

# KENO Validation for the SCALE 6.2 Release

**B.J. Marshall**

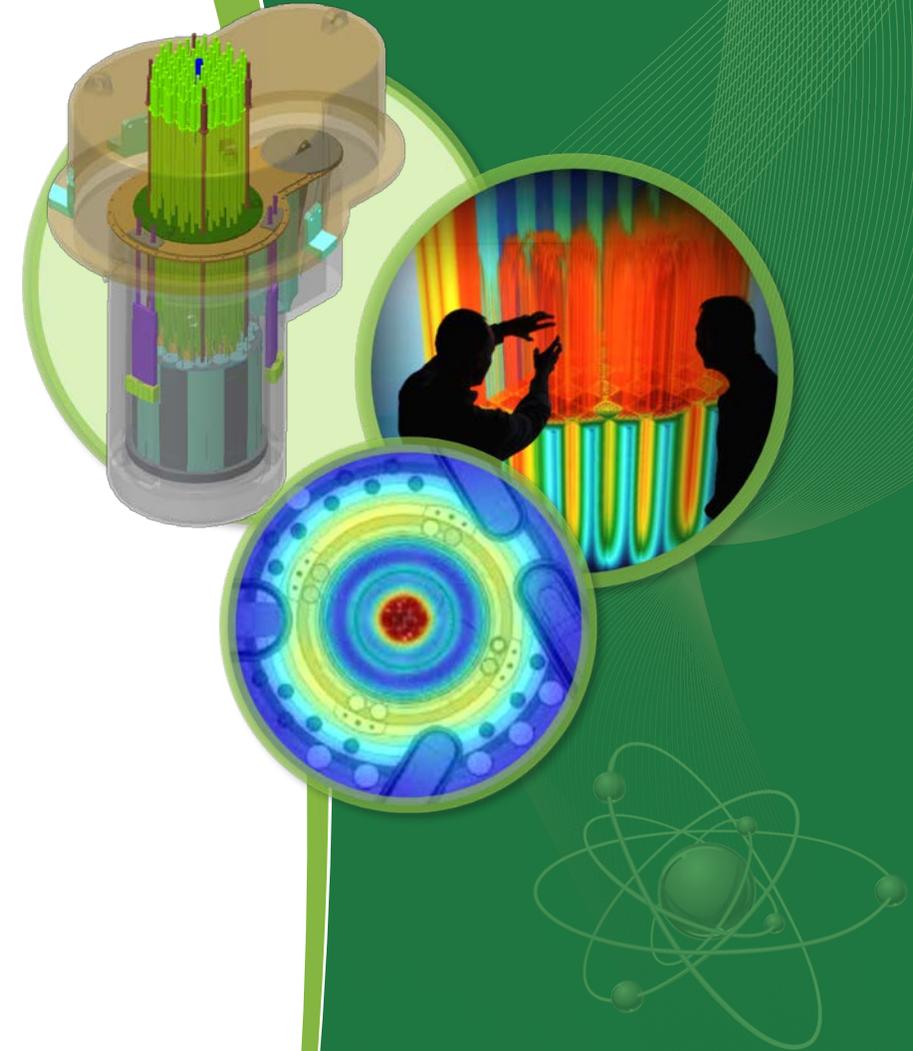
Senior R&D Staff

Oak Ridge National Laboratory

**NCSP Technical Program Review**

Washington, D.C.

