

Independent Data Testing (from the Florida Beaches)

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Outline

- **NJOY Processing**
- **Criticality Data Testing**
- **Summary**

NJOY Processing

- NJOY2016

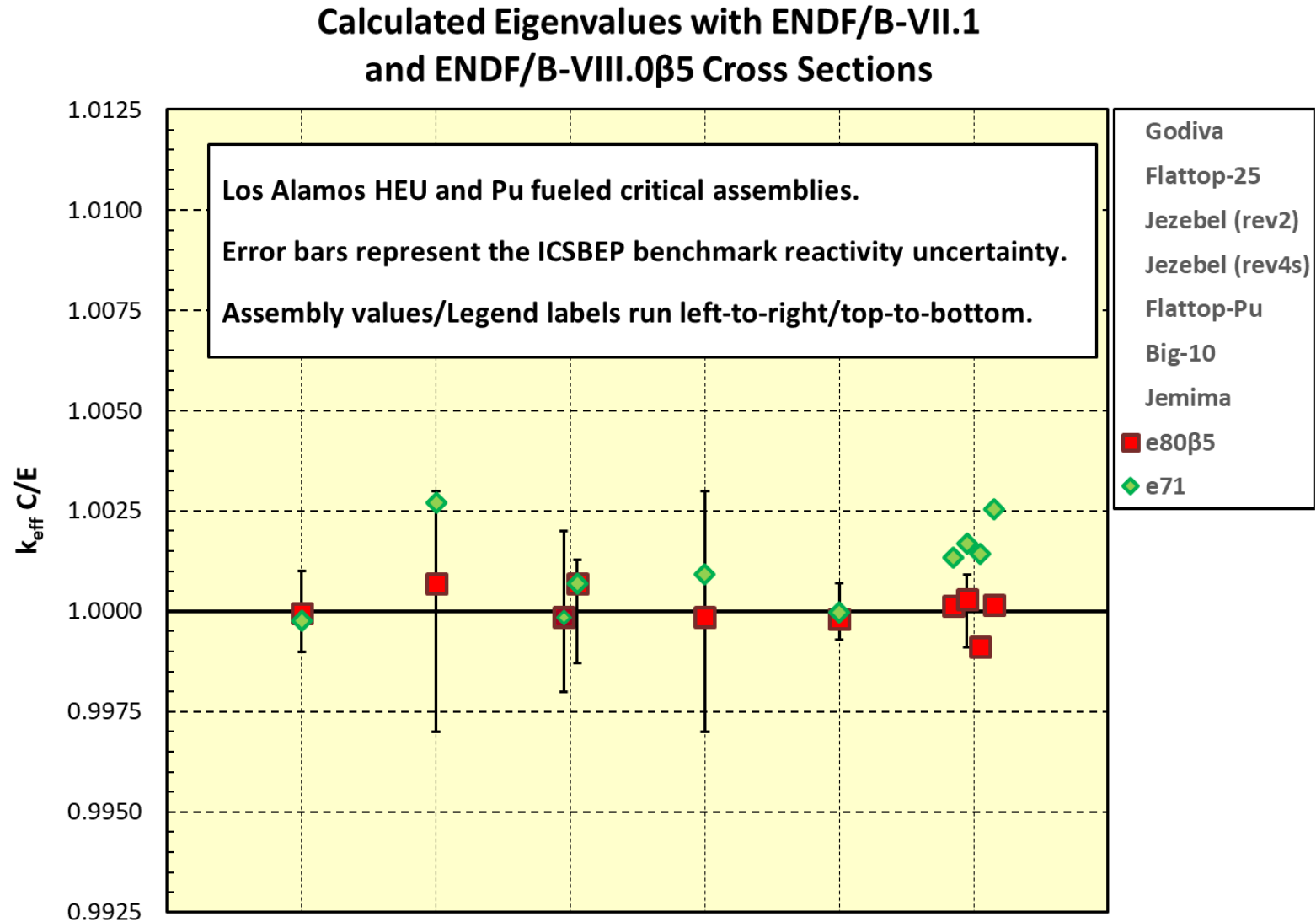
- An open source release, available as of January 2017
- Obtained from <https://njoy.github.io/NJOY2016/> (or <https://njoy.lanl.gov>).
- Users should periodically execute a GitHub “pull” to assure they have the latest version.
 - **The source code as available on 10/2/2017 was used to process the e80β5 files into ACE format.**

- NJOY2012

- Still available, with the latest update files obtained from <https://www.oecd-nea.org/dbprog/Njoy/2012up99.txt>.
- **NOTE: This update is not available from the legacy LANL website.**
- The current release is NJOY2012.99
 - This version of NJOY could process the e80β5 candidate files as formatted in mid-July.
 - Additional format revisions mean the as-released e80β5 ²³⁵U and ²³⁹Pu cannot be processed!

