STAFF TRAINING PROGRAM OF CANDU PROJECTS IN SASKATOON

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This paper describes the training process for a nuclear project on a new site. When AECL opened a project office in Saskatoon, senior management recognized the need for large scale staff training and made the necessary commitments. Two types of training programs were initiated, general and technical. The general training plan included topics related to nuclear project life cycle. Technical training was discipline and task specific. Based on the job descriptions and staff qualifications, technical training requirements were documented for the entire staff. The training strategy was developed and implemented. Detailed records were maintained to monitor the progress, draw conclusions, and plan training for future nuclear facilities.

1. INTRODUCTION

In the summer of 1993, when Atomic Energy of Canada Limited (AECL) opened a CANDU project office in Saskatoon, Saskatchewan, a lot of the staff were new. Many of them were local recruits, others came from various divisions and sites of the Company, and some were former Ontario Hydro employees. The senior management recognized the need for staff training on a large scale and commitments to the Atomic Energy Control Board (AECB) were made to that effect. A Training Coordinator was appointed and was given the responsibility to organize training for the Saskatoon office.

Two basic principles governed the CANDU 3 project training program in Saskatoon: first, the quality principle that personnel will be competent in the work they do; and second, the guiding principle that AECL will provide employees with the training and development necessary to achieve the Company's business plans and to prepare adequately to meet future requirements. To achieve that, two types of training programs were initiated, general and technical, with the objectives to:

- provide orientation on how to do the work the "AECL way",
- become productive as soon as possible, and
- help where help is needed.

During the training program planning, CSA/CAN3-N286.2 Code (Design Quality Assurance for Nuclear Power Plants) requirements and relevant Company policies and procedures were observed.

2. GENERAL TRAINING

2.1 Initial Planning and Organization

The general training plan outline evolved through the amalgamation of thoughts and ideas of many Saskatoon staff members, it was truly a team effort. One of the guiding parameters was that the general training would be given to all CANDU 3 project staff in the Saskatoon office; general training would be repeated when there was a sufficient number of new staff members. The first round of general training was held during the months of November and December of 1993. The general training consisted of ten parts, as follows:

(1) Training Program Overview

This was the introductory session to outline the training schedule, organization, standards for successful performance, and learning material.

(2) Use of Modern Office Facilities

Sessions on how to use modern office equipment and facilities were conducted in a workshop environment with the emphasis on the voice mail features, tele-conferencing, and the telephone manager access.

(3) Use of Computers

Instructions and hands-on demonstrations for personal computer (PC) use concentrated on the local area network (LAN), multi-site communications, Microsoft Windows, and the electronic mail (E-Mail) system.

(4) CANDU Nuclear Generation

Nuclear basics, nuclear generation options, CANDU facilities, nuclear safety philosophy, regulatory requirements, and fuel handling were some of the topics covered during this session.

(5) CANDU 3 Standard Product Design

This session covered the plant design, layout, constructability, maintainability, operability, licensing process, control centre and human factors.

(6) AECL Organization and Responsibility

The CANDU 3 project organization and its relation to the rest of the Company was the focus of this session. The roles and responsibilities of each discipline and the flow of information and interface between them were also elaborated on.

(7) Status of CANDU 3 Project

The CANDU 3 project life cycle was described and the current position was pointed. The work scope split was outlined between the standard product design and the site specific activities.

(8) Quality Assurance Program for CANDU 3

This whole session was devoted solely to mandatory Quality Assurance (QA) requirements, the CANDU 3 standard product design QA program, and practical applications of the policies, procedures, and project instructions in the project environment.

(9) Access and Control of Existing Documents

This session dealt with practical aspects of document management, handling of existing and generation of new documents, paper copies as well as electronic (computer) files.

(10) Engineering Process and Document Production

The last session covered the typical engineering activities for various phases in the project cycle, cost estimating of alternatives, work planning, and progress monitoring. The whole cycle of the document generation was described with the emphasis on quality assurance requirements for each phase of the process.

