Volume 18, Issue 1

Summer 2003

URA *Update...*

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News in Brief:

- **October 2003 ...** URA looks forward to seeing our clients and friends at the Advances in Nuclear Fuel Management III Conference October 5-8 at Hilton Head Island, SC.
- **August 2003 ...** A new URA company brochure "**The RESOURCE in Utility Resource Associates**" went to press.
- **July 2003 ...** URA completes **GROOVY**! A safety grade program which links **MICROBURN-B2** to **RETRAN-3D** for either 1-D or 3-D transient analysis has been delivered to a client. Cross sections and core geometry inputs are extracted from the nodal code and converted to RETRAN's 1-D or 3-D input requirements. For more information, call Don Hines (301-294-1330).
- **June 2003 ...** URA imported client nuclear fuel accounting data into **ACCESS** database tables. URA deciphered undocumented data fields to read the data into **ACCESS** tables to prepare queries and reports. Similar tables may be created for spent fuel inventory, nodal and transient code inputs to improve data accessibility. For more information, call Kevin O'Sullivan (301-294-8019).
- **January 2003 ...** URA completed the development of explicit core & bundle design procedures for both PWRs & BWRs. These procedures provide instructions for systematically developing new lattice designs & reload patterns. For more information, call Kurt Weidenhammer (612-664-0061).

URA Provides Core Monitoring Support

Rodney L. Grow

During the past year, URA has applied its core analysis and on-line monitoring expertise to support Exelon Nuclear in their core monitoring transition project. The scope of work performed by URA has included the building and benchmarking of multi-reactor, multi-cycle CASMO-4/MICROBURN-B2 core models, the conversion of these models to the new core monitoring system's inputs, and the on-going support for generating new thermal limit libraries and core monitoring inputs.

URA's scope of work has been performed under the URA QA Plan as safety related work. The deliverable items from URA to Exelon for these activities have included benchmark reports and model inputs with the supporting engineering calculation files and model reports

A GROOVY Kind Of Love ...

Donald D. Hines

GROOVY, a linking code between Framatome-ANP's MICROBURN-B2 (MB2) three-dimensional nodal simulator and EPRI's RETRAN-3D (R3D) transient analysis package, has been developed by PPL and URA. For traditional 1-D analysis, GROOVY can process data from full core or quarter core MB2 cases to create 1-D cross section and kinetics data along with geometry and thermal-hydraulics data files. While for 3-D analysis, data from a single full core MB2 case can be used to create either a full core or quarter core (southeast quadrant) CORETRAN Data Interface (CDI) file and Binary Cross-section File (BXF). Of course, quarter core MB2 cases can be used prepare quarter core CDI and BXF files, but can't be expanded to full core.

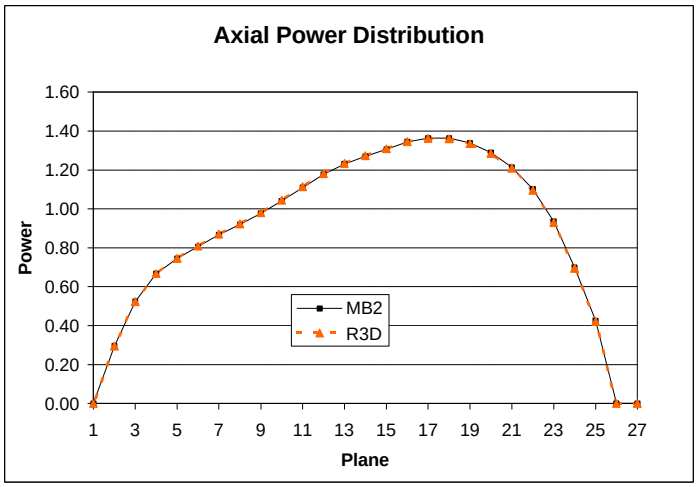
As a result of modifications made by URA to MICROBURN-B2, most of the data needed by GROOVY to prepare the core model and cross-section files for either 1-D or 3-D analysis are derived directly from MB2. This custom enhancement to MB2 is in the form of an ASCII Linker Summary File containing all the available information for GROOVY. No modifications were made by URA to PPL's version of RETRAN-3D. Although most of the information necessary to model the reactor for R3D are obtained directly from MB2, a small amount of data must be supplied via a user input file for GROOVY.