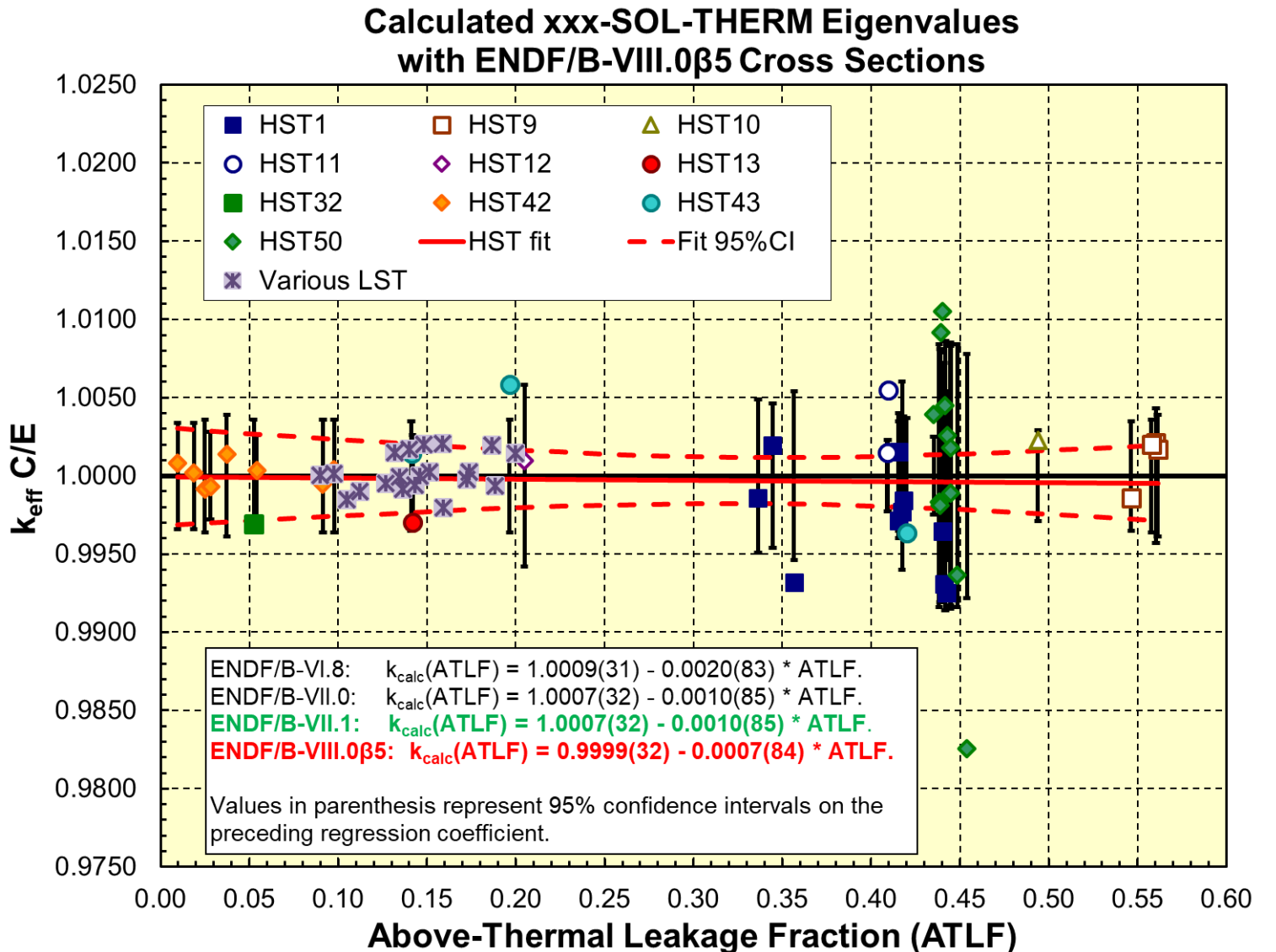
Criticality Data Testing – Legacy LANL Assemblies

- Previous (e71) good bare assembly results are retained with e80 β 5 cross sections.
- Reflected assembly results are significantly improved.
- These results are essentially the same as seen with e80 β 4.



