No.	Section(s)	Comment
1	Section 4.0, Page 115	The discussion does not state that the PRA is used to identify the licensing basis events (LBEs) and to classify the systems, structures, and components (SSCs), which is the main purpose of the licensing modernization project (LMP) guidance.
2	Section 4.01, Page 115	As stated in the non-light-water-reactor (non-LWR) PRA standard (ASME/ANS RA-S-1.4-2013), the scope of the PRA should include internal events, internal fires, internal floods, seismic events, and other external hazards that are not screened out in accordance with the requirements provided in Section 4.5.11, “Other Hazards Screening Analysis (EXT).”
3	Section 4.01, Page 115	Describe the operating modes of the Oklo design. Specifically, what are the operating modes “outside of full power?”
4	Section 4.02, Page 116	The LMP guidance requires the quantitative assessment of uncertainties so that event sequence families can be properly categorized into AOOs, DBEs, and BDBEs. {[redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
5	Section 4.1, Dynamic PRA Page 116	General Observations concerning the use of dynamic PRA (DPRA): • DPRA has not been used to support any previous risk-informed NRC regulatory decision. The “learning curve” for the NRC staff and peer reviewers of the Oklo DPRA may be steep. • The non-LWR PRA standard is oriented toward conventional event-tree/fault-tree PRA methodology, although many of the high-level requirements and supporting requirements would also apply to DPRA. Has Oklo considered engaging the Joint Committee on Nuclear Risk management (JCNRM) concerning the applicability of the non-LWR PRA standard to DPRA? • The LMP guidance is oriented toward conventional event-tree/fault-tree PRA methodology. Has Oklo considered engaging NEI and developers of the LMP guidance concerning the use of DPRA?

No.	Section(s)	Comment
6	Dynamic PRA Section 4.1, Page 116	DPRA is a powerful tool capable of evaluating dynamic degradation scenarios, however during the design stage, with potentially incomplete design information and immature data, the concern is whether: • A complete solution space could be identified and examined • The stochastic and behavior of the system is well understood and properly assessed • The complexity of hardware, software, human interactions, etc., is significant and deemed necessary to use in the dynamic simulation approaches. The dynamic simulation approach can represent a more realistic event sequence timing, thermal hydraulic success criteria, and operator response, but based on the FSAR information, {[redacted] {(ii)-(iv), (vi), (ix)-(xi)}
7	4.1 and 5.1.5	[redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
8	Section 4.2, Page 118	Six resources are identified that were systematically reviewed to establish a "complete set of events." • Define what is meant by "event." • Are the results of the systematic review documented?
9	Section 4.2.1, Page 118	How is miscalibration and setpoint drift of the reactor trip setpoints considered in the PRA?

No.	Section(s)	Comment
10	Section 4.2.2.4, Page 120	Potential dependencies between the {[redacted] {(i)-(xi)}
11	Section 4.2.3, Pages 120-121	According to INL/EXT-17-42758, "Initiating Event Rates at U.S. Nuclear Power Plants: 1988-2016," (available at https://nrcoe.inl.gov/resultsdb/InitEvent/ under the link "Initiating Event 2016 Summary (including data tables)"), the frequency of BWR loss of heat sink is 4.64E-2/ry and the frequency of PWR loss of heat sink is 2.70E-2/ry. [redacted] {(ii)-(iv), (vi), (ix)-(xi)}
12	Figure 4-4 Page 127	Events which are not considered in Section 5 are driven by the assumed unsuccessful {[redacted] {(ii)-(iv), (vi), (ix)-(xi)}
13	Figure 4-5, Page 128	In Figure 4-5, event sequences {[redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
14	Section 4.3, Decrease of Heat Removal, Page 128	Figure 4-5 shows the fuel temperature as a function of time. Suggest adding the temperature criterion in the figure to demonstrate the margin of acceptance.

