
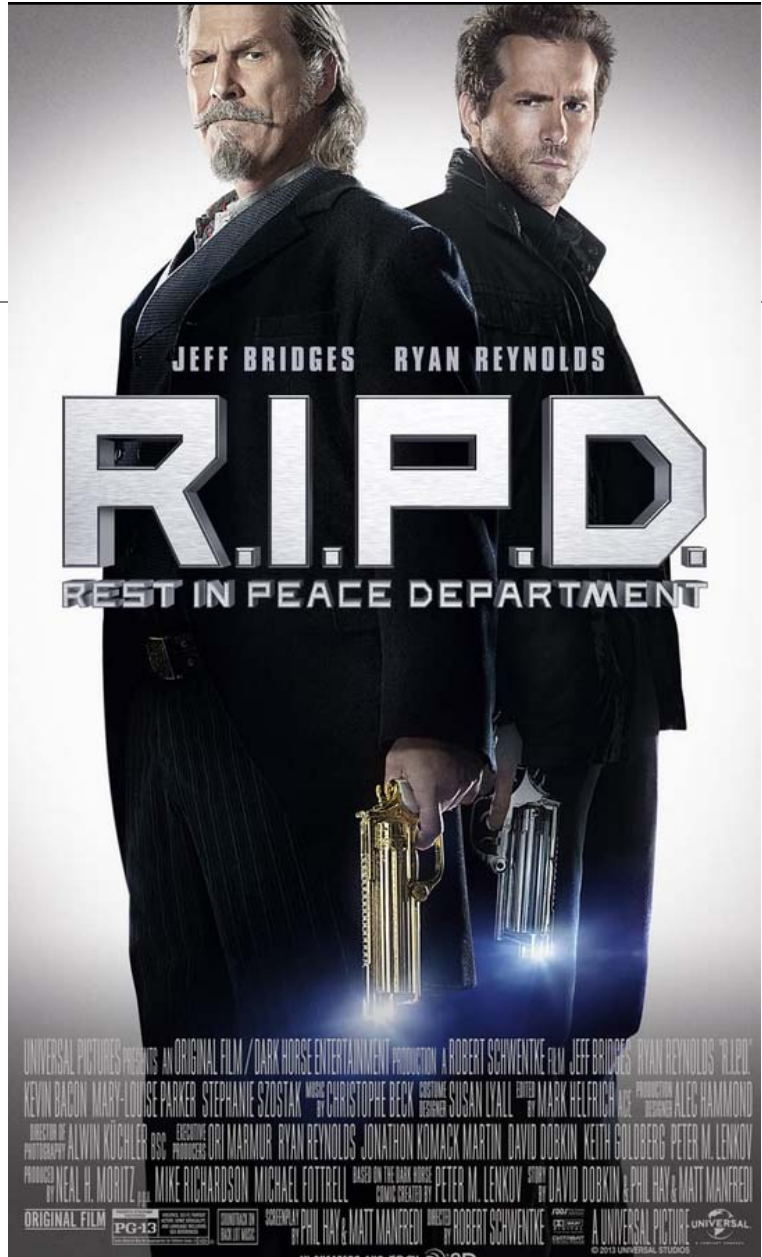


R.I.P.B. , RP3C

ANS 20.2 WRITING GROUP
OUR EXPERIENCE
AND
FEEDBACK

JOHN KUTSCH
THORIUM ENERGY ALLIANCE
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Snippets from 'Intro to RIPB Safety'

The desired outcome objectives of **Risk Informed and Performance Based (RIPB)** methods as formally articulated in the White Paper states that such methods:

"...enable risk insights, engineering analysis and judgment including the principle of defense-in-depth and the incorporation of safety margins, and performance history to be used to:

1. focus attention on the most important activities,
2. establish objective criteria for evaluating performance,
3. develop measurable or calculable parameters for monitoring system and licensee performance,
4. provide flexibility to determine how to meet the established performance criteria in a way that will encourage and reward improved outcomes, and
5. focus on the results as the primary basis for regulatory decision making."

...but provides more flexibility to the licensee as to the means of meeting those outcomes.



Another essential goal is flexibility to licensees regarding means to achieve outcomes.

RIPB strives to make things both Better and Flexible for Design and Licensing - jhk

John Kutsch's Take

The biggest challenge is not so much in the "writing" of RIPB into the philosophy and methods of the ANS20.2 – it is most definitely in the Data Analysis section of ANS 20.2.

