

**Turkey Point Units 3 and 4  
Extended Power Uprate  
Licensing Report**

**Attachment 4  
Appendix B**

**Additional Codes and Methods**

This coversheet plus 3 pages

## APPENDIX B ADDITIONAL CODES AND METHODS

In addition to the codes and methods listed in Appendix A of this Licensing Report (LR), numerous analytical codes and methods were used to support the Turkey Point Units 3 and 4 Extended Power Uprate (EPU). These have been reviewed against the codes and methods currently described in the UFSAR. The information presented below represents the set of key codes used that do not currently reside in the UFSAR as well as their associated application. All of these codes/methods have been determined by Florida Power and Light to be appropriate for use in their respective applications.

CODE	APPLICATION
ABB-NV	This is a DNB correlation for fuel assembly spans below the first mixing grid in the uncontrolled rod cluster control assembly withdrawal from subcritical transient analysis. See LR Section 2.8.3.
ARCON96	This code is used in the Alternative Source Term calculations of the radiological consequences of accidents. See LR Section 2.9.2.
ANSYS/Mechanical	This code is PC based QA Category I general purpose finite element analysis program capable of performing static, modal dynamic, response spectrum, time history and harmonic structural analysis. See LR Section 2.2.2.2.
ASTRUM	This code (Automated Statistical Treatment of Uncertainty Method) is the uncertainty model in developing the peak cladding temperature (PCT) in the best estimate large-break LOCA analysis. See LR Sections 2.8.5.6.3.2 and 2.6.6.
ATHOS	This code consists of a suite of sequentially executed modules that performs steady state analysis of steam generator tube bundle thermal-hydraulics. See LR Section 2.2.2.5.
CHECKWORKS	This code is used to predict the loss of material due to flow accelerated corrosion. See LR Section 2.1.8.
EPITOME	This code was used in the calculation of LOCA mass and energy releases. Although not described in the UFSAR, it was also used for this purpose in the current licensing basis. See LR Section 2.6.3.1.
FERRET	This code is used to determine reactor fluence values. See LR Sections 2.1.1, 2.1.2 and 2.1.3.
GENF	This code is used to perform a steady state thermal-hydraulic analysis of the entire steam generator. See LR Section 2.2.2.5.
GOTHIC	This code is used to calculate the containment response following a postulated LOCA or steamline break. See LR Section 2.6.1. It was also used to calculate the LOCA long-term post-reflood releases. See LR Section 2.6.3.1.

CODE	APPLICATION
LOFTRAN	This code was used at PTN for the first time for the following EPU analyses: to analyze the NSSS response to design basis operational transients. See LR Section 2.4.2; to analyze design basis operational transients to determine pressure control component sizing. See LR Section 2.4.3. In addition, LOFTRAN was used to support the ATWS analyses in the current licensing basis as described in LR Section 2.8.5.7.1. Also see LR Section 2.2.6.
MICROSHIELD	This code is used in the Alternative Source Term calculations of the radiological consequences of accidents. See LR Section 2.9.2.
MULTIFLEX 3.0	This code was used to calculate the LOCA hydraulic forcing functions. See LR Section 2.8.1 and LR Section 2.8.5.6.3.5.
NSSSPLUS	This code is used to facilitate the determination of NSSS design parameters. See LR Section 1.1.
NUPIPE-SWPC	The NUPIPE-SWPC was used to perform detailed pipe stress analysis. This program is designed to perform analyses in accordance with the ASME Boiler and Pressure Vessel Code, Section III and the ANSI B31.1 Power Piping Code. See LR Section 2.2.2.2.
PARAGON	Fuel management code for depletion calculations.
PAVAN	This code is used in the Alternative Source Term calculations of the radiological consequences of accidents. See LR Section 2.9.2.
PERC2	This code was used to model the activity, transport and calculate the offsite doses for the Spent Fuel Pool accident at EPU conditions.
pc-CRACK	This is a fracture mechanics software program used to conduct the crack growth analysis in the Leak-Before-Break evaluation for the Accumulator, pressurizer surge and residual heat removal lines. See Attachment 12, Structural Integrity Associates Leak-Before-Break evaluation for the Accumulator, Pressurizer Surge and Residual Heat Removal Lines Turkey Point Units 3 and 4 dated April 2010.
PC-PREPS	This is a PC based computer program which performs a complete structural analysis, performing an AISC Code check, weld qualification and baseplate/anchor bolt qualifications. See LR Section 2.2.2.2.
RADTRAD-NAI	This code is used in the Alternative Source Term calculations of the radiological consequences of accidents. See LR Section 2.9.2.
RETRAN	This code is used in the EPU analyses of: excessive increase in steam flow (LR Section 2.8.5.1.1); steam line break (LR Section 2.6.3.2 and Section 2.8.5.1.2); loss of external electric load (LR Section 2.8.5.2.1); loss of all AC (LR Section 2.8.5.2.2); loss of normal feedwater flow (LR Section 2.8.5.2.3); loss of reactor flow (LR Section 2.8.5.3.1); locked rotor incident (LR Section 2.8.5.3.2); and uncontrolled rod withdrawal at power (LR Section 2.8.5.4.2).

CODE	APPLICATION
SBLOCTA	This code is used to analyze the thermal-hydraulic responses to the small break LOCA for their effect on the hot rod heat-up to demonstrate that the peak cladding temperature, cladding oxidation and hydrogen generation are below their limiting values as defined by 10 CFR 50.46. See LR Section 2.8.5.6.3.3.
SCALE/KENO	Spent fuel pool criticality calculations.
STEHAM-PC	This was used to determine forcing functions for the main steam isolation valve (MSIV) closure and a turbine stop valve (TSV) closure events. It determines forcing functions in steam filled piping systems due to valve opening and closing conditions. See LR Section 2.2.2.2.
THRIVE	This code is used to determine the distribution of pressure and flow within the reactor vessel, internals and the reactor core. See LR Section 2.2.3.
VIPRE	This is a sub-channel analysis code used in the thermal-hydraulic DNB analyses. It is used in the following EPU analyses: to support operation with Upgrade fuel (LR Section 2.8.3); excessive heat removal due to feedwater malfunction transient (LR Section 2.8.5.1.1); loss of forced reactor flow (LR Section 2.8.5.3.1); reactor coolant pump locked rotor/shaft break (LR Section 2.8.5.3.2); uncontrolled rod cluster control assembly withdrawal from subcritical or low power during startup (LR Section 2.8.5.4.1); and control rod misoperation (LR Section 2.8.5.4.3).
WATHAM-PC	This was used to determine forcing functions for the feedwater regulatory valve and isolation valve closure and feedwater pump trip events. It determines forcing functions in water filled piping systems due to pump start/stop/trip, check valve closure and valve opening and closing events. See LR Section 2.2.2.2.
WEGAP	This code is used to analyze fuel transient loadings. See LR Section 2.8.1.
WLOP	This is a DNB correlation used in the core and reactor coolant system design analyses. See LR Section 2.8.3.