

What we know and can say.

- Frequency of events: **4.5 E-6 and is driven by seismic and requires industry completion of SDAs and IDCs**
- Lower temperature limit: **800 °C --- below this value we can say we don't have to worry about:**
 - Hydrides**
 - Nitrogen reactions**
 - Breakaway oxidation**
 - Ruthenium and fuel fine releases to public due to clad failures (ballooning and burst and/or creep rupture)**
 - Intermetallic interactions**
- Pool performance criteria: **1 E-5 --- Based on Palla's write-up we can justify this as a good value - consequences are bad for zirc fire but are still within QHOs**
- Advance notification time: **At least 10 hours is considered acceptable**
- Slow Draindowns: **At one year, there is >120 hours to take action to restore coolant or cooling (Joe is this true at high burnups?)**
- Fast Full Draindowns: **At some time X years , there is at least 10 hours advance notice time for evacuation (Joe says with high burnups this is beyond one year with perfect ventilation and 800 ° C.)**
- Fast Smart Partial Draindowns: **We don't know at what time there will be at least 10 hours advance notice for evacuation (This requires further research to be done after this report. In the report, we could make the case that only small portion of these draindowns will not give you at least 10 hours.**
- Window of vulnerability: **After 5 -7 years with fast full draindown, there is no longer a possibility of zirc fire**
- **After 5 years with fast partial draindown, we do not know how long it will be before you can say that there will no longer be a zirc fire. (Joe says this is probably around 20 years. This requires further research to determine time to no zirc fire or available time to take action including evacuation. However, we could make the case in the report that there is a long period of time > 100 hours in which to take corrective action or**

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evacuate. Also make the case that we believe only a limited number of these draindowns will be at the right point that would lead to a zirc fire or could not be recovered from)

QUESTIONS WE NEED TO ANSWER

For the report:

1. Do we have 10 hours of advance time for fast full draindown at one year or when do we have 10 hours? **Joe's has not done specific calculations but believes this number will be <10 hours with high burn-ups, 800° C, and perfect ventilation.**
2. At what time would there be 10 hours of advance time?
3. With fast full draindown, when do we no longer have a zirc fire? Is 5 years a good bounding number with high burn-ups? **Joe says with perfect ventilation would be 5-7 years. With 2 building volumes or less would be longer than 5-7 years. This is for high burn-ups.**
4. Can we drive seismic frequency down lower than 4.5 E-5?

Following the report:

1. Do we have 10 hours of advance time for fast partial draindown at one year or when do we have 10 hours?
2. With fast partial draindown, when do we no longer have a zirc fire? Is there a bounding number or is it too far out? **Joe says with perfect ventilation the number would be 20 years or more.**
3. With fast partial draindown case at 5 years, how long do we have until you actually have fire and offsite release? This would tell us how much time we have for corrective action or evacuation. Is it > 100 hours? > 500 hours?
4. What is the frequency of partial draindowns that give results for the 10 hours or 5 years criteria which are not bounded by fast full draindowns?
5. What is frequency of partial or full draindowns that would not have ventilation of at least 2 building volumes changes per hour?