

GENERAL ASSESSMENT METHOD

- Generally in critically safety assessment we select a set of operating parameters among which we can impose criticality control (e.g. Fissile mass, volume, density, environment concentration moderation, geometry, etc.)
- Once the appropriate parameters have been identified we can use our modelling tools to derive a “safe envelope” of combinations of these parameters. This allows us Safety Measures which will ensure that the Safe Envelope is not breached.
- In selecting the most appropriate forms of control for a given application some of the important considerations will include,
 - Passive vs Engineered vs Operation-based controls
 - Sufficiency of Defence-in-Depth (e.g. Double Cont”- DBAA)
 - Tolerability of risk (reliability of controls)

Also a Key consideration is how amenable the forms of control are to a demonstration of compliance at the operations level.

BUC SPECIFIC

So what does this mean in the context of BUC?

- In moving from the Fresh Fuel approach to a BUC-based assessment we are usually extending the list of controlled parameters
 - e.g. for a cask: Fresh Fuel => Enrichment + Geometry
BUC => Enrichment + Geometry + Burnup
- But the reality is more complex - in fact we are extending our list of controls to include the detail of spent fuel material compositions – this is not a simple function of BU
- As we have seen in several presentations this week there are a range of parameters affecting the composition (hence reactivity of spent fuel)
 - Initial enrichment, burnup (used to form loading curve ≡ Safe Envelope)
 - Power level, irradiation time, cooling time
 - Axial and radial variation in power level
 - Set of parameters related to spectral hardening effects e.g.: Fuel and moderator temperature, presence of retention poisons (e.g. soluble Boon, integral burnable poisons, control rods) moderator density/void fraction, core environment
- So the reality is that on moving to BUC we are not simply adding one additional controlled parameter (i.e. Burnup) we are really bringing into play a number of additional factors
 - So, we need to consider how these factors can be properly accounted for.
- 2 key considerations in application of BUC
 - Inclusion of all significant parameters in designing Safe Envelope
 - What level of demonstration of operational compliance is required?