

advances in technology and the evolution of the technical safeguards implementation criteria used by the IAEA. For example, a review of the original approaches for the multi-unit CANDU stations at Pickering, Bruce and Darlington, Ontario, resulted in more emphasis being placed on safeguarding the fuel in the reactor cores and in the development of special instrumentation to achieve this objective. The Canadian Safeguards Support Program provides assistance to the IAEA in carrying out such reviews.

2. Cost-free Experts

The provision of cost-free experts is acknowledged by the IAEA as a most cost-effective means of assistance. It involves providing Canadians free of charge to work for the IAEA, mostly in Vienna, but sometimes in Canada. The advantage to the IAEA is that a source of expertise is provided for short-term projects requiring particular knowledge or special skills for which it is impractical to use regular IAEA staff employed on more general long-term projects.

3. Equipment Design and Development

Once the systems studies have been carried out and the safe-

guards approaches agreed, it is necessary to design and develop appropriate equipment to implement these approaches. This is a complex and challenging undertaking. Depending on the application, an instrument or device may have to operate in a hostile environment such as the high radiation field of a reactor vault or completely under water in a storage pool full of irradiated fuel. The equipment must always be safe, effective and easy to use.

Equipment used to keep nuclear materials under seal and under surveillance must be designed to operate completely without attention and without failure between inspection visits. "Failure" in this context includes giving false alarms due to equipment malfunction as well as being unable to detect diversions. False alarms can lead to costly reverification of nuclear materials under safeguards. In addition to this, designers are faced with the very special demand that this kind of equipment must also be designed to resist or reveal any attempt to tamper with it by a country seeking to cover a diversion. These requirements impose severe limitations on the use of standard industrial equipment and generally mean that each new piece of equipment must be specially designed or adapted.