



NRC Support for SCALE: Past, Present, and Future

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Overview

- **Background**
- **NRC and SCALE History:**
 - 1970s
 - 1980s
 - 1990s
 - 2000s
- **NRC and SCALE Today**
- **The Future**

Background

Division of Spent Fuel Management:

- Within the Office of Nuclear Material Safety and Safeguards (NMSS)
- Transportation of Radioactive Material – 10 CFR Part 71
- Storage of Spent Nuclear Fuel – 10 CFR Part 72



Background

Division of Spent Fuel Management

- ~70 staff, including 11 dedicated to shielding and criticality analysis (Criticality, Shielding, and Risk Assessment Branch)
- Handle around 80–100 licensing actions per year
 - General and site-specific Part 72 licenses
 - Type B and AF transportation package designs

Background

Division of Spent Fuel Management



Michael
Layton
Director

Anthony Hsia
Deputy
Director



John McKirgan
Licensing



Yoira Diaz-Sanabria
Containment,
Structural, and
Thermal



Meraj Rahimi
Renewals and
Materials



Travis Tate
Criticality,
Shielding, and
Risk Assessment



Patricia Silva
Inspections and
Operations

Background

Current NRC/DSFM Contract with ORNL:

- SCALE Maintenance
- Technical Assistance
- Training
- SCALE Development
- Regulatory Assistance
- ANSI N14 Administration

The 70s

- Pre-NRC: ORNL assists Atomic Energy Commission (AEC) with use of codes and data for criticality, shielding, and heat transfer analyses of transportation packages
- NRC staff proposed development of an easy-to-use analysis system incorporating technical capabilities of individual modules
- First contract in place for “Standardized Computer Analyses for Licensing Evaluation” (SCALE) in 1976

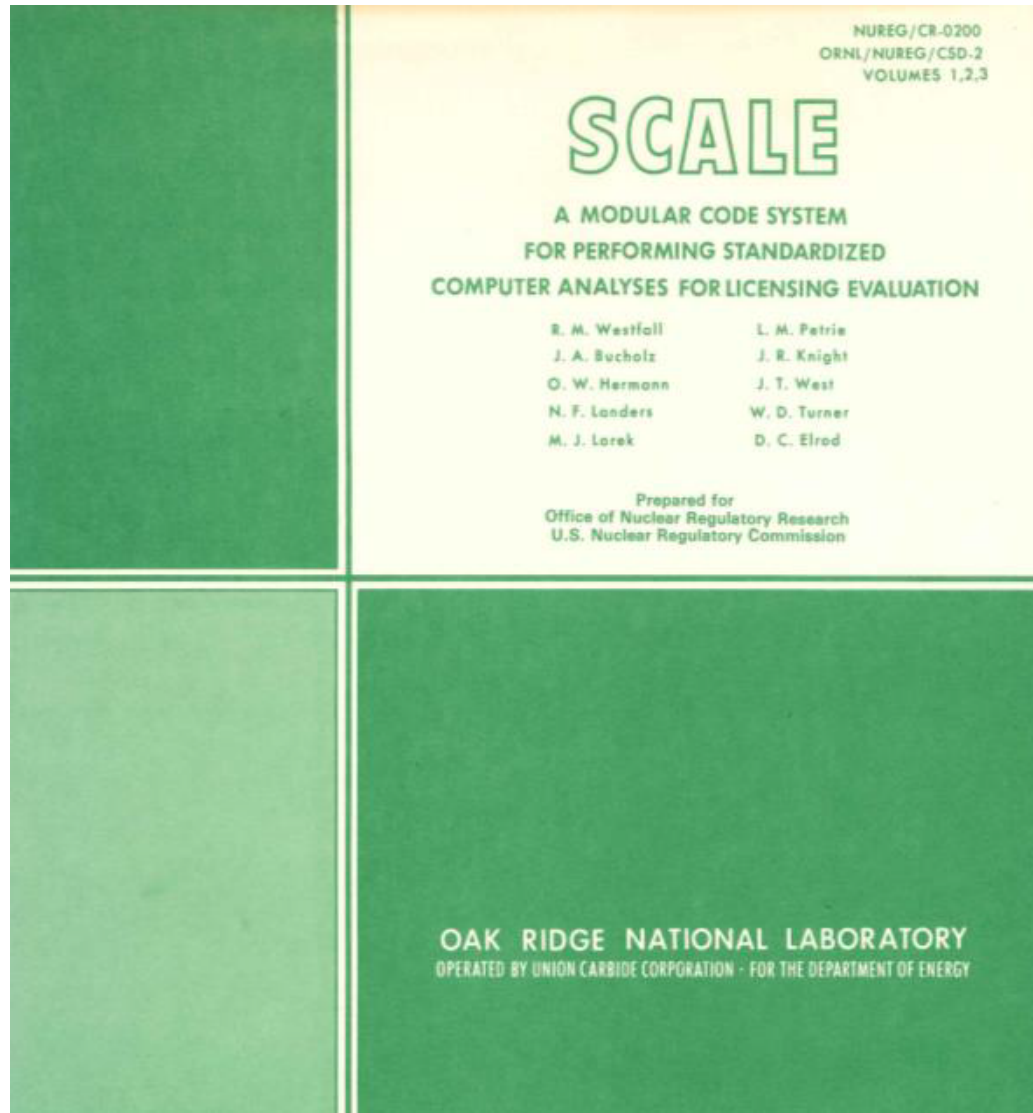
The 70s



SCALE Development Criteria:

- Focus on applications related to fuel facilities and transportation packages
- Use established codes and data
- Input format suitable for occasional or novice user
- Control modules to automate use of multiple codes and data sets
- Documentation and public availability

SCALE - The Original



The 80s



SCALE Revision 0: July 1980

- Standard Composition Library
- Cross-section processing
- KENO
- ORIGEN
- MORSE
- HEATING

The 80s

- SCALE 1: January 1982
- SCALE 2: June 1983
- SCALE 3: December 1984

DOE support beginning in 1987

The 90s



SCALE 4 – 4.4

- SCALE 4.1 – 1992
- SCALE 4.2 – 1994
- SCALE 4.3 – first (partial) PC version – 1995
- SCALE 4.4 – 1998
 - Full PC version
 - Y2K compatible

The 90s



- CSASIN – 1st PC-based GUI for criticality input
 - MS-DOS based
- CSPAN for criticality / ESPN for shielding
 - Windows 95, 98, or NT
- ORIGEN-ARP
- KENO VI

The 2000s

SCALE 4.4a, 5.0, 5.1

- GeeWiz
- KENO 3D
- STARBUCS
- TRITON/NEWT
- MAVRIC/Monaco
- Continuous-energy cross sections
(KENO VI, Monaco)

Now

- SCALE 6.2 (and 6.2.1/6.2.2)
 - Fulcrum interface
 - Origami and Reactor Libraries
- UNF-ST&DARDS
 - Design basis templates
 - Licensing approach
- CISF dose map support

The Future

- UNF-ST&DARDS:
 - “Templates” for standard cask shielding, criticality and thermal analyses
 - Possibly for other configurations
- Shift / parallel sequences
- Fulcrum enhancements
 - 3D visualization
 - Input assistance

SCALE People

ORNL Project Managers:

- Mike Westfall
- Cecil Parks
- Steve Bowman
- Brad Rearden

NRC Contract Managers:

- Dick Odegaarden
- George Bidingger
- Earl Easton
- Marissa Bailey
- Carl Withee
- Drew Barto

Questions?