March 14, 2017



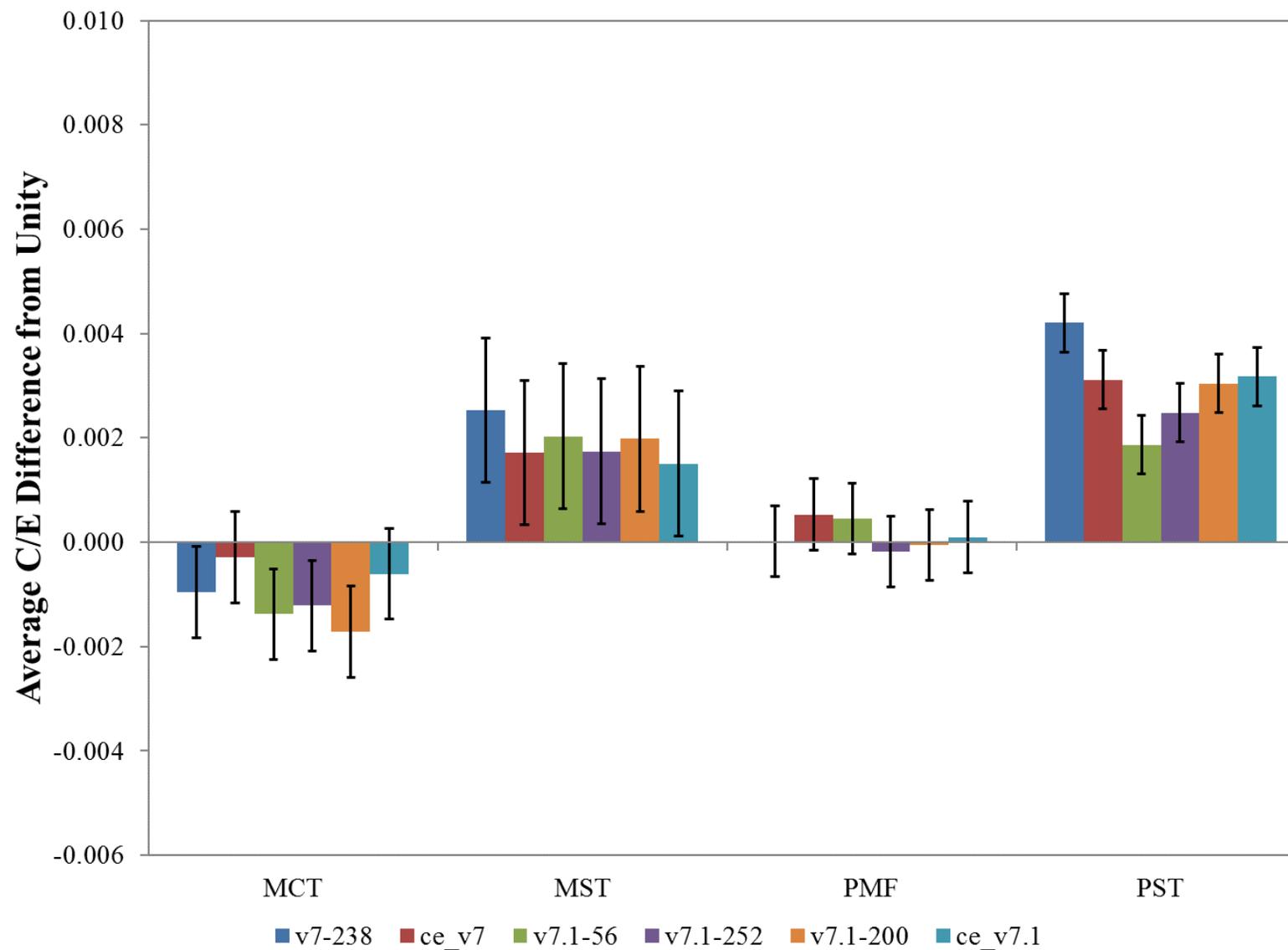
# Outline

- General validation of 6.2 release
- Temperature dependent validation effort
- $^{233}\text{U}$  validation
- Conclusions & future work

# General validation of SCALE 6.2

- Validation studies completed and published SCALE 6.2 Beta 1 & Beta 4
  - Beta 1 results published at NCSD 2013
  - Beta 4 results published at ICNC 2015
- Cross section data did not change after Beta 4 release
- Final validation calculations to confirm accuracy improvements
  - Nothing was broken
- More than 75% of VALID run (320 of 401 cases)
  - Only HST and LST systems not included
- Six libraries included: 2 CE and 4 MG
  - ENDF/B-VII.0: CE and 238-group MG
  - ENDF/B-VII.1: CE and 56-, 200-, and 252-group MG

