

THE BABCOCK & WILCOX COMPANY  
 POWER GENERATION GROUP **PRELIMINARY**

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To	G.A. MEYER - MANAGER, THERMAL HYDRAULIC ENGINEERING	
From	R.M. HIATT - THERMAL HYDRAULIC ENGINEERING	THE-79-191 805 663.1
Cust.	TMI-2	File No. or Ref.
Subj.	LYNX1 MODEL FOR TMI-2 BLOCKAGE STUDY	Date APRIL 10, 1979

This letter is copy one customer and one subject only.

THE OBJECTIVE OF THIS WORK WAS TO DEVELOP A METHOD FOR ANALYZING LOCAL COOLANT CONDITIONS FOR TMI-2 DURING SELECTED TIMES OF THE RECENT ACCIDENT. AN EQUALLY IMPORTANT CONSIDERATION WAS THE DETERMINATION OF LOCAL COOLING CAPABILITY FOR THE BLOCKED CORE UNDER NATURAL CIRCULATION.

FIGURE 1 ILLUSTRATES THE NODING SCHEME FOR THE SIMPLIFIED CORE MODEL. THE TWELVE CHANNELS WERE DESIGNED TO SEGMENT THE CORE INTO AREAS THAT IT WAS BELIEVED EXPERIENCED MAJOR DAMAGE, SOME DAMAGE AND POSSIBLY NO DAMAGE.

LYNX1 PERFORMED WELL WITH THE MODEL FOR A CLEAN CORE. HOWEVER, WE WERE NOT ABLE TO ACHIEVE THE HIGH PRESSURE DROP (18 PSI) ACROSS THE CORE WITH THE FLOW RATE FOR ONE PUMP OPERATION AND A BLOCKED CORE CONDITION PREDICTED BY CONTROL ANALYSIS. THEY PREDICTED A FLOW OF 4500 LB/SEC FOR CORE PLUS CORE BARREL-CORE BAFFLE ANNULUS FOR A BLOCKED CORE CONFIGURATION. SINCE LYNX1 STRUGGLED FOR CONVERGENCE DUE TO A SENSITIVITY OF THE CODE TO THE BLOCKAGE MODEL, A NUMBER OF MODELING SCHEMES WERE TRIED WITH VARYING DEGREES OF SUCCESS. SEVERE BLOCKAGES AT EACH SPACER GRID (K=30-35), AN INCREASE IN WETTED PERIMETER FOR ALL CHANNELS, AND SLIGHT VARIATION IN RESISTANCE FROM CHANNEL TO CHANNEL WERE ITERATING PARAMETERS. THE BEST ESTIMATE OF LOCAL FLOW BEHAVIOR OBTAINED TO DATE ACHIEVED AN UNRECOVERABLE

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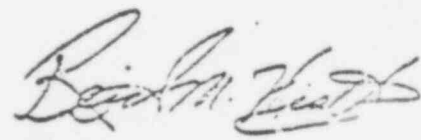
PRESSURE DROP OF ABOUT 7 PSI FOR 4722 LB/SEC CORE FLOW. THE BEST ESTIMATE FROM CONTROL ANALYSIS AT PRESENT IS 13 PSI FOR 4500 LB/SEC FLOW THROUGH THE CORE PLUS CORE BARREL-CORE BAFFLE ANNULUS.

A CHATA CASE WAS MODELED TO GIVE THE FLOW SPLIT BETWEEN THE CORE AND THE CORE BARREL-CORE BAFFLE ANNULUS. IT WAS ESTIMATED THAT 78% OF THE 4500 LB/SEC PREDICTED BY CONTROL ANALYSIS FLOWS THROUGH THE CORE WHICH AGREES WELL WITH CONTROL ANALYSIS ESTIMATES. THUS, BEST ESTIMATES TO DATE SHOW THAT 3510 LB/SEC IS FLOWING THROUGH THE CORE WITH 1 PUMP OPERATION. ONE IMPORTANT FACT THAT WAS EVIDENT FROM AN ENERGY BALANCE ON THIS FLOW RATE IS THAT THE INDICATED THERMOCOUPLE AT IS NOT POSSIBLE CONSIDERING A 4-5 MW<sub>T</sub> DECAY HEAT RATE UNLESS THE THERMOCOUPLES ARE MEASURING LOCAL EFFECTS, SUCH AS AGGLOMERATIONS OF PELLETS NEAR THE THERMOCOUPLES. THIS APPEARS TO DISCREDIT THE THERMOCOUPLES, THEREFORE, SOME DISCRETION IS NECESSARY IN THE INTERPRETATION OF THIS DATA.