Typically, topic presentations were conducted during the morning sessions; each presentation was followed by a discussion and questions and answer period. The afternoon sessions were reserved for video presentations to complement and enhance the morning sessions. A discussion on the day's proceedings was held each day after the last video. In total, the general training lasted about thirty working hours during which time nineteen instructors

delivered 63 presentations and sixteen videos were shown. All of the general training instructors were from the CANDU 3 project; most of them with over twenty years of nuclear experience with AECL and/or Ontario Hydro.

The CANDU 3 Technical Outline book was given to all staff members at the time of joining the CANDU 3 project. They were asked to familiarize themselves with the Technical Outline, as the prerequisite for attending the general training. Handouts were given each morning for the day's presentations. The binder containing all of the handouts and the Technical Outline constituted the learning material.

Since attending general training was considered mandatory, no other activities or meetings were scheduled during the same period. The attendance was recorded for each session.

After the last general training session, feedback sheets were distributed to all attendants. An evaluation was sought for each of the following categories: training organization, presentations, discussions, handouts, videos, and general impression. In order to maintain good working practices and make improvements for future sessions, additional comments were solicited. The general training feedback statistics were generated and the results were as follows: videos and training organizations scored the highest mark followed by discussions, presentations and handouts.

A week after the last general training session, a written examination was held. The examination consisted of a hundred multiple choice questions to be answered over two hours. The acceptance criterion was established: the minimum of seventy correctly answered questions was required to pass the examination. The majority of staff members took the examination seriously; about 92 percent passed the examination. After the examination, an opportunity was given to all attendants to see their examination papers with the objective to improve in those areas which were incorrectly answered. A certificate of successful completion was given to all who passed the examination and a copy of their certificate was also placed in their files which are kept by the human resources department. Those who failed were informed that they would have to write the examination again. All general training documentation, with the exception of the examination paper results, is permanently filed with the Information Centre of the Saskatoon Office.

2.2 Second and Third Round of General Training

For those CANDU 3 staff members who joined the project in 1994 or were unable to attend the first round of general training and for those who failed the examination, the second round of general training was held in April and May of 1994. Seventeen staff members attended about thirty hours of the second round of general training which was virtually identical to that of the first round. The candidates wrote the examination in May of 1994.

The third round of general training was held for fifteen new employees during the months of November and December of 1995. General training was modified to reflect more advanced stages of the project cycle, Company reorganization, and change of the program scope from CANDU 3 to CANDU 9.

For all staff members, general training created the needed momentum for subsequent technical training.

3. TECHNICAL TRAINING

3.1 Scheduling and Subject Selections of Technical Training

While the general training was given to the entire staff, the technical training was discipline and job task orientated: selected individuals received specific training which enabled them to perform necessary technical activities and to keep up with technological advancements.

In accordance with the Company procedure, the qualifications of each incumbent were identified and documented. Based on the Design Process document and the Program Workplan, a position requirements or job description was also established and documented for all staff positions. The qualifications were assessed against the position

requirements so that the training needs could be identified and scheduled on the prescribed procedure form. The timing for technical training courses was determined based on the Program Workplan - detailed schedule for project activities until the end of 1996. Training progress was monitored and the form had to be updated at least once a year.

While it is unlikely that any two staff members took exactly the same set of courses, most of the staff attended at least some courses related to the following subjects:

- Computer Aided Design and Drafting System (CADDS).
- Plant Layout.
- Nuclear Safety Analysis.
- Environmental Qualification of Equipment.
- Human Factors.
- ASME Code.
- Document Management in Electronic Medium.
- Microsoft Office for Windows.

A database in a spreadsheet form was maintained listing all employees along the vertical axis and all training courses along the horizontal axis. When an employee took a course, the date of the course was entered in the designated spreadsheet cell. For those courses which lasted more than a day, only the first day of the course was entered.

3.2 Organization and Structure of Technical Training Courses

For all technical subjects, the following thirteen points were followed during the course organization and structuring:

(1) *Course Objective* must be clearly stated. It basically tells the class members why they are there.

(2) *Training Plan Outline* tells the class what is being taught, by whom, when, and for how long.

(3) *Methodology and Class Format* concentrates on teaching versus making presentations. The selected teaching method corresponds to the category of the learning outcome, such as motor skills, attitudes, cognitive strategies, intellectual skills, etc.