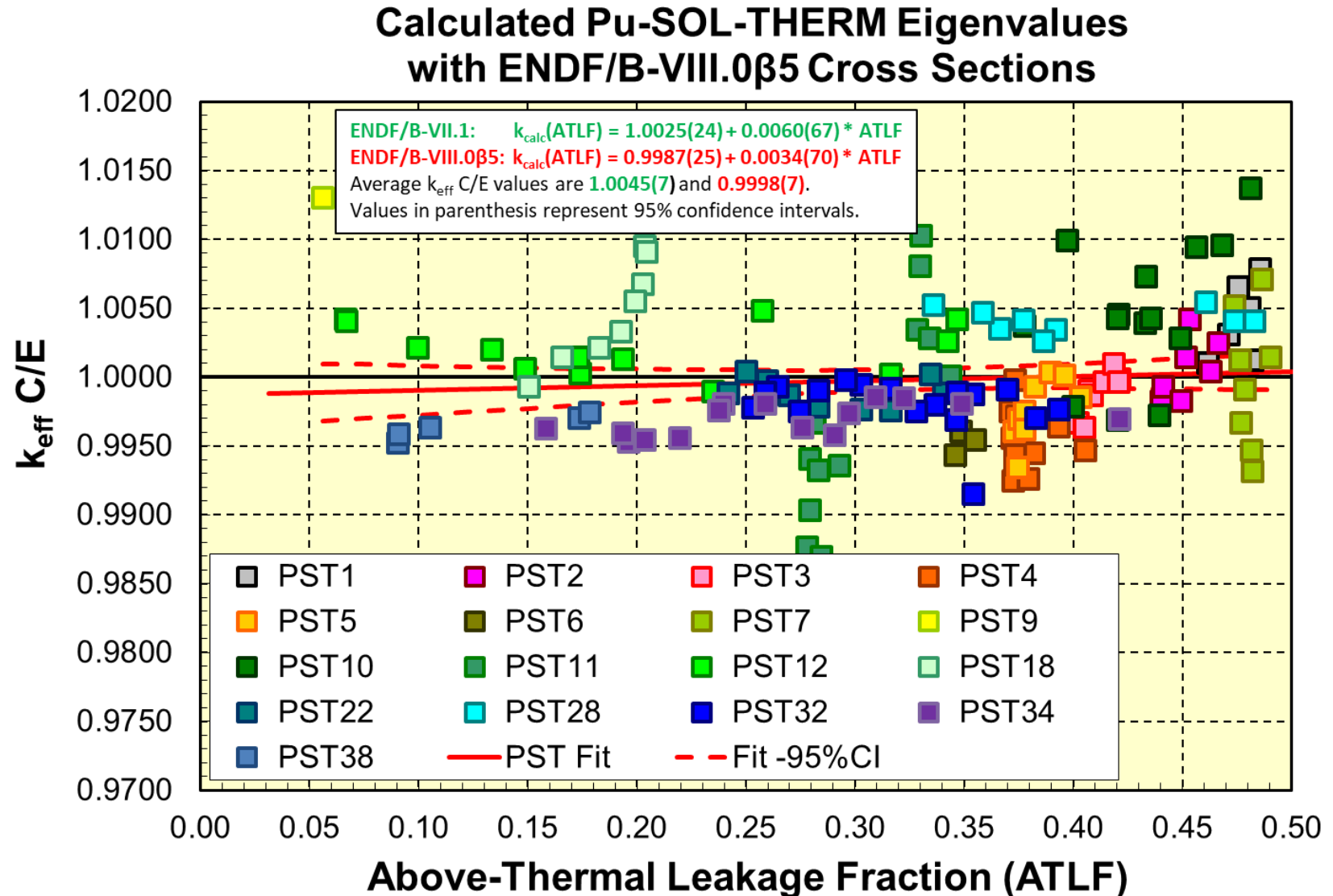
Criticality Data Testing – HST suite

- Previous (e71) good result is retained with e80β5 cross sections.
- Correlations against other parameters such as ATFF, EALF, EAF, H/U all yield a “zero” slope and “unity” intercept.
- These results are essentially the same as seen with e80β4.