15	Section 4.3, Decrease of Heat Removal, Page 129	“protected” vs. “unprotected” a. Clarify these two terms. Specifically, what is protected and how can it be achieved? b. Explain what makes the frequency so low for the unprotected sequence?

No.	Section(s)	Comment
16	PRA Scope	Regarding the completeness with respect to the PRA scope: • Whether internal fires and floods have been considered and modeled (since no discussion in the FSAR was found)? • Based on the available design information, should there be any noticeable risk from external events, human actions, and other operating modes? • It is unclear how the seismic risk is to be assessed (traditional PRA, dynamic PRA, PRA-based SMA)? What are the seismic design response spectra, PGA, and probability of exceedance that the Oklo design is anchored to?
17	PRA Acceptability	Can a DPRA meet the Non-LWR PRA Standard “ASME/ANS RA-S-1.4”? The time dependent PRA modeling may not fit the stationary sequence approach envisioned in the PRA Standard, which was written as a product of the IE frequencies and BE probabilities. If Oklo DPRA cannot meet the Non-LWR PRA Standard, how would Oklo justify its PRA acceptability in support of the DC application?
18	Other Uses of PRA	DPRA, does not provide the traditional risk important measures, would there be sufficient risk information to support other PRA applications during DC and COL stages, i.e., physical security (vital equipment, target sets), Tech Spec, environmental review (costs and benefits of SAMDAs), etc.
19	Plant-specific PRA	With respect to 10 CFR 52.79(d)(1), if a COL application references a DC, then the plant-specific PRA information must use the PRA information for the DC and must be updated to account for site-specific design information and any design changes or departures. Accordingly, are there any expected differences between the Oklo design-specific PRA and plant-specific PRA(s)? If so, what are those? Should there be any impact on the DC licensing basis events, safety-relation of SSCs, as well as defense-in-depth?
20	Treatment of Uncertainty	The LMP process involves identification of risk-significant sources of uncertainty in both the frequency and consequence estimates and recommends following the guidance in NUREG-1855 to address uncertainties. Oklo FSAR does not clearly discuss uncertainty as described in NEI 18-04.

No.	Section(s)	Comment
21	4.0 PRA Page 115	Has Oklo considered or performed deterministic accident dose calculations in place of PRA? {[redacted] {(ii)-(iv), (vi), (ix)-(xi)}
22	Section 5.1, Selection of LBEs Page 132	Clarify how the EBR-II PRA, which was developed in the late 1980s to early 1990s, is representative of a modern state of PRA practice.
23	5.1, Selection of LBEs	For the DBA events the emphasis seems to be on failure of [redacted] {(i)-(xi)}{eci}
24	Section 5.1.2, Event Selection Page 133	In LMP Guidance, page 14 Section 3.2.2, Task 1, “Propose Initial List of LBEs,” it states the following: During design development, it is necessary to select an initial set of LBEs which may not be complete but are necessary to develop the basic elements of the safety design. These events are to be selected deterministically and may be supported by qualitative risk insights based on all relevant and available experience including prior experience from the design and licensing of reactors. The initial selection of events can also be supported by analysis techniques such as FMEAs, HAZOPs, and Master Logic Diagrams. In many cases, the designer may also have an initial assessment regarding which SSCs may be classified as safety-related to meet the safety design objectives for the reactor design. This classification would also be deterministically based and may be supported

No.	Section(s)	Comment
		by qualitative risk insights using the same information utilized for the initial selection of LBEs. The Oklo report Section 5.1.2 describes how Oklo established the events, however, more information may be needed to show that the selected initial set of LBEs is adequate.
25	Section 5.1.4.2, Page 134	It is stated that {[redacted]}{(i)-(xi)}{eci}
26	5.1, Selection of LBEs Page 142	Figure 5-4 shows the event is limited {[redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
27	5.1, Selection of LBEs Page 142	[redacted]}{(i)-(xi)}{eci}
28	5.1, Selection of LBEs Page 143	[redacted]}{(i)-(xi)}{eci}
29	Section 5.1.7.2, Transient Analysis Page 143	{[redacted]