For 3-D analysis, the MICROBURN-B2 GROOVY combination is once-and-done. A single MB2 case is run by the user at the desired core conditions with an input option set to generate the Linker Summary File for downstream preparation of RETRAN data files. Next, a single GROOVY case creates both the BXF and the CDI files for 3-D RETRAN-3D analysis. From these BXF and CDI files, R3D can be executed for the desired transient.

Traditional 1-D analysis is slightly more involved. A base MB2 case is run by the user at the desired core conditions followed by MB2 perturbation cases consistent with the transient to be analyzed by the 1-D RETRAN kinetics model. Each of these MB2 statepoint calculations have the input option set to generate the Linker Summary File for downstream RETRAN 1-D analysis. Next, a single GROOVY execution digests the MB2 base and perturbation cases to create both the ASCII 1-D cross-sections and kinetics file as well as the 1-D geometry and thermal-hydraulics file for RETRAN.

The most exciting aspect of GROOVY is the use of the "Homogenization and Functionalization of One-Dimensional Kinetics Data for RETRAN (Cronin & Smith) cross-section correction factor for 1-D analysis. This preserves the 1-D axial power shape and $K_{effective}$ of the MB2 case when reproduced in RETRAN-3D. This feature produces nearly identical 1-D axial power distributions. Even for the lowest powered planes! Incredibly, the $K_{effective}$ difference between MB2 and R3D is usually under .01 mK too! Industry standard Peach Bottom results are shown here as an example of the exceptionally good comparisons we obtained for the base MB2 case. Equally good comparisons exist for each of the MB2 perturbation cases as well demonstrating the accuracy of the GROOVY linking code package.

Additional information on GROOVY can be obtained by contacting Don Hines at 301-294-1330.



MB2 $K_{effective}$	R3D $K_{effective}$	ΔmK
0.994957	0.994955	-.002

Spreadsheets Seem to Work Fine…

Kevin O'Sullivan

URA recently conducted a telephone survey among domestic Operating Companies regarding the method that they use (and their satisfaction level) to produce the nuclear fuel expense forecast. This is an important activity that affects the bottom line – fuel procurement cash flow and fuel expense (energy burn rate) influence projected and actual earnings. We found that most companies track actual versus predicted expense on a monthly basis, with an objective to stay within a narrow band of error (2%) for both expenditure and fuel expense. The method used for more than 50 percent of domestic reactors is Microsoft Excel worksheets! The people who use spreadsheets expressed general satisfaction with the forecast accuracy and the level of detail for cost analysis and reporting. At some companies, end-of-year personnel performance appraisals are based in part on the accuracy of current year cash flow and energy burn rate (mills/kWh or cents/mBtu) compared to their forecast from the prior year.

It should not be too hard to nail the forecast using Spring refueling data because the reload is almost completely fabricated by the end-of-previous-year and the material has been allocated. The un-amortized investment in-core is also known. Trust the reload design engineers to have provided accurate information for fuel batches and incremental burns.

The data for a Fall refueling is a different animal and is the source of forecast error. At the time the forecast info needs to be provided, there is a good 9 months or more before end-of-cycle, the design engineers may be unwilling to commit to a preliminary design this early or too busy to give time to the design, or dependent on the vendor to provide a multi-cycle plan, or knee deep in operations. This entanglement can be especially gruesome if there is a BWR unit with a Fall outage that has experienced fuel failures during the cycle. More so of course with multiple BWR refuelings, but still the same fuel procurement and fuel expense forecast that needs to be accurate or else!

Whether you use Excel or Access, or a canned Fortran program with a Visual Basic front end, URA can tailor support service or a new approach that specifically meets your needs. We can help you improve the estimate made for the bottom line. We are working to implement other data base applications, and even a web-enabled product for companies that swap info but are not on a private network, in response to potential requirements specifications from our customer base.