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**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



July 10, 2020

The Honorable Dan Brouillette
Secretary of Energy
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Brouillette:

The Defense Nuclear Facilities Safety Board has completed a review of the implementation of the potential inadequacy of the safety analysis (PISA) process across the Department of Energy defense nuclear complex.

The PISA process is a key element of DOE's overall unreviewed safety question process invoked by Title 10 Code of Federal Regulations 830, *Nuclear Safety Management*, and ensures that a DOE site contractor takes proper action when it becomes aware that its documented safety analysis for a nuclear facility may not be adequate.

The enclosed staff report is provided for your information.

Yours truly,

Bruce Hamilton
Chairman

Enclosure

c: Mr. Joe Olencz

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

May 4, 2020

Complex-Wide Implementation of the Potential Inadequacy of the Safety Analysis Process

Summary. Members of the Defense Nuclear Facilities Safety Board’s (Board) staff performed a review of the Department of Energy’s (DOE) complex-wide implementation of the potential inadequacy of the safety analysis (PISA) process. The PISA process is a key element of DOE’s overall unreviewed safety question (USQ) process invoked by Title 10 Code of Federal Regulations (CFR) Part 830, *Nuclear Safety Management* [1]. The PISA process ensures that a DOE site contractor takes proper action when it becomes aware that its documented safety analysis (DSA) for a nuclear facility may not be adequate. DOE Guide 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements* [2], provides guidance for implementing the PISA process.

The staff team found that due to lack of specific requirements and clear guidance in the DOE directives system, contractors inconsistently implement the PISA process across the complex. Specific requirements and clearer guidance related to timeliness would improve the implementation of the PISA process across the complex and help reduce unknown risk.

Background. 10 CFR 830 establishes requirements for the USQ process that include addressing a PISA. A PISA indicates that a facility’s DSA may not be bounding or may be otherwise inadequate and could arise from: a discrepant as-found condition (e.g., installed equipment not meeting design specifications); an operational event or incident; or new information (e.g., discovery of an error in an existing safety analysis) [2]. Subpart B to 10 CFR 830 requires that if a contractor for a DOE nuclear facility discovers or is made aware of a PISA, it must:

1. Take action to place or maintain the facility in a safe condition,
2. Notify DOE of the situation,
3. Perform a USQ determination and notify DOE of the results, and
4. Submit an evaluation of the safety of the situation (ESS) to DOE prior to removing any operational restrictions.

PISA Process Guidance—Appendix A to Subpart B of 10 CFR 830 invokes DOE Guide 424.1-1B as providing DOE’s expectations for a site’s USQ process. DOE Guide 424.1-1B provides guidance for implementing the PISA process as illustrated in Figure 1 below.

- First, the guide notes that it is appropriate to allow a short period of time (“hours to days but not weeks”) to determine the validity of a concern prior to declaring a PISA. Across the DOE complex, most sites refer to this phase as the “new information process” (some sites refer to it as the “initial confirmatory process”). The guide also

notes that if it is immediately clear that a PISA exists, then the site contractor should immediately declare a PISA.

- Once the contractor declares a PISA, it must place or maintain the facility in a safe condition and notify DOE of the PISA declaration. To achieve a safe condition, the contractor may impose operational restrictions.
- Following the PISA declaration, the contractor must perform a USQ determination to evaluate the adequacy of the safety analysis. This evaluation may result in either a positive or negative USQ. The contractor must notify DOE of the USQ determination. Again, the guide notes that this process should be completed in a short period of time (“hours to days, not weeks”). During the USQ determination, the site may identify additional operational restrictions.
- Following the USQ determination, the contractor must submit an ESS to DOE. The ESS includes the final evaluation of the issue and provides a path forward and planned actions for ensuring safety and resolving the issue. If the USQ determination resulted in a positive USQ, then the contractor should submit the ESS to DOE “as soon as practicable and should not take more than a month.” If the USQ determination was negative, there is no time limit on submitting the ESS.
- If operations need to continue under restricted conditions for longer than a month, then the contractor may submit a justification for continued operation (JCO). Under a JCO, a contractor may request that DOE review and approve a temporary change to the safety basis to allow operations to continue for a limited period of time. Occasionally, sites will submit a joint ESS-JCO document. The guide and DOE Standard 1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents* [3], state that DOE should formally approve ESSs for positive USQs and that DOE must approve JCOs. DOE Standard 1104 states that this review should be completed “in a timely manner.”