IN CONCLUSION, ALTHOUGH LYNXI MODELING HAS NOT BEEN SUCCESSFUL IN MATCHING FLOW AND EXIT PRESSURE AT THIS TIME FOR A BLOCKED CORE WITH ONE PUMP OPERATION, IT IS BELIEVED THAT AN ACCEPTABLE MODEL CAN BE DEVELOPED. THE ADVISABILITY OF ADDITIONAL WORK IN THIS AREA DEPENDS ON THE WORK SCOPE OF FUTURE WORK ON THE TRI-2 ACCIDENT. FROM PAST EXPERIENCE, THE MODEL DEVELOPMENT WILL NOT BE QUICK BUT COULD REQUIRE A MONTH'S EFFORT.

RMH/FFA

CC: F.E. UNIT MGRS.  
J.S. TULEWKO  
CORE HOT SPOT TASK FORCE



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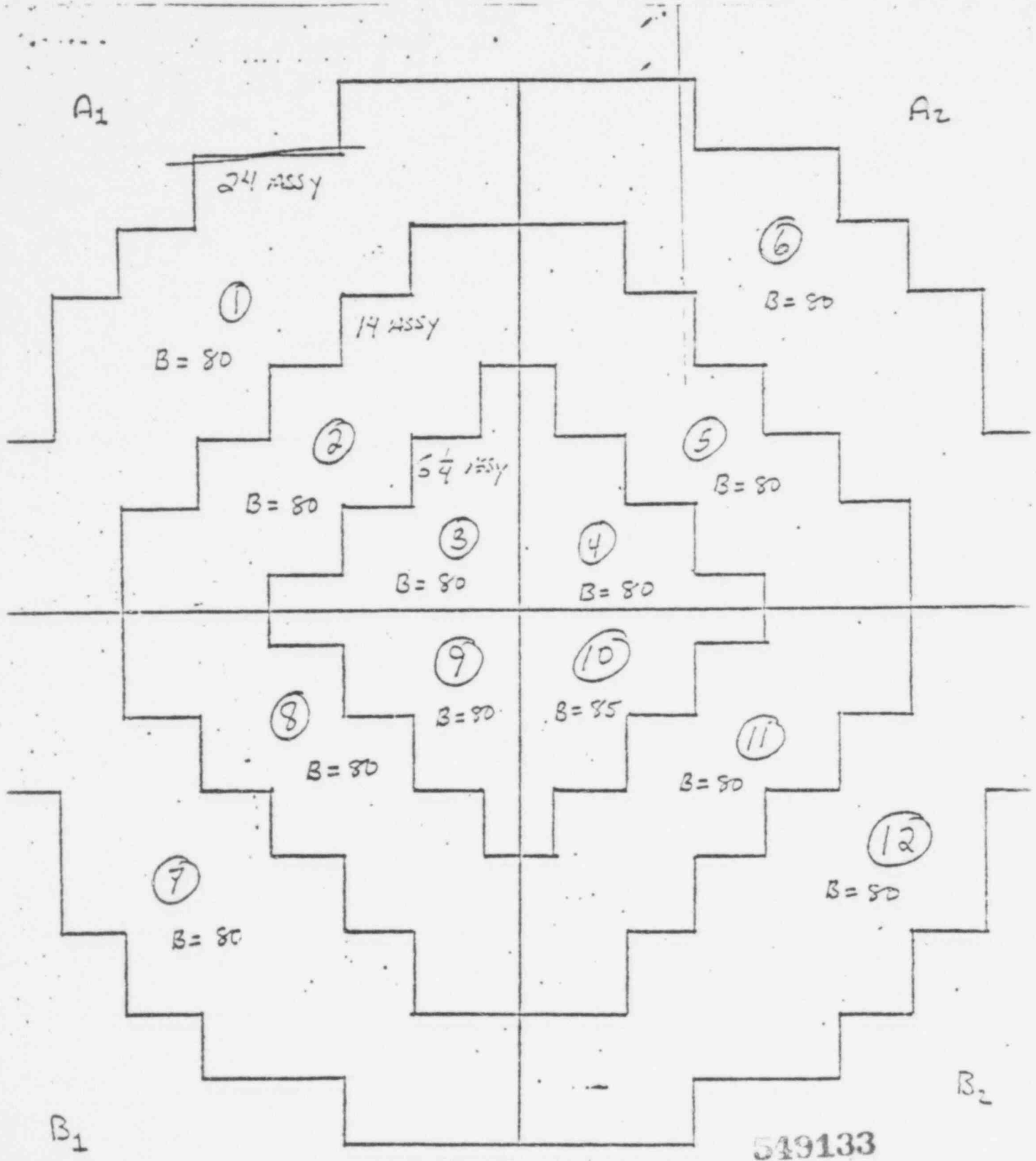


Figure 1 LYNX1 modes ( $B = \text{approximate block} = \dots$ )

POOR ORIGINAL