

Alternative Source Term (AST) Applications for Operating Nuclear Plants



BACKGROUND

The publication of the final NRC Rule — “Use of Alternative Source Terms at Operating Reactors,” FRN 64, No. 246, pp. 71990–72002, has generated opportunities that provide significant benefit to the nuclear industry. Bechtel’s involvement in the NEI Task Force on AST coupled with our experience in Advanced Reactor Designs has resulted in our developing a thorough understanding of the benefits that the application of new technologies and approaches provide to operating nuclear plants. This task force developed the NEI EPRI Generic Framework Document, which identifies benefits that accrue to a mature operating nuclear power plant from the application of the Alternative Source Term — approved by the NRC with the issue of NUREG 1465.

Bechtel has provided technical consultation to the NEI Pilot AST Projects and is assisting other customers in evaluating potential plant-specific applications. In parallel, several recent dose analysis/evaluation efforts by Bechtel have aided plants in recognizing and making better use of existing operating margins. Bechtel’s radiological analyses in support of plant modifications and Cost Benefit Licensing Actions (CBLA) demonstrate our extensive experience and capabilities and the flexibility of LOCADOSE, Bechtel’s in-house proprietary dose analysis program. Our long-standing, active role in the nuclear industry, sensitivity to utilities’ needs to reduce operations and maintenance costs, and cutting-edge capabilities provide unparalleled experience that will provide significant benefits to nuclear plants.

PLANT ASSISTANCE

Given the current favorable regulatory climate and the excellent progress of the AST Pilot Project, the timeliness of assessing and prioritizing AST applications is paramount. There are several benefits beyond the more realistic prediction of post-accident doses and subsequent improvement in safety margins. By coupling Bechtel’s experience and capabilities with those of your plant personnel and applying advanced techniques for analysis, significant O&M cost reductions can be achieved. Benefits highlighted in the NEI EPRI Generic Guidance Document include:

- Allowable leakage rate increases
- Control Room inleakage increases
- Isolation valve actuation timing increase
- Filtration unit simplification
- Mitigation System actuation timing

The indirect plant-specific benefits include improved safety margins, which result in fewer regulatory restraints on operation, a basis for design basis re-evaluation, a more accurate characterization of core damage frequency (CDF) for application to IPE/PSA and risk-based assessment techniques, and reduced operator burden.

Advantages of a Utility/Bechtel Team

The NRC acknowledges the role Bechtel has played in the nuclear industry and maintains a high regard for our capabilities. Bechtel’s experience and capabilities in licensing, analysis, engineering, technical excellence, and project management are well-known and validated. Our familiarity with NRC and industry activities provides you an unmatched advantage. Bechtel has been involved with more than 50 percent of the operating nuclear plants in the United States. A Utility/Bechtel team can provide expert resources to assist your plant staff while providing training and technology transfer. We have solid experience implementing AST principles and willingly share our lessons learned. We are committed to total customer satisfaction and have the sustained financial strength and resources to see every job through to completion. Working with your plant personnel, Bechtel can provide:

- Feasibility and application assessments
- Program plan and schedule development
- Plant-specific AST analysis
- Licensing approach development and execution
- Definition of specific applications and cost-benefit analysis for each
- Licensing support
- Preliminary and detailed engineering



Attributes of LOCADOSE

LOCADOSE is Bechtel's multinode radiation transport and dose calculation program. It is extremely flexible. For each node, time-dependent production and removal terms can be entered and activities, dose rates, and doses calculated. Dose rates and doses at up to 20 offsite locations can be calculated. An unlimited number of time steps are available to model all time-dependent parameters. Much of the data is user-definable such as isotopes, spray and plateout removal terms, internodal flows, and organs for which doses can be calculated. LOCADOSE can model different control room atmospheric dispersion factors for filtered and unfiltered inleakage. Direct inleakage into the control room from other nodes can also be modeled. An extensive library containing isotopic data for over 200 isotopes is included. LOCADOSE calculates the maximum two-hour TEDE dose for compliance with the new dose criteria of 10CFR50.67. LOCADOSE has been validated by Bechtel for use with the AST and has been used for pilot project work by the EPRI contractor.

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Potential LOCADOSE AST Applications

For BWRs and PWRs

- Elimination or reclassification of charcoal filtration systems and costly testing
- Changes to post-accident timing for valves and systems that communicate with containment
- Eliminate post-accident isolation function for valves and systems that do not communicate directly with containment
- Improved emergency diesel generator reliability through reduced or more reasonably sequenced loading
- More margin for control room inleakage
- Relaxation of allowable leakage limits for primary containment isolation valves

For BWRs

- MSIV leakage control system elimination with minimal hardware changes
- Improved MSIV allowable leakage limits
- Less restrictive secondary containment drawdown times
- Increase allowable time for MSIV closure

For PWRs

- Elimination of the need for subatmospheric containment operation
- Eliminate or limit containment spray additives
- Improve operating margin for containment pressure