

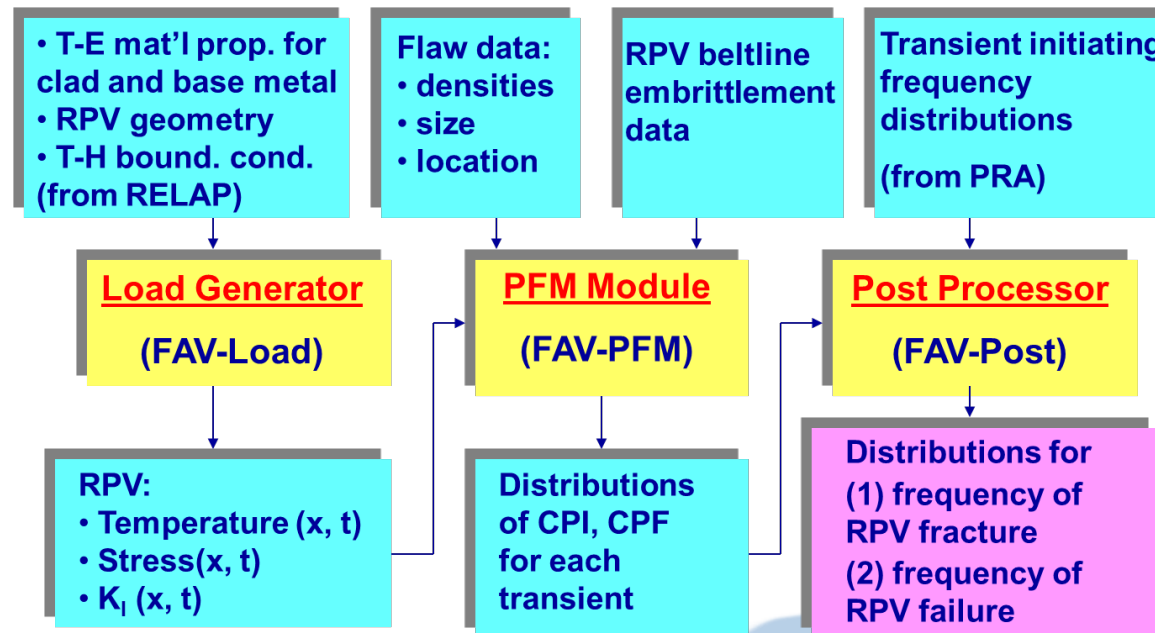
# **Industry / NRC Materials Programs Technical Information Exchange FAVOR Code**

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# Current FAVOR Code

- FAVOR v16.1
- Public release in 2016
- Primary Focus on improvements in the fracture mechanics analysis capabilities of FAVOR with emphasis on shallow internal surface-breaking flaws
  - Stress intensity factor calculation improvements for infinite axial / 360° continuous circumferential flaws
    - New SIFICs for infinite flaws significantly enhance accuracy determined by comparisons to ABAQUS solutions
    - Computed new SIFICs applying same methods used for finite-length surface flaws ( $K_I \text{ total} = K_I \text{ base} + K_I \text{ clad}$ )



- FAVOR SQA and V&V
  - [Technical Letter Report TLR-RES/DE/CIB-2020-01, "Compilation of Software Quality Assurance and Verification and Validation Documentation for the Fracture Analysis of Vessels - Oak Ridge \(FAVOR\) Software Product."](#)
  - [Technical Letter Report TLR-RES/DE/CIB-2020-02, "Assessment of V&V Efforts of the Fracture Analysis of Vessels - Oak Ridge \(FAVOR\) Software Product, Version 16.1."](#)
- Findings and Remediation:
  - Finding #1: Absence of SQA Plan
    - Draft SQA Plan created, under RES review and revisions
  - Finding #2: Absence of Change Control and Documentation
    - Action to close: implement change control procedures in SQA plan
    - GitHub repository created and FAVOR source put under version control in NRC's cloud environment (non-public)
  - Finding #3: Absence of Software Configuration Management
    - Plans to create and implement Configuration Management And Maintenance Plan (CMMP)
  - Finding #4: Absence of FAVOR Baseline
    - Plans to create and run test suite, document results as baseline
  - Finding #5: Key Capability Deficiency: As-Found Flaw Modeling
    - 'As-found flaw' FAVOR code nearly completed and V&V testing mostly completed, documentation still underway

# Future of FAVOR Code – RES Vision

- Utilize proven process for legacy code modernization (developed and proven to work for NRC's fuel performance codes)
  - Can leverage lessons learned and tools developed for fuel performance codes for FAVOR
    - Maximize automation
    - Work in collaborative development environment
  - Benefits:
    - FAVOR code V&V baseline
    - FAVOR code SQA process established
    - FAVOR code configuration control
    - Allows for future rapid evolution of FAVOR
    - Parallelization for probabilistic runs (and other parts of the code as appropriate): currently FAVOR runs sequentially on single processor!
    - Cross-platform portability for users
    - Optimization for HPC cloud utilization
    - Better I/O
    - Probably many more!
- Enable collaborative FAVOR development, where **User/Developer** Group members have an active role
  - NRC has ultimate control
  - **Users/Developers** can contribute
    - Error/bug reporting
    - Improvement/feature recommendations
    - Active development
    - Software testing
    - Documentation

# FAVOR Development – Upcoming Work

- Implementation of better SQA, V&V, and software configuration control
  - FAVOR SQA plan implementation
  - Migration to Git environment and configuration controls (underway)
  - **Test cases library development**
  - **SQA documentation (Configuration Management documents, Software Design, Software Testing, etc.)**
- **FAVOR modernization and overhaul**
  - **Source rewrite/conversion to modern Fortran**
  - **I/O structure and tools**
  - **Eventual merge of all 3 executables FAVLOAD, FAVPFM, and FAVPOST**
- **FAVOR User / Developer Group**
  - Establish User and Developer Groups
  - **Collect independent V&V documentation created by User/Developer Group members**
- **FAVOR/DAKOTA interface**
  - Initial testing completed
  - **Additional V&V**
  - **Further development**

**POTENTIAL FOR IN-KIND  
CONTRIBUTIONS BY **USER** /  
**DEVELOPER** GROUP  
MEMBERS**

# FAVOR Ownership and User/Developer Group

## DRAFT Proposal

- NRC intends to maintain full ownership and control over the official version of FAVOR
- Code distribution vision
  - NRC in control of distribution
  - Two tiers
    - **User Group: Distribution of EXECUTABLES ONLY**
    - **Developer Group: Distribution of SOURCE CODE**
  - Users and Developers vetted at different levels
  - Low nominal cost for US entities
  - Higher cost for international entities
- User/Developer community leverage
  - Sharing of V&V activities with the community
  - Sharing of FAVOR developments
  - User/Developer feedback to help guide FAVOR evolution (new features, improvements, etc.)
  - More rapid development and adaptation to industry and research needs