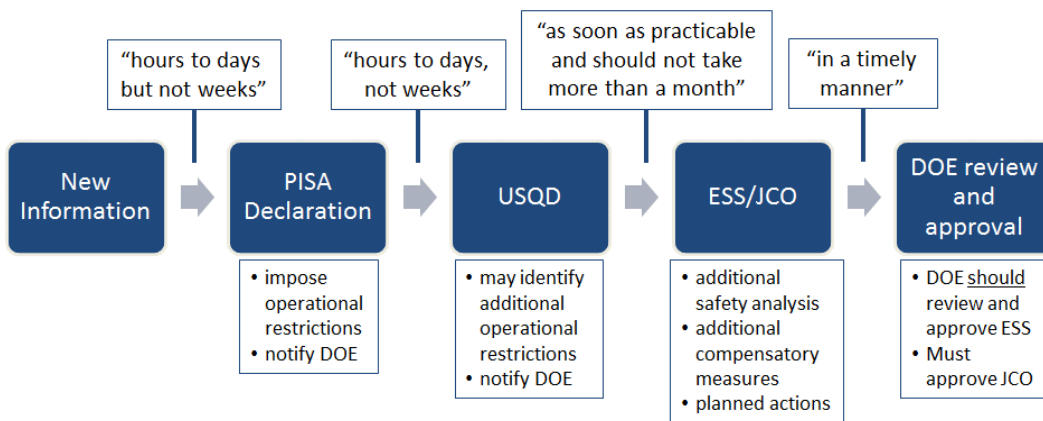


Figure 1. Staff’s illustration of the guidance provided in DOE Guide 424.1-1B and DOE Standard 1104-2016 for meeting PISA process requirements in 10 CFR 830.

In Recommendation 2020-1, *Nuclear Safety Requirements* [4], the Board noted that lack of implementation requirements for the USQ process leads to inconsistent implementation across the complex. The Board recommended that DOE establish requirements for USQs in 10 CFR 830 and/or orders by elevating key guidance. Further, the Board noted that PISA timeliness is important to safety because it impacts the time required for a site to place a facility in a safe condition and ensure that the safety basis is adequate.

Discussion. To understand how different sites across the DOE complex implement the requirements in 10 CFR 830 for the PISA process, the staff team reviewed site USQ procedures, requested available implementation data, and held discussions or received written responses from DOE field offices and site contractors. The staff team identified the following concerns.

Lack of Timely Implementation of the PISA Process Can Lead to Unknown Risk—Due to lack of specific requirements and clear guidance, contractors inconsistently implement the PISA process across the complex. Sites broadly interpret the guidance in DOE Guide 424.1-1B, leading to implementation timelines that do not align with the relative hazard at a site. Further, some sites have used an informal “pre-new-information” phase to further extend the process and time to implement compensatory measures. The PISA process is the sole element of 10 CFR 830 that ensures that a site takes action when it becomes aware that a DSA may not be adequate. Extending the time to declare a PISA and take action to ensure a facility is in a safe configuration can introduce unknown risk. For example, the risk could come from an unanalyzed hazard that requires controls. This hazard would be uncontrolled for the entire time it takes to implement the PISA process and implement compensatory measures.

To further illustrate the inconsistent implementation of the PISA process, the following discussion focuses on the new information process since that determines the time a site contractor takes to formally evaluate the validity of a concern before implementing compensatory measures. Appendix A contains additional data for the time to perform a USQ determination and submit an ESS.

Figure 2¹ shows the complex-wide implementation of the new information to PISA declaration phase. The blue bars (and descriptive text boxes for sites that do not have quantitative thresholds) in Figure 2 show the number of calendar days² a site contractor may take to declare a PISA from identification of new information, based on its DOE-approved site USQ procedure. Some sites have established quantitative thresholds while others echo the language in DOE Guide 424.1-1B.