# Summary results for MIX and Pu systems





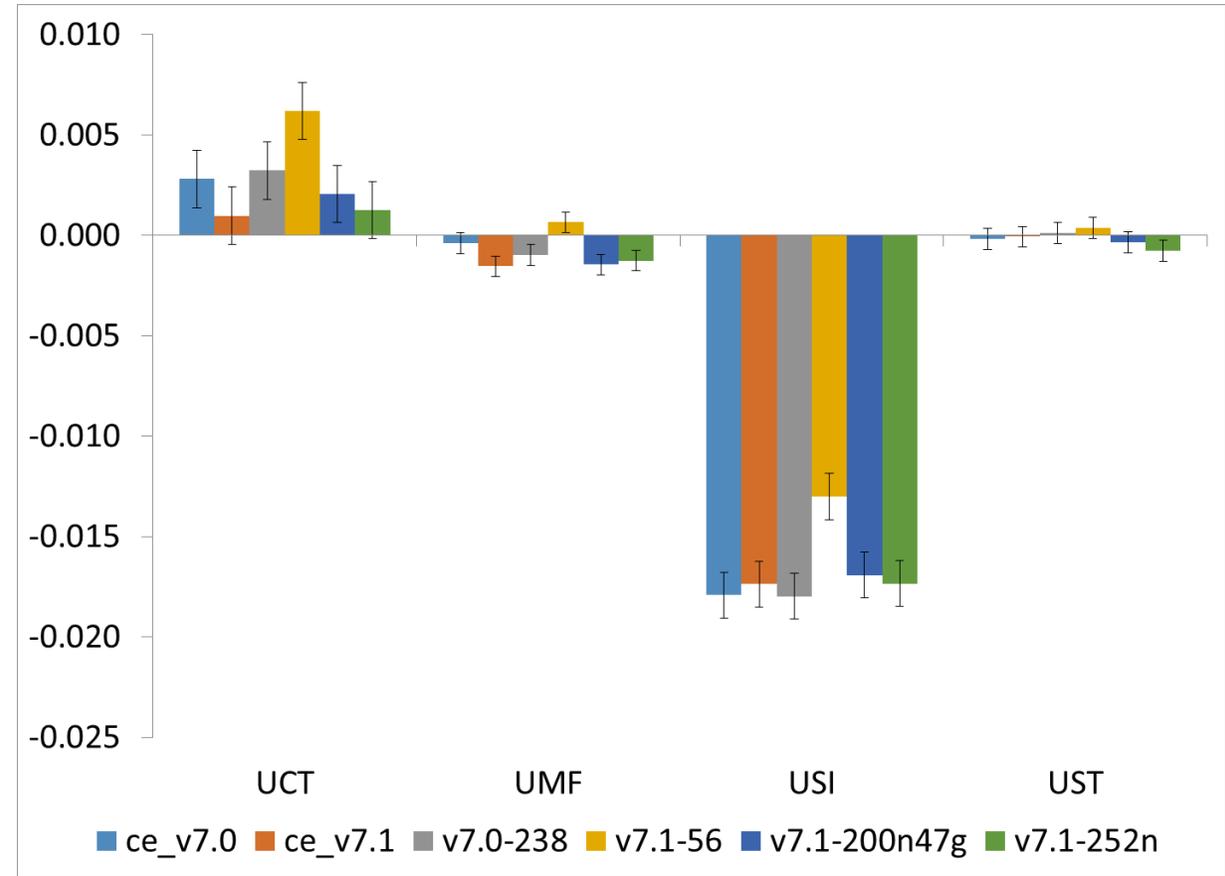
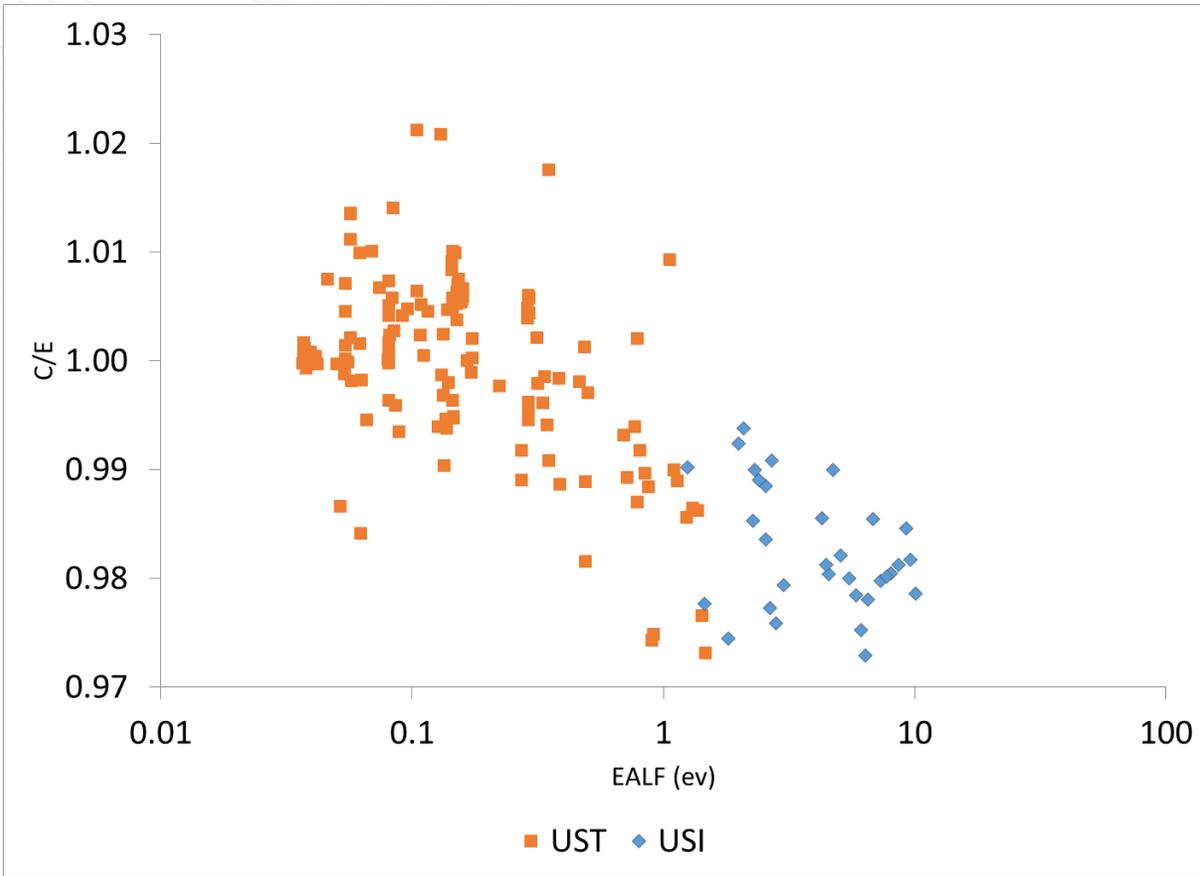
# Temperature dependent validation

