The Carbon Filter Programme: An Example of Success in Applied Nuclear R&D

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In the early 1980s, Ontario Hydro proposed that research be carried out on the behaviour of carbon to be used following an accident for removing gaseous iodine species from air discharged from the Emergency Filtered Air Discharge systems of Ontario Hydro multi-unit nuclear stations. Little was known about the specific behaviour of iodine on these carbon materials, and data was needed to assess the weaknesses and the degree of conservatism that may have been inherent in the relatively primitive carbon filter models that were used at that time for safety analysis. A study programme was established in 1983, and has continued to the present, although there was a hiatus between 1988 and 1992.

The results of the carbon filter research work have forced a complete change in our view of how these filters function. The programme has resulted in a large body of high quality data, from which has been constructed a mechanistic model of iodine retention on the carbon and its migration through the filter bed. The work has also resulted in a model to predict the heatup of the carbon as a result of a loading of radioiodine, and has generated a body of data that can be used for validation of these carbon filter models.

Of particular interest is the way in which this project has evolved, and the insights that have been derived from it on the management of effective research and development work. The initial five years of the programme was almost entirely scientific in nature, and the emergence of patterns of carbon filter behaviour and how these patterns should be captured in a model are discussed in the paper. The second part of the work, from 1992 to the present, has been much more applied in nature, and the interaction between the research scientists and the applications engineers is discussed in some detail. This second portion of the work has seen successful high grade applications of the research results and the development of a longer term plan to follow the application of the work through to a reasonable end point. This plan represents a path for completion and closeout of the entire project, with the intention of leaving behind a minimum of unfinished business and loose ends. Of particular interest is the changing role of the research scientist as an applied research project matures and approaches completion. The elements of this plan are presented and discussed in the paper.

Based on our experience in this work, a model for the conduct of effective applied nuclear R&D is proposed. The paper concludes with a review of the costs and the benefits of this R&D project.