¹ Sites, contractors, and site procedures identified in Figure 2 are: Hanford CH2M Hill Plateau Remediation Company (CHPRC) [5], Hanford Washington River Protection Solutions (WRPS) [6, 7], Idaho National Laboratory (INL) [8, 9], Los Alamos National Laboratory (LANL) Newport News Nuclear-BWXT (N3B) [10], LANL Triad National Security, LLC (Triad) [11, 12], Lawrence Livermore National Laboratory [13], Nevada National Security Site [14], Oak Ridge National Laboratory (ORNL) Transuranic Waste Processing Center (TWPC) [15], Pantex Plant (Pantex) [16, 17], Sandia National Laboratories (SNL) [18], Savannah River Site (SRS) [19], Waste Isolation Pilot Plant (WIPP) [20], Y-12 National Security Complex (Y-12) [21].

² Some sites establish their timelines in business days. To compare all sites together in Figure 2, the staff team converted business days (BD) to calendar days (CD) as: *if* $BD=0$, $CD=0$; *if* $0 < BD < 5$, $CD=BD+1$; *if* $5 \leq BD < 10$, $CD=BD+2$; *if* $10 \leq BD < 14$, $CD=BD+4$, *if* $BD = 14$, $CD=20$.

Sites that have established quantitative thresholds have interpreted the language in the guide (i.e., “a short period of time” or “hours to days but not weeks”) to mean anywhere from three business days (WIPP) to ten business days including information maturation (i.e., Pantex and Y-12).

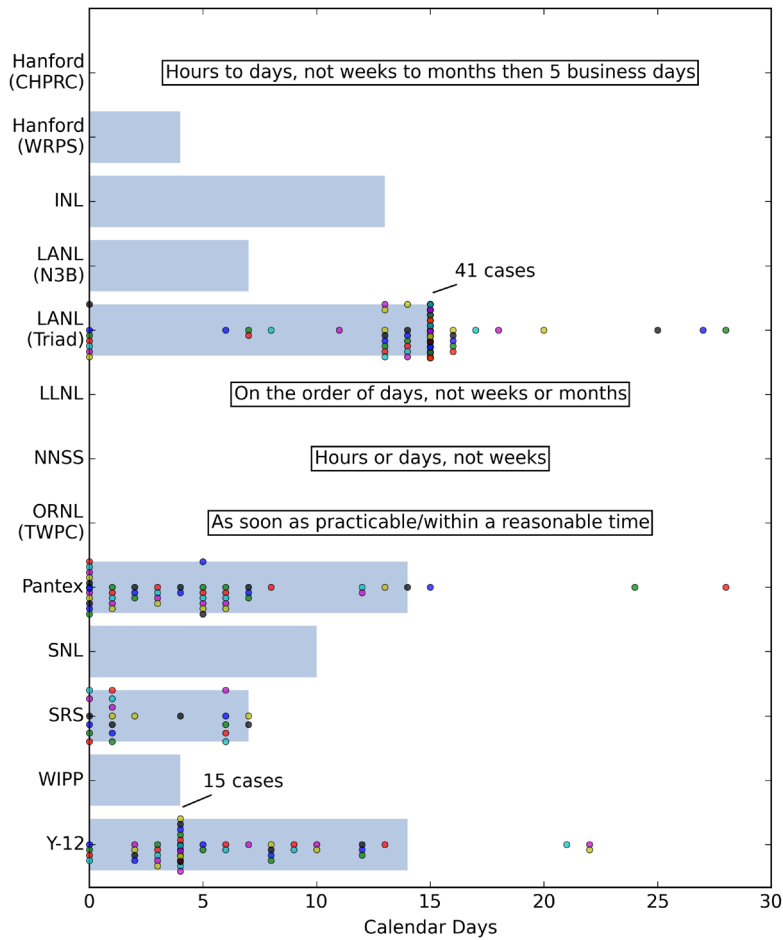


Figure 2. Complex-wide implementation of the new information to PISA declaration phase. Blue bars and text boxes show site-specific requirements contained in the site’s USQ procedures. Multi-colored circles represent implementation data for LANL-Triad, Pantex, SRS, and Y-12 for PISAs processed from 2016–2020. Not shown in the figure are one case for LANL-Triad (44 days), three cases for Pantex (39 days, 44 days, and 60 days), and two for Y-12 (47 days and 109 days).