- Built models of LCT-046 to examine temperature dependent bias
  - Used funds from NCSP University task with UTK and ORNL
- Results presented in ANS summary at New Orleans meeting
  - June 2016
- Subsequent review within VALID identified deficiencies in benchmark description
  - Number density and dimension correction factors are inconsistent
  - Causes some changes in mass as a function of temperature
  - Unknown if small apparent bias is a result of temperature dependence or mass changes

# $^{233}\text{U}$ validation

- Discrepant results generated by Ian Hill @ OECD/NEA with some  $^{233}\text{U}$  systems
- Cause identified and fixed
- Validation of  $^{233}\text{U}$  desired
  - Over 175 models existed from prior work at ORNL
  - Models updated and run by 2 USNA midshipmen (June 2016)
- Results published in ANS summary at Las Vegas meeting
  - November 2016
- Significant bias identified in upper thermal and intermediate region

# $^{233}\text{U}$ results



# Conclusions & future work

- SCALE 6.2 improves KENO accuracy with CE and MG libraries for most systems
- Temperature dependent validation remains problematic
  - Plan to have summer student extract temperatures from all ICSBEP evaluations this summer for inclusion in DICE
- $^{233}\text{U}$  validation indicates problems with intermediate spectrum systems
- Perform and document complete validation of SCALE 6.2.2 for 6 libraries with all of VALID
  - $^{233}\text{U}$  cases will be added to VALID prior to validation effort

# Acknowledgements

- Thanks to NCSP (Jerry and Angela) for funding continued validation efforts
- Thanks to Defense Threat Reduction Agency (DTRA) for funding that allowed the 2 midshipmen to come to ORNL