We are already trying to make the standard as NON-prescriptive as possible, and part of that is :
“. . . use RIPB as a part of design criteria“ – But It absolutely should not be the **ONLY Method**
(There are other very good tested paths one can take to make a safety case for License)

MY RIPB Problem for MSR is that the only working MSR shut down 50 years ago and we have virtually no new modern information about how components like valves and fitting and pumps work using different fuel salts and different temps, etc. (!)*

We do not even have any reliable modern material properties for the different Fuel salts being considered, with different amounts of fuels dissolved in it. (melt point, freeze, viscosity)

Therefore, how can we JUST be “Risk Informed”
if there is little information to be informed about.

Performance based on actual performance and not postulated.

We need several methods to achieve a safety case.

We can not even do reliable thermal hydraulics (of a verifiable NQA1 quality suitable for licensing) because it is all based on old data and guesses.

* There is a rich trove of Historical info about advanced Reactors & Components, Materials

Other Feed Back from ANS20.2 Members and Others

Prasad has Full comments

Brian Johnson – “TerraPower is executing and integrated effects test. We do know the types of equipment being used, pumps, valves, pipes, and their failure types, leak, rupture, fail to operate. We know what actions we can take to mitigate postulated failures. We have human failure models (if we expect people to take actions). We have relevant data for all sort of electrical and control equipment. We have all the essential information for building a PRA except for a large database sufficient to confidently say the risk is appropriately quantified in an absolute manner.”

Cyril Rodenburg – Terrestrial Energy

“RIPB – I think you’re right about this. Nice in theory, but hard to apply to MSR’s due to lack of failure probabilities. Still, there is a ton of data on high temperature vessels and pumps used in other industries, so there should be enough data for some ballpark PSA. High temp liquid metal reactors and non nuclear applications have a ton of data to support pump and pipe, vessel failure probabilities.”

Amir Afzali – “Southern Company believes that the RIPB-based safety case is critical (I would say dispensable) for a MSR technology-based nuclear system’s owner/operator to achieve its objective of:

- Reducing the overall technology development and licensing cost through providing a systematic and NRC-endorsed approach for establishing its safety case,
- Maximizing commercial viability of the design by allowing innovation and minimizing prescription, and
- Optimizing social acceptability by clearly showing the safety margin of the design.”
- Minimize the operational-life burden for regulatory-driven activities. (Ed Wallace)

**- I would say the problem is not a chicken and egg
- it is putting a cart before the horse**

if we don't make real big,
full size stuff, not scaled,
Nuclear, Radioactive & HOT , in every sense
A lot of it, and not just thimble size crucibles,
and test it to failure over and over,
If we do not do that,
get the resources and permission to do that ,
then we won't be truly Modeling and "Risk Informing"
based on performance, but on applying old historic data &
speculation, . . . we can do better.

This should be a core mission of ANS ;
To get the facilities like VTR needed to make RIPB reality.
Or support ventures like Christian Abilene's project.

Note: INL built 70 test reactors from 1950 to 1980, **we can do this !**



Some discussion questions And answers

Let us hear from all Gen4 , and other , reactor designers – **JHK will start . . .**

Let's take an inventory of what we do know about MSRs. Is there any reason that we should doubt what we think we know?

JHK – I do not doubt what was recorded by the heroic MSRE team, it is simply that 1.) some of the informations has to be verified 2.) even some of the basic MSRE design parameters are not readily available to this day 3.) No one is building an MSRE today, we are using different salts, fuels, vessels, moderators, pumps – or no pumps – or supplemental pumps, HX is new, and the MSRE was never allowed to scale. If we had built MSRs for the last 40 years we would have the data set that would allow vast confidence in Design.

How is Modern Modeling technology, like the Animal Codes, likely to be helpful today in a way that was not possible previously?

How to factor in the transformative changes at the NRC? And regulatory authorities elsewhere in the world?
Are there positive or negative trends?

A Question has been posed about the idea of flexibility for the designer and operator.

The performance-based construct states that the more margin you can show, the more flexibility you can garner. Maybe you begin with a relatively low level of confidence in the margins. The licensing system can be used to parlay any increase in confidence in the magnitude of margin into greater operational flexibility.

Can ANS-20.2 take advantage of this concept? –

Next question is how can RP3C help? We have been running RP3C as a "learning by doing" organization. What has been done so far and what has been learned?

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