		[redacted]

No.	Section(s)	Comment
		[redacted] {(i)-(xi)}{eci}
30	Section 5.1.7.2, Transient Analysis Page 143	In terms of the core heat-up results for the various events, could Oklo summarize the assumed heat removal pathways and heat sinks and what alternative pathways/heat sinks may exist that would likewise limit the fuel's temperature rise to below the selected success criterion? {[redacted] {(ii)-(iv), (vi), (ix)-(xi)}
31	Table 5-6, Page 144 and 145	The table shows the reactor operating {[redacted] {(i)-(xi)}{eci}
32	Figure 5-7 Page 147	It is unclear why [redacted] {(i)-(xi)}{eci}
33	Figure 5-7 Page 147	In Section 5.1.7, a {[redacted] }{(i)-(xi)}{eci}
34	Section 5.1.7.4	What are the specific fission produce release rates/amounts from the fuel and then from the reactor enclosure that assumed for the dose analysis presented in Section 5.1.7.4?

No.	Section(s)	Comment
35	Section 5.1.7	Where does the design-basis accident analyzed in Section 5.1.7 lie on the F-C target diagram?
36	5.1.8, Safety Functions, Page 151	The report states that {[redacted]}{(iii),(iv), (ix)-(xi)}
37	[redacted]}{(ii)-(iv), (vi), (ix)-(xi)} 5.1.8, Safety Functions, Pages 150 and 151	According to the LMP guidance, all SSCs (active and passive) need to be considered when identifying safety functions and classifying SSCs. The Oklo pilot appears to be limited to consideration of active SSCs. Describe how passive SSCs are considered.
38	Section 5.2, Safety Classification and Performance Criteria for SSCs Pages 150 and 151	Some inherent properties limit the power excursion and shutdown the reactor. {[redacted]}{(i)-(xi)}{eci}
39	Section 5.2, Safety Classification and Performance Criteria for SSCs	If a geometric arrangement (both in and outside the core) is assumed to transfer residual heat to surrounding area or is required to maintain a configuration for another credited safety function such as reactivity control, these structures would likely be Category I.

No.	Section(s)	Comment
	Pages 150 and 151	
40	Section 5.2.2.1 Determination of Required Safety Functions Page 151	How was task 5a of the LMP (“Identify Required Safety Functions”) implemented? It appears that only component level failures were modeled, rather than safety functions on a holistic level.
41	5.2 Safety Classification and Performance Criteria for SSCs Page 150	Could Oklo elaborate on its determination that structures, systems, and components, whether inherent, passive, or active, that are used to prevent or mitigate accidents or maintain the facility in a safe shutdown condition {[redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
42	5.2.2 Determination of Required and Safety-Significant Functions Page 151	[redacted]}{(i)-(xi)}{eci}
43	Section 5.2.2.2, Page 152	This section warrants further elaboration to explain its conclusion. {[redacted] {(i)-(xi)}{eci}

No.	Section(s)	Comment
44	5.3 Evaluation of DiD Adequacy Page 155	Justifying the uncertainties using more deterministic methods was not discussed; this is related to additional defense in depth discussions.
45	Decision Panel, Page 157	The report states that appointing a standalone integrated decision making panel (IDP) is {[redacted]}{(ii)-(iv), (vi), (ix)-(xi)} Based on the gaps discussed in the FSAR, it is unclear whether the guidance in NEI 00-04 is suitable for LMP. The Oklo pilot should identify any other alternatives that were taken to fulfill the gaps. The decisions and results from the peer review were not clearly documented, especially the compensations for the limitations of the DPRA. Peer review meeting minutes would be helpful to the staff in performing its safety review and may need to be made available for audit.
46	Decision Panel, Page 157	[redacted] {(ii)-(iv), (vi), (ix)-(xi)} The LMP guidelines either need to be updated, or Oklo needs to reconsider how they applied them.
47	Control/operators	{[redacted] [redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
48	General	Has Oklo considered other guidance for developing its application based on its low operating power and accident dose consequences (e.g., NUREG-1537 for non-power reactors)?
49	General	Oklo may need to perform a significant amount of upfront analysis to provide the justification that may lead to reduced regulatory requirements/review.
50	General	There are a lot of statements to the effect of "…this requirement or guidance does not apply." In many instances this may be true, but there are design

