

Contributions/Expectations of Universities

Trevor Blackburn
University of New South Wales
Australia

For both the university and CIGRE communities close and continuing collaboration is arguably an indispensable way of furthering the technological development and operation of modern electric power engineering supply systems.

The current era is one of a world-wide dearth of undergraduate students entering the power engineering discipline and this has led to difficulties in getting sufficient power engineers into the industry to service the current boom in the electrical infrastructure expansion. It has also led to difficulties in obtaining an adequate supply of postgraduate research students in power engineering for maintaining the current high levels of technological development in the industry. There are also concomitant problems of ageing academic staff in power engineering at universities and the significant increase in numbers of new “power” engineers in industry with less than ideal preparation in terms of knowledge of power engineering and the associated technical disciplines that make up the scope of modern power infrastructure.

There have been a number of attempts in various countries to address this problem by developing power engineering “institutes”, “academies” or other variations on the same theme.

The primary aim of these entities is to foster the development of power engineering by supporting undergraduate students with bursaries, supporting course development, providing financial assistance with laboratory and web-based developments and provision of academic and/or technical staff support, either in cash or in kind and the provision of staff from utilities to help develop and run continuing education courses for engineers in the industry.

The extent or scope of these programs varies. Some provide only assistance at the undergraduate level, while others extend their support to the continuing education program development and a few also have a research component involved which. The research component essentially involves having industry nominate potential research projects, based on specific problems arising in the industry.

It is in this context that interaction between CIGRE and electric power engineering activities in universities should be discussed.

There are three aspects that should be considered when considering the possible mutual benefits of CIGRE-university collaboration that may arise: these are (in no specific order of importance):

- Undergraduate teaching

- Research
- Continuing education

In the undergraduate teaching area there is only a limited role for CIGRE. The power engineering curriculum development is best done by the universities but there is some essential need to have industry input and guidance of the appropriateness of the program structure and to ensure that new technology is being adequately covered. Apart from some general assistance in the program development, CIGRE members should have some role in providing occasional lectures on modern developments in the industry to assist with keeping students' interest by discussing new technology.

While the undergraduate role is limited the main, and significant, role in the involvement of CIGRE should be in the continuing education and research areas.

Continuing Education

The seemingly exponential increase in the scope and application of modern technology developments in electric power engineering have meant some necessary reduction in the coverage in the university undergraduate curriculum of the more traditional areas such as power system equipment, electrical protection methods, measurement methods etc. and also a reduction in laboratory practice. The result of this is that more continuing education is needed for new power engineers in the electrical supply industry. This continuing education generally includes coverage of both traditional material and state-of-art practice in the industry. Such continuing educational activity can be assisted significantly by involvement of CIGRE contributions from local members and perhaps with the involvement of the local national committees.

Areas that are generally poorly served in current undergraduate courses are power system equipment (transformers, cables, switchgear etc), protection and asset management, an area of considerable and increasing importance. To provide continuing education in such areas requires considerable practical experience for the presenters and this can be provided by use of CIGRE industry members in conjunction with university staff.

While the larger utilities generally (although not always) have significant in-house training schemes in place, some of the smaller utilities do not have any structured in-house training and thus they are forced to rely on external sources for provision of continuing education programs. CIGRE has the expertise to provide and assist with such educational activities. As an example, in Australia recently there have been both introductory and leading edge continuing education courses provided in the insulation area by CIGRE and university members. The reactions of attendees were positive to such bimodal courses.

In terms of only university academics providing such courses it is often the lack of practical experience that limits the benefits of such courses. However, with the experience of working in the CIGRE system, as members of task forces or working groups, academics do gain such practical knowledge that will benefit both their continuing education activities for the industry and their own internal undergraduate and postgraduate course offerings.

Research

It is in the research area where the most fruitful interaction between the universities and CIGRE arises. This is where much of the developmental activity in new technology for the electrical supply industry takes place. The aim of task forces and working groups is to address problems of current and future concern to the industry. The work may involve solving specific immediate problems or to develop new methods or technology for use in the future. This activity is of immense value to the university academic in that it provides an involvement in activities that are at the forefront of research and development in the specific area.

The value of CIGRE involvement is exemplified by the fact that CIGRE-generated work has often been the genesis of significant developments in technology applications. An example of this is in the area of partial discharge methods applied to assessment of high voltage insulation condition. While partial discharges had been in development for some time it was CIGRE activities that really initiated the forensic aspects of PD pattern analysis in terms of fault identification. The work of Professor Kreuger and his "Discharges" working group 21.03 (published in *Electra* #11 in 1969) was instrumental in assembling the first real catalogue of PD patterns. This work was seminal to the development of PD as a diagnostic tool. This has been further developed by CIGRE work in recent years.

Thus, involvement with CIGRE activities is an important issue for academics in that it presents him/her with a forum for contributing to modern technology. In a more prosaic sense it will also provide him with a range of research topics for new research students (and, in some cases, final year undergraduates). It is always an area of some concern to the academic engineering community to have research topics that are relevant but with enough originality to satisfy the requirements of original research for postgraduate theses.

The use of research students and their potential input to CIGRE is also beneficial in that they can provide a useful source of labour for focused work on a particular topic: such focused attention is not always possible with academic staff and industry engineers, with their many other activities in need of attention.

Thus involvement of university academics in CIGRE working groups and task forces has considerable benefit in maintaining the development of research. It also has the other rather more practical benefit of providing good background for the research grant applications that are the necessary torture that form part of the typical academic's research activities. Such involvement always stands the researcher in good stead with the research councils in their deliberations.

Some improvements

While the collaboration between CIGRE and universities has very substantial benefits, one of the possible demerits is that the work that results can be limited to a relatively small audience. To this end, the scope and activities of the university-CIGRE collaboration should be made more readily accessible to any universities with interests in the research relating to the electrical supply industry. This could be done for example

by making CIGRE-related theses available on a web site for general dissemination and download. At present much of the work is performed and recorded only in working group or task force documents. The only general public dissemination may be in journal papers which provide a very abbreviated form only. A web site with access to detailed theses relating to CIGRE work would be of much greater value to the wider electric power engineering community.

Similarly, any CIGRE continuing education courses or seminars could be posted on the web site for general access to all interested parties.

In summary the CIGRE - University relationship is a major resource for both the electrical power industry and for the universities. It should be fostered, nurtured and developed further particularly in the research and continuing education areas.

To the electrical supply industry the involvement of academics and their students in contemporary electric power supply issues is a valuable resource for development and progress in the industry. For the academics, involvement in CIGRE working groups and task forces has manifold benefits. It provides research projects that are the lifeblood of any university research program, it provides intellectual challenge and the practical involvement and knowledge gained provides the academic with the necessary background for maintaining and passing on his knowledge to undergraduates and postgraduate students.