an important part of their careers
- Employees who participate in mentoring are more likely to advance pay grades
- 91% of employees with mentors say that they are satisfied with their job

- Mentoring helps manage the pooling and sharing of knowledge and assist in organisation learning programs
- Mentoring programs are low cost compared to other development approaches.
- Mentoring results in higher staff retention rates
- Builds self-confidence and self-awareness in mentees.

How to get the most out of a mentoring program

There are several studies that give tips on how to achieve the most from a mentoring arrangement. Some of these include:

- Mentors and partners should be matched either by self-matching or by use of templated questionnaires to ensure compatibility. Matching considers experience of both participants and their goals. CIGRE Australia used a standard form to determine key characteristics and to consider the best matches.
- There are various tools and checklists that can be used to guide discussions and interactions
- Can be done entirely by remote interaction
- Needs to be done with confidentiality

Experience to Date

I am a power industry consultant with more than 40 years power industry experience, I am a “Baby Boomer” and I am matched with a young substation engineer (Gen Y) who works for an Australian power utility in another state and with a few years of excellent substation experience as an asset manager and a project engineer. We have never met face-to-face but have arranged several video call meetings. Many of our first meetings have been getting to know and trust each other. One of the key benefits for the mentee is the ability to access experience and career advice outside of his or her organisation. This provides a safe environment to discuss wider career and personal issues and options.

I recently received some feedback from my mentee to incorporate in this Contribution:

Xiang Yung Choo said: I'm very fortunate to be matched with my mentor as part of the CIGRE Mentoring Program in 2022. I'm in the late stage of Gen Y and I value feedback and advice, whether technically or professionally, and how my work fits into the bigger picture. Throughout this program, Terry and I share a lot of our lives professionally and personally. What I enjoy the most is the ability to tap into the wealth of knowledge Terry has over his career, but also share with him my work experience. Terry has given me different perspectives to think and has provided guidance to help me in navigating my career in modern work life.

Summary

Ongoing skill shortages, the retirement of experienced utility engineers and changes in the needs of developing engineers means we have to reconsider knowledge sharing methods and training approaches. CIGRE Australia has encouraged the development of the Australian Power Institute to support education in STEM and power engineering at all levels of education, the further enhancement of KMS and also the recent introduction of a Mentoring scheme are aimed at stimulating training and development of a skilled power industry workforce. You may wish to consider if some of the initiatives in Australia are suitable for your country. I would be happy to share our experience with you.

Submitted,

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 NGN