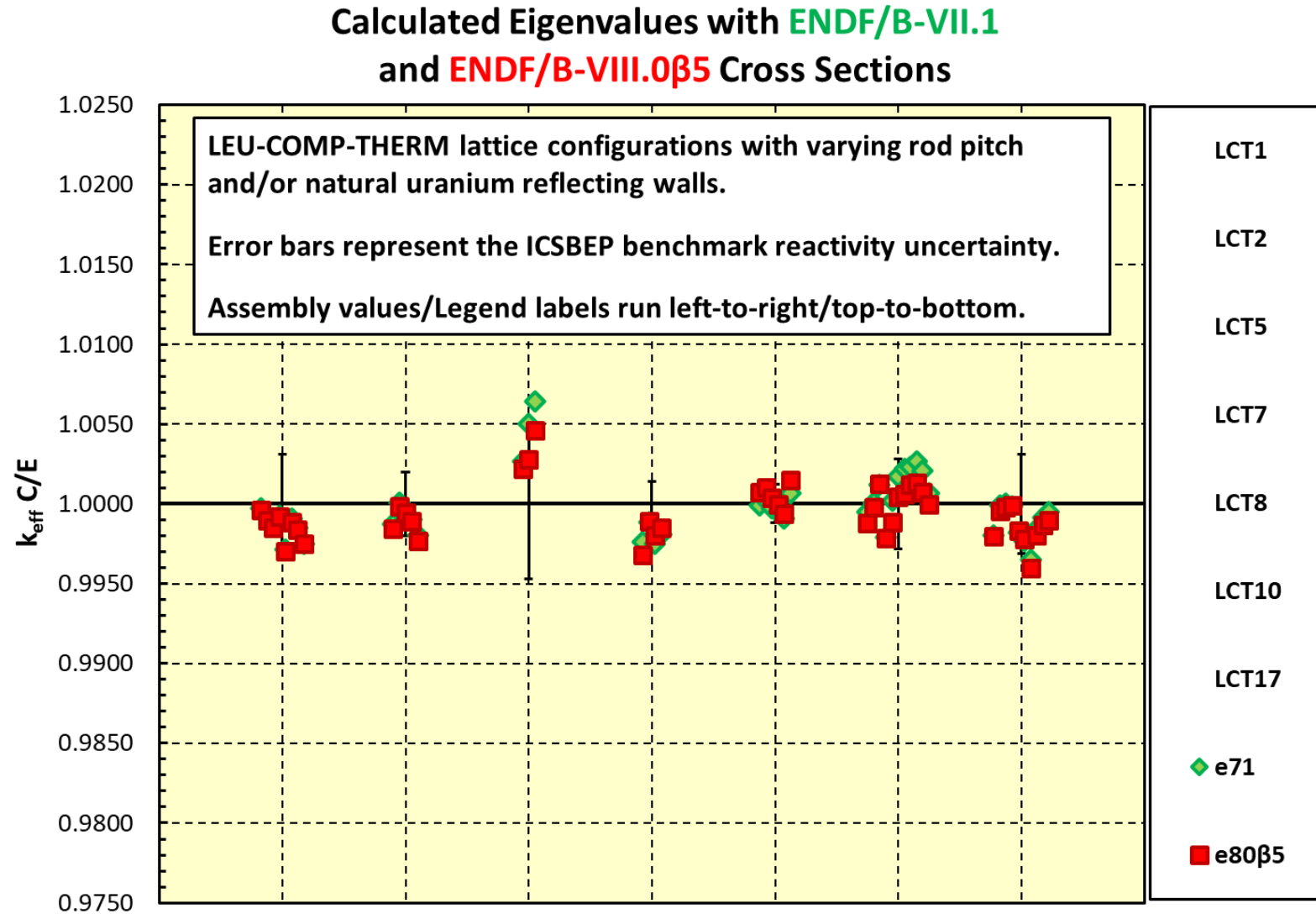
Criticality Data Testing – PST suite

- Previous (e71) result is significantly improved with e80β5 cross sections.
- Correlations against other parameters such as ATFF, EALF, EAF yield a “zero” slope and “unity” intercept.
- Slight evidence for a trend and bias with ^{239}Pu abundance, but the database is small.