(4) *Target Audience* defines who the course is for while taking into account the lowest common denominator of class knowledge of the subject matter.

(5) *Course Applicability* is particularly relevant when a course is given to a multi-discipline class because different disciplines may apply the gained skills in various ways and for diverse purposes.

(6) *Handouts* are directly related to the course material; they are used as the primary learning text. The handouts are distributed to class members prior to the course commencement.

(7) *Reading Material and References* constitute secondary learning material which is not essential for completing the assignments but enhances and broadens the knowledge gained during the course.

(8) *Course Prerequisites* determine in what sequence certain courses are to be taken. The course prerequisites also ensure that a certain common denominator of the class is achieved.

(9) *Evaluation Method* can be in the form of an examination, work assignment, computer program output or some other method of measuring success in a quantifiable manner.

(10) *Acceptance Criteria* for passing the course is stated before the course starts so that the trainees know what is expected from them in order to successfully complete the technical training course.

(11) *Feedback* in a written form is solicited for every course. The two main objectives of the feedback are to learn what are good working practices in order to maintain them for the future and where to make improvements for subsequent training sessions.

(12) *Summary Report* captures main points of the seminar and is used as reference and guidance for future sessions.

(13) *Documenting and Filing* is essential for verification, auditing, and structuring future training sessions. Usually, complete seminar documentation is kept in a single binder bearing the unique file number. The following sections (tabs) are recommended for a seminar binder.

(i) Training plan outline.
(ii) Handouts, list of references, learning and reading material.
(iii) Feedback sheets and feedback statistics.
(iv) Evaluation documentation.
(v) Attendance sheets and statistics.
(vi) Certificates of completion.
(vii) Summary report.
(viii) Correspondence and support documentation.

4.0 TRAINING AUDIT

Training of the AECL staff was audited by four Atomic Energy Control Board (AECB) Auditors on March 28-31, 1994 in Saskatoon. The audit was conducted along the following six modules:

(1) Personnel Qualifications.
(2) Planning.
(3) Course Content.
(4) Training Courses.
(5) Evaluation of Trainees.
(6) Evaluation of Training Program.

In their Audit Summary the AECB Auditors stated: *"The Auditors have not identified any deficiency that require a Directive, Action Notice or Recommendation."*

4.1 Training of Trainers

While the Auditors recorded that *"CANDU 3 staff were found to have a very good mix of experience with background in design, research, and operations"*, they also identified *"that most instructors had received presentation courses but had never received any "training" on how to train."*

A corrective action was taken within a month. The Training Coordinator attended a three day course titled "Accelerated Instructional Methods" organized by the General Physics Corporation (GPC) in Maryland, US. Based on the GPC course, a shorter seminar was organized and presented to AECL training instructors in Saskatoon. The main theme of the seminar given to the training instructors was how to teach rather than just make a presentation.

5.0 STATISTICAL DATA AND ANALYSIS

Statistical data were assembled and reported until the end of March of 1995 which was the end of the 1994/1995 fiscal year.

5.1 Magnitude of Training Program

58 courses were offered to the AECL staff in Saskatoon from October of 1993 to March of 1995. 96 staff members were trained. Total of 1452 person-courses were taken during the eighteen month period.

5.2 Class Size

A frequency distribution of the class size of the 58 courses is shown in Table 1 and Histogram 1 on Page 7.

35 courses (60%) were attended by more than 10 trainees.

5.3 Course Attendance

A frequency distribution of the number of courses taken by the 96 trainees is shown in Table 2 and Histogram 2 on Page 7.

The majority of trainees (70%) completed between 10 and 20 courses. However, 4% of trainees completed more than 45 courses.

