

ORIGINS OF ARAC

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The original mission of the Atmospheric Release Advisory Capability (ARAC) was to provide reliable and timely assessment advisories to emergency managers at DOE nuclear facilities and US nuclear power plants in the event of accidental emissions to the atmosphere. ARAC products and analyses were to be used to reduce exposure to downwind populations, and to assist in the planning of any needed countermeasures. The birth of the ARAC concept in 1973 came in the form of a simple question from a DOE-BER program manager, Rudy J. Engelmann, to Livermore scientists in the Atmospheric Sciences Group. Is it possible that the wind prediction models, atmospheric transport and diffusion models, current weather data bases, and the data bases regarding dose response of humans to multiple nuclide exposures could be merged into an integrated system for the DOE? With reflection on the complexity of the question, our answer was that the Laboratory would indeed like to do a feasibility study to select the necessary and various capabilities and to devise the path of development and testing of an integrated system. With a grant of fifty thousand dollars from the DOE-BER, the feasibility project was launched in 1973.

Within about twelve months the DOE organized a site visitation review team for the BER efforts at LLNL—our feasibility project and its progress and findings were on the review agenda. Our project team including Todd Crawford, Joe Knox, Marvin Dickerson and others devised a skit (a mini-play) to illustrate how an assessment team with the then unnamed system would assist in a nuclear emergency. In a real emergence, in most instances, little is known about the source term, its height, strength, heat content, or effects of building wake dilution effects. However, all these effects are reflected in the downwind isotopic measurements (at ground level or in the air) that are submitted to analysis in an atmospheric dispersion model based on a unit source term. With such a tool, the effective isotopic source term can be determined on an hourly basis through the integrated use of the models and measurements, and prediction of exposures in other areas without measurements can be made. At the end of the skit, we proposed that this capability be called the “emergency emission forecast center”(EEFC). The skit was a communication success that avoided the use of endless view graphs, but clearly made its point. Over coffee, one of the reviewers, Dr. Bob Catlin from EPRI, suggested that a more politically correct name for the project should perhaps, be the “Atmospheric Release Advisory Capability”. And so, it was so named and endorsed. The project entered its early developmental stage for the next few years.

On March 28, 1979 a telephone call from DOE Headquarters signaled a nuclear accident at TMI. The question at this time was “Could ARAC help and how soon?” The actions that were initiated at LLNL that morning led to a fourteen- day response by the ARAC project members. The authors of “Crisis Contained”, DOE-EV 10278-T1(December 1980) tell the story of “The Department of Energy at Three Mile Island—a History”. The

following paragraph from this history describes the ARAC contribution and its value to the emergence operations at TMI.

“Another recent development in radiological safety had taken place at the Lawrence Livermore Laboratory in Livermore California. There, scientists combined computer technology with meteorology to predict possible levels and areas of radioactive fallout. The system was tagged with a convoluted name, Atmospheric Release Advisory Capability, but the acronym ARAC was much easier to handle and few knew the system by any other name. After locating the radioactive cloud or plume through the aerial measuring, the ARAC could use the levels detected in the plume to calculate the radiation level of the source. Then, plotting these measurements against the weather conditions and the topography of the area, with five minutes the computer could tell the ground monitoring teams where they should expect to find radioactivity. Not only did this system integrate aerial and land radiation monitoring efforts, but when used properly, it could also provide invaluable aid in evacuation planning.” The development of the ARAC capabilities and their testing in years prior to TMI had indeed paid off. ARAC had responded well in keeping with its original concept in 1973. The telephone in the ARAC center has rung many times for help in the period of 1979 to 2002; in this time period, ARAC has been there ready to serve with an evolving and maturing capability on numerous occasions.