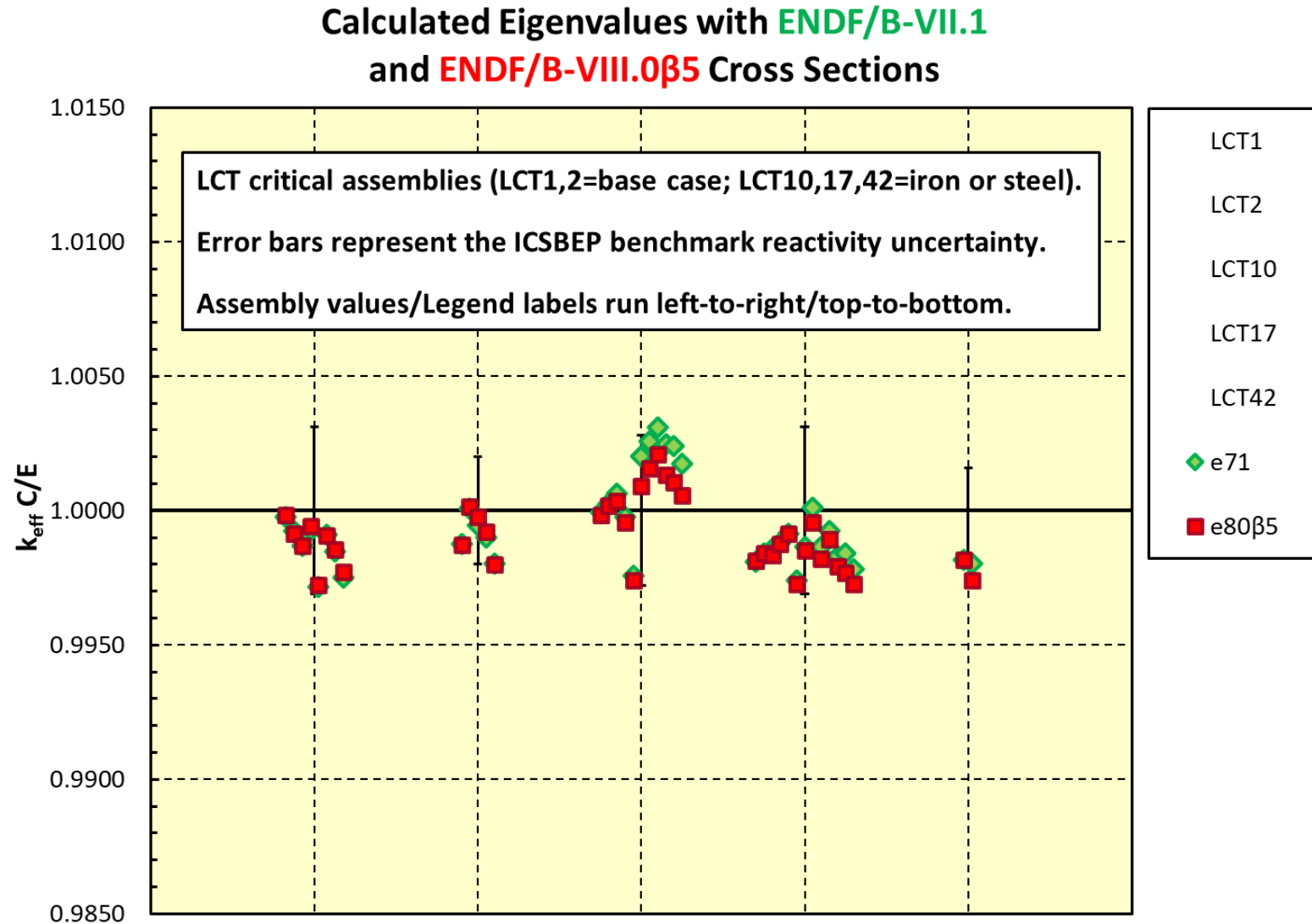
Criticality Data Testing – LCT suite

- Previous (e71) good results are retained with e80β5 cross sections.
- Average k_{eff} C/E change is 46 pcm, mainly due to the improved LCT5 and the natU wall reflected LCT10 results.
 - LCT5: 1.00471 → 1.00320
 - LCT10: 1.00095 → 1.00007
- For a suite of ~200 LCT assemblies the average k_{eff} C/E changed from 0.99951 to 0.99918, or -33 pcm.



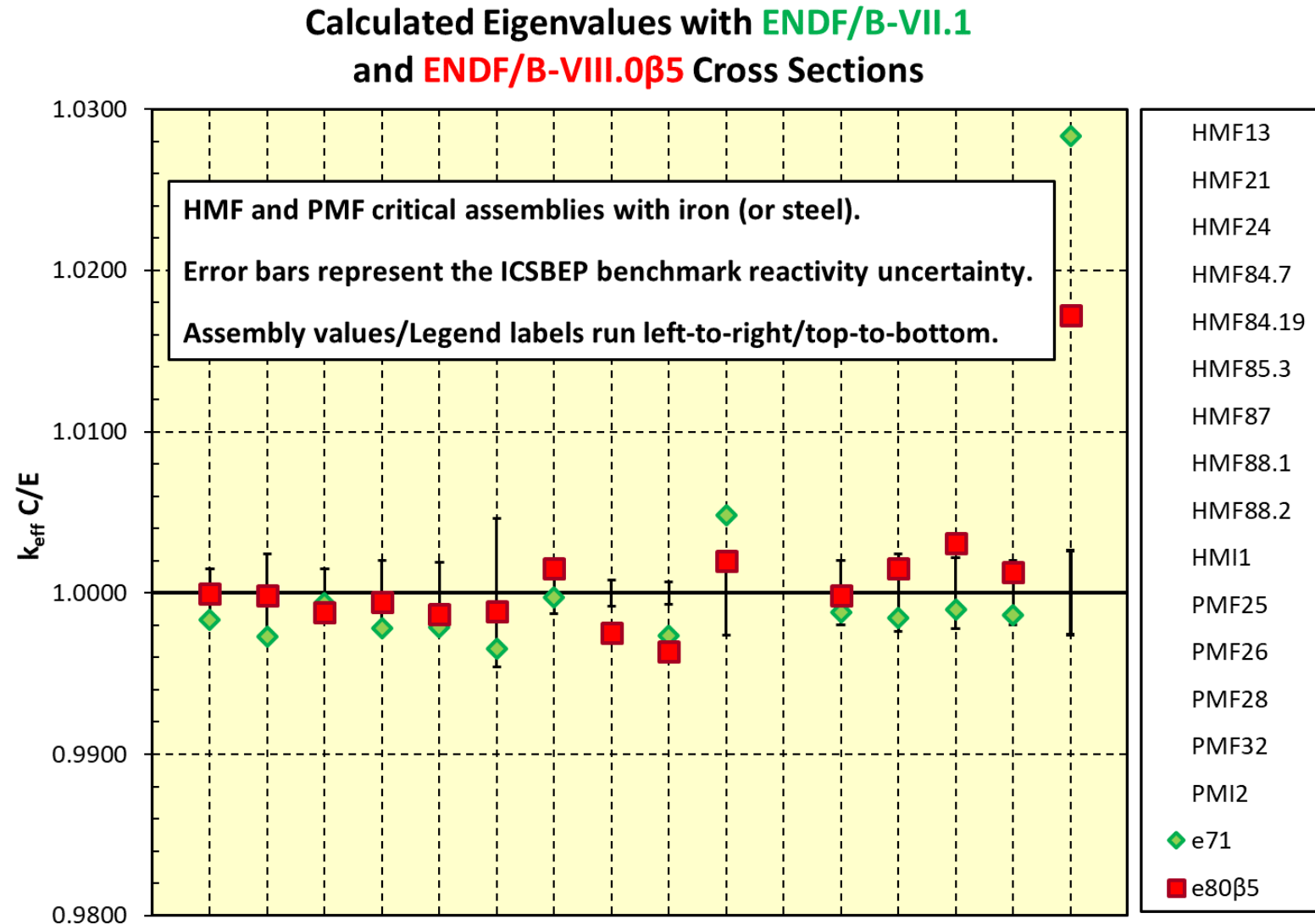
Criticality Data Testing – LCT suite with Fe