6.0 CONCLUSION

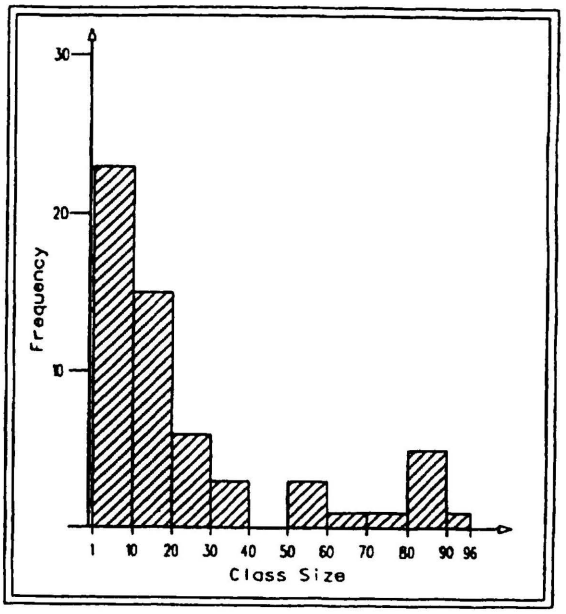
AECL has invested very substantial resources in training their staff in the new office in Saskatoon. A comprehensive and auditable training program was developed and implemented to ensure a competent staff which is needed to maintain the current world class performance of CANDU reactors. The reasons for the successful training program include, but are not limited to, the following: experienced training instructors, a dedicated program for all staff and thorough planning. The formal evaluation method proved to be very useful because it offered a quantifiable method of measuring the degree to which the training material had been absorbed. It is recommended that some method of measuring success in a quantifiable manner be retained for future training programs. In addition to detailed records for every course, a database in spreadsheet form was maintained to monitor training progress. The spreadsheet data were used to conduct a statistical analysis and draw conclusions. The spreadsheet may also be used for the planning of training programs for future nuclear facilities.

7.0 ACKNOWLEDGEMENT

The training program in Saskatoon was successful because of the team effort of all Saskatoon staff members who enthusiastically participated, generously shared their experiences, provided valuable suggestions, ideas and feedback comments. Saskatoon management support is also gratefully acknowledged.

Class Size Number of Trainees	Frequency
1 - 10	23
11 - 20	15
21 - 30	6
31 - 40	3
41 - 50	0
51 - 60	3
61 - 70	1
71 - 80	1
81 - 90	5
91 - 96	1
T o t a l	58

TABLE 1

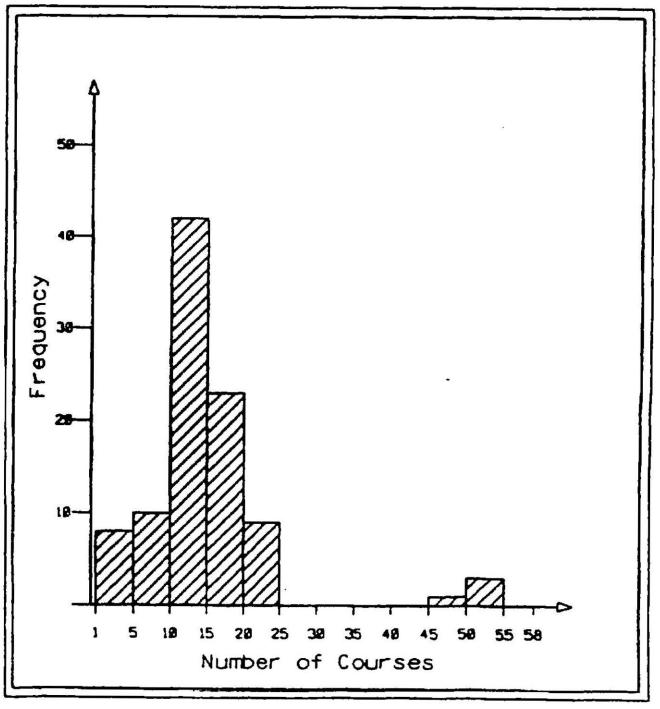


HISTOGRAM 1

FREQUENCY DISTRIBUTION - CLASS SIZE OF 58 COURSES

Course Attendance Number of Trainees	Frequency
1 - 5	8
6 - 10	10
11 - 15	42
16 - 20	23
21 - 25	9
26 - 30	0
31 - 35	0
36 - 40	0
41 - 45	0
46 - 50	1
51 - 55	3
56 - 58	0
T o t a l	96

TABLE 2



HISTOGRAM 2

FREQUENCY DISTRIBUTION - NUMBER OF COURSES TAKEN BY 96 TRAINEES