No.	Section(s)	Comment
		features and accident analysis that is relevant to Oklo and this should be clearly identified and discussed.
51	General	Has Oklo considered developing a facility-specific definition of “safety-related”?
52	General	How will Oklo develop and implement a quality assurance program for construction and operation of its facility?
53	General	What relationship does Oklo see between principal design criteria, safety-related structures, systems, and components, and engineered safety features?
54	General	Passive and inherent features (including configuration of SSCs) that assure that fuel damage doesn’t occur and/or radioactivity isn’t released don’t seem to be captured.
55	General Figure 5-1	I’m not sure why they adjusted the look of the frequency-consequence curve to make the x-axis (dose) linear. I’m not sure that it matters much, but it looks different.
56	FSAR Gaps Section 2.2.2, Page 68	The report states that [redacted] [redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
57	FSAR Gaps Section 2.2.1,	The report states that “when operated within specific operational temperature range, heat pipe performance increases with temperature, automatically maintaining proper power-flow ratios in the event of transients, including failure of

No.	Section(s)	Comment
	Page 66	neighboring heat pipes." An analysis to demonstrate the above statement may need to be provided.
58	FSAR Gaps Section 2.2.2, Page 68	The report states that "The heat transport system complies with Oklo's quality assurance plan to reduce potential leaks and ruptures." Clarify the criteria for the leakage and ruptures and how to meet the criteria. The quality assurance plan can reduce, but not eliminate, potential leaks and ruptures. A failure effects analysis of leaks and ruptures may need to be provided.
59	FSAR Gaps Section 2.2.2, Page 68	The report refers to the term "abnormal loadings". Define
60	FSAR Gaps Section 2.2.4, Page 69	Results of the heat transport analyses to demonstrate the adequate performance of the design in terms of the temperature, flow rate, heat balance of the system may need to be provided. What are the testing requirements to demonstrate the capability of the heat transport system?
61	FSAR Gaps Section 2.2.4.5, Page 70	The report states that "Steady-state heat pipe performance is analyzed using [redacted] [redacted] {(i)-(xi)}{eci}

No.	Section(s)	Comment
62	FSAR Gaps Figure 2-21 Page 76	"main hot leg" and "main cold leg" a. There is no piping analysis in the report. It is not clear whether there is a need to postulate a pipe failure. If not, why not. Otherwise, failure effects analysis for the pipe failures may need to be provided. b. [redacted]}{(ii)-(iv), (vi), (ix)-(xi)}
63	FSAR Gaps Section 2.4.4.2 Page 87	The report states that "the air cooling system functions to remove all decay-heat indefinitely following a reactor trip." a. Is the air cooling system relied on to ensure long term safety (the period beginning 72 hours after a design basis event and lasting the following 4 days) and to address seismic events? If not, a description of how this is met may need to be provided. b. If yes, demonstration that there are sufficient protections for the system against seismic, flooding, and missiles from high wind (tornados and hurricanes) per PDC 2 may need to be provided.
64	FSAR Gaps Section 2.4.4.4.1 Page 88	The report states that [redacted] {(i)-(xi)}{eci} a. An analysis to show the limit of air flow and outside air temperature for the air cooling system to perform its intended function of removing decay heat following a reactor trip may need to be provided. Section 3.2.1.4 states the air cooling flow velocity of 7.30 m/s. Is 7.3 m/s the limit? A description of how the air flow and air temperature is assured may need to be provided. b. The failure effects analysis for the air cooling system may need to be provided.