Often, these site-specific requirements do not align with the relative hazard at the site. For example, the WIPP documented safety analysis does not identify any accidents with unmitigated dose consequences to the public that exceed the DOE Evaluation Guideline, whereas Pantex and LANL analyses include accidents that could result in unmitigated dose consequences to the public that significantly exceed the Evaluation Guideline. WIPP noted that the basis for its timeframes was not safety related, but to lessen the potential impacts to National Transuranic Program shipments and emplacement activities at WIPP. LANL-Triad noted that it believed that

15 calendar days³ was a reasonable timeframe to investigate new information (e.g., if safety basis personnel needed to discuss the issue with operations and program personnel).

The staff team also reviewed data for select sites to evaluate the implementation of the PISA process in accordance with site USQ procedures. The multi-colored circles in Figure 2 represent implementation data for the new information to PISA declaration phase for LANL-Triad, Pantex, SRS, and Y-12 during calendar years 2016–2020.

- From October 3, 2016, to September 19, 2019, LANL-Triad⁴ entered its new information process 80 times (27 cases per year with an average completion time of 13.9 days). LANL-Triad completed most of its new information entries (85 percent) within its site procedure requirement, however, most cases skewed towards the later end of the timeframe (13-15 days) and 12 cases exceeded 15 days, including one case that took 44 days.
- Pantex implements its new information to the PISA declaration phase in two steps: 1) an initial step to determine the maturity of the new information (allowed seven business days per site procedure); and 2) a mature new information to PISA declaration step (allowed three business days per site procedure). From July 10, 2017, to July 10, 2019, Pantex entered the first step of its new information process 98 times. Pantex determined 54 of these cases were sufficiently mature to enter the second phase of its process (27 cases per year with an average completion time for both steps of 7.4 days). Pantex completed most of its new information to PISA cases within its site procedure requirement; however, 6 cases exceeded 10 business days, including cases that took 39 days, 44 days, and 60 days.
- From October 26, 2017, to March 10, 2020, SRS entered its PISA process 22 times (9.3 cases per year). As noted in the SRS USQ procedure [19], SRS tracks timeliness for a PISA determination starting from when the originator of SRS's PISA determination form signs the descriptive portion of the form to when the facility manager signs the form. Figure 2 shows the time taken to complete this process (average completion time of 2.6 days). SRS completed this process within its site procedure requirement, with most cases being skewed to zero or one days. SRS does not have a formal process or track timeliness for evaluating the validity of new information, which has resulted in delays in declaring a PISA. For example, SRS's PISA tracking system identifies that the Savannah River National Laboratory 776-A Complex PISA took zero days to declare. However, as noted in a letter from the DOE Savannah River Operations Office to Savannah River Nuclear Solutions [23], the issue was discovered about nine days before declaring the PISA.

³ In a July 2019 revision [22] to its new information procedures, LANL-Triad reduced its timeline from 15 calendar days to 13 calendar days. The discussion in this report is based on LANL-Triad's response to the staff team's agenda from July 2019.

⁴ On November 1, 2018, Triad National Security, LLC, took over the LANL management and operating contract. Prior to that, LANL was managed and operated by Los Alamos National Security, LLC.

- From July 17, 2017, to June 24, 2019, Y-12 entered its new information process 50 times (25.8 cases per year with an average completion time of 9.0 days). Y-12 implements the new information to PISA declaration process similar to Pantex. Y-12 had 25 cases where it determined the new information was sufficiently mature and skipped to the second step of its process, which is the reason for the grouping around two to four calendar days. In one case, Y-12 took 47 days to declare a PISA, and in another case took 109 days.