- Previous (e71) good results are retained with e80 β 5 cross sections.
- Slight decrease in LCT10 eigenvalues brings these results more in line with the LCT1 base case.
- These results are essentially the same as seen with e80 β 4.



Criticality Data Testing – HMF & PMF suites with Fe

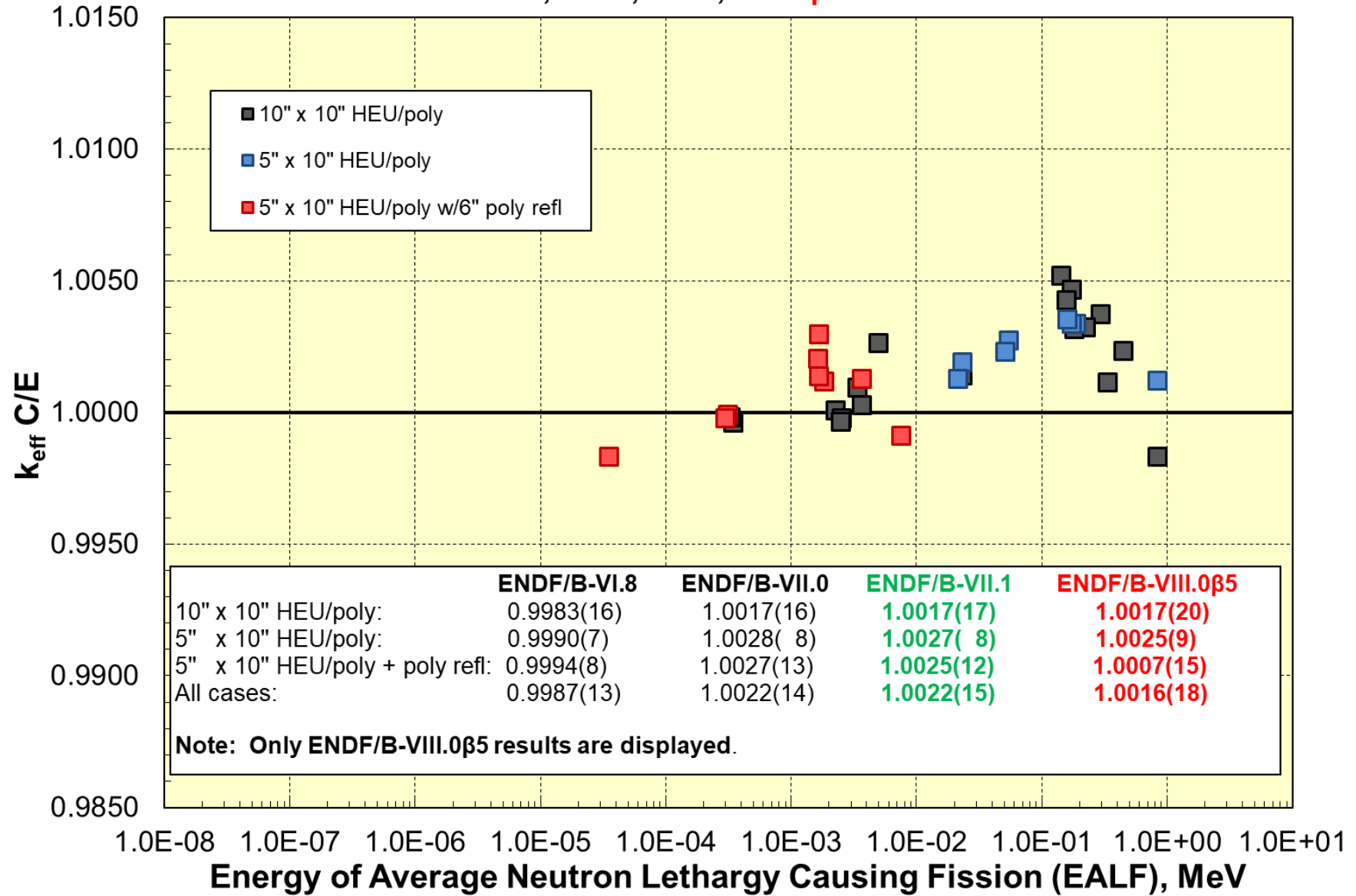
- Previous (e71) results are mostly improved with e80 β 5 cross sections.
- These results are essentially the same as seen with e80 β 4.



