Comment on "Response Matrix Properties and Convergence Implications for an Interface-Current Nodal Formulation"

Yang has investigated the properties of the response matrices in a given group.[1] He makes a false statement when expressing the opinion "... no analytic study has in the past been performed on the properties of these response matrices derived by nodal diffusion theory." That statement would annul works by Henry at the Massachusetts Institute of Technology and his former students (among others, Smith and Shober), Bonalumi (Ontario Hydro), and many others including me. All those works have been published in leading American journals. I do not intend to deprive Yang from the stimulating search of the literature; thus, this letter is confined to a short list of bare facts.

1. Analytical response matrices are explicitly known in multigroup formalism as well. The row has been opened by Henry and Shober by presenting explicit two-group matrices for square nodes.

2. Analytical solutions to the multigroup diffusion equation appeared in 1984, including hexagonal geometry.

3. As to hexagonal geometry, the first analytical response matrix appeared in 1981 in an American journal following a local report in 1980.

4. Properties of the response matrices have been studied (eigenvectors, eigenvalues).

5. The effect of involving higher moments of the entering current has also been studied and revealed nonnegligible effects.

6. A formulation of an analytical three-dimensional response matrix for hexagonal node appeared first in Ref. 2, which mentioned test results of a production code. There is nothing essentially new in the three- compared with the two-dimensional case.

7. Y. Gotoh determined response matrices with regionwise different, i.e., space-dependent cross sections.

8. As far as I know, today there are almost a dozen production codes based on analytical solutions in a hexagonal three-dimensional node. Several of them use the response matrix method.

It should be emphasized that there are many possible choices of the vectors representing the partial currents given at the faces of the node; notwithstanding, the vectors in Table I of Ref. 1 are not lucky. The vector $(1,1,1,1,1,0,0)$ means zero partial currents at the top and the bottom. Such entering currents can be given, but the exiting currents will follow the pattern (a,a,a,a,a,b,b), whereas, if the entering current follows the foregoing vector, so does the exiting current with different a and b ($a \neq 0$, $b \neq 0$) values.

Mihaly Makai

KFKI AEKI
H-1525 Budapest 114
P.O. Box 49
Hungary

November 23, 1995

REFERENCES

1. W. S. YANG, "Response Matrix Properties and Convergence Implications for an Interface-Current Nodal Formulation," *Nucl. Sci. Eng.*, **121**, 416 (1995).

2. M. MAKAI, *Ann. Nucl. Energy*, **19**, 715 (1992).

On "Neutron Fluence at the Pressure Vessel of a Pressurized Water Reactor Determined by the MCNP Code"

Reference 1 is of interest to me because it addresses one of the major factors directly affecting reactor operation and lifetime. During the past 7 yr, my students and I have been investigating transport theory methodologies for accurate estimation of neutron fluence at the reactor pressure vessel. While reading Ref. 1 very carefully and with much interest, I became concerned by its lack of quality and accuracy—especially because the results of the paper may potentially have an impact on the safe operation of commercial reactors. Therefore, I feel compelled to comment on a few major issues, including accuracy of results, Monte Carlo modeling, and inaccurate and/or superfluous statements.

ACCURACY OF RESULTS

In Ref. 1, p. 443, Laky and Tsoulfunidis's (L&T's) statement "... the MCNP results clearly predict a lower integral flux