No.	Section(s)	Comment
65	FSAR Gaps Section 2.8.1 Page 111	The report states that [redacted] [redacted] }{(iii),(iv), (ix)-(xi)}
66	FSAR Gaps Section 2.8.1, Page 111	The report states that "The performance and evaluation of the power conversion system will comply with Oklo quality assurance. Further information for this section will be provided at a later date." a. The performance and evaluation of the system is design information. How can it be in Oklo "quality assurance"? b. It will be provided at a later date. Is it a COL information item?
67	FSAR Gaps Software V&V	The non-LWR PRA Standard, SR "MS-B4" states, "Use an accepted process for verification and validation of computer programs." Since the FSAR does not identify the simulation codes and other software used for Oklo DPRA development, it is unclear whether software V&V has been performed and SR "MS-B4" was met.
68	FSAR Gaps Transportation Risk	The LMP process considers all radionuclide sources, should transportation of reactor core for refueling be assessed and discussed in the FSAR?
69	FSAR Gaps 5.1.7.4 Dose Analysis Page 145	With respect to the accident source term and radiological consequence analysis discussion, there is definitely more detail needed, but some of the detail may be able to be given as reference to supporting reports, calculations or other documents.

No.	Section(s)	Comment
70	FSAR Gaps Section 5.2.4.3, Page 153	The report states that “The Oklo design includes a system that removes appropriate amount of decay heat after reactor shutdown …” and that [redacted] {(i)-(xi)}{eci}
71	FSAR Gaps	Certain topics don’t seem to be addressed (e.g., radwaste system design) – which may or may not be appropriate for the design, but there are regulatory requirements that would need to be addressed, including by exemption if supported and necessary. This also may be a function of the pilot not including operating states other than operation in Chapter 31, Radiation Protection.
72	FSAR Gaps Section 2.1.2, Reactor Core System	The Oklo design is based on the assertion that there are {[redacted]}{(i)-(xi)}{eci}

[redacted]
[redacted]

73	FSAR Gaps Section 2.1.3, [redacted]}{(ii)-(iv), (vi), (ix)-(xi)}	[redacted]

No.	Section(s)	Comment
		[redacted] {(i)-(xi)}{eci}
74	FSAR Gaps Section 5.2.4.1, Seismic Considerations	This section states that seismic evaluation is outside the scope of this pilot. It discusses the understanding of RG 1.29, but has no discussion classification of Oklo SSCs. Seismic design of SSC for SSE is required to be address in the FSAR. The standard for seismic qualification of equipment may need to be discussed.
75	FSAR Gaps SRP Section 10.1.3, “OM Code,”	Section 10.1.3, “OM Code,” provides a proprietary statement regarding pumps, valves, and snubbers in the Oklo design that would be applicable to the scope of the NRC regulations in 10 CFR 50.55a. A description of Oklo nuclear power plant design to support its position in Section 10.1.3 may need to be provided.
76	FSAR Gaps	[redacted]}{(iii),(iv), (ix)-(xi)}
77	FSAR Gaps	At some point there will need to be a description of fuel storage and handling facilities and operations. Also some discussion of potential accidents involving the {[redacted] {(i)-(xi)}{eci}
78	FSAR Gaps	It seems like the consideration of the fuel-steel interaction process could/should be reviewed/discussed a little more thoroughly given the differences in geometry, heat flow direction etc. between Oklo and EBR-II. This may conclude that the Oklo fuel design is less prone to failure by the fuel-steel interaction process.
79	FSAR Gaps Table 2-2 , Page 39	Table 2-2 (page 39) says the {[redacted] [redacted]}{(i)-(xi)}{eci}

[redacted]

[redacted]

