

Enclosure 3

**Presentation Slides for the Westinghouse-NRC Pre-Submittal Meeting on
Topical Report WCAP-16747-P/NP, Appendices C and D, Revision 2,
“POLCA-T: System Analysis Code with Three-Dimensional Core Model,
Appendices C and D”**

(Non-Proprietary)

June 2023

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NRC Pre-submittal Meeting

WCAP-16747-P/NP Appendices C and D, Revision 2, “POLCA-T: System Analysis Code with Three-Dimensional Core Model, Appendices C and D”

June 20th, 2023

* Electronically approved records are documented in the Electronic Document Management System (PRIME).



Safety Brief

- Nuclear Safety Culture Employee Behaviors
 - Show Respect for Others
 - Follow the Rules
 - Stop When Unsure
 - Promptly Report Problems
 - My Signature is My Word

Agenda

- POLCA-T – Code overview
- Licensing status
- Time schedule for submittal and approval
- Code updates and new models

POLCA-T – Code overview

POLCA-T - Overview

POLCA-T: System Analysis Code with Three-Dimensional Core Model (WCAP-16747-P-A Revision 0) is a general plant-independent code and has been qualified for a wide range of applications.

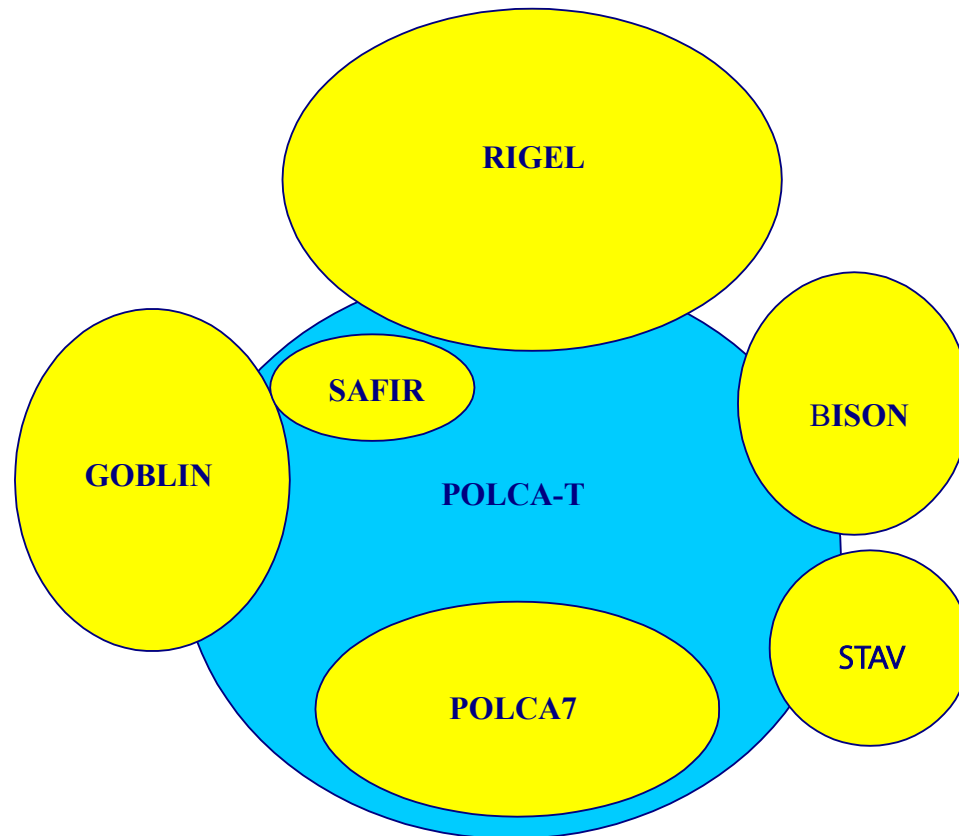
The LTR is structured with a General Part describing the general methods and models and appendices with qualification of the code for transients and accident analyses.

POLCA-T was generically approved by the NRC in 2010 for Control Rod Drop Accident Analysis, described in Appendix A, and for Stability, described in Appendix B.