In addition to the broad interpretation of the timeliness guidance in DOE Guide 424.1-1B, site contractors often take time to evaluate new information before entering the formal new-information process in their DOE-approved USQ procedure (this is the informal “pre-new-information” phase described above). This practice is contrary to 10 CFR 830 requirements and outside the framework established in DOE Guide 424.1-1B. It further extends the time a facility may be in an unsafe condition and delays the implementation of compensatory measures. For example, on June 11, 2018, members of the Board’s staff discussed concerns with the dose conversion factors for heat source plutonium oxides used in the safety basis for the LANL Plutonium Facility. In the DOE Occurrence Reporting and Processing System (ORPS) report [24] for this event, LANL noted that after safety basis personnel held several meetings with various internal stakeholders, it entered its formal new information process. LANL made this entry on July 18, 2018, 37 days after being made aware of the issue. LANL declared a PISA and implemented operational restrictions on August 15, 2018 (day 65).

Another example the Board’s staff has observed is that Pantex generally only considers information from design agencies mature (i.e., actionable to pause operations and declare a PISA) when the design agency transmits a formal notification. The staff has noted instances where a concern would be known at Pantex; however, Pantex would allow operations to continue until it received the formal design agency notification (e.g., 2017 hose whip scenarios [25]).

PISA Notification Process Lacks Rigor—10 CFR 830 requires a site contractor to notify DOE of the situation upon discovery or being made aware of a PISA. Prior to October 2017, DOE’s ORPS had provided for formal, timely, and comprehensive notification to the site office, DOE headquarters’ line management, and DOE’s independent oversight organizations on the situation arising from a PISA. In October 2017, DOE implemented revised DOE Order 232.2A, *Occurrence Reporting and Processing of Operations Information* [26]. DOE Order 232.2A deleted the requirement to issue occurrence reports for PISAs that had been in the prior revision, DOE Order 232.2 [27].

In its May 10, 2017, letter [28], the Board identified concerns with the revisions in DOE Order 232.2A, including deletion of the requirement for the site contractor to report a PISA declaration in DOE’s ORPS. The Board’s letter noted that the deletion of PISA reporting “may impede line and independent oversight organizations’ awareness of the PISA and ability to effectively oversee the immediate actions taken and the follow-on USQ determination.” Additionally, the staff report forwarded by the Board’s letter noted “Without occurrence reporting of PISAs, DOE will need to establish another mechanism to meet the [PISA] notification requirement in 10 CFR 830.”

To understand how sites are now meeting the 10 CFR 830 requirement to notify DOE following a PISA declaration, the staff team requested each site provide its methodology. Upon PISA declaration, most sites inform the DOE field office facility representative. Some sites reported that they also inform DOE field office management, typically by email or phone call. Some sites also send out PISA notifications as part of a general event notification protocol to a distribution list.

Neither DOE Headquarters nor sites have established a formal mechanism for PISA notification to DOE Headquarters following elimination of the occurrence reporting requirement for PISAs in DOE Order 232.2A. While this lack of PISA notifications to DOE Headquarters is not contrary to 10 CFR 830 requirements, the concerns in the Board's 2017 letter are still valid. The lack of a formal mechanism(s) for PISA notification to DOE Headquarters (and dissemination within DOE Headquarters) will impede DOE line and DOE's independent oversight organizations' awareness of PISAs and ability to effectively oversee the immediate actions taken and the follow-on USQ determinations.

Conclusion. The PISA process is the sole element of 10 CFR 830 that ensures that a DOE site contractor takes action when it becomes aware that its DSA may not be adequate. Due to lack of specific requirements and clear guidance in the DOE directives system, contractors inconsistently implement the PISA process across the DOE complex. Specific requirements and clearer guidance related to timeliness would improve the implementation of the PISA process across the complex and help reduce unknown risk.

Appendix A: Additional Information Regarding Complex-Wide Implementation of the Potential Inadequacy of the Safety Analysis Process

This appendix presents additional information regarding implementation of the potential inadequacy of the safety analysis (PISA) process across the Department of Energy (DOE) defense nuclear complex.

Figure A-1 shows the complex-wide implementation of the PISA declaration to unreviewed safety question (USQ) determination phase. The blue bars (and descriptive text boxes for sites without quantitative thresholds) in Figure A-1 show the number of calendar days a site contractor may take to make a USQ determination following a PISA declaration based on its DOE-approved site USQ procedure.