HMF7 ...

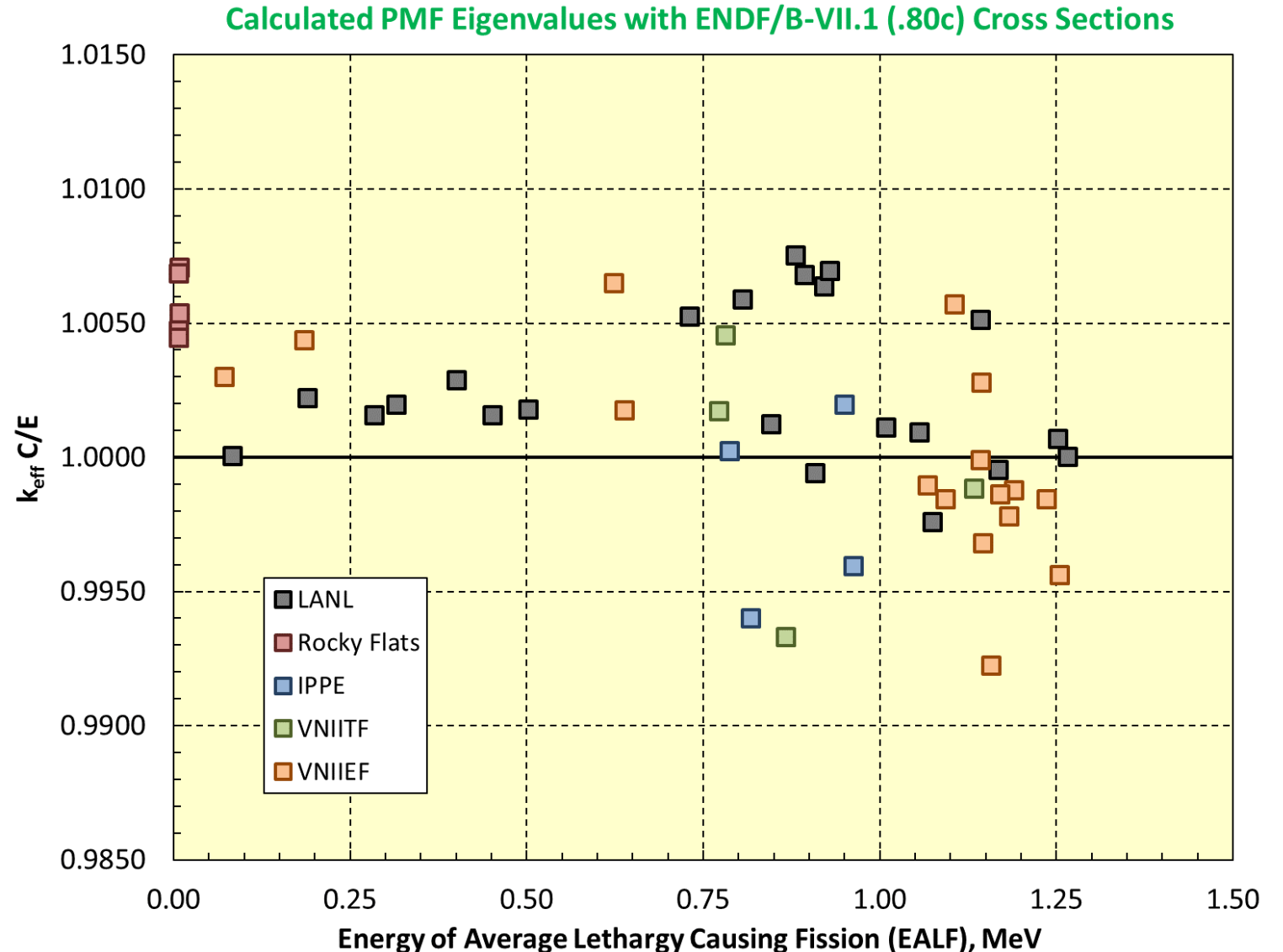
- Average calculated eigenvalues jumped from ENDF/B-VI to ENDF/B-VII.
- Higher values are retained with the latest cross section files.
- Shape versus energy is unchanged throughout.