WCAP-16747-P Appendices C and D, Revision 2, presents the models and qualification for the analysis of AOOs (Appendix C) and ATWS (Appendix D). These appendices were being reviewed by the NRC until 2019, but the review was put on hold at Westinghouse request 2020.

Code Structure

- The POLCA-T code is based to an extent on the following codes:



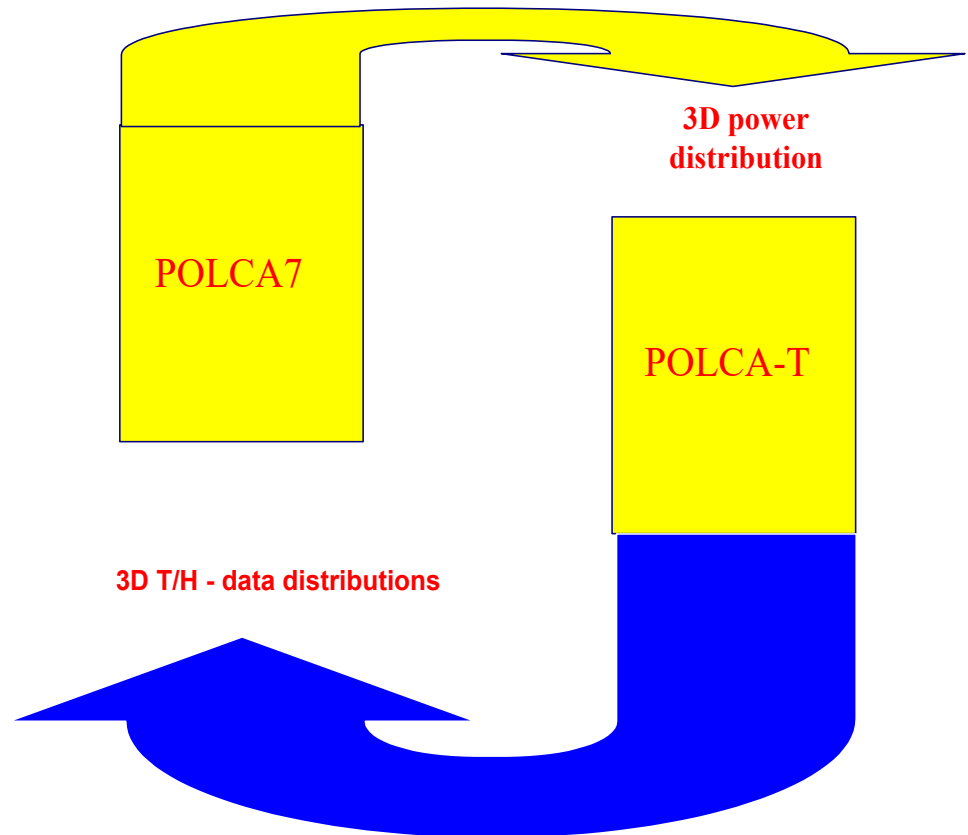
Code Structure

- Bases for POLCA-T

<u>Code</u>	<u>Application area</u>	<u>Feature used in POLCA-T</u>
– RIGEL	Transients and LOCA	Design
– SAFIR	Control System Simulator	Control systems
– GOBLIN	BWR LOCA & plant simulation	Num Method, drift flux model
– POLCA7	Steady-state Core Design	Core state
– BISON	BWR Transients	Specific models
– STAV7	Fuel rod design	Fuel Rod Equations

Code Structure

- Computational procedure
 - POLCA7 3D neutronics calculation
 - POLCA-T calculation
 - core and system T/H response, all assemblies and bypass
 - fuel temperature
- Interaction between POLCA-T and POLCA7 code



Code structure

The POLCA-T code can be divided into four main sections:

- *The thermal-hydraulic model* includes thermal non-equilibrium between phases.
- *The system model* includes models of the various reactor systems and components.
- *The fuel thermal mechanical model* solves the heat conduction equation for the heat structures (fuel rods, pressure vessel, and internals) using heat transfer boundary conditions.
- *The power generation models* calculate the heat generation due to fission in the fuel, direct heat released in the coolant, and decay heat.