The multi-colored circles in Figure A-1 represent implementation data for the PISA declaration to USQ determination phase for LANL-Triad, Pantex, SRS, and Y-12 during calendar years 2016–2020.

- From October 3, 2016 to September 19, 2019, LANL-Triad declared 20 PISAs (6.8 PISAs per year with an average USQ determination time of 12.8 days). LANL-Triad completed most of its USQ determinations within its site procedure requirement, however, most cases skewed toward the later end of the timeframe (14–15 days).
- From July 20, 2017, to July 10, 2019, Pantex declared 54 PISAs (27 PISAs per year with an average USQ determination time of 8.1 days). Pantex does not have a quantitative requirement for completing a USQ determination. Pantex completed all USQ determinations within 20 days.
- From October 26, 2017, to March 10, 2020, SRS declared 17 PISAs (7.2 PISAs per year with an average USQ determination time of 5.2 days). SRS completed all of its USQ determinations within its site procedure requirement.
- From July 17, 2017, to June 24, 2019, Y-12 declared 15 PISAs (7.7 PISAs per year with an average USQ determination time of 8.4 days). Y-12 does not have a quantitative requirement for completing a USQ determination. Y-12 completed all USQ determinations within 20 days.

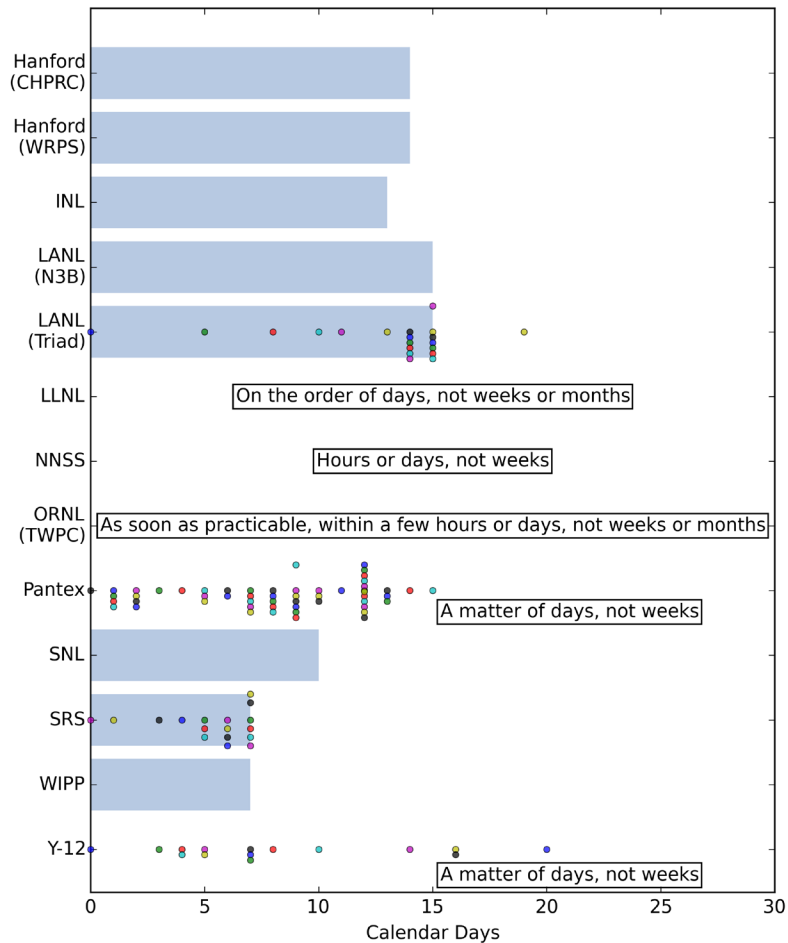


Figure A-1. Complex-wide implementation of the PISA declaration to USQ determination phase. Blue bars and text boxes show site-specific requirements contained in the site USQ procedures. Multi-colored circles represent implementation data for LANL-Triad, Pantex, SRS, and Y-12 for PISAs processed from 2016–2020.