HEU-MET-FAST-007 Calculated Eigenvalues with ENDF/B-VI.8, -VII.0, -VII.1, -VIII.0β5 Cross Sections



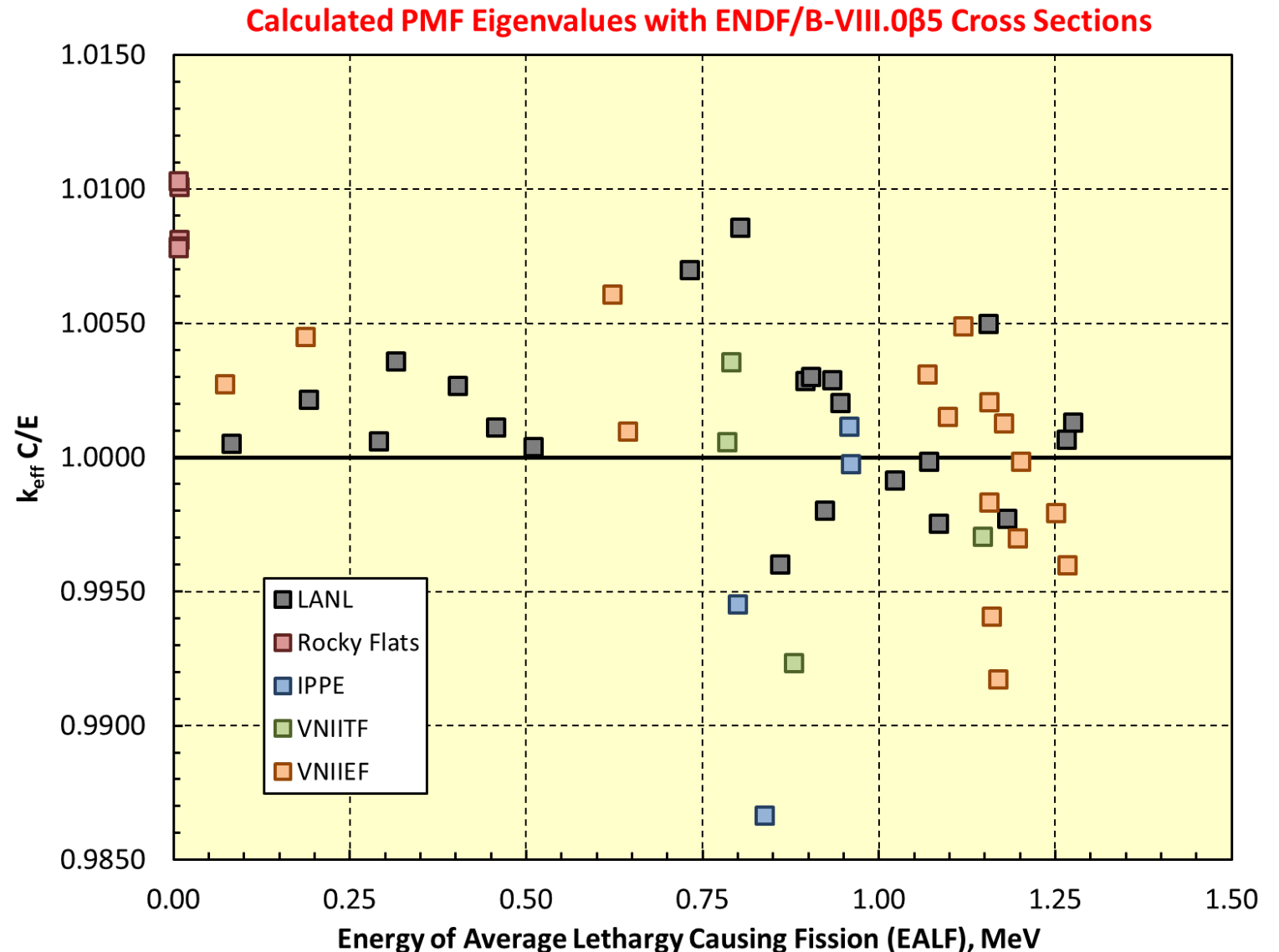
PMF suite ... ENDF/B-VII.1

- Lots of scatter in these data, particularly in the 0.75 MeV to 1.25 MeV interval.
- Results are generally biased high for $E < 0.75$ MeV.



PMF suite ... E80β5

- Lots of scatter in these data, particularly in the 0.75 MeV to 1.25 MeV interval – *arguably worse than ENDF/B-VII.1*
- Results are generally biased high for $E < 0.75$ MeV.
- These results are essentially the same as seen with e80β4.



Summary

- With E80 β 5 we have retained the good ENDF/B-VII.1 eigenvalue performance.
- The long-standing PST eigenvalue bias has been eliminated.
- Benchmarks with significant quantities of iron are calculated more accurately.
- Small trends in calculated eigenvalues over large energy intervals remain (HMF7, PMF suite).
- Results obtained with E80 β 5 are essentially identical to those obtained with E80 β 4 ... including reaction rate results reported previously (but not shown here).