Conclusion

- The code is based on well established USNRC approved codes such as GOBLIN, BISON, POLCA7.
- The code represents an evolution from above older codes with modern design improvements.
- POLCA-T is very general and flexible.
- As-loaded mixed cores with different fuel types can be simulated.
- Each fuel assembly in the reactor core is represented in the thermal-hydraulic model.
- A hot rod can be simulated in the fuel rod model.
- Validation base is extensive and covers analytical solutions, operational transients, stability, depressurizations events, natural circulation events, and separate effects.

POLCA-T licensing status



* Electronically approved records are documented in the Electronic Document Management System (PRIME).

POLCA-T – Licensing status

- WCAP-16747-P, “POLCA-T: System Analysis Code with Three-Dimensional Core Model”
 - General Part, Appendix A “*Control Rod Drop Accident Analysis (CRDA)*” and Appendix B “*Application for Stability Analysis*” were approved in 2010.
 - Appendix C “*Application for AOO Transient Analysis*” and Appendix D “*Application for Anticipated Transients without Scram*” were submitted for NRC review (NRR and NRO offices at that time) in October 2010.
 - Following several changes in licensee and Westinghouse priorities, Westinghouse requested that the LTR be put on hold.

POLCA-T – Licensing status

- Westinghouse subsequently requested that the NRC’s review be reactivated in 2017.
- A regulatory audit was conducted by the NRC staff and ERI personnel on June 11-13, 2018, at Westinghouse Rockville office, to discuss open items (AIs) and potential requests for additional information (RAIs).
 - A number of review issues were identified by the NRC and discussed with the representatives of Westinghouse during the audit.
 - Westinghouse submitted Revision 1 in February 2019 to incorporate changes related to AIs that have been resolved. Supplemental information was also provided in June 2019 in response to the remaining audit issues (LTR-NRC-19-33).

POLCA-T – Licensing status

- A clarification call was held on September 2019, between NRC staff and Westinghouse to discuss and clarify draft AIs and open items from the audit, the revised TR and supplemental information submitted by Westinghouse.
- Based on the discussions, it was agreed that the unresolved audit issues will be issued as final RAIs.
 - A total of 20 RAI were issued.
- In early 2020, Westinghouse withdrew WCAP-16747-P Appendices C and D, Revision 1, and requested no further review by the NRC. Westinghouse is now requesting that the review again be reactivated with the submittal of Revision 2.

POLCA-T – Licensing status

- Westinghouse will issue for NRC review:
 - Revision 2 of the LTR to update the validation and verification calculations, as necessary, considering recent code improvements since the issuance of Revision 1.
 - Responses to the 20 RAIs, including reference to related modifications made in the text of the report.
 - Revision 2 will continue to apply to BWR/2-6 plant designs. It will not apply to the ABWR design.

POLCA-T Schedule for submittal and approval

Schedule for submittal and approval

- Submittal of Revision 2 is estimated in December 2023
- Approval is requested for December 2024 (12 months review)
 - A large part of this information has already been reviewed with an audit and responses to many of the audit items.
 - Westinghouse is planning to submit additional LTRs during 2024 that will be required to support our **TRITON11™** fuel.

POLCA-T – Code updates and new models



* Electronically approved records are documented in the Electronic Document Management System (PRIME).

POLCA-T – Code updates

- Code modifications are routinely incorporated to improve code functionality, input structure, code interfaces or for error correction. Such modifications follow the established Westinghouse procedures, such as requirements, design and code inspections, verification and validation testing, configuration control and documentation.

POLCA-T – Code updates

- Modifications that have been made to POLCA-T since the NRC audit in 2018 are:



- Updated library with dryout correlations for new fuel types.

POLCA-T – Code updates

- The calculated results in Revision 2 have incorporated these modifications. Incorporation of these modifications is expected to have minor effect, if any, on the results of the POLCA-T calculations.

POLCA-T – Code updates

Questions or Comments?