Figure A-2 shows the complex-wide implementation of the USQ to submittal of the evaluation of the safety of the situation (ESS) phase. The blue bars (and descriptive text boxes for sites without quantitative thresholds) in Figure A-2 show the number of calendar days a site contractor may take to submit an ESS following a positive USQ determination based on its DOE-approved site USQ procedure.

The multi-colored circles in Figure A-2 represent implementation data for the USQ determination to ESS submittal phase for LANL-Triad, Pantex, SRS, and Y-12 during calendar years 2016–2020.

- From October 3, 2016, to September 19, 2019, LANL-Triad submitted 19 ESSs (6.4 ESSs per year with an average time to submit of 36 days).
- From July 10, 2017, to July 10, 2019, Pantex submitted 51 ESSs, JCOs, or DSA change packages (25.5 per year with an average time to submit of 41.7 days),

including cases that took 70, 87, 92, 100, 106, 156, 163, 200, and 224 days.

- From October 26, 2017, until March 10, 2020, SRS submitted 16 ESSs (6.7 ESSs per year with an average time to submit of 49 days), including three cases that took 68, 89, and 330 days.
- From July 17, 2017, to June 24, 2019, Y-12 submitted 15 ESSs, JCOs, or DSA change packages (7.7 ESSs per year with an average time to submit of 33 days).

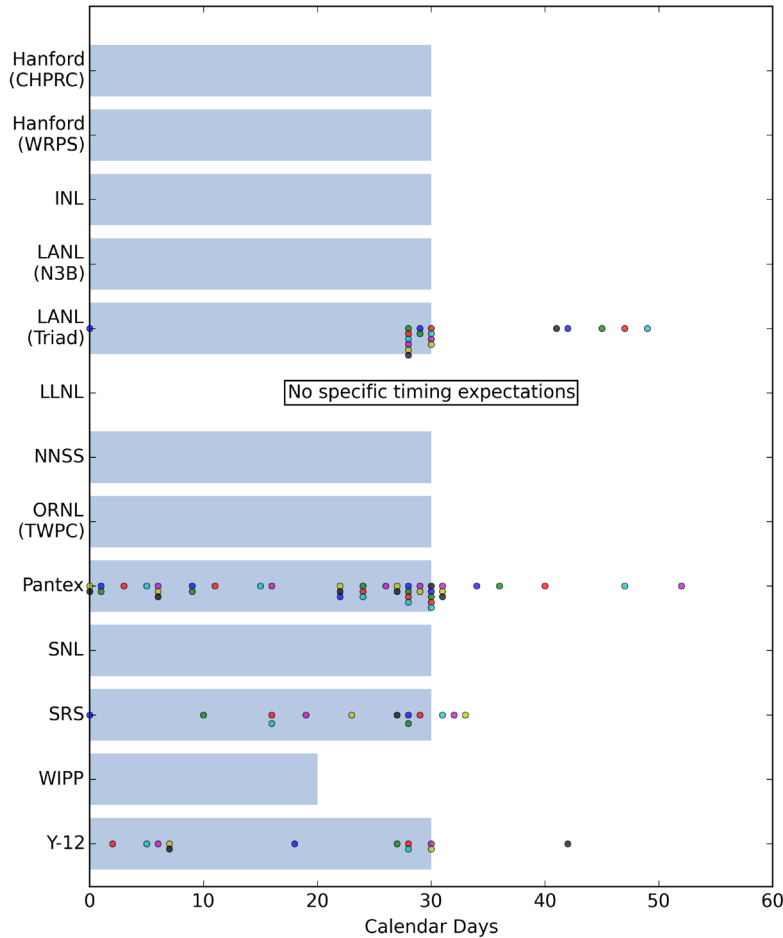


Figure A-2. Complex-wide implementation of the USQ determination to ESS submittal phase. Blue bars and text boxes show site-specific requirements contained in the site USQ procedures. Multi-colored circles represent implementation data for LANL-Triad, Pantex, SRS, and Y-12 for PISAs processed from 2016–2020.

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