No.	Section(s)	Comment
80	FSAR Gaps Section 2.2.1, Page 66	What is the working fluid in the heat pipe (Section 2.2.1, page 66)?
81	FSAR Gaps Section 2.2.4.2 Page 69	What is the pressure in the various parts of the reactor system {[redacted]}{(i)-(xi)}{eci}
82	FSAR Gaps Table 5-5, 5-6 Figure 5-6 Pages 138, 144	Fuel temperatures are provided {[redacted]{(i)-(xi)}. Where in the core do these peak temperatures occur? [redacted]}{(i)-(xi)}{eci}
83	FSAR Gaps Section 2.7.3.2, Page 108	[redacted] {(i)-(xi)}{eci}
84	FSAR Gaps Section 2.7.4, 2.4.2.1 Page 109, 80	[redacted]}{(i)-(xi)}{eci}

No.	Section(s)	Comment
85	FSAR Gaps Table 5-8, Pages 146-147	Is there a specific reference/basis for the element release fractions presented in Table 5-8, pages 146-147?
86	FSAR Gaps Pages 147,148 Reference 20	[redacted] }{(i)-(xi)}{eci}
87	FSAR Gaps Page 245	Additionally, the environmental report didn't seem to include SAMA (severe accident mitigation alternatives), which are required for power reactors under NEPA. We may have to look into the specific requirements.
No.	**Section(s)**	**Comment**
88	General	The Oklo Pilot is for a custom COL application without referencing a certified design. This requires a complete FSAR including detailed safety analysis and evaluation of the design including classification of safety-related and non-safety related SSCs, discussion of the method of LBE selection, and discussion of uncertainties (Ref: LMP Guidance version N), and a complete environmental report with no gaps (this is not possible without selection of a particular site). The Pilot report seems to be limited in its detail related to the LMP guidance.
89	Section 2.1.2.4, Pages 41, 42, 47	Oklo is a completely new and unique reactor plant design. It has no operational experience, and it does not reference a certified design. Hence all design parameters are calculated using analytical tools, which are mentioned from Page 47. There will be uncertainties in V&V results of the tools used. These uncertainties will reflect in uncertainties in the calculated design parameters. For example, if we look at the fast neutron spectrum and the core power distribution in 2.1.2.4.2. How would you include this aspect of the Oklo design, and its impact on the overall safety performance uncertainties of the design?

No.	Section(s)	Comment
90	Section 2.1.2.4.5 Pages 47-51 Analytic Tools	Oklo uses Serpent for reactor physics and core design modeling. This is a commercial code. Who is its developer and what is the extent of its V&V and maturity?
91	Page 53 Thermal Analysis	Paragraph 3 indicates that the heat pipe possesses an effective thermal conductivity on the order of one million W/m-K. Paragraph 5 (Thermal Analysis) states that heat pipes have a very high effective thermal conductivity on the order of ten million to 100 million W/m-K. This is one to ten orders of magnitude higher than what was indicated in paragraph 3. This needs clarification.
92	Page 54 Effective thermal conductivity	The report states "Various studies and calculations using heat pipe thermal conductivity were part of Oklo analyses. Any references for these?
93	2.2.3.1 Material Specification Page 68	"The wick is composed of high porosity metal that provides capillary pressure to help drive the flow of the heat pipe working fluid." What if the wick gets separated from the inner surface of the container? Any long term studies in an irradiated environment to demonstrate the reliability of the wick function in the heat pipe in an irradiated environment?
94		How important is the role of the heat pipes in the operation of Oklo? For example, if you lost all the heat pipes, what impact would this have on i) transfer of core heat to the heat exchangers and the tertiary system? and (ii) removal of heat to the environment during a postulated accident?
95	2.34 Page 77	The heat pipes operate at sub-atmospheric pressure as they transfer heat to the [redacted]}{(ii)-(iv), (vi), (ix)-(xi)}

[redacted]
[redacted]

No.	Section(s)	Comment
96	2.4.2, Reactor Enclosure System, Fig. 2-22 Page 79	[redacted]}{(i)-(xi)}{eci}
97	2.5.2.1.2 Page 92	[redacted] {(i)-(xi)}{eci}